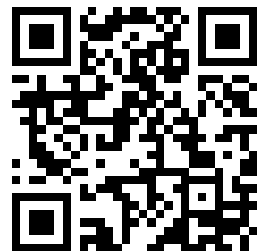


---

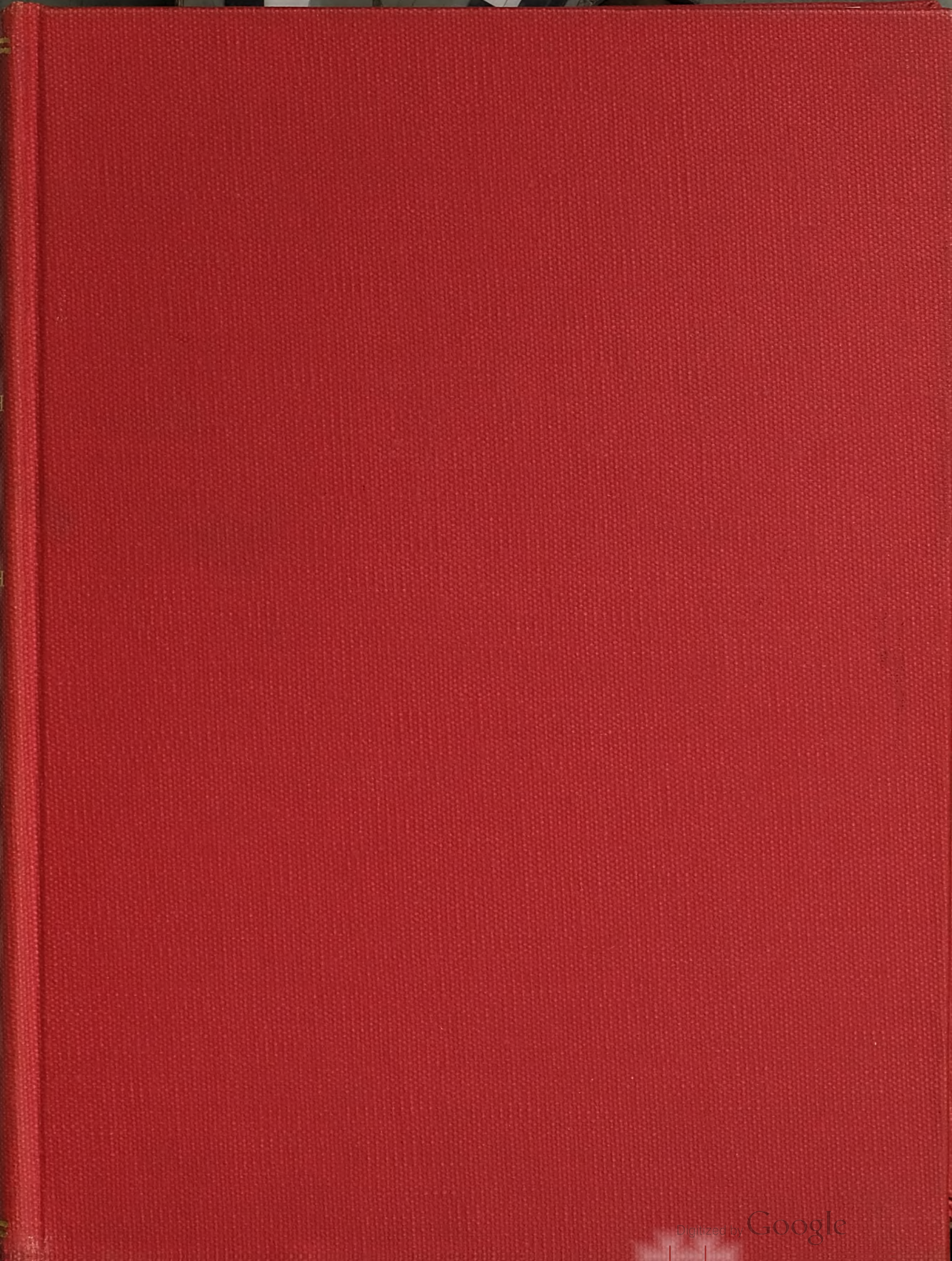
This is a reproduction of a library book that was digitized by Google as part of an ongoing effort to preserve the information in books and make it universally accessible.

Google<sup>TM</sup> books

<https://books.google.com>









UNIVERSITY  
OF FLORIDA  
LIBRARIES













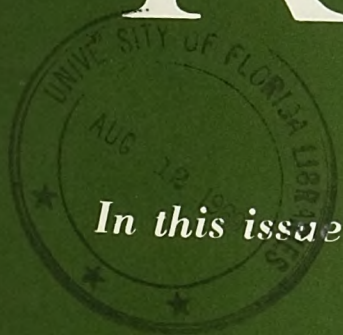






JULY 1969 Volume 84 Number 7

# PUBLIC HEALTH REPORTS



*In this issue*



**Skin Test Survey of Tularemia**

**Methods for Planning Health Services**

**Automated Multiphasic Screening**

**Health Defects of Adolescents**

**Training the Disadvantaged as Aides**

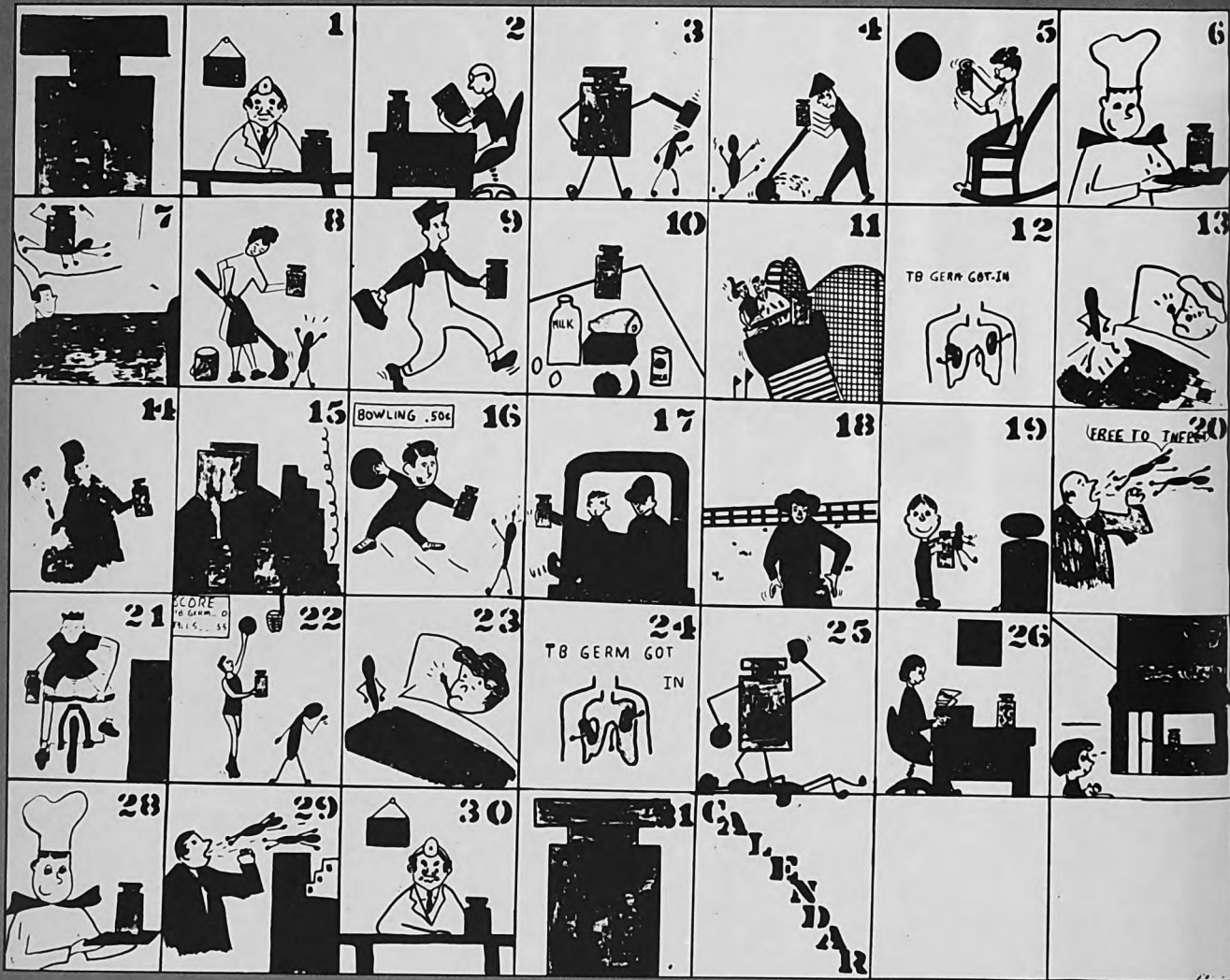
**Survey of Group Practice, 1965**

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

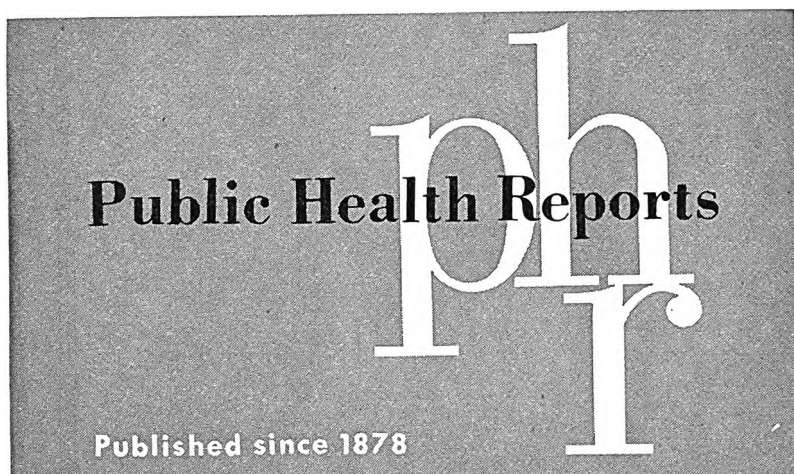
Public Health Service

Digitized by Google

614.0973  
15p







CONTENTS	PAGE
Planning for the distribution of personal health services. A review of methods used..... <i>Vicente Navarro</i>	573
Automated multiphasic health testing..... <i>W. R. Ayers, H.M. Hochberg, and C. A. Caceres</i>	582
Health study of adolescents enrolled in the Neighborhood Youth Corps. Pilot screening program..... <i>Ariel S. Compton</i>	585
A survey of group practice in the United States, 1965..... <i>Bruce E. Balfe</i>	597
An evaluation of immunization status of white children in a Kentucky county..... <i>Dan A. Martin, Sally J. Fleming, Timothy G. Fleming, and Deanna C. Scott</i>	605
A skin test survey of tularemia in a Montana sheep- raising county..... <i>Elizabeth A. Casper and Robert N. Philip</i>	611
Training the disadvantaged as home health aides. Pro- gramming success achieved by the Alameda County (Calif.) Health Department..... <i>Wilbur Hoff</i>	617

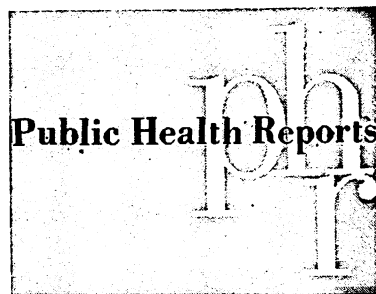
continued

### frontispiece

The original (in color) of this reminder for tuberculosis patients, drawn by case register clerk Lydia Torrez, hangs in a Weld County (Colo.) Health Department clinic in Greeley.



Uses of a recordkeeping system to evaluate rat infestation and to develop control programs.....	625
<i>Elden J. Waller</i>	
Revaccination against smallpox. Take and complications.....	635
<i>Ragnar Rylander</i>	
Variables related to a referendum vote on staffing county health department.....	639
<i>Charles O. Crawford</i>	
Relationship between comprehensive and environmental health planning.....	647
<i>Albert Metts</i>	
Health concerns and attitudes regarding fluoridation.....	655
<i>Harlan Hahn</i>	
Average age at death of scientists in various specialties....	661
<i>S.M. Luria</i>	
Short reports and announcements:	
Grants for staffing narcotics addiction treatment centers.....	581
Contract for health data collection awarded to U.S. Conference of Mayors.....	596
Planning, model cities style.....	604
Two new regional medical libraries.....	610
Migrant health grants awarded.....	615
Education notes.....	616
Community Mental Health Centers Support Branch....	623
Films.....	624
Decline in births slows in 1968.....	638
PHS staff appointments.....	646
Publication announcements.....	654
Federal publications.....	660
Synopses.....	664



## MANAGING DIRECTOR

EDWARD J. McVEIGH

*Assistant Administrator for Information,  
Office of Information, Health Services  
and Mental Health Administration.*



## STAFF

Keith Kost, M.P.H. *Editor*  
Marian K. Priest *Managing Editor*  
Esther C. Gould *Asst. Managing Editor*  
Eugene Fite *Art Editor*

*Address correspondence to Editor, Public Health Reports, Public Health Service, Department of Health, Education, and Welfare, Lee Building, 6935 Wisconsin Avenue, Chevy Chase, Md. 20015.*

*Opinions expressed are the authors' and do not necessarily reflect the views of Public Health Reports or the Public Health Service. Trade names are used for identification only and do not represent an endorsement by the Public Health Service.*

**For subscriptions to *Public Health Reports*, please use the order form on the inside back cover.**

## U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

ROBERT H. FINCH, *Secretary*

### PUBLIC HEALTH SERVICE

### HEALTH SERVICES AND MENTAL HEALTH ADMINISTRATION

JOSEPH T. ENGLISH, *Administrator*

# Planning for the Distribution of Personal Health Services

VICENTE NAVARRO, M.D., D.M.S.A., Dr.P.H.

**P**LANNING for personal health services involves four steps, closely related but conceptually different: the elaboration of the plan, its acceptance by those affected, its implementation, and its evaluation. These four steps, united in a cyclical time sequence, are emphasized differently, depending on the social, political, and economic environment in which the planning takes place. In environments unfamiliar with or unreceptive to the concept of planning, discussions among planners tend to focus on acceptance and implementation, while in environments with a clear commitment to planning, the focus is primarily on the elaboration of the plan and its evaluation. Differences in the importance accorded to each of the four steps motivate much of the lively discussion on the purpose and value of planning (1).

This paper reviews the methods used in the first step, the elaboration of the plan. It deals with planning for adequate and appropriate distribution of health resources. The six methods described are based on (a) morbidity, (b) mortality, (c) utilization, (d) distribution, (e) system performance, and (f) system structure. These methods were developed in a variety of situations that differ in time, location, and country.

## **Methods Based on Morbidity**

Although the level and structure of morbidity are believed to be important determinants of health resources utilization, morbidity data often have been overlooked in the planning of health services.

Two sequential steps are to be followed in planning health services in relation to morbidity: first, to survey the extent and character of so-called "need" for medical care as determined by the morbidity of the chosen population—this morbidity can be either "perceived" by the individual or "defined" by the health professional—second, to translate the need defined by morbidity into health resources.

The use of data from morbidity surveys of general populations for planning purposes has been described elsewhere (2). The conversion of morbidity data into measurement of health resources needed usually has relied on subjective judgment—"expert professional opinion."

Several investigators in different countries—Lee and Jones (3) and Falk and associates (4) in the United States, Kalimo and Sievers (5) in Finland, and Forsyth and Logan (6) and Barr (7) in the United Kingdom, among others—have surveyed morbidity patterns in either general or specific populations, for example, hospital populations, and have calculated needed health resources to cope with the morbidity reported.

Among the most detailed studies is that reported by Popov from the Soviet Union (8). This study included several cities and rural dis-

---

*Dr. Navarro is assistant professor, department of medical care and hospitals, Johns Hopkins University, Baltimore. The study was supported by a research grant (CH-00158-04) from the National Center for Health Services Research and Development, Public Health Service.*

tricts in which "experts" on delivery of medical care considered that demand for personal health services was met; for example, there were no waiting lists for hospitalization. The extent of satisfied demand was indicated by the amount of utilization of the personal health resources. For the survey every member of the community was given a card, on which all use of medical and hospital facilities was recorded for an undetermined period of time.

Following the utilization survey, a health examination survey was carried out on the whole population by medical specialists. The return for this survey, according to a summary of Popov's report by Burkens (9), was high but precise figures were not given. Elderly people in particular were reluctant to cooperate in such studies. The objective of this massive health investigation was to determine the extent of the "iceberg of need" (10), the submerged as well as the visible parts, based on a professional definition of need.

The two Soviet Union surveys of utilization and need were compared and analyzed; "over-use," "underuse," and "misuse" of health resources were estimated. To make this judgment, standards for use of health resources for different types of morbidity were defined by "experts" on the delivery of medical care. They calculated, for instance, the average number of hospital beds required per year per 1,000 population from the formula:

$$K = \frac{A \times R \times P(N - 3\sqrt{N})}{365 \times N \times 100} \quad (1)$$

where

- K* is the average number of hospital beds required per 1,000 persons per year.
- A* is the morbidity (conditions or persons) per 1,000 persons estimated from the utilization and need surveys.
- R* is the percentage of *A* (conditions or persons) judged by the experts to require hospitalization.
- P* is the average length of hospital stay in days.
- N* is the average number of currently available beds in all hospitals in the region under survey per year.

In this mathematical formula two assumptions are made: (a) that the number of beds available equals the number of beds demanded and (b) that the demand for beds, reflecting the

number of hospitalizations, follows a Poisson distribution.

Among the limitations commonly attributed to the method of estimating potential demand for health services, based on measures of need determined by morbidity surveys and defined by expert standards, are the following.

First, the method uses as the basis for planning the highly subjective concept of need instead of the more objective one of demand. The fact that need exists does not imply that it will be expressed as demand for services.

Second, adequate morbidity data are scarce (11a, 12a). In a recent review of morbidity statistics said to be available in 98 countries, Smith commented that "administration and planning of services in most countries lack this kind of basis [morbidity and utilization statistics] to an extremely serious extent" (13a). The present reality is that "health administrators faced at first with the virtual necessity of doing without an adequate numerical basis for their decisions have now come to feel that they can dispense with statistical information. The results of this may be seen in many countries today where the available services bear very little relation to the health needs of the communities they are supposed to serve" (13b). The main reason for this scarcity is the high cost of obtaining reliable morbidity information; however, this cost should be weighed against the benefits obtained from the data. The increasing pressure for morbidity and utilization data is the result of their demonstrated value, not only for planning health services but also for epidemiologic surveillance and for studies of the effects of medical and social intervention (13b).

Third, the method requires a consensus of medical opinion on how best to care for each condition. This consensus is difficult, if not impossible, to reach in some cultural environments (11b, 12b, 14).

#### Methods Based on Mortality

In their calculations of required health resources, some authors have preferred to plan on the basis of mortality data rather than morbidity data (15, 16). The reasons given for this preference are (a) mortality statistics are more reliable than morbidity statistics, (b) mortality data are available annually for most localities,

whereas morbidity data are not similarly obtainable, and (c) when morbidity data are available, translation into health resources required to meet need or demand, or both, requires the difficult process of establishing criteria for services.

The assumption made in all planning based upon mortality data is that there is a constant ratio of health resources utilization to mortality. However, technological, demographic, and socioeconomic changes, among others, condition changes in utilization as well as changes in mortality, and hence the validity of the hospital bed utilization to mortality ratio may be questioned.

### Methods Based on Utilization

In the approach based on utilization, the present use of personal health resources is taken as a reliable indicator of future use, and the objectively quantifiable concept of demand is preferred to the subjective notion of need.

Within this approach, two closely related concepts must be considered. The first is "adequacy of resources"—the availability of sufficient facilities to meet the demand for them. The second is "distribution and coordination of resources"—the geographic and functional relationships between resources and population.

*Methods based on demand.* Among the methods designed to calculate the health resources required to meet future demands, the most frequently used has been extrapolation of the present ratio of health resources to population (conditioned by current demand) to the future projection of the population (17-19). This method takes into account only increased demand due to demographic growth. It assumes that the workloads carried in the past are the best and most objective guide to the requirements of the future (20). Sometimes this demand is corrected to exclude overuse and include underuse, according to expert judgment. The main reservation to this correction, however, is that definitions of overuse or underuse are matters of opinion and depend on the criteria selected; they may reflect value judgment regarding the purposes of the health resource.

Bailey (21) introduced the concept of the "critical number of beds," which has been widely used in England (22). This is the number of

beds that will just keep pace with current demand. It is calculated by noting the change in the length of the waiting list for hospital admissions over a given period of time and adding this change to the satisfied demand, that is, the patients actually admitted to the hospital during the same period.

The method is illustrated by the following hypothetical utilization experience for a general hospital by a population of 10,000 for a 1-year period (20a).

Satisfied demand—actual admissions (1)-----	1,070
Discharges (2)-----	1,047
Total demand for hospitalization—actual admissions plus waiting list (3)-----	1,094
Desired change in waiting list to meet all unsatisfied demand (4)=(3)-(1)-----	+24
Average length of stay in days (5)-----	16.3
Bed patient days (6)=(5)×(2)-----	17,066

The critical number of hospital beds per a population of 10,000 is calculated from the formula:

$$C=D \times S \quad (2)$$

where

- C* is the critical number of hospital beds,
- D* is the daily demand for hospitalization, and
- S* is the average length of stay in the hospital.

An example is:

$$C = D \times S = 1,094 \frac{\text{total annual hospital admissions}}{365 \text{ days}}$$

$$\times 16.3 \text{ days} = 47.2 \text{ beds}$$

To determine the desired occupancy rate (total available hospital beds per total occupied hospital beds), Bailey (21) and McPhee (22) divided hospital admissions into elective and nonelective (emergencies). They observed that elective admissions tend to follow a normal distribution. They defined the occupancy rate by choosing a desired turnover interval, that is, the average number of days a bed is vacant between successive hospital admissions. They considered nonelective admissions to follow a Poisson distribution and accordingly they chose the occupancy rate from prepared tables on "variation of beds required based on a Poisson distribution" (23).

Recently, Drosness and associates (24) published one of the first studies in the United States on variations in daily hospital bed census in an entire municipality (Santa Clara County, Calif.). They concluded that for all hospital



bed units studied (medical, surgical, obstetrical, and pediatric) a normal distribution gives a more accurate description of variation in daily census than does a Poisson.

Planning based on these methods of extrapolating into the future past and present demand can be criticized because it not only maintains the status quo but it also magnifies the size of its defects. Another shortcoming of such methods is that they usually do not take account of shifts in demand related to socioeconomic changes in the population or to scientific and technological developments in medicine.

A further reservation about the use of these methods has been created by Roemer's (25) and Newell's (26) findings that supply appears to promote demand, although Rosenthal (27) and Sigmond (28) questioned these findings. This divergence of opinion seems to indicate that there is as yet no clear understanding of the effect that supply has upon demand for hospital beds.

*Comparative method.* Similar to the methods based on demand, the comparative method takes the ratios of resources to population from an area or region where health resources are considered adequate to satisfy demand and applies these ratios to another population (29). This method suffers from the same defects as the previous one, as well as two others; few areas or regions are truly comparable, and even fewer where the demands, to say nothing of the needs, of the population are satisfied.

*Methods based on analysis of demand.* A more sophisticated approach than simple extrapolation to the future either of present demand or of ratios of resources to population is that based on analysis of present demand (30). This method represents, in fact, market analysis of consumer use. Brooks and associates (31) predict future demand by multiple regression analysis of 117 variables, such as demographic data, mean life expectancy, mean effective buying income, average length of stay in hospital, average occupancy rate, ratio of physicians to population, and others. Monthly figures are collected for each of these variables for 5 years, and then multiple regression techniques are applied to establish the relation between the number of patients in each hospital department and the 15 to 20 most important factors. The number of

patients expected per month in each department can be predicted by estimating the value of the factors for that month. The number of beds needed by departments or by the whole hospital is estimated by multiplying the number of patients per month by the average length of stay and dividing by the average number of days in a month.

Feldstein and German use two methods: (a) extrapolation of present supply and demand and (b) in relation to estimates of population growth, analysis of selected socioeconomic factors that affect utilization (32). By predicting the future level of these factors they derive estimates of future hospital utilization.

Reinke and Baker have developed a new analytic method, the multisort technique, that improves the analysis of the effects of multiple demographic variables on utilization (33). Multiple regression techniques can be used to analyze effects of demographic variables, but interactions may be overlooked entirely or inadequately identified. Analysis of variance has proved useful in handling interactions, but uneven distribution of observations among cells creates orthogonality. The multisort technique is an approximation procedure that simplifies computations while maintaining the analysis of variance approach. The procedure assigns weights to cells for all factors, according to the rules for evaluating main effects; thus, the assessment of interactions is approximate but not tedious (33).

Swedish workers base their estimates of required medical and hospital resources on a demographic analysis of hospital utilization. Because of the polarized age distribution of the country, they are particularly interested in differences in utilization by different age groups (34, 35). Swedish health planners therefore use an index, the "consumption unit," which reflects differences in utilization by different age groups rather than by the number of persons, for estimating future demand.

An example of the Swedish approach is presented in the Göteborg plan (36). The mean annual number of physician visits for each age group is related to the mean annual number of physician visits for all age groups (231.6 visits per 100 persons) to obtain the consumption unit, which measures the proportional consumption

**Annual number of consumption units per person in the city of Göteborg, Sweden, 1967**

Age group	Number of visits per 100 persons ( $V$ ) <sup>1</sup>	Number of consumption units ( $C.U.$ ) <sup>2</sup> per person
0-15-----	125.0	0.540
16-19-----	154.0	.665
20-29-----	196.9	.850
30-39-----	236.0	1.019
40-49-----	274.9	1.187
50-59-----	311.1	1.343
60-66-----	345.2	1.491
67 and over-----	308.9	1.334
Mean number of visits ( $\bar{V}$ )-----	231.6	-----

<sup>1</sup> Data taken from Swedish National Insurance Board Study, 1963 (reference 35).

<sup>2</sup>  $C.U. = \frac{V}{\bar{V}}$ ; for example:

$$C.U. \text{ for age group 0-15 years} = \frac{125.0}{231.6} = 0.540.$$

per age group (right-hand column of the table). The total number of consumption units for the region can be estimated by multiplying the consumption unit for each age group by the number of people in Göteborg in each age group in 1963, 1970, 1975, and 1980.

By taking into account differences in the consumption of medical and hospital services by different age groups, the method gives more detailed estimates of future consumption than those estimates based on the growth of the entire population.

#### Methods Based on Distribution

The concepts of distribution and coordination refer to the geographic and functional relationships between resources and the population served. To study these characteristics two methods have been used: the "facilities-centered" (37-40) and the "population-centered" (41) approaches.

In the facilities-centered approach a group of facilities, usually hospitals, is surveyed to define the population served by these hospitals. This method requires collection of information about hospital discharges, according to patients' places of residence, for each hospital in the community or region being studied. For each hospital in the region, the proportion of its total patients from

each small area (county, township, municipality) can be calculated and the percentage of the area's total population can be estimated. By applying the percentages for each hospital to the total population of each small area and adding them, the population served by each hospital in the region can be estimated. By estimating projected changes in the populations of these areas, one can predict future hospital use and thus future requirements for the whole region. The defect in this method is that it does not consider the influence of selective bias in choosing a hospital by residents in the same small areas.

Schneider (42) in the United States has described a conceptual model for evaluating the locational efficiency of health resources—physicians' offices and hospitals—using a facilities-centered approach in his analysis. The locational efficiency measures the costs of operating a hospital which may be attributed to its location.

The population-centered method is based on the analysis of the current patterns of hospital use by a defined population. The initial step is to define the survey population as the residents of a particular geographic area. The pattern of bed utilization for this specified population is then determined by analyses of bed-use data from hospitals both inside and adjacent to the defined area. This method measures current use of hospital beds rather than demand for beds.

The population-centered method has been used more often for planning hospital beds than for manpower planning. It has the advantage of fostering the idea of community care with the hospitals as an essential but not the only component.

Forsyth and Logan (6) have used both facilities-centered and population-centered methods in Barrow-in-Furness in the north of England. A factor facilitating the use of both approaches was Barrow's peninsular geography and consequent clear regional boundaries.

The study in the Soviet Union mentioned earlier (8, 9), which was based on estimates of morbidity and utilization, also used both of these methods. Engel (43) and Godlund (44) used a modification of both approaches in their plan for regionalization of the health services of Sweden. A similar approach was used more

recently in Göteborg (35). It was decided to centralize the super-specialties, such as neurosurgery, in one teaching hospital which would be the principal medical center of a region. Using hospital utilization experiences of different surveyed populations, as well as experts' opinions, the Swedish planners defined the desired ratio of super-specialty beds to population. By defining the minimal desirable size for the super-specialty units in regional hospitals, they were able to define the optimal size of a region. For example, if the experts defined the minimal size of a plastic surgery unit as 60 beds and the suggested number of beds for plastic surgery patients per 100,000 persons as 5.5, then the minimal size of a region that could generate enough patients to support a plastic surgery unit would be  $(60 \times 100,000) \div 5.5 \approx 1$  million persons.

With respect to geographic distribution of regional centers and their size, the Swedish planners gave primary importance to the accessibility of the regional hospital center for the population living in the region. The constraints chosen as the basis for selection were travel times and costs. No person within a region should have to travel more than 4 hours round trip by car or public transport.

The travel times for alternative locations of regional centers were shown on isochrone maps. (Isochrones are lines which join points situated at similar traveling times from a given center. If travel cost instead of time is used, isochrone maps can also be used as travel cost maps, isodapan maps, since travel cost is proportional to travel time.) The isochrone maps for each alternative location were placed over the population projection maps for each future year. The population living within each travel time zone was then estimated. The location chosen was that which minimized aggregate travel times and costs.

### Methods Based on System Performance

In planning personal health services based on analysis of the performance of the system, the required resources are determined by the amount and type needed to achieve a defined output, measured in terms of performance such as reduction or control of death, disease, disability, or discomfort. Effectiveness is the relationship

between input and output in the system performance method.

Unfortunately, little is known about the effectiveness of different health services systems. Most analytic studies of health services have been concerned with productivity, expressed in terms of efficiency, but not with effectiveness.

The paucity of effectiveness studies is due to present limitations in knowledge of methods to measure the different variables in the output as well as in the input of the system and their interrelationships. Except in a few instances, relationships between the system and its performance are not known; even less is known about methods of quantifying them. For example, there is no evidence that providing  $X$  units of prenatal care will save  $Y$  children's lives.

The absence of objective measurement of the relationship between systems and performance explains the use of subjective measurements, such as the opinions of experts or the experiences of other areas or countries, as described in the earlier sections dealing with planning based on morbidity and mortality. Actually, subjective measurements may be regarded as variants of the system performance method. (The increasing use of panels of experts to develop quantitative estimates of phenomena in social services has been studied by the RAND Corporation (45).)

An example of the panel-of-experts approach is the method used by the Centro de Estudios de Desarrollo (CENDES) and the Pan American Health Organization (PAHO) in health planning (46). In this method the main goal is to decrease mortality by disease categories, subject to the constraint of cost. Although it would be possible to take morbidity into account also, only mortality is considered owing to the lack of data on morbidity. The first step is to establish a priority rating for each cause of death by disease category based on the incidence of death, that is, the proportion of deaths due to each disease category to total deaths. The relative importance of the disease category is measured by an arbitrary score based on age at death and the degree to which premature deaths caused by this disease could be prevented. This preventability is defined either by experts' opinions or epidemiologic studies.

For nonreducible morbidity and related non-reducible mortality, the CENDES and PAHO method defines two alternatives: (a) in the so-called minimum alternative, the future resources required are calculated by extrapolation of current demand determined by nonreducible diseases and (b) in the so-called maximum alternative, the future resources required are defined by experts' opinions of what resources should be provided to care for the present and prospective demand, regardless of cost. For reducible morbidity and mortality, the resources needed are divided into preventive and curative resources. The number of preventive resources required is defined by experts' opinions of standards of prevention needed, according to the minimum alternative, to keep morbidity and thus mortality at the current ratios, or, according to the maximum alternative, to reduce morbidity and mortality as much as possible, regardless of the cost.

The number of curative resources required is based in both alternatives on the ratio of utilization to mortality, that is, "a correlation between the mortality rate for each reducible disease and the hospital and consultation rates for the same disease" (46a).

In the United States, the Indian Health Service of the Public Health Service has developed a planning method that defines its objectives as quantifiable reduction of morbidity and mortality (47). The determination of health problem priorities is based on a Health Problem Index, which takes into account morbidity, mortality, and utilization for each category of disease. The resources required are estimated by the plan of action chosen, with choices based on a cost-benefit analysis of the different alternatives.

The difficulties in applying similar approaches in open health services systems, in contrast to the closed system of the Indian Health Service, have been discussed by Kissick (48). Several other studies have used a comparable approach for certain categories of diseases (49, 50).

#### Methods Based on System Structure

System structure methods are based on the knowledge of the internal relations among the system's parts, and therefore they require knowledge not only of the system's static

aspects—the counting of the system's parts and the measuring of their productivity as the number of services per part—but also of its dynamic aspects. They are based on the knowledge and understanding of the referral and transferral system, which provides the dynamic relationship among the system's parts. By considering the dynamic aspects and knowing the population defined according to the desired demographic or epidemiologic interest, or both, one can then speak of the probability (transitional probability) that a person will be in a particular flow from one part of the system to another.

Navarro and Parker (51) have described a planning model based on these concepts. The model, based on the Markovian process (52, 53), is used to predict resource requirements, to calculate change in these requirements in simulated situations, and to estimate the best alternative for reaching a desired goal in the presence of a defined constraint. In "prediction" and "simulation" the required resources are obtained from the multiplication of the vector representing the utilization of health services by the transitional probability matrices representing the dynamics of the system. In the last application or "goal seeking" the problem solved is to minimize the "change" or "cost" subject to reach the desired goal. This minimizing of change or cost is the objective function in a mathematical quadratic program (54).

Williams and associates (55) have used a Monte Carlo technique to simulate present and future situations in a hospital outpatient clinic to improve its efficiency.

The advantage of the mathematical models in planning is that they allow greater clarity and precision than purely intuitive methods. Further, the use of probability models is essential to describe patterns of happenings that could occur with their relative chances of occurrence (56). This allows maximum flexibility to the planner to face the continuously changing health services system. The validity of these models, of course, depends on the validity of their implicit assumptions.

#### REFERENCES

- (1) Myrdal, G.: *Beyond the welfare state*. Yale University Press, New Haven, Conn., 1960.
- (2) Logan, R. F. L.: *Assessment of sickness and*



- health in the community: needs and methods. *Med Care* 2: 173, pt. 2; 218, pt. 3 (1964).
- (3) Lee, R., and Jones, J.: The fundamentals of good medical care. The University of Chicago Press, Chicago, 1962.
  - (4) Falk, I. S., et al.: The development of standards for the audit and planning of medical care: I. Concepts, research design and the content of primary physician's care. *Med Care* 6: 101 (1968).
  - (5) Kalimo, E., and Sievers, K.: The need for medical care: Estimation on the basis of interview data. *Med Care* 6: 1 (1968).
  - (6) Forsyth, G., and Logan, R. F. L.: The demand for medical care. Nuffield Provincial Hospitals Trust Publication. Oxford University Press, New York, 1960.
  - (7) Barr, A.: The extent of hospital sickness. *Brit J Prev Soc Med* 12: 61 (1958).
  - (8) Popov, G. A.: Questions of theory and methodology of health services planning [in Russian]. Ministry of Health of the Soviet Union, Moscow, 1967.
  - (9) Burkens, T. E.: The estimation of hospital bed requirements. *World Hospitals* 2: 110 (1966).
  - (10) Last, J.: The iceberg—completing the clinical picture in general practice. *Lancet* No. 7297: 28 (1963).
  - (11) Baker, T. D.: Dynamics of health manpower planning. *Med Care* 4: (a) 205; (b) 208 (1966).
  - (12) Klarman, H. E.: Some technical problems in area-wide planning for hospital care. *J Chronic Dis* 17: (a) 735; (b) 738 (1964).
  - (13) Smith, A.: Morbidity statistics. A report on current practice in member countries of the World Health Organization. Report of the 11th meeting of the Expert Committee on Health Statistics. Report No. H.S./W.P. 60.1. World Health Organization, Geneva, 1967, (a) p. 28; (b) p. 26.
  - (14) World Health Organization: Estimation of hospital-bed requirements. Report on a symposium convened by the Regional Office for Europe of the World Health Organization. Report EURO-295. Copenhagen, 1966, p. 8.
  - (15) Elliot, E. B., et al.: Hospital resources and needs. The W. K. Kellogg Foundation, New York, 1946.
  - (16) Commission on Hospital Care: Hospital care in the United States. The Commonwealth Fund, New York, 1947.
  - (17) Bane, F.: Physicians for a growing America. Report of the Surgeon General's Consultant Group on Medical Education. PHS Publication No. 709. U.S. Government Printing Office, Washington, D.C., 1959.
  - (18) National League for Nursing: Nurses for a growing nation. New York, 1957.
  - (19) U.S. President's Commission on Health Needs of the Nation: Building America's health. U.S. Government Printing Office, Washington, D.C., 1953.
  - (20) Navarro, V.: Planning in the hospital services. Diploma in medical services administration thesis. University of Edinburgh, 1965, (a) p. 15.
  - (21) Bailey, N. T. J.: Statistics in hospital planning and design. *Appl Stat* 5: 146 (1956).
  - (22) McPhee, J.: Application of statistics to hospital planning and management. Department of Social Medicine, University of Edinburgh, 1965. Processed.
  - (23) Molina, E.: Poisson's exponential binomial limit. D. Van Nostrand Co., New York, 1942.
  - (24) Drossness, D. L., et al.: Uses of daily census data in determining efficiency of units. (Parts I and II.) *Hospitals* 41: 45, 65 (1967).
  - (25) Roemer, M. I.: Bed supply and hospital utilization: A national experiment. *Hospitals* 35: 36 (1961).
  - (26) Newell, D. J.: Problems of estimating the demand for hospital beds. *J Chronic Dis* 17: 735 (1964).
  - (27) Rosenthal, G. D.: The demand for general hospital facilities. American Hospital Association Monograph 14. Chicago, 1964.
  - (28) Sigmond, R. M.: Does supply of beds control costs? *Mod Hosp* 93: 6 (1959).
  - (29) Ewing, O. R.: The nation's health: A ten year program. Federal Security Administration, Washington, D.C., 1948.
  - (30) Feldstein, M. S.: An aggregate planning model of the health care sector. *Med Care* 5: 369 (1967).
  - (31) Brooks, G. H., et al.: A new development in predicting hospital bed needs. *Int Nurs Rev* 11: 33 (1964).
  - (32) Feldstein, P. J., and German, J. J.: Predicting hospital utilization: An evaluation of three approaches. *Inquiry* 2: 13 (1965).
  - (33) Reinke, W. A., and Baker, T. D.: Measuring effects of demographic variables on health services utilization. *Health Serv Res* 2: 61 (1967).
  - (34) Engel, A., et al.: Regionsjukvarden. Rikspan för samarbete inom specialiserad sjukhusvard av särskilt tillkallad ukredningsman. Stateus Offentliga Utredningar, Stockholm, 1958.
  - (35) Höglund, T., et al.: Sjukvardsplan för Göteborg. AB Svenska Telegrambyran GBG/Typografa, Göteborg, 1966.
  - (36) Navarro, V.: Methodology in regionalization and health planning. A case study: Sweden. Department of Medical Care and Hospitals, Johns Hopkins University School of Hygiene and Public Health, Baltimore, 1967. Processed.
  - (37) Llewelyn-Davis, R., et al.: Studies in the function and design of hospitals. The report of an investigation by the Nuffield Provincial Hospitals Trust and The University of Bristol. Oxford University Press, New York, 1955.
  - (38) Barr, A., and Davies, J. O. F.: The population served by a hospital group. *Lancet* No. 7005: 1104 (1957).
  - (39) McKeown, T., et al.: A balanced teaching hospital. Oxford University Press, London, 1965.

- (40) Bridgman, R. F.: An international study on hospital utilization. World Health Organization, Geneva. 1967. Processed.
- (41) Ferguson, T., and McPhail, A. N.: Hospital and community. Oxford University Press, New York, 1954.
- (42) Schneider, J. B.: Measuring the locational efficiency of the urban hospital. Regional Science Research Institute, Philadelphia, 1967.
- (43) Engel, A.: The Swedish regionalized hospital system. In *The Hospital Services of the Western European Conference*. King Edward Hospital Fund, London, 1962.
- (44) Godlund, S.: Population, regional hospitals, transport facilities and regions. Department of Geography, The Royal University of Lund, Lund, Sweden, 1961.
- (45) Brown, B., and Helmer, O.: Improving the reliability of estimates obtained from a consensus of experts. RAND Corporation, Santa Monica, Calif., 1964.
- (46) Ahumada, J., et al.: Health planning: Problems of concept and method. Pan American Health Organization Publication No. 111. Washington, D.C., 1965; (a) p. 63.
- (47) U.S. Public Health Service: Program packaging. Division of Indian Health, Bureau of Medical Services, Washington, D.C., 1966.
- (48) Kissick, W. L.: Planning, programming, and budgeting in health. *Med Care* 5:201 (1967).
- (49) Klarman, H.: Present status of cost-benefit analysis in the health field. *Amer J Public Health* 57:1949 (1967).
- (50) U.S. Public Health Service: Disease control programs. Motor vehicle injury prevention program. Office of the Assistant Secretary for Program Coordination, Washington, D.C., 1966.
- (51) Navarro, V., and Parker, R.: A mathematical model for health planning: Prediction, simulation and goal seeking. Paper presented at the fifth scientific meeting of the International Epidemiological Association, Primosten, Yugoslavia, 1968.
- (52) Bartholomew, D. T.: Stochastic models for social processes. John Wiley & Sons, Inc., London, 1967.
- (53) Loeve, M. M.: Probability theory. Van Nostrand, Princeton, N.J., 1963.
- (54) Navarro, V.: Systems approach to health planning. Paper presented at the Social Systems Dynamics Session of the 21st annual conference on Engineering in Medicine and Biology, Houston, Tex., 1968.
- (55) Williams, T. W., et al.: Simulation modeling of a teaching hospital outpatient clinic. *Hospitals* 41:71 (1967).
- (56) Bailey, N. T. J.: The mathematical approach to biology and medicine. John Wiley & Sons, Inc., London, 1967.

## Grants for Staffing Narcotics Addiction Treatment Centers

Staffing grants are now available to non-profit agencies for the operation of narcotic addict treatment and rehabilitation facilities. The National Institute of Mental Health, which will administer the grant program, has issued preliminary guidelines to assist eligible community agencies in developing plans for treatment programs.

Grants are available to community agencies for an initial period for salaries of personnel to staff the new rehabilitation facilities. Funding covers up to 75 percent of the professional and staffing costs to operate a new facility or a new program housed in existing facilities for the first 15 months. Thereafter, maximum Federal support is 60 percent for the second year, 45 percent for the third, and 30 percent for the fourth.

The program was authorized by Congress

under the amendments to the Community Mental Health Centers Act which provide \$4 million during fiscal year 1969 for the construction and staffing of specialized facilities for addicts, and for developing training programs for such treatment. Although current funds have been earmarked only for staffing grants, funds for the construction of new facilities will also be available after July 1, 1969.

The program will be administered by the Center for Studies of Narcotic and Drug Abuse in the Division of Narcotic Addiction and Drug Abuse of the National Institute of Mental Health. Applications for funds can be made by public or other nonprofit organizations through the associate regional health directors for mental health in the Regional Offices of the Department of Health, Education, and Welfare.

## AUTOMATED MULTIPHASIC HEALTH TESTING

W. R. Ayers, M.D., H. M. Hochberg, M.D., and C. A. Caceres, M.D.

ADVANCES in automation and instrumentation have brought medicine and allied disciplines to the brink of a new era in health care. It is now feasible to screen total populations or selected subgroups for asymptomatic disease at reasonable cost and with minimal use of physician time.

Medical personnel and facilities will be progressively incapable of delivering health services if the population born after World War II in the United States is allowed to enter middle age with undetected and unaltered disease. Because of this population boom the portion of the population aged 25 to 45, for example, will increase by 69 percent by 1990 (1).

Chronic illness costs our economy an estimated \$57.8 million annually. Included in this amount are direct costs of treatment and care and the loss of present and potential income (2).

Total health care implies a continuum from prevention to early detection of a disease through the stages of clinical disease, rehabilitation, and demise. Clearly, prevention and early detection are the first—and only the first—steps toward solving this situation.

We define the word "screening" very explicitly. It is the presumptive identification of previously unrecognized disease or defect, by the application of tests, examinations, or other procedures which can be applied rapidly. This

is the definition of the Commission on Chronic Illness Conference (3).

The salient points of this definition are presumptive, unrecognized, and rapid. For most investigators, screening implies only the differentiation of normal from abnormal, hence the emphasis on the word presumptive; we have progressed little if we redetect previously known disease, hence unrecognized is stressed. To be sure, there is a place for surveillance of subjects with known disease for a status check or a followup, but none of these is screening. The special feature of modern screening clinics is rapidity, which reduces both the costs and the loss of time for patients and personnel alike.

Traditionally, disease detection proceeds through a progressive system of procedures and tests that enable the physician to arrive at a definitive diagnosis. A classic example of such a uniphase series of tests can be drawn from pulmonary tuberculosis detection; "presumptively" afflicted persons are identified by mass chest X-ray units. Positive skin tests for tuberculosis delineate some of these persons as "probably" tuberculous, and obtaining a positive culture for tuberculosis "definitely" diagnoses the disease. Note that mass X-ray is the screening procedure in this example.

Those involved in health testing have long known that health-service consumers, like other consumers, prefer one-stop service. So several tests are performed at a single visit, but each series of tests from presumptive to definitive is unidirectional, that is, it leads to one diagnosis independently. An example of another series of tests that could be performed in conjunction with tuberculosis detection is glaucoma testing. The presumptive tests for this prevalent disease, subject to some local option, are tonometry (the indirect measurement of pressure within the eye) or visualization of the retina by photography, or both. Additional information for the

---

*The authors are with the Medical Systems Development Laboratory, National Center for Health Services Research and Development, Health Services and Mental Health Administration, Public Health Service. Dr. Ayers is the pulmonary project officer, Dr. Hochberg is chief of the Medical Development Unit, and Dr. Caceres is chief of the laboratory. Portions of the paper were given at the 70th annual meeting of the American Hospital Association, Atlantic City, N.J., on September 18, 1968.*

establishment of the diagnosis is obtained by applying progressively sophisticated techniques leading to the definitive test of tonography.

Most multiphasic clinics are at the unidirectional level of sophistication. Some procedures and techniques are automated, but they proceed in an essentially unidirectional manner. It is incorrect to speak of such units as multiphasic screening clinics if a mechanism exists within the clinic for validation, followup, or treatment of presumptive findings. The true multiphasic screening clinic includes only a series of presumptive tests. Confirmatory tests, followup procedures, and therapy are not properly within the scope of screening clinics.

It is well known that existing specialty clinics evaluate only their particular area of interests, thereby overlooking other diagnoses. Communication between different subspecialty clinics is notoriously poor. Duplication of the clerical tasks in outpatient clinics is great, and the inconvenience to patients in time, travel, and job absenteeism is marked. The potential of a properly automated screening clinic is to minimize these costly nuisances and improve patient care.

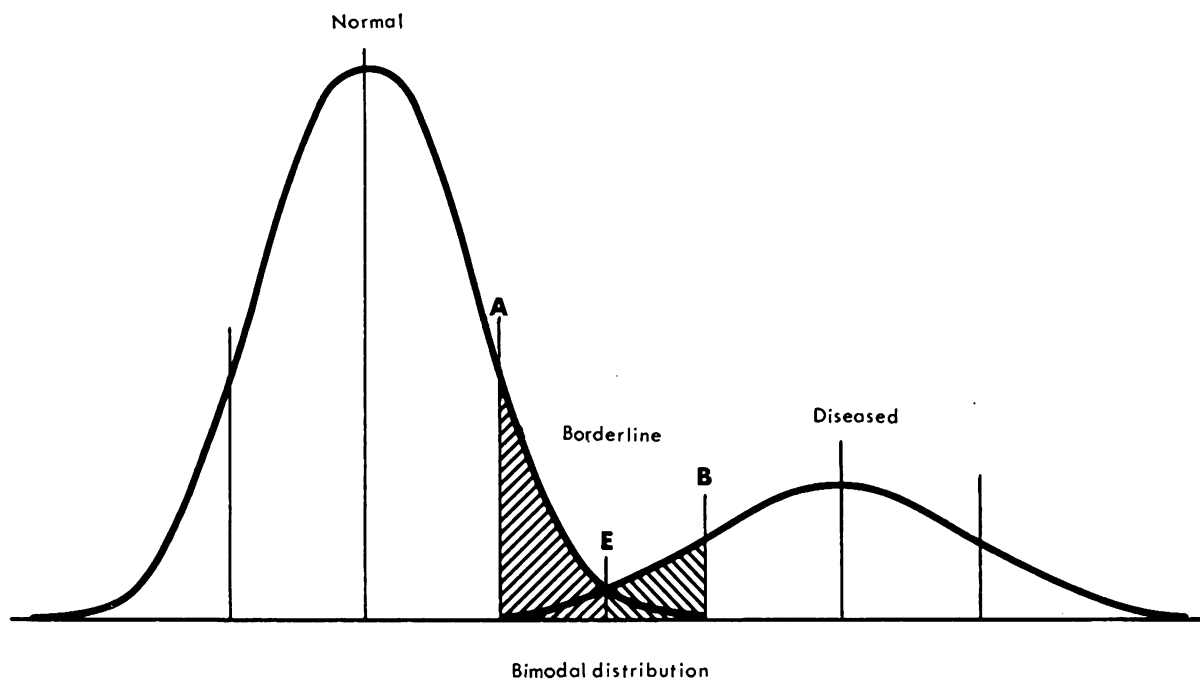
An example of a multiphasic screening clinic is one operated by the city of Milwaukee under the direction of Dr. Edward R. Krumbiegel,

commissioner of health, and financed in part by the Public Health Service (4). Residents of Milwaukee aged 40 and over may undergo a series of tests designed to detect loss of sight and hearing, diabetes, glaucoma, breast cancer, cancer of the cervix, and high blood pressure. Included are lung function tests, electrocardiogram, chest X-ray, blood tests, and a self-administered medical history. The findings are sent to the subject's private physician, who schedules confirmatory tests, followup, and treatment if necessary.

We contend that proper use of automation will allow for predictive multiphasic testing. If results of screening tests were available rapidly (that is, on-line), the definitive tests could be scheduled before the subject leaves the unit. The necessity of rescheduling patients for confirmatory tests would be reduced. The physician's time would be more productive, since data would be available to him as needed. For example, if the results of two screening tests, the EKG and spiogram, were rapidly available and indicated a probable chest abnormality, a definitive test could be performed before the subject left the clinic. Intermediate tests would not be needed.

The traditional examination by body systems (that is, head, eyes, ears, lungs, heart, and so

### Distribution of a variable in a population



forth) may well be replaced by an examination sequence tailored to characteristics of patient flow. All the tests that can be performed in one body position may be grouped together, or all the tests that are measured by the same basic kind of instrument might be combined at one station.

The Kaiser-Permanente Multitest Unit (5) employs some of these principles in acquisition, measurement, and recordkeeping. According to Collen, automation provides "improved quality control, reduced costs, and substitutes hours for days in patient and physician time" (6).

We offer the following guidelines to those planning a multitest unit.

1. *Know your population.* The male-to-female ratio, age, occupation, and socioeconomic level of the population will determine the characteristics of patient flow, choice of tests to be performed, and the level of detection.

The level of detection refers to the ratio of sensitivity to specificity (see chart). If the result of a test or procedure has a bimodal distribution within a population, that is, a group of normals and abnormals who overlap (line E on the chart), the point of borderline determination can be arbitrarily altered (toward line A on the chart) so that all the diseased are identified, but a relatively large number of normal persons will also be included. The consequence of this tactic is to load the validation or followup facilities with many normal subjects who require delabeling. However, the necessity of identifying all who may possibly be diseased may be so compelling (because of the nature of the disease) as to make worthwhile the retesting of a proportionately large number of false positives.

2. *Clearly define your goals.* Another way of saying this is, "How are the data going to be used?" For health education of the public? For screening only or for screening and definitive diagnosis, or both? Is only curable disease or only prevalent disease to be detected? Are clinical applications, such as preadmission screening

of patients for elective surgery, the primary interest? Or are the reasons for screening some combination of these?

3. *Know the limits of instrumentation.* Physical examination has not been replaced by a series of machine-performed tests. Automation and instrumentation merely aid the examiner. Great variability exists in the measurement of signals, whether by hand or by machine. Availability of instrumentation relates directly to cost. Duplicate equipment may be necessary to insure full-time operation of the testing unit, and this factor increases cost. An electronically oriented technician who can troubleshoot equipment is integral to a highly instrumented unit.

Instrumentation and automation have not supplanted the physician and the physical examination. Large portions of the examination, such as the search for gastrointestinal and neurological conditions, remain unautomated. Once the total purpose for data collection is established, automated techniques can be rationally applied to serve that purpose.

#### REFERENCES

- (1) U.S. Bureau of the Census: Population estimates. Series P-25, No. 381 (1967).
- (2) Subcommittee on Health of the Elderly: Detection and prevention of chronic disease utilizing multiphasic health screening techniques—A report to the Special Committee on Aging of the U.S. Senate. U.S. Government Printing Office, Washington, D.C., 1966.
- (3) Commission on Chronic Illness: Chronic illness in the United States. Prevention of chronic illness. Harvard University Press, Cambridge, Mass., 1957, vol 1, p. 45.
- (4) Krumbiegel, E. R.: The Milwaukee Health Department's multiphasic health screening program. Philosophical concepts and operational methods. Milwaukee Medical Society Times, July 1967, p. 3.
- (5) Collen, M. F.: The multitest laboratory in health care of the future. *Hospitals* 41: 119-127 (1967).
- (6) Collen, M. F.: Periodic health examination using an automated multitest laboratory. *JAMA* 195: 830-833 (1966).



# Health Study of Adolescents Enrolled in the Neighborhood Youth Corps

ARIEL S. COMPTON, M.D.

**A**DOLESCENCE is one period of life thought to be comparatively free from major health problems. A pilot study of the health status of Santa Clara Neighborhood Youth Corps enrollees revealed, however, that many of these underprivileged youngsters did have significant health problems. Of 109 school dropouts surveyed by the San Jose City Health Department in May 1966, 11 percent had a significant hearing loss, 7 percent had a positive reaction to tuberculin tests, 35 percent had abnormal results in laboratory tests, and 18 percent were judged to have a mental health problem which warranted referral.

Because of the health problems which this survey had demonstrated, the present study was undertaken by the San Jose City Health Department between December 1966 and May 1967.

The primary objective of the study was to identify health problems and provide followup which would achieve necessary medical care. Secondary objectives were to provide health education and to assist Neighborhood Youth Corps administrators in dealing with enrollees who presented physical or mental health problems.

In addition, it was hoped that the study would answer some of the following questions. How would the health of these adolescents compare with the health of so-called privileged adolescents? How did the health of in-school enrollees

compare with those who had become school dropouts? Were health factors significant in causing adolescents to drop out? Did health defects among in-school enrollees influence their school performance? Would community services be adequate to meet the health needs identified by this program?

In order to answer the first question, the data from this study have been compared with those from a health study of 985 presumably normal high school students in Dormont, Pittsburgh (1). Because the Dormont study described students from white middle-class homes in an eastern suburb, and the study on the youth corps dealt with low-income western adolescents of mixed racial background, it was felt that this comparison would serve to demonstrate the needs of the underprivileged adolescent as opposed to the privileged adolescent of the middle class.

## Population Studied

All adolescents in the program were between the ages of 16 and 21 and were enrollees in the Neighborhood Youth Corps. The youth corps is a work training program for underprivileged adolescents, which was established under title 1-B of the Economic Opportunity Act. All came from families whose incomes were classified by the Santa Clara Economic Commission as below the poverty level (maximum income, \$3,130 for a family of four). Approximately 90 percent were white and 10 percent Negro. Of those who were white, about two-thirds had

---

*Dr. Compton was formerly a contract physician with the San Jose City Health Department and is currently a public health physician with the Santa Clara County Health Department, San Jose, Calif.*

Spanish surnames. There were 138 school dropouts in the program (54 boys and 84 girls) and 131 in-school enrollees (62 boys and 69 girls). The racial composition of those in school were similar to those who were dropouts.

### General Description

Screening clinics were held at the health department, and approximately 16 enrollees were seen at each clinic. Enrollees were first welcomed to the clinic, and the purpose of the program was explained. They were then shown a film on venereal disease entitled, "A Quarter Million Teenagers." The film was followed by a discussion period during which questions were encouraged, and an attempt was made to help enrollees feel at ease about the anticipated examinations.

Specific screening procedures included a review of a health questionnaire, brief physical examination, check of blood pressure and pulse, vision and hearing tests, serologic test for syphilis, hematocrit value determination, serum cholesterol value, urine examination, skin tests for tuberculosis and histoplasmosis, dental inspection, and a mental health interview.

Following each clinic, the physician, project nurses, school nurse, youth corps counselors, and either the consulting psychologist or psychiatric social worker attended a medical review session. All data from the clinic sessions and from school health and academic records were considered at this time and the necessary followup was determined.

No funds had been allocated for followup; however, approximately 10 percent of the enrollees had insurance connected with their parents' work, and another one-third were eligible for Medi-Cal (title XIX). It was hoped that by using these and community resources, treatment could be provided for the majority of those needing it.

### Procedures and Methods

Each enrollee completed a health questionnaire before seeing the physician. This questionnaire was then reviewed with the physician, and any health problems were discussed. At this time the enrollee was encouraged to ask questions about his health or other problems. Following this, physical examinations were given

school dropouts, but because of a limitation of funds, in-school enrollees did not receive an examination unless a need had been indicated by the questionnaire.

Physical examinations included observation of general appearance, nutritional status, posture, inspection of skin, head, face, neck, eyes, ears, nose, throat, extremities, auscultation of heart and lungs, examination of female breasts, and palpation of lymph nodes and abdomen. Genitalia were not examined. Blood pressure was taken by the nurse, who used the auscultatory method with the enrollee in an upright position.

Nutritional status was assessed by the physician and by a comparison of the enrollee's height and weight with height-weight-age tables (2). Using these tables as a guide, weights were classified as within normal limits, moderately overweight, markedly overweight, moderately underweight, and markedly underweight. The Wetzell grid (3) was used as an additional aid in assessing weight.

Visual acuity was measured by the Snellen test. A defect was considered significant if the visual acuity was 20/40 or less in at least one eye.

Hearing was tested by students from San Jose State College with a pure tone audiometer at 15-decibel intensity at frequencies of 500, 1,000, 2,000, 4,000, and 6,000 cycles per second. The test was failed if losses were shown at two or more frequencies below 4,000 cycles per second, or if there was a loss of 30 decibels or greater at any one frequency below 4,000 cycles per second in at least one ear.

Teeth were inspected by a dental hygienist using a mouth mirror, explorer, and optical illumination. The presence of decayed, missing, or filled teeth, malocclusion, poor oral hygiene, or chronic pain was recorded. Each enrollee was apprised of his oral condition as the inspection proceeded and oral hygiene was discussed.

Venous blood was obtained for examination by venipuncture. A serologic test for syphilis, Venereal Disease Research Laboratory (VDRL), was performed on all blood samples. Hematocrit values were determined by the microhematocrit method within 2 hours. Serum cholesterol values, using the AutoAnalyzer method, were also determined from the blood

samples as part of a larger study being conducted by the city health department.

The nurse told the enrollees how to collect a clean urine sample. The urine was tested for specific gravity, pH reaction, glucose, and protein. The criteria for abnormalities were the presence of glucose, protein or casts, any red blood cells or white blood cells in the boys, and more than 0 to 3 red blood cells or 5 to 10 white blood cells in the girls. Any abnormal test results on the urine were verified by a repeat examination before referral was made.

All enrollees except those known to have positive reactions to tuberculin were given five units (0.0001) of purified protein derivative intradermally and a histoplasmosis skin test.

Enrollees were interviewed by either a psychiatric social worker or a youth corps counselor for mental health problems. A mental health questionnaire was used to assist the interviewer. A few examples of the type of questions asked were, "Do you think you stand a chance of being as successful as you would like to be?" "What kinds of things do you worry about most?" and "What do you like about yourself?" The impression of the interviewer, together with that of the physician and project nurse, was presented at the medical review session, and recommendations for referral were then made with the help of the consulting psychologist.

## Results

In all those procedures where a comparison of data was possible because of similar methods, observations have been presented separately for in-school enrollees, school dropouts, and students of Dormont High School.

*Health questionnaire.* All enrollees completed the questionnaire. The most frequently occurring current health complaints are presented in the following table.

<i>Present health complaints</i>	<i>Number</i>
Fatigue, extreme.....	3
Headaches, severe.....	3
Difficulty hearing.....	16
Difficulty seeing.....	50
Cough, chronic.....	4
Abdominal pain.....	5
Dysmenorrhea, severe.....	3
Pregnancy.....	4
Vaginal discharge, profuse.....	3
Epilepsy.....	4
Total.....	95

The health status of youth corps enrollees by past medical history is given in the following table.

<i>History of—</i>	<i>Number</i>
Automobile accident.....	60
Head injury.....	33
Epilepsy.....	1
Rheumatic fever.....	7
Kidney disease.....	5
Bladder infection.....	3
Stomach ulcer.....	3
Pregnancy, completed.....	19
Urethral discharge.....	6
Mental illness.....	5
Tuberculosis or record of positive tuberculin test.....	15
Total.....	157

Most of the head injuries were caused by an automobile accident. In all of the head injuries listed, the person had been unconscious for an hour or more. Of the four cases of epilepsy listed under present health complaints, three were attributed by the enrollee to a previous head injury.

In addition to the 19 pregnancies, four girls had had two pregnancies each, and four admitted having had an abortion (it was not determined if these were spontaneous). All the girls who had been pregnant were school dropouts! Most of them had not returned for postpartum examination, and only a few had been given information as to methods of birth control.

Illnesses among the families of the enrollees were as follows:

<i>Family illnesses—</i>	<i>Number</i>
Heart trouble.....	73
Diabetes.....	48
Cancer.....	21
Mental illness.....	16
Epilepsy.....	11
Tuberculosis.....	23
Total.....	192

Although the 269 enrollees listed 192 serious health problems within their families, this number is probably low because few families have regular medical care. Frequently, an enrollee knew a parent was not well, but did not know what was wrong.

*Blood pressure and pulse.* Four obese girls and one obese boy had systolic pressures between 140 and 170. No enrollee had a diastolic pressure above 90. No significant abnormalities were detected in pulse rate or rhythm.

*Physical examination.* Medical observations are classified as to body sites and systems in table 1.

*Vision.* Of the 269 enrollees screened, approximately 34 percent of the girls and 17 percent of the boys had significant uncorrected visual defects. Of these, more than 60 percent of the boys and 30 percent of the girls did not have glasses (table 2).

For those enrollees who had glasses, glasses failed to provide correction to 20/30 or better in both eyes for 36 percent of the girls and 57 percent of the boys. In comparison, only 14 percent of the girls in the Dormont study and 23 percent of the boys had glasses which did not correct adequately.

*Hearing.* Approximately 11 percent of youth corps enrollees had a significant hearing loss (table 3). An additional 13 percent of enrollees had minor losses, generally at high frequency, for which referrals were not made.

In testing Dormont students, losses were recorded at frequencies of 8,000 cycles per second. Yet even with the inclusion of this higher frequency, only 9.3 percent of the boys and 2.1 percent of the girls failed the test. A higher percentage of school dropouts failed the hearing test than did those in school. It was of interest that several who had a moderate hearing loss on testing had been unaware of it according to the health questionnaire.

*Teeth.* Enrollees were classified as essentially normal, needing routine care, and needing immediate care. Essentially normal included enrollees with moderately poor hygiene and one or two minor cavities. Those adolescents with two to four cavities of a moderate degree of severity were classified as needing routine care, and those with four or more cavities, abscessed teeth, chronic pain, or who were suspected of having Vincent's infection were classified as needing immediate care.

Results of the dental inspection follow.

Condition of teeth	Percent of 109 boys	Percent of 153 girls
Essentially normal.....	28.4	29.4
Needing routine care.....	19.3	22.9
Needing immediate care.....	52.3	47.7
Total.....	100.0	100.0

In contrast to approximately 70 percent of the Dormont students, only about 30 percent of

**Table 1. Classification of physical examination abnormalities**

Condition	School dropouts		In school <sup>1</sup>	
	N=54 boys	N=84 girls	N=29 boys	N=30 girls
Nutrition:				
Undernourished.....	3	0	2	2
Obese.....	11	27	8	13
Skin:				
Acne, severe.....	3	3	5	1
Generalized rash.....	2	0	0	1
Scarring, extensive.....	1	0	0	0
Tattoos, extensive.....	1	0	0	0
Scalp, alopecia				
areata.....	0	0	0	1
Face, congenital				
asymmetry.....	0	0	1	0
External eye:				
Blue sclerae				
(osteogenesis imperfecta)....	0	0	1	0
Pterygia.....	0	0	1	0
Granular conjunctivitis.....	1	0	0	1
Hordeolum.....	1	0	0	1
Tearing, chronic.....	0	1	0	0
Strabismus.....	2	0	0	1
Ears:				
Otitis media.....	2	0	0	0
Impacted wax.....	0	1	0	0
Nose, deviated				
septum (complete obstruction).....	0	0	1	0
Speech, nonspecific defects.....	5	0	0	0
Throat, tonsillitis.....	1	5	4	3
Neck, thyroid, enlarged.....	0	2	1	1
Heart, systolic				
murmur, probably organic.....	4	4	0	2
Lungs, increased				
breath sounds, rhonchi.....	2	1	0	0
Abdomen:				
Pregnancy.....	0	2	0	0
Tenderness.....	0	2	0	1
Extremities:				
Unequal leg				
length.....	1	0	2	0
Arthritis, elbow.....	0	1	0	0
Arthritis, fingers.....	0	0	0	1
Hand deformity.....	0	0	2	0
Abscess, toe.....	0	0	0	1
Tremor.....	0	0	0	1
Spine, kyphosis.....	0	1	0	1
Neurological				
system:				
Cerebral palsy.....	0	0	1	0
Minimum brain				
damage.....	0	0	1	0
Brain damage.....	2	0	0	0
Epilepsy.....	0	0	0	1

<sup>1</sup> Physical examinations when indicated by medical history questionnaire.

**Table 2. Adolescents with defective vision and no glasses**

Category and sex	Number with defective vision	Number without glasses	Percent without glasses
School dropouts:			
Male.....	8	5	62
Female.....	22	7	32
In school:			
Male.....	12	8	67
Female.....	31	12	39
Dormont study:			
Male.....	180	12	7
Female.....	244	6	2

the enrollees had teeth that were classified as essentially normal. Fifty percent of the enrollees needed immediate care. White blood cell counts of 10,000 to 12,000 were common among youngsters with rampant dental decay. Approximately 16 percent of the enrollees complained of chronic dental pain.

Two boys were being excused daily from class because of severe dental pain. One-fourth of the enrollees were judged to have moderate to severe malocclusion, the criteria for which was the absence of two or more contiguous teeth. For some enrollees, the cosmetic effect of malocclusion made it difficult to get employment.

*Serologic test for syphilis (VDRL).* Among the 269 enrollees there were no positive serologic results.

*Hematocrit values.* Many enrollees had low or borderline hematocrit values. Whereas in the Dormont study only 3 percent of female adolescents had hematocrit values of 40 percent or below, 91 percent of female school dropouts, and 88 percent of those in school had values below this. Only 0.6 percent of the boys in the Dormont study had a value of 42 percent or below, but 61 percent of male school dropouts and 57 percent of those in school had values below this (see chart).

*Serum cholesterol.* Results of test for cholesterol levels are given to add to information presently available on adolescent values. No referrals, however, were made on the basis of these observations. The mean serum cholesterol level was 165 mg. per 100 ml. for male enrollees and 171 mg. for female enrollees. Higher values were noted for school dropouts than for those in

school. The mean level for male dropouts was 178 mg., for female school dropouts, 186 mg. Boys and girls in school had values of 155 mg. each.

Seventeen percent of youth corps boys and 23 percent of the girls had cholesterol levels of more than 200 mg. It was noted that enrollees who were obese tended to have higher cholesterol levels than those who were not. Of the 55 obese enrollees, approximately 40 percent had cholesterol levels of 200 mg. per 100 ml. or above, whereas of the 185 non-obese adolescents, approximately 15 percent had levels of 200 mg. or above. Serum cholesterol levels for 254 enrollees follow.

Level per 100 milliliters	Number	Percent
Under 200 mg.....	202	80
200-225 mg.....	31	12
225-250 mg.....	15	6
More than 250 mg.....	6	2
Total.....	254	100

*Urine.* A total of 48 or approximately 18 percent of the enrollees had abnormal results for urine tests. Of these, 22 percent were among school dropouts and 13 percent were among those in school. On repeat urinalysis, three boys and three girls were found to have sugar in their urine, 14 boys and 31 girls had protein, red blood cells, white blood cells or casts, two boys and 10 girls were found to have bacteria, and five girls had a *Trichomonas* infection. One case of gonorrhea in a male school dropout was identified on a routine urine examination. No comparisons were possible with the Dormont study because urinary examination was not included in the Dormont screening.

*Skin tests.* A total of 9.8 percent of enrollees were either known to react positively to tuber-

**Table 3. Percent failing audiometric testing, by sex**

Category	Percent failing
School dropouts:	
54 males.....	20.4
84 females.....	9.5
In school:	
62 males.....	12.9
65 females.....	4.6
Dormont study:	
410 males.....	9.3
431 females.....	2.1

culin or were identified as such during the screening program (table 5). Ten previously unknown positive reactors were identified during the screening. Two enrollees had active tuberculosis. One was a school dropout who was identified by the screening program. The other was an in-school enrollee who was a known positive reactor, but who had failed to take previously recommended medication. Two other persons living in her home were subsequently identified as having active tuberculosis. Enrollees having positive reactions to tuberculin were as follows:

Category	Total tested	Positive	
		Number	Percent
Dropouts-----	135	11	8.1
In school-----	131	15	11.5
Dormont study-----	1,181	38	3.3

In contrast to these discoveries, 3.3 percent of the Dormont students had positive tuberculin reactions. Followup of these students revealed no active tuberculosis.

Seven enrollees had a positive reaction to histoplasmin, but X-ray examinations of these enrollees were either negative or showed that the infection had healed.

*Nutritional status.* In-school enrollees, school dropouts, and Dormont students have been categorized as to weight in table 4. Enrollees considered to be markedly overweight were also observed to fall in or above channel A4 on the Wetzel grid (3).

In the Dormont study 75 percent of adoles-

cents were considered to be within normal weight limits, but only 50 percent of youth corps enrollees were considered within normal limits. Obesity was the major weight problem. In contrast to approximately 10 percent of Dormont girls and 5 percent of Dormont boys, in the youth corps 26 percent of the girls and 16 percent of the boys were classified as obese.

The many intriguing questions which arise as to the increased occurrence of obesity in these youngsters is beyond the scope of this paper. Certain correlations of data were noted, however, and are presented as follows.

**DIABETES IN FAMILY.** A record of diabetes in a family was determined solely from the medical history questionnaire. Because few of these families were knowledgeable as to specific illnesses, it is probable that this number is low. About 30 percent of those adolescents who were obese, however, had reported diabetes in the family, whereas only 12 percent of those who were not obese reported diabetes (table 5). Further studies investigating the correlation of adolescent obesity and diabetes in the family seem warranted on the basis of these data.

**ANEMIA.** Obese enrollees did not demonstrate a greater percentage of low or borderline hematocrit values than did the non-obese.

**DEPRESSION.** To determine if periods of depression were more frequent among those adolescents who were obese than among those who were not, a comparison was made of replies to the question, "How often have you felt unhappy for a period of 3 days or longer?" No difference

**Table 4. Nutritional status of Neighborhood Youth Corps enrollees and Dormont students, in percent**

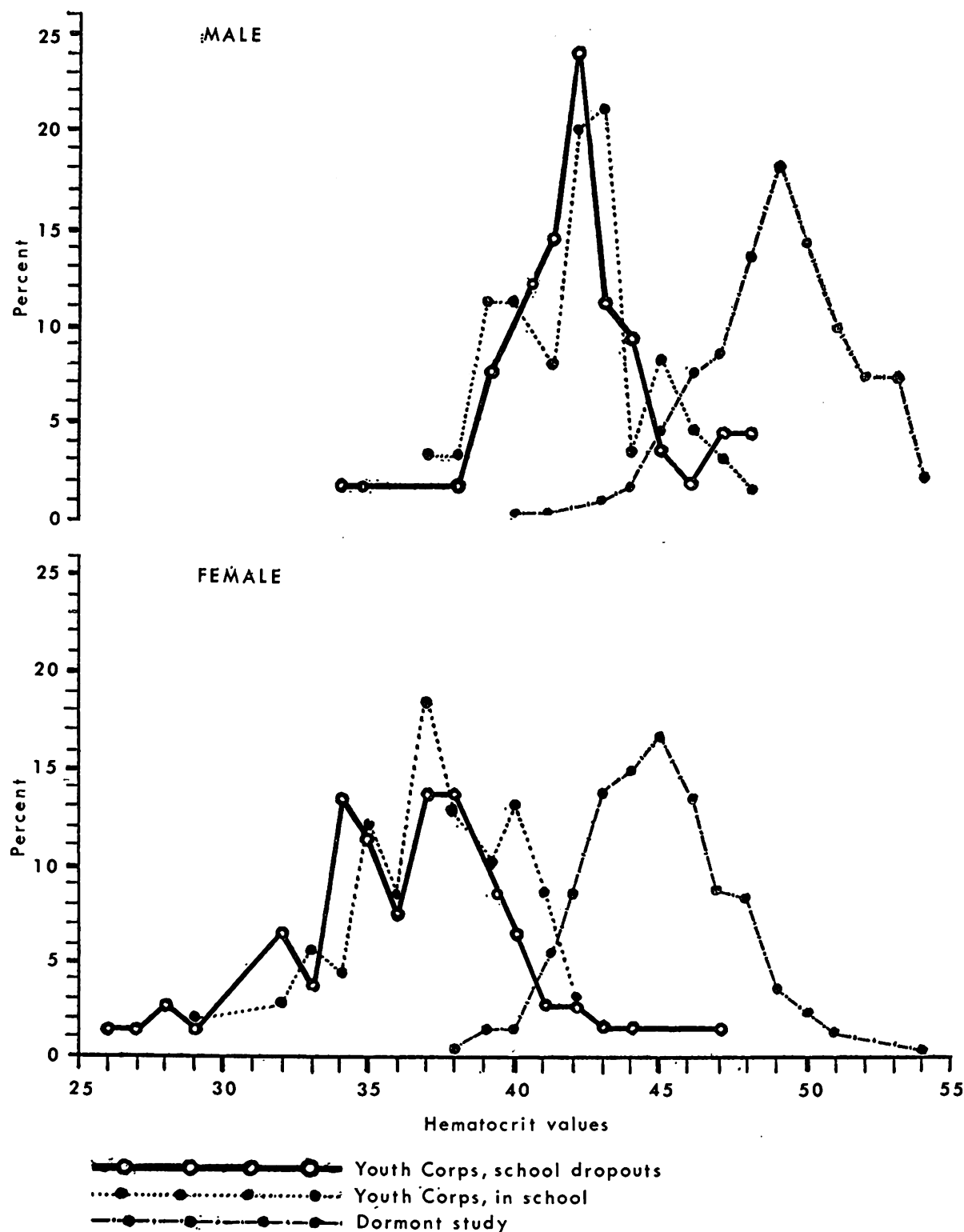
Category	Number	Within normal limits	Moderately overweight	Markedly overweight	Moderately underweight	Markedly underweight
Dormont study:						
Males-----	488	86.7	5.5	5.2	2.1	0.4
Females-----	497	77.3	7.5	10.3	3.0	1.9
School dropouts:						
Males-----	54	51.9	20.4	20.4	7.4	0
Females-----	84	46.4	8.3	32.1	11.9	1.2
In school:						
Males-----	62	53.2	24.2	12.9	9.7	0
Females-----	69	56.5	14.5	15.9	13.0	0

NOTE: Definitions given in reference 3. Moderately overweight, between 10 and 20 percent more than average weight; markedly overweight, 20 percent or more

above normal; moderately underweight, between 10 and 20 percent below normal; markedly underweight, 20 percent or more below normal.



# Hematocrit values of male and female Neighborhood Youth Corps enrollees and high school students in Dormont, Pittsburgh



was noted—40 percent of the obese adolescents and 40 percent of non-obese adolescents indicated that they had frequent periods of unhappiness which lasted 3 days or longer.

*Mental health.* Almost all enrollees came from families with multiple problems. It was anticipated, therefore, that serious emotional problems would be far greater than for adolescents generally. Few statistics are available as to the frequency of emotional disturbances in adolescence; however, an estimated 10 percent of the adolescents in boarding school and college have mild and transient emotional disturbances (4a). Of this 10 percent, it is thought that a much smaller undetermined number will develop emotional difficulties serious enough to warrant a psychiatrist's care. In contrast to these estimates, 34 percent of the enrollees had emotional problems serious enough to warrant professional help, and many others had milder emotional problems which were referred to counselors, teachers, or school nurses. Among enrollees who were felt to need professional help, 45 were referred for group therapy and 13 for individual psychiatric care.

Indicative of the importance of adolescent mental health is the fact that suicide ranks as the fourth major cause of death for this age group. In the United States in 1955 the suicide rate for boys between 14 and 19 years of age was 3.9 per 100,000; for girls, 1.3 per 100,000 (4b). In the present study, three of the 269 enrollees had made a suicide attempt in the past, and two others made suicide attempts during the program.

### Followup and Referral Completion

Referrals and followup were determined at the medical review sessions. Many hours were spent by the staff in achieving referral completion. It was estimated that a minimum of 143 home visits, 335 telephone calls to enrollees, and 41 telephone calls to physicians were made. In addition, numerous conferences were held with Neighborhood Youth Corps counselors and school nurses.

Referrals were made to physicians and dentists in private practice, Santa Clara Valley Medical Center (county hospital), Santa Clara County mental health and dental clinics, Crip-

**Table 5. Record of diabetes in families of 138 school dropouts and 131 enrollees in school**

Classification	Diabetes in family		No history of diabetes in family	
	Number	Percent	Number	Percent
In school:				
Obese-----	6	31.6	13	68.4
Non-obese-----	13	11.6	99	88.4
School dropouts:				
Obese-----	11	30.6	25	69.4
Non-obese-----	14	13.7	88	86.3
Total:				
Obese-----	17	30.9	38	69.1
Non-obese-----	27	12.6	187	87.4

pled Children's Services, Alcoholics Anonymous, and Alateen. Other organizations included adult and child guidance clinic, the day care center associated with the San Jose Community Mental Health Center, and the Family Service Association of Santa Clara County. Because of time and financial limitations, it was necessary to consider followup complete when the initial visit for care had been made.

The success of followup varied considerably with the type of health problem. For conditions identified by the physician through the medical history questionnaire or on physical examination, referral completion was about 70 percent. Of the 27 enrollees referred for hearing loss, 22 completed medical referral, but of the 47 enrollees with defective vision, only eight had obtained glasses by the end of the program.

Dental referrals were a major problem. For many enrollees the cost of dental care was prohibitive. Those enrollees who had Medi-Cal were encouraged to use it to receive care. A few enrollees received care that was paid for by school funds, and for some, arrangements were made for free treatment by dentists in private practice. For the great majority of these adolescents, however, no resources were available.

Fifteen of 30 enrollees referred for low hematocrit values completed referral. Of 48 referrals for urinary abnormalities, 30 completed an initial visit to a physician, four were seen at the Diabetes and Glaucoma Screening Clinic, and two were referred to the county public health nurse for subsequent followup. All enrollees

with newly positive tuberculin skin tests, or enrollees who had had previous positive reactions and who had allowed care to lapse, completed referral to the county hospital. After completion of the health study, followup was continued for them by the district public health nurse.

Recommendations for mental health referrals were made with the help of the consulting psychologist and psychiatric social worker. There were three classifications for referrals: first for enrollees who had what were considered minor emotional problems, second for applicants for group therapy, and third for those who needed individual psychiatric care.

Under the first classification, many referrals were made to youth corps counselors and the school nurses. Counselors could often arrange job changes for an enrollee, or keep an enrollee on the program longer because of a mental health problem. The school nurse was in an excellent position to carry out referrals as she could contact students directly and could consult with a teacher or make a home visit when necessary.

Under the second classification, 45 enrollees were referred for group therapy. Nine school dropouts were referred to therapy sessions which met near their area of work at Gilroy and Mountain View, and 23 in-school enrollees were referred to a group therapy session at the San Jose Community Mental Health Center. Since, at the beginning of the screening program, no local group existed as a referral source, an effort was made to establish a group financed from MediCal (title XIX).

Group therapy was conducted at the city health department by a psychiatrist, Dr. Theodore J. Sabot, who was particularly interested in group therapy for adolescents. The following comments are from a report evaluating the group's progress after 3 months.

The group enthusiasm has been most impressive, with a core of about five members who have attended regularly and have created a sense of cohesion. The group has developed a spirit of its own with an increasing sense of responsibility and autonomy. Some evidence of the group's impact on the members is as follows. One overly shy youngster has become an active group member and an informal leader. One who had been very aggressive is able to talk and delay action with less evidence of aggressive preoccupations. One with "psy-

chogenic fits" has had none since entering the group, and one who had shown evidence of depression and suicidal thoughts has become actively involved in the group with a lessening of depression and withdrawal.

Of those judged to need individual psychiatric care, 13 enrollees were referred to the adult and child guidance center, and six were referred to the Santa Clara County Mental Health Clinic. Only four of these referrals were completed.

When enrollees had the responsibility of making their own appointments and providing their own transportation, completion of mental health referrals was poor. To achieve successful followup, care should include contact with the enrollee's family, and it may often have to include making the referral appointment, providing transportation, and even accompanying the youngster on his initial visit.

#### Comments

Certain health problems warrant comment based on the frequency of occurrence. Two of the most prevalent were anemia and obesity.

The frequency of borderline anemia among enrollees is not surprising when it is realized that many enrollees eat meat only once a week. Undoubtedly this was related to complaints of chronic fatigue: "I'm tired all the time." "I feel too tired to do anything but sit and watch TV when I get home." "I'm too tired to go to school in the morning." Certainly a marked change was observed in the well-being, appearance, and even attitude of enrollees who were given supplemental iron.

In contrast to obesity, anemia is a health problem which is easily, inexpensively, and often effectively treated. Hematocrit value determinations alone would have substantial merit as a screening procedure. A program which identified anemia and provided supplemental iron might be very effective in improving the health and possibly even the school performance of underprivileged youngsters.

The high proportion of obesity among youth corps enrollees corresponds to the observation by Goldblatt and co-workers (5) that obesity is correlated in an inverse way with socioeconomic level. Many enrollees who were obese had been so since infancy. Frequently they expressed both guilt and hopelessness about being fat.

A family history of diabetes was recorded far more frequently among enrollees who were obese than among those who were not. A similar correlation was not observed, however, between enrollees who were anemic and those who were obese. Of significance in this regard is a study by Seltzer and Mayer (6) which showed that obese adolescents with normal hematocrit values have considerably lower mean serum iron values than have non-obese adolescents. In future screening programs, determination of serum iron levels as well as hematocrit values would be of great interest, particularly for underprivileged adolescents who might be anticipated to have a latent iron deficiency.

Head injuries were frequent enough to warrant comment. Twelve percent of enrollees had had an injury which had caused them to be unconscious for 1 hour or longer, and the injury had left many with a residual health problem. Many of these injuries had been caused by an automobile accident.

It was not realized until the study was well under way that, for many of these families, parental alcoholism was also a major problem. These are families, often with many children, who frequently need the help of several community agencies.

## Discussion

How did the health of youth corps adolescents compare with that of middle class adolescents of Dormont? Screening procedures data that could be compared were vision and hearing tests, hematocrit value determinations, tuberculin tests, and nutritional and dental evaluations. In all these procedures, the health of youth corps enrollees was significantly below that of Dormont students. Examination of adolescents in the Dormont study did not reveal serious disease; however, youth corps enrollees had illnesses that included tuberculosis, kidney disease, venereal disease, arthritis, serious mental disturbances, and extensive dental caries.

A second question asked in this study was, "How did the health of in-school enrollees compare with those who had become school dropouts?" A greater percent of school dropouts were obese, had significant hearing and visual defects, and were anemic than were those in

school. Urinary abnormalities were more frequent among school dropouts. Pregnancy and abortions were acknowledged only by school dropouts.

Discoveries on several physical examinations related directly to a person's becoming a dropout. One boy had refused to go to school because of an extensive skin rash. One girl volunteered that she had dropped out of school because her obesity embarrassed her. A boy with a severe speech defect had left school because of this. Two girls had dropped out because of pregnancy. The health, therefore, of the school dropout was definitely below that of the in-school enrollee, and in several adolescents a health problem had been the primary cause for dropping out.

Not only were some health defects directly responsible for youngsters becoming dropouts, but many defects among in-school enrollees directly influenced their school attendance and performance. If they had not yet caused the person to drop out, they were certainly contributing to academic failure.

A few examples of such health problems follow. One boy was found to be in a constant state of lethargy from medication for epilepsy which had been prescribed 6 years previously. On referral to a physician, the medication was stopped and his school performance had improved noticeably by the end of the program.

Another boy, who had been in a class for the mentally retarded since the second grade, was referred to the Northern California Diagnostic School for Neurologically Handicapped Children for reevaluation. Studies there revealed that he had normal intelligence but suffered from a minimal cerebral dysfunction with an emotional overlay. His classification in school was subsequently changed and efforts were made to assist him in achieving skill in a trade commensurate with his ability.

Community services were not adequate to provide care for many of the health problems identified. It is apparent that facilities for treatment must be available if the health needs of these youngsters are to be met. Facilities alone, however, will not insure that medical care will be received. Among additional factors to be considered are (a) will the adolescent be

motivated enough to use facilities that are offered? (b) what are obstacles that keep adolescents from using facilities? and (c) will the care given be meaningful?

To be motivated to seek health care, adolescents have to realize its importance. For underprivileged youngsters whose homes frequently do not provide this education, it is necessary for schools or health programs to take the initiative in educating them as to the importance of health care and the part it plays in the prevention of disease. Youth corps enrollees, like most adolescents, are very aware of their health and their appearance. Almost without exception they were eager for help and appreciative when interest was shown in them. They were, however, primarily worried about relatively minor health problems such as acne, dizziness on rising, and occasional stomach aches. Often, because of ignorance, serious health problems were unrecognized. Chronic cough, constant fatigue, night sweats, and burning when urinating might well be dismissed by them as unimportant conditions which most people have at one time or another.

One of the greatest obstacles that kept enrollees from achieving care was their own timidity or actual fear. The thought of having to undress, especially among Mexican-Americans who have a very strong sense of modesty, was enough to discourage them from seeking medical care unless the condition was severe. Several enrollees were genuinely fearful of having skin or blood tests.

Transportation was also a major obstacle. Most enrollees chose to go to the county hospital for treatment even though they had Medi-Cal and could have chosen a private physician. The hospital was a long way from the east side where most of these youngsters lived, and therefore transportation provided a real problem. Similarly, transportation was the main obstacle to the group therapy session held at the health department. Occasionally, such a major effort was needed in getting to a place for care that this effort seemed of greater inconvenience than the health problem, particularly if the importance of care was not understood.

Care that is given must be meaningful. It accomplishes little to tell an anemic youngster

that he should eat more meat if there is no money to buy meat, or to provide glasses for enrollees who will not wear them. Several boys in the study, for example, would wear only dark glasses since these were socially acceptable and regular glasses were not.

Several of these obstacles could be overcome by using neighborhood centers for the health program. Transportation difficulties would thus be lessened, and familiar surroundings would help to diminish feelings of timidity and fear. Every effort should be made to create a relaxed, nonclinical atmosphere. Care could be made more meaningful if special training as to ethnic customs were given to the staff or if at least some of the staff were of similar cultural background.

### Summary

A study of the health of 269 Neighborhood Youth Corps adolescents was made by the San Jose City Health Department between December 1966 and May 1967. The primary objective of the study was to identify health problems and provide followup which would achieve medical care as well as to evaluate the need for future health programs for these youngsters.

Screening procedures consisted of a review of a medical history questionnaire, brief physical examination (school dropouts routinely and enrollees in school only as indicated), check of blood pressure and pulse, vision and hearing tests, dental inspection, blood and urine tests, tuberculin and histoplasmosis skin tests, and mental health interview.

The data from in-school enrollees were compared with that of school dropouts and, whenever possible, screening results were also compared with those from a health study of middle class high school students in Dormont, Pittsburgh.

Screening procedures revealed that among youth corps enrollees 34 percent of the girls and 17 percent of the boys had a significant uncorrected visual defect, 8 percent of the girls and 16 percent of the boys had a significant hearing loss, 50 percent of enrollees needed immediate dental care, 13 percent were anemic, 18 percent had abnormal results for urine tests, approximately 10 percent had positive tuberculin skin tests, and 34 percent had emotional problems



serious enough to warrant professional help. Observations during physical examinations identified 91 conditions among the 131 school dropouts which warranted medical attention. Among in-school enrollees, who were examined only when indicated by answers to the medical history questionnaire, 53 medical referrals were made.

For those procedures for which it was possible to compare results—vision and hearing tests, dental inspection, hematocrit determination, tuberculin skin test, and nutritional evaluation—the health of youth corps enrollees was significantly below that of Dormont students. Examination of adolescents in the Dormont study did not reveal serious disease; however, many youth corps enrollees had serious health problems.

School dropouts had a greater percentage of obesity, significant hearing and visual defects, urinary abnormalities, and anemia than did those in school. In some instances a health problem had been a primary factor in causing a youngster to become a dropout, and among in-school enrollees several health conditions were identified which directly affected academic performance.

Community services were found not adequate to meet the health needs demonstrated by this study. If the goal of improving the health of these young people is to be achieved, a health program must do more than merely screen for health abnormalities; it must also provide services for treatment which are both acceptable and readily available to those who need them.

#### REFERENCES

- (1) Rogers, K. D., and Reese, G.: Health studies—presumably normal high school students. *I. Amer J Dis Child* 108: 572-600, January 1965.
- (2) Association of Life Insurance Directors and Actuarial Society of America, as cited *In Diseases of metabolism*, edited by G. G. Duncan. W. B. Saunders Co., Philadelphia, 1964, pp. 974-975.
- (3) Wetzel, N. C.: Physical fitness in terms of physique, development and basal metabolism. *JAMA* 116: 1187-1195, Mar. 22, 1941.
- (4) Gallagher, J. R.: Medical care of the adolescent. Appleton-Century-Crofts, Inc., New York, 1960. (a) p. 348; (b) p. 345.
- (5) Goldblatt, P. B., Moore, M. E., and Stunkard, A.: Social factors in obesity. *JAMA* 192: 1039-1044, June 21, 1965.
- (6) Wenzel, B. J., Stults, H. B., and Mayer, J.: Hypoferraemia in obese adolescents. *Lancet* No. 7251: 327-328, Aug. 18, 1962.

### Contract for Health Data Collection Awarded to U.S. Conference of Mayors

A \$175,325 contract with the U.S. Conference of Mayors to assist city and county health departments to increase their involvement in the implementation of Model Cities Programs has been awarded by the Community Health Service, Health Services and Mental Health Administration. The contract calls for the collection and dissemination of data which will help health officials make maximum use of programs to improve the health of people in their cities.

The Conference of Mayors will conduct a survey to determine current and planned participation of health authorities in all 153 model neighborhood programs, identify barriers to more effective participation, and provide information on how these and other obstacles may be overcome. In addition, nine model cities will be selected to receive in-depth consultation and assistance in a concerted effort to stimulate their local health departments toward maximum participation in the Model Cities Program.

Dr. Joseph T. English, Administrator of the Health Services and Mental Health Administration, in announcing the contract, pointed out that the U.S. Conference of Mayors is the ideal organization to undertake this contract, since it is the only formal organization representing the mayors' offices of all model cities—offices which in conjunction with elected governing boards have local responsibility for the program.

# A Survey of Group Practice in the United States, 1965

BRUCE E. BALFE, M.A.

SINCE 1945, the group practice of medicine has become a major organizational factor in the health care delivery system. In the past several years, the concept of group practice has come under renewed scrutiny as a means of alleviating some problems of the health care system, particularly in regard to manpower shortages and the cost of medical care. Because the solutions of these two related problems are vital to the medical profession and to the public, trends and developments in group practice should be carefully watched.

One of the prerequisites to intelligent analysis of the future of group practice is sound data on the number and characteristics of groups and group physicians. In 1946 and 1959, the Public Health Service conducted surveys of group practice to provide such data. In 1965, the American Medical Association, recognizing the need for more up-to-date information, conducted a similar survey. The purposes of the AMA project were twofold: to provide a statistical profile of group practice as of 1965 and to compare the results with those of the group practice surveys of 1946 and 1959 in order to identify trends in the nature and magnitude of group practice.

---

*Mr. Balfe is research associate in the department of survey research of the American Medical Association, Chicago, Ill. This paper summarizes the results of a survey of medical groups that the AMA conducted in November 1965. The detailed tabulations of the results were published in "Survey of Medical Groups in the U.S., 1965," by Balfe and M. E. McNamara, American Medical Association, Chicago, 1968.*

The success of the survey in achieving these two objectives provides a basis upon which the various definitions and concepts of group practice can be evaluated. In addition, the data provide a new base upon which future surveys can be designed.

This survey was not designed to provide an in-depth analysis of group practice from a functional viewpoint. Rather, it was designed to provide a thorough description of its characteristics. In the publication upon which this paper is based, we expressly avoided making judgments or providing reasons for the observations reported. Such judgments in a descriptive publication only open the door to controversy over interpretation and tend to overshadow the validity of the data presented. Hence we decided that the data should be presented in a purely descriptive fashion, to stand or fall on their own merit, free from the complications of interpretive value judgments.

## Survey Method

A listing of medical groups in the United States was compiled and published in November 1959 by the Council on Medical Service of the American Medical Association. This list has since been maintained and updated with information received from annual surveys of physicians conducted by the AMA and from other sources.

In November 1965, the 5,838 medical groups listed in AMA records were sent a questionnaire soliciting information on their size, geographic location, form of organization, method of in-

come distribution, specialty composition, and the allied health personnel which they employed. A 60 percent response was received from this first mailing. In March and July of 1966, those groups which had not responded previously were sent followup letters and questionnaires. The two followup mailings resulted in a 90.9 percent overall response.

Of the 5,838 medical organizations to which questionnaires were originally mailed, 529 either did not meet the definition of group practice used in this survey, had been dissolved, or represented duplicates in the response, leaving an effective population of 5,309 groups. The 1,020 nonrespondents consisted of 31 groups which indicated a desire to be excluded from the survey and 989 which did not respond at all. The remaining 4,289 groups which constituted the usable response represented 80.8 percent of the total number of medical organizations recorded by the AMA Physicians Records Service which met the definition of a group.

**Definitions.** The term "group practice" covers a variety of meanings in regard to organizational arrangements, number of physicians and fields of practice required, and methods of distributing income and expense among members. The following definition was used in this survey:

Group medical practice is the application of medical services by three or more full-time physicians formally organized to provide medical care, consultation, diagnosis, and/or treatment through the joint use of equipment and personnel, and with the income from medical practice distributed in accordance with methods previously determined by members of the group.

This definition differs from the one used for the AMA Physicians Records Service in that it specifies three or more full-time physicians irrespective of the number of part-time physicians. Most of the groups which were eliminated because "they did not meet the definition of a group" were respondent groups which were in the AMA master listing but had fewer than three full-time physicians. The definition used in the report was not included on the questionnaire or in any of the accompanying letters.

The 4,289 responding groups which met the definition were divided into three basic categories:

1. *Single specialty groups.* Medical groups

**Table 1. Number and percent of groups and of full-time and part-time group physicians, by type of group**

Type of group	Groups	Group physicians		
		Total	Full-time	Part-time
<hr/>				
		Number		
		<hr/>		
All types...	4, 289	28, 381	25, 452	2, 929
Single specialty...	2, 161	8, 956	8, 798	158
General practice...	651	2, 284	2, 252	32
Multispecialty....	1, 477	17, 141	14, 402	2, 739
		<hr/>		
		Percent		
		<hr/>		
All types...	100. 0	100. 0	100. 0	100. 0
Single specialty...	50. 4	31. 6	34. 6	5. 4
General practice...	15. 2	8. 0	8. 8	1. 1
Multispecialty....	34. 4	60. 4	56. 6	93. 5

providing services in only one field of practice or major specialty, except groups composed exclusively of general practitioners.

2. *General practice groups.* Groups composed exclusively of general practitioners.

3. *Multispecialty groups.* Groups providing services in at least two fields of practice or major specialty.

Groups consisting exclusively of general practitioners and other single specialty groups are presented separately in order to allow flexibility in the interpretation and use of the data. The user of our statistics may therefore interpret the data to fit a variety of group practice definitions.

The 4,289 groups in this survey range in size from three physicians to more than 750 and include a wide range of distributions of full-time and part-time physicians in each type of group. Such a heterogeneous population should be studied in terms of the differences that size makes in the characteristics of groups. The criterion used to determine the size of a group was the number of full-time physicians in the group. Hence, a group with three full-time and two part-time physicians is considered a three-man group. Neither the questionnaire nor the accompanying letter stated the criterion for establishing whether a physician was a full-time or part-time member. This omission precludes establishment of any accurate numerical full-

time to part-time equivalent relationship. Therefore, in order to provide comparability, the size of groups was determined by the number of full-time physicians.

### Number and Size of Groups

Of the total 4,289 groups in the survey, one-half were single specialty, one-third were multispecialty and the remainder were general practice groups (table 1). There were 28,381 physicians who were either members of, or employed by, the 4,289 groups, including 246 dentists, all of whom were associated with multispecialty groups. Almost 90 percent of the physicians were engaged full time in group practice. Of the remaining 10 percent who were part-time group physicians, almost all practiced in multispecialty groups. Of the total 28,381 group physicians, 60.4 percent practiced in multispecialty groups, 31.6 percent in single specialty groups, and 8 percent in general practice groups.

The average size of groups responding to the survey was 6.6 physicians. Multispecialty groups, with an average of 11.6 physicians, were considerably larger than either single specialty groups, with an average of 4.1 physicians, or general practice groups, with an average of 3.5 physicians.

Three-fourths of the groups were in the size category of three to five physicians. The distribution by type of group shows that general practice groups and single specialty groups were highly concentrated in this size category; 96.8 percent of general practice groups and 88.6 percent of single specialty groups consisted of three to five physicians, while only half of the multispecialty groups were in this size category. On the other hand, 11.7 percent of the multispecialty groups reported 16 or more physicians per group; less than 1 percent of the single specialty and general practice groups combined fell into the larger size categories. Part-time physicians were more heavily concentrated in the

**Table 2. Number and percent of groups and of group physicians, by type of group and size**

Type of group	All sizes	Size of group (full-time physicians)									
		3	4	5	6	7	8- 15	16- 25	26- 49	50- 99	100 and over
Number											
Groups-----	4, 289	1, 809	1, 001	451	244	167	435	119	39	16	8
Single specialty-----	2, 161	1, 076	604	234	97	49	92	7	2	0	0
General practice-----	651	446	145	39	14	3	4	0	0	0	0
Multispecialty-----	1, 477	287	252	178	133	115	339	112	37	16	8
Percent <sup>1</sup>											
Groups-----	100. 0	42. 2	23. 3	10. 5	5. 7	3. 9	10. 1	2. 8	0. 9	0. 4	0. 2
Single specialty-----	100. 0	49. 8	28. 0	10. 8	4. 5	2. 3	4. 3	. 3	. 1	0	0
General practice-----	100. 0	68. 5	22. 3	6. 0	2. 2	. 5	. 6	0	0	0	0
Multispecialty-----	100. 0	19. 4	17. 1	12. 1	9. 0	7. 8	23. 0	7. 6	2. 5	1. 1	. 5
Number											
Physicians-----	28, 381	5, 789	4, 314	2, 465	1, 608	1, 344	5, 109	2, 861	1, 388	1, 068	2, 435
Single specialty-----	8, 956	3, 283	2, 453	1, 189	598	356	880	139	58	0	0
General practice-----	2, 284	1, 360	587	195	87	21	34	0	0	0	0
Multispecialty-----	17, 141	1, 146	1, 274	1, 081	923	967	4, 195	2, 722	1, 330	1, 068	2, 435
Percent <sup>1</sup>											
Physicians-----	100. 0	20. 4	15. 2	8. 7	5. 7	4. 7	18. 0	10. 1	4. 9	3. 8	8. 6
Single specialty-----	100. 0	36. 7	27. 4	13. 3	6. 7	4. 0	9. 8	1. 6	. 6	0	0
General practice-----	100. 0	59. 5	25. 7	8. 5	3. 8	. 9	1. 5	0	0	0	0
Multispecialty-----	100. 0	6. 7	7. 4	6. 3	5. 4	5. 6	24. 5	15. 9	7. 8	6. 2	14. 2

<sup>1</sup> Percentages may not add to 100.0 because of rounding.

larger groups, since most of them were associated with multispecialty groups (table 2). There were eight groups with 100 or more physicians, accounting for 8.6 percent of total group physicians. The average size of groups in this category was 304 physicians.

In the survey, information was gathered on the size of each group during its initial year. Tabulation of the responses to this question by the current size of groups revealed that more than three-fourths have increased in size since formation. An additional 20 percent of the groups have not changed in size since formation, and only 2.7 percent decreased in size. These tabulations by initial and current size of groups were limited to the 3,593 groups in the 3 to 7 physicians size categories.

### Geographic Location

Three census divisions, the East North Central, West North Central, and Pacific, contained more than half of the total groups and group physicians. New England had the smallest percentage of total groups (3.5 percent) and the smallest proportion of group physicians (3.8 percent). The East North Central Division had the highest percentage of groups (19.8 percent), while the highest percentage of group physicians (21.2 percent) were located in the Pacific Division (table 3).

There was considerable variation from the national average of 14.7 group physicians per 100,000 population. The highest ratios were in the West North Central Division with 24.9 group physicians per 100,000 population and in the Pacific Division with 24.8. The lowest was in the Middle Atlantic Division with 8.0.

The distribution of groups and group physicians within census divisions by type of group showed some interesting variations. In New England, almost three-fourths of the groups were single specialty, as compared with only slightly more than one-third in the West North Central Division. The most even distribution of groups was in the West North Central Division, in which 35.6 percent of the groups were single specialty, 24.1 percent were general practice, and 40.3 percent were multispecialty groups.

California, Texas, New York, Ohio, and Illinois together accounted for more than one-third

of all groups. There were no States without a group, but five States had fewer than 10 groups each. Thirteen States had 100 or more groups each, and eight States had more than 1,000 group physicians each. Alaska, Delaware, Maine, Vermont, and Wyoming each had fewer than 50.

The distribution of groups by size of community showed that single specialty groups tended to be concentrated in larger communities and general practice groups in smaller ones.

**Table 3. Percentage distribution of groups and of group physicians, by census division and type of group**

Census division	Type of group			
	Total	Single specialty	General practice	Multispecialty
Groups				
Total number-----	(4, 289)	(2, 161)	(651)	(1, 477)
Total percent <sup>1</sup> -----	100. 0	100. 0	100. 0	100. 0
New England-----	3. 5	5. 0	. 9	2. 4
Middle Atlantic--	9. 6	12. 8	4. 9	7. 0
South Atlantic---	12. 6	15. 7	9. 5	9. 5
East North Central-----	19. 8	18. 9	20. 7	20. 6
East South Central-----	6. 0	6. 5	3. 4	6. 5
West North Central-----	13. 6	9. 6	21. 7	16. 0
West South Central-----	11. 9	10. 4	12. 3	14. 0
Mountain-----	5. 6	5. 0	7. 2	5. 8
Pacific-----	17. 3	15. 9	19. 4	18. 4
Physicians				
Total number-----	(28, 381)	(8, 956)	(2, 284)	(17, 141)
Total percent <sup>1</sup> -----	100. 0	100. 0	100. 0	100. 0
New England-----	3. 8	5. 4	. 8	3. 3
Middle Atlantic--	10. 2	12. 9	4. 7	9. 5
South Atlantic---	11. 3	14. 9	9. 1	9. 7
East North Central-----	18. 9	19. 6	19. 9	18. 3
East South Central-----	5. 1	6. 1	3. 3	4. 8
West North Central-----	14. 0	9. 6	22. 3	15. 2
West South Central-----	10. 4	10. 4	12. 1	10. 2
Mountain-----	5. 2	5. 0	7. 4	5. 0
Pacific-----	21. 2	15. 9	20. 4	24. 1

<sup>1</sup> Percentages may not add to 100.0 because of rounding.



**Table 4. Percentage distribution of groups by form of organization and type of group**

Form of organization	Type of group			
	Total	Single specialty	General practice	Multispecialty
Total number-----	(4, 289)	(2, 161)	(651)	(1, 477)
Total percent-----	100. 0	100. 0	100. 0	100. 0
Single owner-----	3. 0	1. 7	3. 5	4. 8
Partnership-----	77. 8	79. 9	84. 9	71. 5
Corporation-----	8. 1	7. 6	4. 5	10. 3
Association-----	8. 8	8. 9	6. 0	10. 0
Foundation-----	. 3	( <sup>1</sup> )	0	. 9
Other-----	2. 0	1. 9	1. 1	2. 5

<sup>1</sup> Less than 0.1 percent.

One-third of the single specialty groups were in communities of 500,000 or more population. Almost three-fourths of the general practice groups, on the other hand, were in communities with populations of 50,000 or less. Multispecialty groups were about evenly divided between communities of less than 50,000 population (54.7 percent) and those with 50,000 or more (45.3 percent).

### Organization and Structure of Groups

Respondents were asked to indicate the form of organization under which the group provides professional services. There were six choices—single owner, partnership, corporation, association, foundation, and “other.” Partnerships were by far the most popular form of organization, accounting for slightly more than three-fourths of total groups. The next most prevalent form was the association, which represented 8.8 percent of total groups, followed by corporations, which accounted for 8.1 percent of the groups. Single owner groups accounted for 3.0 percent of all groups. Less than 1 percent of the groups were foundations (table 4).

Groups with 3 to 5 physicians comprised more than 60.0 percent each of the single owner groups, partnerships, corporations, and associations. Foundations were the only organizational form found predominantly in the larger sized categories. Four of the eight groups with 100 or

more physicians were partnerships, one was a corporation, one was an association, and two were classified as “other.”

Only groups with a predetermined method of distributing income among their members were counted as part of the usable response to this survey. Three methods of income distribution were reported—salary only, salary plus a share of net income, and share of net income only. The “share of net income only” category was further divided into equal shares and varying shares. Most of the groups (83.1 percent) reported “share of net income only” as the method of income distribution. Of the 3,563 groups which used this method, 44.5 percent distributed income equally among group members, and 55.5 percent used a method which distributed varying shares to different group physicians in accordance with some predetermined formula. Only 3.6 percent of the groups distributed income exclusively by salary, while 3.9 percent supplemented a basic salary with a system of sharing net income. The remaining 9.4 percent of the respondents either reported “other” for method of income distribution or did not answer the question.

### Specialties of Group Physicians

General practitioners, internists, and general surgeons combined accounted for almost half of the total physicians in the survey. Group practice was found to be more popular among certain specialists than others. More than one-fourth of the radiologists and anesthesiologists who were engaged in patient care practiced in groups (table 5). The specialists least inclined to practice in groups were psychiatrists and general practitioners. Certain specialists were found to be concentrated in multispecialty groups. At least three-fourths of the dermatologists, general surgeons, internists, ophthalmologists, otolaryngologists, and physiatrists in group practice were associated with multispecialty groups.

### Allied Health Personnel

One of the advantages often attributed to group practice is more efficient use of allied health personnel to handle the routine medical procedures and paperwork of medical practice,

thus freeing more physician time for providing direct care. We did not attempt to analyze this hypothesis in the survey since data would be required on the the employment of allied health personnel in solo practice, in nongroup partnerships, and in other practice arrangements as well as in group practice. In this survey, data were merely collected on the number of allied health personnel employed by groups. The distribution of the 65,336 allied health personnel in all types of group practice shows that clerical workers made up the single largest category, representing one-third of total allied health personnel. Registered nurses, licensed practical nurses, and nurses aides combined accounted for another one-third (table 6).

The average number of allied health personnel per physician was 2.3 for all types of group practice, with 2.5 in multispecialty, 1.9 in single specialty, and 2.5 in general practice groups (table 6). Groups in the size category of 100 physicians and over had a relatively high percentage (10.4 percent) of allied health personnel, probably because some of these groups run hospitals or large clinics which require large staffs of such personnel.

#### Groups With Prepayment Plans

Information on prepayment was not sought on the questionnaire. However, because of the current interest in prepaid group practice, we believed that a profile of group practice would not be complete without some information on prepaid groups. With the cooperation of the Medical Group Management Association, 88 groups in the survey were identified which pro-

**Table 5. Group physicians as a percentage of total physicians engaged in patient care in 1965, by specialty and type of group**

Specialty	Type of group		
	Total	Single specialty and general practice	Multi-specialty
Total.....	10.9	4.3	6.6
Anesthesiology.....	26.4	23.2	3.2
Dermatology.....	9.7	1.3	8.3
General practice.....	7.7	3.2	4.5
General surgery.....	10.9	1.8	9.2
Internal medicine.....	13.7	3.3	10.4
Neurological surgery.....	14.6	6.7	7.9
Obstetrics-gynecology.....	14.5	5.1	9.3
Ophthalmology.....	8.8	2.4	6.3
Orthopedic surgery.....	18.8	10.3	8.5
Otolaryngology.....	11.1	2.8	8.3
Pathology.....	9.2	5.6	3.6
Pediatrics.....	14.7	5.1	9.6
Physical medicine.....	9.0	2.0	7.0
Psychiatry.....	3.8	1.3	2.6
Proctology.....	12.1	4.0	8.0
Radiology.....	27.1	17.6	9.5
Urology.....	13.9	4.8	9.1

vided a significant amount (50 percent or more) of care on a prepayment basis. Separate tabulations were made on these groups. Most of the prepaid groups were multispecialty (88.6 percent), and almost all of the physicians in prepaid groups were in multispecialty groups (98.5 percent). The average size of prepaid groups was 39.7 physicians.

Two-thirds of the prepaid groups were in the Middle Atlantic, West North Central, and Pacific Census Divisions. These same three census divisions contained 84.2 percent of the physi-

**Table 6. Number of allied health personnel per physician, by type of group and size**

Type and size of group	Total (N=65,336)	Registered nurses	Licensed practical nurses and nurses aides	Laboratory and X-ray technicians	Clerical	Other
<i>Type</i>						
All groups.....	2.3	0.4	0.3	0.5	0.8	0.2
Single specialty.....	1.9	.3	.2	.7	.7	.1
General practice.....	2.5	.5	.6	.3	.8	.3
Multispecialty.....	2.5	.5	.4	.4	.9	.3
<i>Size of group</i>						
3-5.....	2.2	.4	.4	.5	.7	.2
6-15.....	2.1	.4	.3	.4	.8	.2
16-25.....	2.3	.5	.3	.3	.9	.3
26-49.....	2.7	.6	.3	.4	1.1	.3
50 and over.....	3.0	.5	.4	.5	1.2	.4

cians in prepaid groups. Only 29 States had prepaid groups. Of these, California, Minnesota, and New York contained 44.3 percent of the prepaid groups and 71.7 percent of the physicians in prepaid groups. Prepaid groups were concentrated in large communities.

Although partnerships were the dominant form of organization for prepaid groups, a lower percentage of prepaid groups were partnerships (60.2 percent) than was true of the total groups in the survey (77.8 percent). On the other hand, a larger percentage of prepaid groups were corporations (12.5 percent) than was true of total groups (8.1 percent).

There were 4,623 allied health personnel in the 88 prepaid groups. Of these 4,623, registered nurses, licensed practical nurses, and nurses aides combined represented 37.2 percent; laboratory and X-ray technicians, 17.4 percent; and clerical and maintenance personnel, 38 percent.

#### Comparison of Surveys, 1946, 1959, 1965

Comparison of the Public Health Service group practice surveys of 1946 and 1959 with the AMA survey of 1965 presented some definitional problems. As a result, general practice groups and multispecialty groups had to be combined, and most comparisons were limited to this classification to the exclusion of single specialty groups. Since the 1959 survey conducted by the Public Health Service included groups with fewer than three full-time physicians, comparisons are limited to instances in which data in the 1959 survey were presented by size of group.

The percentage changes mentioned in this section refer to differences between the surveys and do not necessarily provide accurate estimates of the real growth of group practice generally. Reporting errors have accrued on account of the failure to include some groups whose existence was not known at the time the survey was being conducted. This lack of completeness is particularly true of the earlier surveys when recordkeeping was not as comprehensive as it is now.

The total number of groups with three or more full-time physicians increased from 404 in 1946 to 1,546 in 1959 and to 4,289 in 1965. These figures represent an annual average increase of 10.9 percent from 1946 to 1959 and an 18.5 per-

cent annual average increase from 1959 to 1965. Single specialty groups increased faster than the other types of groups. In 1946, single specialty groups represented 8.9 percent of total groups. By 1959, this figure was 25.4 percent; by 1965, it had increased to 50.4 percent.

The 13.9 percent annual average increase in total group physicians from 1959 to 1965, when compared with the 18.5 percent annual average increase in groups during the period, explains the decrease in the average size of groups from 8.4 physicians per group in 1959 to 6.6 in 1965. Another indication of the decrease in size is that multispecialty and general practice groups with three or four physicians represented higher percentages of total groups in 1965 than in 1959, but groups with five or more physicians decreased relative to total groups during the 1959-65 period.

There were several changes in the geographic distribution of groups and group physicians in the periods between the three surveys. The Pacific Census Division, which included 12 percent of multispecialty and general practice groups in 1946, had 14.6 percent of these groups in 1959 and 18.7 percent in 1965. The South Atlantic Division showed similar increases, going from 5.7 percent of multispecialty and general practice groups in 1946 to 8.1 percent in 1959 and 9.5 percent in 1965. The South Atlantic Division also showed a similar trend over the two periods.

There was considerable variation in the annual average percentage increases of multispecialty and general practice groups and group physicians among census divisions from 1959 to 1965. The smallest annual average increase in groups was in the West North Central Division (4.7 percent); the largest was in the East North Central Division (15.6 percent). Physicians in multispecialty and general practice groups had the lowest annual average increase in the West North Central Division (5.4 percent) and the highest in the South Atlantic Division (14.5 percent).

The average size of all multispecialty and general practice groups declined from 9.9 physicians in 1959 to 9.1 in 1965, but the average size of these types of groups in the South Atlantic, East South Central, and West North Central Census Divisions increased during the 1959-65 period.

# PLANNING,

## MODEL CITIES STYLE

Planning, model cities style, began in October 1967 for Model Neighborhoods in 75 cities and counties throughout the nation. Following the first planning year, each of the 75 localities produced plans consisting of problem analyses, 5-year forecasts of programs to meet the problems, and first-year action plans to begin the programs.

Key features that encapsulate the model cities concept are local planning and local decision making, meaningful participation by residents of the target (model neighborhood) area of the city, the mandate to innovate, and comprehensiveness in planning.

A good illustration of how the features and the overall concept are working is evident in Denver. This city has ghetto problems which may be considered typical, but presently less severe than those in some of the larger cities. Twelve resident committees, each with the aid (usually nondirective) of local technical consultants, were encouraged to produce a ranked list of problems. Each of these committees functioned in a separate subject area, such as health, welfare, police-community relations, and so forth. Education was divided among three committees—adult education, vocational education, and individualized education, which was concerned with children from kindergarten through 12th grade.

The resident committee on individualized education concluded that the overall problem is underachievement of school children as measured by standard scholastic achievement tests and as compared with children in the rest of the city. In order of priority, beginning with the

most important, they listed causes, or subproblems, and proposed solutions in their 5-year plan.

The following are the subproblems listed in descending order of importance: hunger, poor physical health, poor mental health, mental retardation (and other physical and mental handicaps), transportation, teaching, clothing, parent involvement, cultural deprivation, and inequality of educational opportunity.

This list brings to mind several interesting speculations: Would educational or health professionals, working together or separately, have come up with this wide ranging mixture of causes of scholastic underachievement or anything similar to this sequence? On the other hand, it seems doubtful that professionals can argue against this list and its priorities. The collaboration among agencies and individuals which will be necessary to attack these problems (along with continued participation of residents) is as wide ranging as the problems themselves, and could provide, in the microcosm of just one subject area, a challenging test.

This test will surely involve people and organizations who have not thought themselves to be associated with furthering the achievement of school children, as well as those more traditionally considered, at least by the professionals, to be involved.—RUTH E. DUNHAM, M.D., M.P.H., *program director, Health Facilities Planning and Construction Service and HSM-HA Model Cities Representative for Region VIII, Health Services and Mental Health Administration, Public Health Service, Denver, Colo.*

# An Evaluation of Immunization Status of White Children in a Kentucky County

DAN A. MARTIN, M.D., SALLY J. FLEMING, M.D., TIMOTHY G. FLEMING, M.D., and DEANNA C. SCOTT

**T**HE DIFFICULTIES in achieving measles immunization in 12- to 15-month-old children in Hopkins County, Ky., have been described in a previous retrospective study (1), in which we also assessed the effect of mailed notices to the parents urging protection against measles. A rather small number of children—only about one-half—were found to be protected against measles either by natural disease or by immunization. Moreover, no effect of the mailed notices could be detected.

In the belief that these disappointing results might have been due to the relative newness of the campaign for measles immunization, we undertook a study of immunization against poliomyelitis and DPT (diphtheria-pertussis-tetanus) which we expected might yield different and better results.

A prospective study was designed to (a) assess the effectiveness of notices urging polio-

myelitis and DPT immunization, (b) reveal the total number of children for whom such immunizations had been started by 4 and 12 months of age, (c) determine the factors preventing 100 percent poliomyelitis and DPT immunization of all children born in a particular period, as well as the effort that would be necessary to produce 100 percent immunization, and (d) disclose the characteristics of families that had and had not begun immunization of their children by an acceptable time after birth.

## Materials and Methods

Beginning May 1, 1966, and continuing through April 30, 1967, the names of all children born in Hopkins County were listed serially along with other information pertinent to our study, including sex of the child, address of the parents, number of other children in the family, legitimacy of the birth, education of the mother, income of the family, and name of the child's physician. Scott elicited these data at the time of the mother's confinement.

To the parents of every other baby born during the period May 1, 1966–April 30, 1967, notices were sent when the baby was 3 weeks old urging poliomyelitis and DPT immunization (see box); no known selection factors were involved in this system. Since all the children's records that were available for study at 4 and 12 months after birth were reviewed in physicians' offices and at the Hopkins County Health Department, we did not need to rely solely upon

---

*Dr. Martin is clinical professor of community medicine, University of Kentucky School of Medicine, Lexington, and acting health officer for Hopkins County. Dr. Sally J. Fleming and Dr. Timothy G. Fleming, who at the time of the study were senior students in the school's department of community medicine, are interns at the University of Wisconsin Hospitals in Madison. Mrs. Scott is a clerk in the vaccine assistance program, department of epidemiology, Kentucky State Department of Health, Frankfort. This program provided financial support for the study.*

the parents' memory. The physicians' records could have been incorrect, of course, but we do not believe that they were an important source of error.

To fulfill the four aims of the study, we decided to keep separate records on (a) births to residents which occurred outside Hopkins County when these residents were considered to belong rightfully to the county's population and (b) births of nonwhite infants both within and outside the county. As the following distribution of babies born to county residents in the period May 1, 1966–April 30, 1967, shows, the total births to nonwhite residents and to white residents outside the county were so small in number that further subdivision of the groups would have precluded profitable statistical examination:

<i>Births</i>	<i>Number</i>
To white residents:	
In the county.....	487
Outside the county.....	42
To nonwhite residents:	
In the county.....	62
Outside the county.....	1
Total.....	592

## Results

Because the groups of nonwhite children and of white children born outside the county were too small to subdivide profitably for further study, our results are limited to the 487 infants born to white residents within Hopkins County in the period May 1, 1966–April 30, 1967.

*Effectiveness of notices.* There was no statistically significant difference between the results of immunization among families receiving notices urging immunizations and families receiving no notices, as the following table shows:

<i>Item</i>	<i>Sent notice</i>	<i>No notice</i>
Total selected <sup>1</sup> .....	243	240
Available for study.....	229	224
Started immunization by 4 months:		
DPT.....	189	179
Poliomyelitis.....	177	178
Unavailable for study.....	14	16
Letters unclaimed.....	6	
Moved from county.....	8	16

<sup>1</sup> 4 of the 487 white babies born in Hopkins County in the period May 1, 1966–April 30, 1967, were excluded from the study because they were adopted.

These data suggest that nothing is gained by mailed notices urging immunization. The reason may be that most parents take their children to physicians often enough so that preventive measures are initiated irrespective of the parents' desire for this service. But not all parents fall into this group. Approximately one-fifth of the total group of 453 babies available for study had not been started on preventive immunization (85 for DPT and 98 for poliomyelitis) by the expected and desirable time of 4 months after birth. We expected, however, that a restudy of the babies at 12 months of age would show an improvement.

*Immunizations by 4 and 12 months.* By October 31, 1967, that is, 18 months after the study began, we were able to determine how many of the 254 babies born in the county to white residents in the 6-month period May 1, 1966–October 31, 1966, had been started on poliomyelitis and DPT immunizations by 4 and by 12 months of age. Records of the babies at the health department and in physicians' offices were reviewed when the children were 4 months of age and again when they were 12 months of age to determine what had happened between these two points with respect to immunization. The results for the 254 babies born in the 6-month period, excluding 23 who were adopted or had moved, were as follows:

<i>Initiation of immunization</i>	<i>DPT</i>	<i>Poliomyelitis</i>
By 4 months.....	186	183
By 12 months <sup>1</sup> .....	11	12
No started.....	<sup>2</sup> 34	36
Total.....	231	231

<sup>1</sup> But after 4 months.

<sup>2</sup> Also had not been started on poliomyelitis.

To find that only an additional 5 percent of the study children had been immunized by the 12th month of age was disappointing. It had been postulated originally that the passage of time would bring a large number of children to physicians and that immunizations would be started on these visits. Our results indicate, however, that if a child has not been started on his initial immunizations by 4 months of age, he is unlikely to have been started on them by 1 year of age. Of the 231 babies available for study at both 4 and 12 months of age, 34 (ap-



proximately 15 percent) had not been started on either DPT or poliomyelitis immunizations by 1 year of age.

*Study of children not immunized by 1 year.* Thirty-four children had not received any immunizations by 1 year of age. It therefore became necessary to visit or to attempt to visit these children in their homes. A public health nurse and Scott, who had established the initial contact with the hospitalized mother following the child's birth, obtained the following information on their first home visit, or attempted visit:

<i>Immunization status</i>	<i>Number of children</i>
None obtained in county-----	13
Family moved from county or State-----	10
Incorrect address or family not known to neighbors or post office-----	3
Obtained in county-----	11
DPT and poliomyelitis, "spontaneously" before visit-----	2
DPT and poliomyelitis at home as result of visit-----	7
DPT and poliomyelitis at health department after refusing at home-----	1
Measles only at health department after refusing DPT and poliomyelitis at home <sup>1</sup> -----	1
Potential immunizations through second visit--	10
Family moved within county and must be relocated-----	5
Family not at home <sup>2</sup> -----	3
Baby ill at time of visit <sup>3</sup> -----	2
<b>Total-----</b>	<b>34</b>

<sup>1</sup> Baby later developed clinical whooping cough; no organism was cultured.

<sup>2</sup> Later one of these babies also developed clinical whooping cough.

<sup>3</sup> One family asked nurse and clerk not to return.

If we exclude the families of the 13 infants that could not be located because they had moved or initially had given unlocatable addresses, as well as the two families that had obtained immunizations for their babies spontaneously, 19 of the 34 "problem group" infants remained who needed immunizations and were available for intensive followup. One home visit resulted in approximately 25 percent of the 34, or eight babies, receiving immunizations. This result was accomplished by two people spending 9½ days each and traveling 329 miles. A second visit was to be directed at the 10 children presumed still to be in the county and still "at risk."

Were there any unusual personal or family characteristics by which the parents of these 34

---

*Dear Parent,*

From the minute a baby is born, he begins counting on you to keep him safe . . . warm . . . happy. He's also counting on you to protect him from the serious diseases most children can still get—diseases such as diphtheria, whooping cough, lockjaw, polio, smallpox, and measles. Your first act of defense against such serious diseases is the "Baby-Shots" available from your family doctor or health department.

These diseases are especially dangerous to children under five and may lead to permanent damage or death if untreated. Aftereffects or complications can be severe and may include heart failure, paralysis of muscles, nerve damage or destruction, blindness, pneumonia, and skin diseases.

*Doctors recommend that protection be started as early as two months of age.* A three-in-one shot keeps an infant or child safe from diphtheria, whooping cough, and lockjaw. Polio protection is available by shot or by letting a sugar cube containing protective vaccine dissolve in the mouth. Smallpox requires a separate vaccination later in the baby's first year.

Don't let your baby down . . . See that he gets the protection he needs. *Take him to a doctor as early as two months of age.* You'll be glad you did. Good intentions won't keep your child safe!

*Hopkins County Health Department*

---

babies might have been detected early and tagged as being at high risk of not obtaining immunizations? If such identification had been possible in our study, the two unfortunate cases of clinical whooping cough might have been avoided. In this study, families were not contacted as soon after a missed immunization as they might otherwise have been because of the design of waiting a year to determine what families do "spontaneously" about immunization. Followup closer to the time of a missed immunization would probably produce better results.

*Immunized and nonimmunized babies.* When 317 of the 453 children under study had reached 8 months of age, S. J. and T. G. Fleming compared the characteristics of the 38 families that had not obtained initial poliomyelitis and DPT immunizations for their children with the characteristics of the 279 families that had. The significant data are summarized in table 1.

As a group, the families which had not immunized their babies showed statistically significant differences from the group that had.

These differences included a lower income, greater parity and less education of the mother, and more rural residences. These attributes then are some of the characteristics of families of babies who have a high risk of not being immunized by an acceptable time after birth.

Of course not all rural families of low income in which the mother has three (or more) babies and is poorly educated fail to obtain immunizations; nor do all families not exhibiting these characteristics immunize their babies.

We next paired 33 of the nonimmunized babies with the same number of immunized babies matched for family residence and income level and for parity and education of the mother. To try to determine the reasons for the differences in the matched groups, we analyzed (a) the babies' birth weights, (b) length of mothers' postpartum hospital stays, (c) number of prenatal visits by mothers, (d) evidence of bacteriuria—by number of white blood cells in the mothers' hospital urine specimens, (e) hematocrit levels of the mothers, and (f) number of well-baby and "sick" baby visits in an 8-month period. A sick visit was defined from the child's chart, which was reviewed in the physician's office. Since all physicians provided

access to their records, we were able to determine which physician the children had visited and what had been done for them.

This comparison did not prove as useful as was originally expected. Not surprisingly, the immunized children accounted for significantly more total visits to physicians, including both sick and well visits, than the nonimmunized. The most significant difference was in the greater number of well-baby visits for immunized children between 2 and 8 months of age. Families of the nonimmunized children simply did not bring their children to physicians in this critical period when immunizations should be started. Mothers whose babies were not immunized tended not to come for prenatal care as often or as early as those mothers who had their babies immunized. The only other statistically significant difference in the two groups, however, was with respect to hematocrit levels (table 2).

The significance of the lower hematocrit levels in the mothers of the nonimmunized babies is not clear. Taken along with their tendencies to make fewer visits to physicians, the lower levels may indicate only that these mothers do not value health care for them-

**Table 1. Characteristics of families in which babies were and were not immunized against poliomyelitis and DPT by age 8 months, Hopkins County, Ky., 1967**

Characteristic	Immunized (N=279)		Not immunized (N=38)		Difference	
	Observed	Expected	Observed	Expected	Chi-square	Significance
Residence:						
Urban <sup>1</sup> .....	152	141.7	9	19.3	12.69	$P < 0.01$
Rural.....	127	137.3	29	18.7		
Family income:						
More than \$3,000.....	193	184.0	16	25.0	10.91	$P < 0.01$
Less than \$3,000.....	86	95.0	22	13.0		
Parity of mother (including present index child):						
1 child.....	113	103.9	5	14.1	14.48	$P < 0.01$
2 children.....	78	79.2	12	10.8		
3 or more children.....	88	95.9	21	13.1		
Age of mother (years):						
15-24.....	171	169.9	22	23.1	.19	<sup>2</sup> $P < 0.05$
25-34.....	83	83.6	12	11.4		
35-45.....	25	25.5	4	3.5		
Education of mother (years):						
0-9.....	<sup>3</sup> 63	74.3	23	11.7	18.04	$P < 0.01$
10 or more.....	<sup>3</sup> 177	165.7	15	26.3		

<sup>1</sup> Urban=town of more than 2,000.

<sup>2</sup> Not significant.

<sup>3</sup> Number of years of education is not known for 39 mothers who immunized their babies.

**Table 2. Hematocrit levels in 33 pairs of mothers, matched for residence, income level, parity, and education, who had and had not had their babies immunized**

Level	Immu- nized <sup>1</sup>	Not immu- nized	Total
35 and over-----	25	14	39
34 and under-----	8	19	27
Total-----	33	33	66

<sup>1</sup> Had received initial DPT and poliomyelitis immunizations by 8 months of age.

NOTE: Chi square=7.584;  $P < 0.01$ .

selves or their children in the way that their matched counterparts do. Even if this interpretation is correct, however, our study did not reveal the basic reason for this attitude.

### Conclusion

Mailed notices to parents urging immunizations for DPT and poliomyelitis did not result in an improved immunization status in their children as compared with the children of a control group. This result suggests that knowledge about childhood immunizations and the activity of physicians in performing these preventive measures are already about as extensive as can be expected. Therefore few additional immunizations are likely to be induced by mailed notices. By the time children in Hopkins County are 4 months old, DPT and poliomyelitis immunizations have been started for about 80 percent. Yet such a small proportion of children are started on immunizations between 4 and 12 months of age—5 percent—that for practical purposes it can be stated that if a child is to receive these immunizations in the first year of life, they will have been initiated by 4 months of age.

Home followup of the "hard core" 15 percent of children who have received no immunizations by the end of their first year, by a public health nurse or clerk, or both, is practical even though some of the children will have moved by the time of the visit. On the basis of our results, we estimate that if two attempts at home visits are made as soon after the baby is 4 months of age as possible, fully one-half to two-

thirds of the hard core group could be located and immunized at home.

The staff of most health departments will have difficulty learning which children have not had their immunizations by 4 months of age. One method is to ask physicians to notify a central agency (the State health department, for example) when they begin children's immunizations. Another method is to ask the parents by mail what immunizations have been given. Both methods have obvious drawbacks. A third method might incorporate two approaches. A clerk could obtain an exact address, telephone number, and other data while the mother was still in the hospital after the child's birth. Then the State health department could request information from the mother when the baby was about 4 months old. All parents not responding or giving inadequate information would be telephoned, if possible, and visited, if necessary, to obtain the information or to provide the needed immunizations.

A partial approach to reaching the hard core group would be to initiate immunizations in the still hospitalized newborn baby if his parents belonged to the group which shows a high risk of not returning for immunizations. In our study such parents tended to be poor, to live in rural areas, have three or more children, and the mother was likely to be poorly educated. If early immunization can be accepted as being of benefit (2-4) or at least as doing no harm, some partial protection might be obtained in this way. In addition to immunizing many children of the hard core group, it might also catch some children like the 5 percent of the total selected for our study who had moved or otherwise could not be located by age 4 months.

Still another approach to the nonimmunized 15 percent would be to seize any opportunity to immunize the baby. Most physicians do not consider immunization advisable if a baby is ill. If, however, the child is believed to be at high risk of not being immunized, this step may be justified, especially if the child has a relatively minor illness. Two children in our study who had not received any immunizations by 1 year of age and in whom clinical whooping cough developed had been taken to a physician's office for earlier illnesses and might have been immunized

if this approach had been taken. These are judgments that only the physician can make in the light of all facts and risks.

### Summary

The 453 infants that could be located among the 487 born to white residents in Hopkins County, Ky., in a recent 1-year period were divided into two groups. Parents of one group received mailed notices urging DPT (diphtheria-pertussis-tetanus) and poliomyelitis immunizations; parents of the other group did not. When the babies were 4 months old, the two groups did not differ significantly in the percent of immunizations started. For approximately 20 percent of the 453 infants, neither DPT nor poliomyelitis immunizations had been initiated.

Study of a subgroup of 231 babies at 12 months of age showed that only 5 percent more received immunizations between 4 and 12 months of age than had received them by 4 months. Thirty-four infants of this subgroup had received no immunizations of any kind. A home visit by a public health nurse and a clerk resulted in completion of immunizations in eight of the 34; one mother refused to have her child immunized. The parents of two children

had already voluntarily had them immunized before the visit. Families of 13 infants could not be located. A second home visit was planned to try to persuade the parents of the remaining 10 infants to provide the protection their children needed.

Families unlikely to have babies immunized by an acceptable time were characterized by poverty, rural residence, a mother with an education of 9th grade or less, and three or more children.

### REFERENCES

- (1) Martin, D. A., Scott, D. C., Underwood, W. F., and Thurber, D. C.: Measles vaccination study in Hopkins County, Kentucky—1966. *J Kentucky Med Assoc* 65: 675-677, July 1967.
- (2) Adams, J. M., Kimball, A. C., and Adams, F. H.: Early immunization against pertussis. *Amer J Dis Child* 74: 10-18, July 1947.
- (3) Osborn, J. J., Dancis, J., and Julia, J. F.: Studies of the immunology of the newborn infant. 1. Age and antibody production. *Pediatrics* 9: 736-744, June 1952.
- (4) Osborn, J. J., Dancis, J., and Julia, J. F.: Studies of the immunology of the newborn infant. 2. Interference with active immunization by passive transplacental circulating antibody. *Pediatrics* 10: 328-334, September 1952.

## Two New Regional Medical Libraries

The National Library of Medicine has awarded two \$150,000 grants to establish two more regional medical libraries under the authority of the Medical Library Assistance Act of 1965. The grants were awarded to the New York Academy of Medicine in New York City, and to the University of California at Los Angeles (UCLA) Biomedical Library Center for Health Sciences.

The awards will initiate regional library services for health professionals in New York State, the 11 northern counties of New Jersey, and the Pacific Southwest Region, which includes California, Nevada, Arizona, and Hawaii.

The UCLA Biomedical Library, under the direction of librarian Louise Darling, will be assisted by a 19-man advisory committee. The library also will have a subcontract for inter-

library loan assistance to northern California and Nevada with the University of California Medical Center Library in San Francisco.

The New York Academy of Medicine, under the direction of Dr. James E. McCormack, director of the academy, will serve as the administrative unit for the New York Regional Medical Library.

The Regional Medical Library operation will improve flow of biomedical information through local medical libraries to medical practitioners, researchers, and educators throughout the New York and Pacific Southwest Regions. The main goal of the new library service is to provide the most effective delivery of health science information to members of the health professions of the region. Operation of the service in the two new regions is scheduled to begin this year.

# A Skin Test Survey of Tularemia in a Montana Sheep-Raising County

ELIZABETH A. CASPER, M.S.P.H., and ROBERT N. PHILIP, M.D., M.P.H.

IN AN epidemiologic study of tularemia in Montana trappers (1), intradermal tests with an ether-extracted vaccine proved useful for identifying persons with delayed hypersensitivity to *Francisella tularensis*. Although skin tests and agglutination tests correlated well, the skin tests were more sensitive than the agglutination tests in identifying prior infection among occupationally exposed persons. Our study was undertaken to determine by skin tests the prevalence of past infection among residents of a sheep-raising county in Montana where tularemia cases have frequently been reported.

Garfield County, in eastern Montana, comprises an area nearly as large as the State of Connecticut but is sparsely populated, with less than one person per square mile. Ranching is the principal occupation, and the county ranks second in the State in production of sheep. There are 70 times as many sheep as people in the county. Jordan, the only town in the county—and currently advertised as the most isolated frontier town in the United States—has a population of 557. The remaining 1,424 inhabitants are scattered on ranches or farms.

Garfield County's average annual reported tularemia case rate of 5.23 per 10,000 population

is the highest in Montana (fig. 1). During the past 40 years, 58 cases have been reported, almost all by the one county physician, a man who has practiced medicine for that entire period in Jordan and is fully cognizant of the tularemia problem. The sources of infection in 71 percent of the reported cases was listed as tick bite or contact with sheep or rabbits. More than half of the cases occurred in men in the 30- to 59-year age group. Waterborne illnesses or death from tularemia have never been reported.

In 1964 an epizootic in sheep and an outbreak of human tularemia occurred (personal communication, 1964, from W. L. Jellison, retired parasitologist, Rocky Mountain Laboratory). The epizootic began during lambing season, which coincides with peak wood tick (*Dermacentor andersoni*) activity. Sheep losses ranged from 1 to 43 percent of the lamb crop on various ranches. Fewer losses occurred among ewes and yearlings. Selective serologic testing after the epizootic and again 6 months later demonstrated tularemia agglutinins in 101 of 179 ewes and yearlings. Twenty-one lambs tested had no antibodies against tularemia.

In other sheep epizootics in western United States and Canada, Rocky Mountain Laboratory investigators found few or no associated human cases (2), but in Garfield County 12 cases were disclosed. In one sheepshearing crew of 12, five persons had serologically confirmed tularemia. Seven other cases occurred among sheep ranchers. All were men of median age, about 40. Severity of illness ranged from a mild influenza-like syndrome requiring no medical care to typi-

---

*Miss Casper and Dr. Philip are with the National Institute of Allergy and Infectious Diseases, Rocky Mountain Laboratory, Public Health Service, Hamilton, Mont. This paper was presented at the 23d annual meeting of the International Northwest Conference on Diseases in Nature Communicable to Man, held in Hamilton on August 19, 1968.*

cal ulceroglandular tularemia requiring hospitalization. Sheepshearers in this outbreak apparently had a milder illness, with cervical adenopathy and chest pain as the principal symptoms, while most of the ranchers had ulcers and adenopathy involving an upper extremity.

#### Methods

Participation in the 1967 survey was requested, by letter, of all county residents 6 years old and older. Participation of residents with a known history of tularemia was not encouraged over participation of those without a history of the disease. To facilitate attendance, skin-test clinics were held in four areas in the county. Information on ranching activities and history of tularemia or tularemia-like illness following exposure to sheep or after tick bites was elicited from each participant before the skin test reading. Persons who were or had been sheep ranchers, sheephands, sheepshearers, or residents on sheep ranches were considered as having contact with sheep.

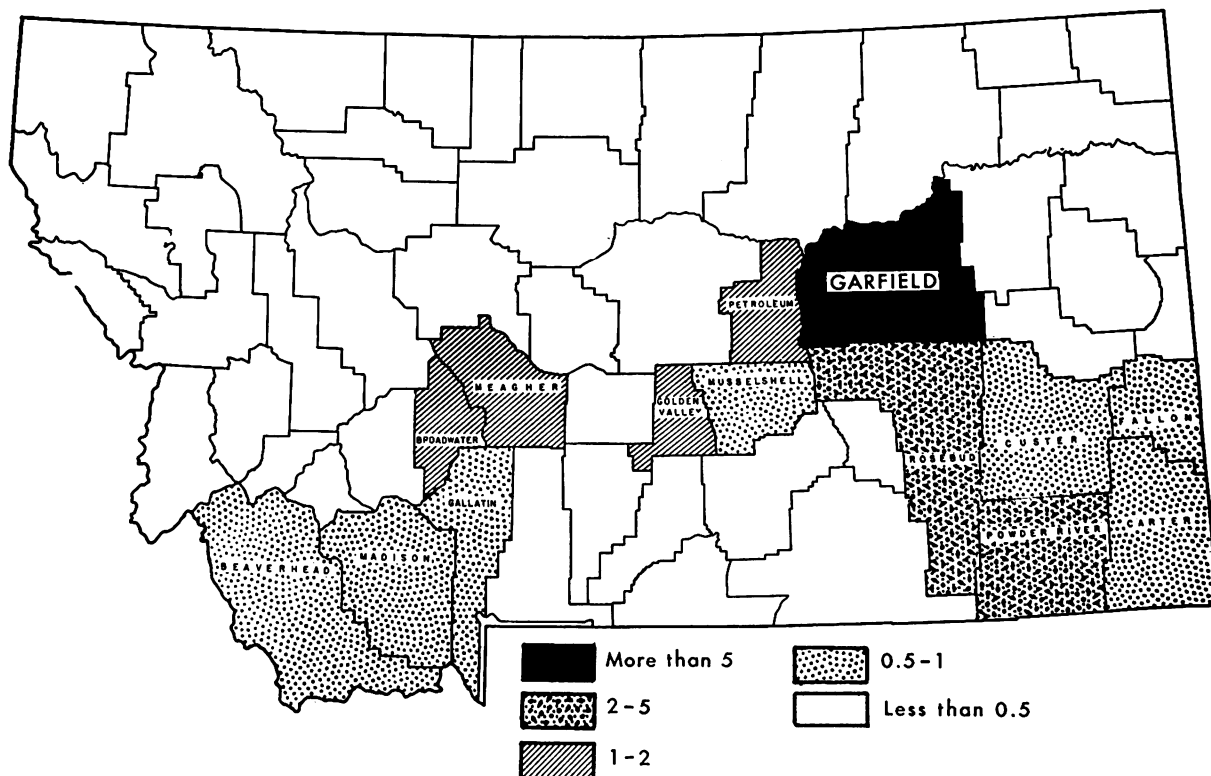
The skin-test antigen was Larson's ether-extracted tularemia vaccine (3), prepared in one

**Table 1. Participation in the Garfield County tularemia skin-test survey, by age, sex, and place of residence, 1967**

Characteristics	Population	Participants	
		Number	Percent
Total.....	1, 981	365	18. 4
Age (years):			
Less than 20.....	828	142	17. 2
20-39.....	452	80	17. 7
40-59.....	416	112	27. 0
60 and over.....	285	31	10. 9
Sex:			
Male.....	1, 079	194	18. 0
Female.....	902	171	19. 0
Place of residence:			
Town (Jordan).....	557	118	21. 2
County.....	1, 424	247	17. 3

lot in 1963 by Dr. Cora R. Owen, of the Rocky Mountain Laboratory, and lyophilized and stored at 4° C. until used. It was rehydrated with sufficient normal saline to give 2.5 precipitating units in the dilution used for testing, and 0.1 milliliter of this dilution was injected intradermally in the volar surface of the forearm. Readings were made at 48 or 72 hours by

**Figure 1. Average annual tularemia case rate per 10,000 population, Montana, 1925-64**



measuring the transverse diameter of erythema and induration. Induration of 5 millimeters or greater was considered a reaction (1).

## Results

Three hundred and sixty-five (18 percent) of the county's 1,981 residents were skin tested. Twenty-six percent of the 592 households were represented by one or more members (4). The characteristics of the sample were similar to those of the county population in sex and in county to town ratio (table 1) but differed in age from the general population. Participation was highest in the 40- to 59-year age group and lowest in the 60 and over age group.

Twenty-four (6.6 percent) of 365 participants were reactors including 19 (9.8 percent) of 194 males and five (2.9 percent) of 171 females. The reactor rate in each age group, according to sex, is shown in table 2. Frequency of reaction was predominant among all males except those under 20 years old. The highest rate was noted among men 40 to 59 years old; this group included 54

percent of all reactors. No children under 10 reacted although 34 were tested.

Skin sensitivity was more frequent among persons having contact with sheep than among those without such exposure (table 3). Twenty (9.5 percent) of 211 persons who had worked directly with sheep or lived on sheep ranches were reactors, while only four (2.6 percent) of 154 persons without exposure reacted. This difference is statistically significant ( $P < 0.01$ ) and was particularly evident in the 40- to 59-year age group. Nearly one of every five persons with sheep contact was a skin-test reactor. Sensitivity to *F. tularensis* in more than one family member was found in two sheep-ranching families.

A history of clinically diagnosed tularemia was elicited from only four reactors. Infection had occurred from 3 to 30 years previously, following tick bites or while the person was directly engaged in sheep-ranching activities. Among the 20 reactors with unrecognized infection, nine had febrile illnesses associated with

**Table 2. Frequency of skin-test reaction, by sex and age group, Garfield County tularemia survey, 1967**

Age (years)	Male			Female			Total		
	Number tested	Reactors		Number tested	Reactors		Number tested	Reactors	
		Number	Percent		Number	Percent		Number	Percent
Total.....	194	19	9.8	171	5	2.9	365	24	6.6
Less than 20.....	83	3	3.6	59	2	3.4	142	5	3.5
20-39.....	36	2	5.6	44	0	0	80	2	2.5
40-59.....	60	13	21.7	52	3	5.8	112	16	14.3
60 and over.....	15	1	6.7	16	0	0	31	1	3.2

**Table 3. Frequency of skin-test reaction, by occupational exposure and age group, Garfield County tularemia survey, 1967**

Age (years)	Sheep contact <sup>1</sup>			No sheep contact		
	Number tested	Reactors		Number tested	Reactors	
		Number	Percent		Number	Percent
Total.....	211	20	9.5	154	4	2.6
Less than 20.....	75	3	4.0	67	2	3.0
20-39.....	43	2	5.0	37	0	0
40-59.....	78	15	19.0	34	1	3.0
60 and over.....	15	0	0	16	1	6.0

<sup>1</sup> Worked directly with sheep or lived on sheep ranch.



lambling or shearing activities, one had a tularemia-like illness not known to be sheep or tick related, and 10 had no history of illness. The last group included four men, all sheep ranchers, three other males living on a sheep ranch (two of whom were teenagers), and three who had no direct contact with sheep. One female non-reactor reported that she had tularemia 10 years earlier, but the illness had not been serologically confirmed.

Figure 2 shows the distribution of skin-test reaction sizes. Among reactors, 7 millimeters of induration was the least and 20 millimeters the greatest. Mean reaction size was 13.1 millimeters of induration, which compares favorably with sensitivity reaction sizes in an earlier study of Montana trappers and tularemia cases (1).

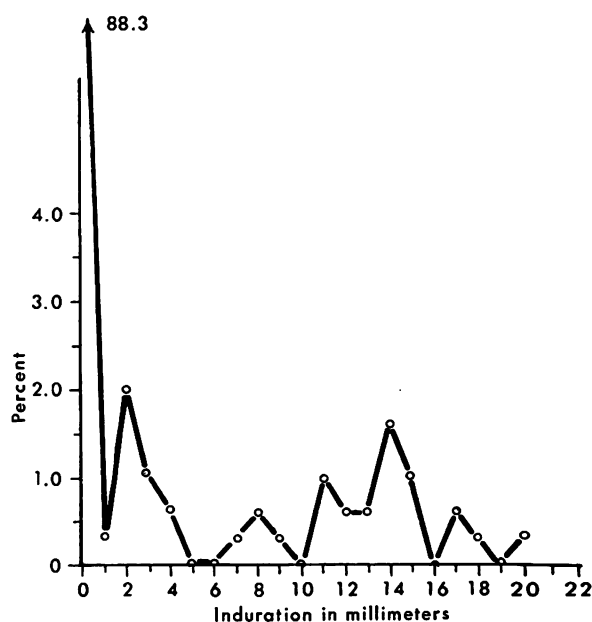
### Discussion

Sensitivity and specificity of the skin test to identify missed or inapparent infections has been discussed (1). Dermal sensitivity from clinical infection persisted for many years. Our survey provides additional information on the usefulness of the skin test. In an area where tularemia is a problem, this test can provide reliable information on the prevalence of past infection.

Although clinical tularemia has been diagnosed and reported consistently in Garfield County by one physician, the number of reported cases has not reflected the true incidence of tularemia infections. In the outbreak that occurred in 1964, four of the 12 patients did not seek medical care and would have been missed if a special effort had not been made to find additional infections. Also in 1964, in a selective serologic sampling of 67 persons having a history of diagnosed tularemia or tularemia-like illness or who worked with sheep, 27 had tularemia agglutinins. This serologic-positive group included the 12 persons with cases diagnosed in 1964, nine persons with a history of tularemia occurring before 1964, and six persons with no history of a tularemia-like illness. Twenty-three of the 27 persons with agglutinins in 1964 did not participate in the 1967 survey.

By combining the results of the two surveys, a total of 47 persons could be identified as having past infections, or 2.4 percent of the county

**Figure 2. Percentage distribution of tularemia skin-test reaction sizes, Garfield County, 1967**



population. In the skin-test survey, 24 persons reacted to *F. tularensis*, only four of whom had previously diagnosed tularemia infections. If the population tested was representative of the total population, the true incidence of past tularemia infection in Garfield County was five times higher than reported.

Previously reported cases, as well as the results of this survey, indicate that tularemia in Garfield County is predominantly an infection of adult male sheepworkers. Illness, even if mild, can interfere with the performance of ranching duties, and serious illness (for example, among sheepshearers) can jeopardize the economic advantage of an entire season. In areas where the opportunity for infection from tick vectors is high, a risk of tularemia is sufficient to warrant consideration of preventive vaccination for sheepworkers.

### Summary

Three hundred and sixty-five persons from sparsely populated, sheep-ranching Garfield County in eastern Montana were skin tested for sensitivity to *Francisella tularensis*. Twenty-four persons (6.6 percent) were reactors: 19 (10 percent) of 194 males and five (3 percent) of

171 females. Only four reactors had a history of prior tularemia infection.

Although clinical tularemia had been consistently diagnosed and reported in Garfield County, the true incidence of tularemia infections had not been reflected. Most infections were unrecognized or subclinical. Tularemia skin tests were useful for determining the prevalence of infection in this county, and evidence of the risk of tularemia is sufficient to warrant consideration of preventive vaccination of sheepworkers.

#### REFERENCES

- (1) Philip, R. N., Casper, E. A., and Lackman, D. B.: The skin test in an epidemiologic study of

tularemia in Montana trappers. *J Infect Dis* 117: 393-402, December 1967.

- (2) Jellison, W. L., and Kohls, G. M.: Tularemia in sheep and in sheep-industry workers. PHS Publication No. 421 (Public Health Monograph No. 28). U.S. Government Printing Office, Washington, D.C., July 1955.
- (3) Larson, C. L.: Immunization of white rats against infections with *Pasteurella tularensis*. Public Health Rep 60: 725-734, June 29, 1945.
- (4) U.S. Bureau of the Census: Census of population: 1960. General population characteristics. Montana. Final report PC(1)-28B. U.S. Government Printing Office, Washington, D.C., 1961.
- (5) Philip, R. N., Huntley, B., Lackman, D. B., and Comstock, G. W.: Serologic and skin test evidence of tularemia infection among Alaskan Eskimos, Indians and Aleuts. *J Infect Dis* 110: 220-230, May-June 1962.

## Migrant Health Grants Awarded

Eighteen migrant health projects, located in 11 States, have been awarded grants totaling about \$500,000 from the Public Health Service.

The grants, authorized by the Migrant Health Act, will be used to improve health services to migrant agricultural workers and their families. Funds will be used to provide medical and dental care, supported by field nursing and sanitation services, health education, and in-hospital care.

The largest single grant, \$69,034, was awarded to the Skagit County Health Department, Mount Vernon, Wash. Two projects, in Paw Paw and Hoopes-ton, Ill., received grants for the first time. Four projects in Texas, a home-base area for many migrant workers, were awarded a total of \$147,276.

There are now 118 projects making family health services available to migrant workers in more than 300 counties in 36 States and Puerto Rico. Grants are made to State and local public agencies and to nonprofit private organizations which are required to contribute part of the cost of the projects.

Following is a list of the projects and amounts of the grants.

<i>State and recipient</i>	<i>Amount</i>
Connecticut:	
Connecticut State Department of Health...	\$6, 032
Idaho:	

Idaho Department of Health.....	29, 244
Illinois:	
Hoopeston City Migrant Council.....	6, 400
Lee-Ogle Counties Migrant Council	
(Paw Paw).....	9, 131
Princeville City Migrant Council.....	2, 655
Illinois Department of Health.....	15, 313
Indiana:	
Indiana State Board of Health.....	42, 274
Iowa:	
Migrant Action Program (Mason City) --	27, 744
Maryland:	
Wicomico County Health Department....	9, 686
Nebraska:	
Nebraska Department of Health.....	43, 815
Ohio:	
Wood County Health Department.....	22, 310
Darke County General Health District..	17, 446
South Carolina:	
South Carolina State Board of Health	
(Beaufort County).....	30, 446
Texas:	
Castro County Commissioner's Court..	46, 058
Floyd County Commissioner's Court....	38, 042
Jim Hogg County Commissioner's Court..	17, 413
La Salle County Commissioner's Court..	45, 763
Washington:	
Skagit County Health Department.....	69, 034

## Education Notes

### Care of Premature and Other High-Risk Infants.

The institutes for physicians and nurses in the care of premature and other high-risk infants at the New York Hospital-Cornell Medical Center, sponsored by the New York State Department of Health and the U.S. Children's Bureau, will begin their 21st year in the fall of 1969. The institutes are designed to meet the needs of physicians and nurses in charge of hospital nurseries for high-risk and premature infants and special centers for infant care and of medical and nursing directors and consultants in State and local programs for the care of such infants.

Five institutes are scheduled between September 1969 and May 1970. The sessions are 2 weeks for physicians and 4 weeks for nurses.

#### Physicians

September 22–October 3  
November 10–21  
January 19–30  
March 16–27  
May 18–29

#### Nurses

September 8–October 3  
October 27–November 21  
January 5–30  
March 2–27  
May 4–29

Attendance at each institute is limited to six physicians and six nurses. Early application for the institutes is essential because plans are contingent on the number of applications received.

Participants pay no tuition, and stipends are provided to cover other expenses. For additional information write to Box 143, Institutes in the Care of Premature and Other High-Risk Infants, New York Hospital, 525 East 68th Street, New York, N.Y. 10021.

**Western Institute of Drug Problems.** The second annual summer school of the Western Institute of Drug Problems will be held on the campus of the Portland (Oreg.) State University, August 11–15, 1969.

The course, directed to professionals and students in all disciplines, will deal with the nature, prevention, and control of drug abuse and the treatment of drug-dependent persons. *General sessions* will present historical, sociocultural, medical, economic, and other fundamental aspects of drug problems. *Interdisciplinary sessions* will be designed to stimulate the exchange of information concerning drugs and drug-related problems among various special interest groups. *Specific group sessions* will provide an op-

portunity for persons with special interests, background, or professional training to discuss drug problems in relation to their activities.

Undergraduate, graduate, and professional (non-college) transcript credit is available. American Academy of General Practice credit, category one, may be applied for.

The \$55 registration fee covers admission to general sessions and participation in interdisciplinary and special group sessions, class materials, prepared library materials, and transcripts of professional papers. Requests for the limited number of scholarships are handled in order of application.

Information about housing is available on request. Reservations should be arranged directly with whatever facility the applicant chooses.

Additional information is available from the Administrator, Summer School, Western Institute of Drug Problems, Post Office Box 4372, Portland, Oreg. 97208.

**Regional Planning Program.** The University of Michigan's School of Natural Resources offers a program leading to a master of regional planning degree.

The purpose of the program is to train students for careers of broad scope and responsibility in both the public and private sectors—emphasizing policies and programs, cities, resources, and public facilities. The 2-year curriculum covers application of problem-solving methods to relationships among natural and human ecological, technological, and politico-economic systems.

Students must have a bachelor's degree from an accredited college or university and submit an official transcript showing all academic work completed. Undergraduate studies in natural resources, geography, economics, political science, sociology, landscape architecture, planning, architecture, or engineering are particularly appropriate. Students from other disciplines, with special analytic skills or with substantive knowledge or interests may also apply.

Fellowships up to \$1,700, graduate assistantships of \$1,000 per term, and research assistantships up to \$3,250 are available. Formal application with application fee must be submitted 2 months before enrollment.

Additional information is available from the Chairman, Regional Planning Program, School of Natural Resources, University of Michigan, Ann Arbor, Mich. 48104.

# Training the Disadvantaged As Home Health Aides

WILBUR HOFF, Dr.P.H.

**B**Y 1975, about 45 percent more manpower will be needed in all health occupations (1). Employment of indigenous workers and the poor in delivering health services is one approach to fulfilling this need. The recent policy statement on health and poverty by the American Public Health Association Committee on Public Policy has recommended action in this direction (2).

The Alameda County Health Department, Oakland, Calif., has demonstrated how persons from poverty areas can be effectively trained and employed in a health program (3). With a 1-year grant from the Federal Office of Economic Opportunity, the department conducted a home health aide pilot training project to test how effectively older unemployed men and women in poverty areas could be recruited and trained to provide nursing care for ill people in their homes.

The staff recruited persons from the most disadvantaged sections of the community and, contrary to many training programs, did not "cream off" the most experienced and most able persons for the project but placed highest priority on selecting persons with the least income and education and those without jobs or on welfare.

## From Principles to Practice

The principles and techniques of programmed learning have significant value for training health workers (4). Much has been said and written about its many applications to various

educational settings (5), but its basic elements do not differ significantly from sound educational philosophy. Various definitions for programmed instruction or learning exist, but there is common agreement about using the six basic premises that we followed in our project.

1. *Determining characteristics of trainees.* The first principle of a training program is gearing it to the educational level of the trainees. The recruitment criteria must emphasize the importance of determining educational backgrounds and other characteristics of the adults in order to plan a training program to meet their special requirements.

The classes were held in 1968 in the Alameda County Health Department. Originally, 100 adults were selected for training. Eight did not report for the first class, and nine were terminated at various times during the course. The remaining 83 (90 percent) consisted of 81 women and two men who either were unemployed or earned an income below the poverty level. Nearly a third were on welfare. Most were divorced, separated, or from broken homes. Many had experienced great difficulty in obtaining jobs, and their self-confidence was low.

Eighty percent of the trainees were nonwhite; most were Negroes. Ethnic groups, ages, educa-

---

*Dr. Hoff was director of the project described in this article. He is now health education specialist, Institute for Health Research, Oakland, and health education consultant, California State Department of Public Health, Berkeley.*

tional levels, and reading grade levels at the beginning of the course are presented in table 1. Most trainees were over the age of 45; the oldest was 62. The most important characteristic was the low level of education. Schooling of more than a fourth (28 percent) ended at the third through eighth grades; the remainder completed grades nine through 12. The average grade completed was 9.5.

These figures do not indicate the actual educational level of the adults. Since most of them were over 45, their schooling was in the distant past. Many had attended poor-quality schools in small towns or in rural areas of the country. Many had dropped out of school at an early age, and the great majority had no formal education beyond elementary school. As a result, their actual reading ability was considerably lower than the grade levels indicated.

Fifty-three of the 83 trainees were given the wide-range achievement test to determine their reading grade level. Thirty were exempted from testing because of education levels beyond the eighth grade. All 53 persons tested (51 women and two men, 35 to 62 years old) had reading levels below the 12th grade, and 90 percent had reading levels below the eighth grade. Although the schooling of 28 percent of the 83 ended at the third through eighth grades, the test results showed that 58 percent actually had reading grade levels in the third- to eighth-grade range.

Reading levels more accurately indicate educational ability than school grade completed. Without testing, an adequate basic education program for the group probably could not have been developed.

*2. Identifying behavioral objectives.* Training, to be effective, must be related to specific behavioral objectives. Unless such objectives are carefully identified, a student will not perceive clearly the desired end result and purpose of training. Neither will it be possible to plan and carry out the most effective educational experiences to accomplish the expected result.

To implement this principle, the duties of a home health aide were carefully defined in a job description which listed not only general functions and responsibilities but also specific activity items including 64 independent home

nursing tasks (for example, helping the patient move in and out of bed, giving the patient a bath in bed, cleaning and making the bed, and reporting information concerning the patient to the nurse).

A behavioral objective was written for each task (6), expressed in terms that were measurable and observable for the graduates of the program. For example, the aide is able to cleanse her hands by the proper handwashing procedure, the aide is able to demonstrate the proper way to give a urinal to a patient in bed and remove it without spilling the contents, and the aide is able to discuss with the nurse the patient's condition and any problems she is having with the patient.

The behavioral objectives served three important functions: It gave the trainees a clear statement of where they were going and helped them check their progress, it gave the instructors a concise statement of goals for teaching, and it gave the project evaluation staff behavioral criteria for measuring the extent to which the training objectives were met.

*3. Breaking subject matter into small discreet steps.* This phase consists of organizing the subject matter into discreet units of a size that the trainee can assimilate easily and rapidly. He should be required to focus his attention on only a limited amount of material at one time. The units then are written into a program for him.

We applied this principle in developing the aide's training. Separate lesson plans were developed around each concept or skill to be learned. The specific knowledges, skills, and attitudes that were required for each behavioral objective were identified and incorporated in each lesson plan. Each single-concept instruction unit contained basic information, a list of materials and supplies that were required, and a step-by-step procedure for carrying out each task.

*4. Arranging learning in a progressive sequence.* Lesson plans were arranged in simple to the more complex concepts and learning experiences and incorporated into a training manual for the trainees and the teaching staff. Classes were held 3 hours per day for 11 weeks. The course began with a series of classroom-, demonstration-, discussion-type experiences,

**Table 1. Ethnic groups, ages, educational levels, and initial reading grade levels of 83 trainees**

Characteristics	Number	Percent
Ethnic group-----	83	100
Negro-----	61	73
White-----	16	20
Mexican-American-----	5	6
Indian-----	1	1
Age range (years)-----	83	100
25-34-----	6	7
35-44-----	3	4
45-54-----	53	64
55-62-----	21	25
Last school grade completed <sup>1</sup> -----	83	100
3-4-----	2	2
5-6-----	3	4
7-8-----	18	22
9-10-----	21	25
11-12-----	30	36
Undetermined-----	9	11
Reading grade level-----	<sup>2</sup> 53	100
3.0-3.9-----	2	4
4.0-4.9-----	9	17
5.0-5.9-----	9	17
6.0-6.9-----	16	30
7.0-7.9-----	12	22
8.0-8.9-----	2	4
9.0-9.9-----	2	4
10.0-10.9-----	0	0
11.0-11.9-----	1	2

<sup>1</sup> Average 9.5.

<sup>2</sup> 30 trainees were exempted from testing because of education levels beyond the eighth grade. The average initial reading grade level was 6.1, as tested individually by wide-range achievement test.

followed by a period of closely supervised training with rehabilitation patients in nursing homes. It ended with several weeks of supervised on-the-job training during which each aide gave health care to patients in their homes.

We emphasized experiential learning and practice sessions wherein the trainees could control the subject matter with which they were dealing. We created situations that they could master successfully so they could obtain wins while learning job skills. This developed the self-confidence of those persons who had considered themselves failures in earlier jobs.

Basic education (reading, writing, and mathematics) was programed into the course and taught as an integral part of nursing skills. The basic education teaching materials were specially developed at the sixth grade reading level; reading, vocabulary, and sentence struc-

ture were taught by using words, terms, and reading material about home nursing care. Mathematical concepts (decimals, fractions, and other computations) were taught by using problem situations with which the aides would be confronted on the job; for example, how to read a thermometer, how to determine and prepare a diet for a diabetic patient, how to read an odometer and figure mileage, and how to fill out records accurately.

5. *Allowing trainees to progress at own speed.* We followed this principle as closely as was possible in a group teaching situation. If only programed instruction materials are used, each trainee can proceed at his own pace, but this method is not entirely feasible when trainees are in groups or when demonstrations and other experience-type learning situations are presented. Our instructors modified the usual group-teaching setting in the following ways to incorporate this concept.

1. Classes were kept small to give trainees the opportunity to ask questions and discuss materials. One nurse instructor per 20 persons was the average faculty to trainee ratio.

2. The attention given to each trainee was increased by employing as faculty assistants on the project staff health aides who had experience in the health department. One aide was used with each class of 20 persons. They helped the trainees with demonstrations, lessons, examinations, and other problems and were able to offer them closer emotional support than other professional staff members could. They bridged the gap between the trainee and the instructor.

3. Keeping flexible training schedules allowed more time for instruction when trainees were having learning difficulties, particularly with basic education materials. Supplementary reading materials and lessons were developed for these persons.

Many teaching adjustments were necessary because of the varied backgrounds of the students. The instructors counseled and encouraged the trainees individually and told them to discuss their problems at any time.

6. *Giving immediate feedback to trainees.* This principle is important to the trainee for checking his progress. One of several methods

used for immediate feedback after teaching specific nursing skills was demonstrations. Each person was coached and corrected step by step until he could perform all procedures properly.

The instructors frequently used short quizzes in class and either discussed results immediately or returned the written papers the next day. Each lesson plan had a self-evaluation section consisting of several objective questions that were designed to help the student understand the key points of the lesson. Answers to these questions were given on the back of the lesson sheet, and the trainee could immediately compare his answers with the prepared answers.

### Results of Training Program

The following three standards were used to evaluate the effectiveness of the training project.

*Number of graduates.* Of the 92 adults, 83 (90 percent) successfully completed the course. The nine who did not graduate were terminated at various times: Four dropped out at their own request because of nervousness and instability, one married and moved out of the area, two were terminated by mutual consent for serious personal and family problems, and two were unable to graduate because of low scholastic ability in reading and writing. The reading grade levels of these two students were 3.7 and 4.6—the lowest in the class.

*Gains made by trainees.* Classes in reading, word-attachment skills (syllabication and phonics), and mathematics were conducted for 1 hour of the 3-hour day, concurrently with the home health care training. Progress in each skill was documented by before and after test scores.

Initially, we wanted to use a comprehensive test that would give valid measurement of reading ability, but many trainees lacked confidence and had little or no experience in taking tests. Even the better students feared that the test results would "brand them for life." Therefore, this type of test was not used.

The simpler wide-range arithmetic achievement test was given to 53 trainees during the first week of class and again at the end of the course; consequently, changes in the mathematics grade levels could be measured. Initial

**Table 2. Initial mathematics grade level and change after basic instruction of 53 trainees, determined by wide-range arithmetic achievement test**

Mathematics grade level	Number	Percent
Initial level:		
3.0-3.9-----	18	34
4.0-4.9-----	22	41
5.0-5.9-----	9	17
6.0-6.9-----	3	6
7.0-7.9-----	1	2
Change after basic instruction:		
-0.2-----	3	6
No change-----	2	4
0.0-0.9-----	6	11
1.0-1.9-----	22	41
2.0-2.9-----	13	24
3.0-3.9-----	3	6
4.0-4.9-----	3	6
5.0-5.9-----	1	2

levels ranged from 3.0 to 7.9, and 75 percent scored between the two lowest ranges of 3.0 to 3.9 and 4.0 to 4.9. The average initial level was 4.6.

Changes in the mathematics grade levels after basic instruction ranged from -0.2 to +5.9 (table 2). Apparently the initial test was not completely valid and a few negative results occurred. Several persons were frightened and obtained help from their neighbors. Certain trainees had significantly lower skills than the test results indicated.

The mathematics learning ability of 65 percent of the trainees increased from 1 to 3 grade levels after instruction; the average increase was 1.6. These changes are significant considering the nature of the group being trained and the length of time they were trained—55 hours of classroom instruction, or less than school students generally receive in a semester. Under our traditional system of elementary education, a student spends approximately three times that number of classroom hours for each grade in school. The results of our instruction demonstrated that significant learning can be achieved by adults who are highly motivated in a job training program if the training is programed to meet the needs of the trainee and the job.

*Performance on the job.* The performance of 24 graduates employed immediately after graduating from the the first training class was



evaluated after they had worked 15 weeks as home health aides. A rating sheet was constructed so that each aide's nurse supervisor could rate the aide, using a 3-point scale, on 22 items of job behavior. The list corresponded to the essential activities outlined in the job description and the behavioral objectives developed for the training program.

The evaluation instrument had been tested among other aides and nurses and appeared to be very reliable. Each item was in one of three important work-skill categories: technical home care, professional behavior (work habits), and interpersonal relations. The nurse marked each item according to whether the activity was performed "most of the time," "some of time," or "seldom."

Numerical scores were assigned to the ratings; for example, one point for "seldom," two points for "some of the time," and three points for "most of the time."

Performance evaluations were determined by an aide's total score on behavioral objectives and on each of the following items:

#### PROFESSIONAL BEHAVIOR—EIGHT ITEMS

Grooming: clothing neat, clean, and appropriate

Team member: knows and assumes role of home health aide

Personal health: is well, no physical complaints

Dependable: reports to patients on time and on days assigned

Absences: less than  $\frac{1}{2}$  to 1 day absent per month

Learning ability: can transfer learning from one situation to another

Confidentiality: keeps information confidential

Recordkeeping: keeps notes and reports problems and unusual symptoms to public health nurse

#### ATTITUDES AND INTERPERSONAL RELATIONS—FOUR ITEMS

Aide is friendly, warm, and pleasant

Accepts annoyances and peculiarities of patient

Listens in an understanding way

Accepts and benefits from suggestions and criticism

#### TECHNICAL SKILLS—TEN ITEMS

Aide uses good mechanics

Uses proper transfer techniques

Washes hands at appropriate times

Gives good back care

Cleans patient's hands and feet

Clips fingernails and toenails

Ambulates patient properly

Gives a good bed bath

Makes patient's bed neatly and properly

Nutrition: prepares proper diet for patient

Analysis of the total scores showed that all 24 aides were performing in a satisfactory or above-satisfactory manner. Ranges of total scores follow, with number and percent in each group:

<i>Scores</i> <sup>1</sup>	<i>Number</i>	<i>Percent</i>
51-54-----	1	4
55-58-----	4	17
59-62-----	7	29
63-66-----	12	50

<sup>1</sup> Possible range, 22-66.

An aide could have received a score within the range of 22 to 66; all aides scored between 51 and 66. If an aide had been rated "seldom" on all items, she would have received a score of 22; if rated "some of the time," a score of 44; and if rated "most of the time," a score of 66. Fifty percent of the group scored in the top bracket and the other half in the next three highest brackets.

As a group, the aides scored highest in nursing skills. This result tended to corroborate conclusions reached by the instructors that teaching nursing techniques and the skills of caring for patients was the easiest part of the course and was accomplished satisfactorily. The group's scores on items concerning attitudes and interpersonal relations were lowest. Only six trainees received the maximum group score in this category.

On the positive side, the aides were given top ratings in friendliness, warmth, and pleasantness. On the negative side, the data show that aides were weakest in their ability to accept the annoyances and peculiarities of patients, in not listening in an understanding way, and in not accepting and benefiting from suggestions and criticism. These data are supported by the results of several group sessions during training and the instructor's final evaluation of the trainees.

One weakness of the aides was their inability to accept criticism. Often, if an instructor commented about the need for individual improvement, they interpreted the incident as a personal failure. They tended to equate constructive criticism with failure and usually insisted that they were right. In the final evaluation the instructors discussed the need for improvement, and the trainees seemed to accept the evaluation, but the performance evaluation definitely indi-

cated further need for inservice education and strengthening in communication skills and interpersonal relationships.

It is relatively easier to teach a trainee how to bathe a patient in bed than how to respond in a helpful way to an angry, critical patient. We attempted to develop more positive and helpful attitudes through group discussions, role playing, and hypothetical situations. Evaluation results indicated that much more time should have been spent on this aspect of training.

Scores on items of professional behavior ranged between the other two categories. The results generally were satisfactory although improvement was indicated. In the classroom the trainees dressed in good taste and were well groomed. We encountered no problems with confidential information. In class discussion, the aides strongly favored keeping personal information private. Many were or had been on welfare and had personally experienced the client role of revealing information to a public agency to qualify for assistance. The instructors therefore used these feelings to emphasize the importance of not discussing the patient with anyone but the nurse supervisor.

The trainees had no serious problems with absenteeism or tardiness. Many of the aides had never worked for a public agency where they were expected to arrive at work and leave on time. To help them in developing good working habits, the instructors insisted that they come to class on time and demanded an explanation for tardiness or absence. These work habits apparently were developed to a satisfactory level.

The aides showed a wide range of competence in recordkeeping. Several nurse evaluators commented that some aides had reported observations verbally but few had kept usable notes. If an aide reported her observations but did not keep notes, she was rated near the middle of the scale. The results in this category are not surprising considering the low levels of basic education. The verbal skills of most aides were better than their writing skills, which indicated the importance of having an effective continuing program of basic education.

We were not able to evaluate the performances of the remaining 59 trainees. Nothing indicates, however, that the evaluations of 24 are not rep-

resentative of the total group. The composition of all classes was generally the same, and the performance of the total group—as observed by the training staff—was about the same as that of those evaluated.

### Conclusion

The results of this project indicated that adults who are recruited from ghettos and other poverty areas can be trained in a relatively short time to become effective health workers.

Despite little education, great poverty, and histories of failure, frustration, and hopelessness, the trainees as a group demonstrated a high motivation and willingness to learn. This desire, together with a training program designed to meet special needs, resulted in few dropouts, significant gains in basic education abilities, and job performances rated as satisfactory or above.

The high motivation of the group was attributed to the following basic factors: The training program was practical and support was given throughout the course, and the trainees knew that a meaningful and adequately paying job would be available to them when they had successfully completed the course.

The staff attributed the successful outcome of the program to two things: It was designed to develop specific knowledges and skills for the job, and it was programed to meet the specific needs of the trainees.

### Summary

The purpose of a project conducted during 1968 in the Alameda County Health Department, Oakland, Calif., with a 1-year grant from the Federal Office of Economic Opportunity, was to demonstrate how older unemployed men and women—most were 45 to 62 years old—in poverty areas could be trained to become effective home health aides.

An 11-week training program was designed to teach specific knowledges and skills of home nursing care. In developing the course, principles of programed learning were followed to (a) determine the characteristics of the trainees, (b) identify behavioral objectives,

(c) break subject matter into small discreet steps, (d) arrange learning in a progressive sequence, and (e) allow trainees to progress at their own speed.

Of the 92 adults selected for the program, 83 (90 percent) successfully completed the course and were certified as home health aides. Results of the basic education instruction given to 65 percent of the trainees showed that after instruction the average increase in mathematics grade levels was 1.6. The range of increase for the trainees was from 1 to 3 grade levels.

A behavior-rating instrument, constructed to measure performance on the job, was used to evaluate the performance of 24 graduates of the program after 15 weeks of employment. Aides were rated by their nurse supervisors on 22 items in three important work-skill categories: technical home care, work habits, and interpersonal relations. The results of this evaluation showed

that all the aides were performing at satisfactory or above-satisfactory levels.

#### REFERENCES

- (1) U.S. Department of Labor, Bureau of Labor Statistics: *Health manpower 1966-75*. Report No. 323. U.S. Government Printing Office, Washington, D.C., 1967.
- (2) Health and poverty. *Amer J Public Health* 59: 158-159, January 1969.
- (3) Hoff, W., and Stewart, P.: Home health aide pilot training project. Final evaluation report. Alameda County Health Department, Oakland, Calif., February 1968. Mimeographed.
- (4) Shindell, S.: Programmed instruction and its usefulness for the health professions. *Amer J Public Health* 54: 982-989, June 1964.
- (5) Pipe, P.: *Practical programming*. Holt, Rinehart & Winston, Inc., New York, 1966.
- (6) Mager, R. F.: *Preparing objectives for programmed instruction*. Fearon Publishers, San Francisco, 1962.

## Community Mental Health Centers Support Branch

In response to a growing program funded by the National Institute of Mental Health, a reorganization and a new post within the National Institute of Mental Health, Division of Mental Health Service Programs has been announced.

The program, Federal aid for the construction and staffing of community mental health centers, will be handled by the division's new Community Mental Health Centers Support Branch.

Previously two separate branches of the division administered grants to centers. Now with the program well underway—more than 350 centers have been funded in 49 States with Federal construction and staffing aid—further application and followup will be handled in one central branch.

The division also has created a new Community Mental Health Services Development Branch to help tailor the Federal program to current needs. This branch will carry out the division's responsibility for encouraging pro-

gram development in the new mental health centers. The centers, as they are established, will need help with improving their services, developing new programs, and dealing with administrative and training problems. Grants will support research and training activities to help develop effective community mental health services.

Administration of the two branches will be centralized under an Associate Director for Community Mental Health Services. Appointed to fill the new position is Dr. Saul Feldman. He is assistant to Dr. Alan I. Levenson, Director of the Division of Mental Health Service Programs.

He will be responsible for directing the review of community mental health center grants, construction and staffing; evaluating the progress of the centers' programs; recommending new directions; and consulting with community mental health officials on all aspects of their programs.

# Films

**How to Complete a Certificate of Live Birth.** *Filmstrip, order No. F-1593; 35-mm. slide series, order No. S-1593. With record (12 inch, 33 1/3 rpm) or audiotape (1/4 inch, 7 1/2 ips), color, sound, 23 minutes, 1968. Cleared for educational closed-circuit television. Produced by the National Medical Audiovisual Center for the Division of Vital Statistics, National Center for Health Statistics, Public Health Service.*

**AUDIENCE:** Registrars, health officials, medical record librarians, medical students, nurses, and others concerned with completing birth certificates.

**SUMMARY:** Explains method of completion of the 1968 U.S. Standard Certificate of Live Birth, prepared by the National Center for Health Statistics, Public Health Service, in cooperation with State vital statistics officials. Introduces new items. Discusses each item, in order, emphasizing importance of completeness, accuracy, and legibility of entries. Gives examples of responses to each item and mentions uses of data secured (health services, demographic research).

**AVAILABLE:** Free short-term loan (filmstrip or slides, with record or tape) from the National Medical Audiovisual Center (Annex), Station K, Atlanta, Ga. 30324. Order by number, specifying record or tape. Purchase from DuArt Film Laboratories, Inc., 245 West 55th St., New York 10019. (Slides not presently available for purchase.)

**One of Sixteen Million.** *Order No. M-1634-X. Motion picture 16 mm., sound, color, 20 minutes, 1968. Produced by Design Center, Inc., Washington, D.C., for the Diabetes and Arthritis Control Program, Health Services and Mental Health Administration, Public Health Service.*

**AUDIENCE:** The general public, paramedical personnel, and public health officials.

**SUMMARY:** To inform the general public about the problems of arthritis—to assure that something can be done about them—and to encourage arthritis victims to seek medical assistance. Presents, in animated cartoon, the story of George Brown, family man, an unsuspecting victim of arthritis. The story, told with great humor, depicts common attitudes: nothing can be done about arthritis; the victim is doomed to become increasingly crippled. A physician comes to grips with these attitudes, warns against superstitious beliefs regarding arthritis cures, and explains in down-to-earth language what is known about arthritis—its prevalence, major forms (with emphasis on rheumatoid), symptoms, effects, and methods of treatment which can relieve pain and swelling and prevent crippling. The film ends on the optimistic note that the arthritic can lead a relatively normal life if he adopts a balanced program of diet, exercise, and other therapy carefully tailored to his individual needs.

**AVAILABLE:** Free short-term loan from National Medical Audiovisual Center (Annex), Station K, Atlanta, Ga. 30324. Purchase from the Arthritis Foundation, 1212 Avenue of the Americas, New York, N.Y. 10036.

**Onchocerciasis in Ghana.** *Order No. M-1543-X. Motion picture, 16 mm., color, sound, 31 minutes, 1966. Photographed and written by Dr. George J. Burton, scientist director (Medical Entomology), National Cancer Institute, Public Health Service.*

**AUDIENCE:** Medical and zoology students, physicians, nurses, laboratory and field technicians, public health workers, sanitarians, entomologists, parasitologists, workers in vectorborne diseases, and the general public in countries where onchocerciasis occurs.

**SUMMARY:** Emphasizes the entomological and parasitological aspects of the African vector of onchocerciasis. Most of the scenes and diseased persons were photographed in Ghana, where the disease is especially prevalent. Explains the life cycle of the vector blackfly; traces development of the parasite within the fly and human host; shows the

nature of the skin and nodules in onchocerciasis, explains their relationship to the parasite, and the association of the microfilariae with blindness. Demonstrates diagnosis and presents control aspects.

**AVAILABLE:** Free short-term loan from National Medical Audiovisual Center (Annex), Chamblee, Ga. 30005, Attention: Film Distribution. Purchase from DuArt Film Laboratories, Inc., 245 West 55th St., New York, N.Y. 10019.

**Computer Analysis of Electrocardiograms.** *Order No. M-1477-X. Motion picture, 16 mm., color, sound, 20 minutes, 1966. Cleared for television. Produced by Computer Instruments Corporation, Hempstead, N.Y., in cooperation with the National Center for Health Services Research and Development, Public Health Service.*

**AUDIENCE:** Physicians, hospitals, medical schools, technicians, hospital administrators, public health officials, and scientists.

**SUMMARY:** Demonstrates the use of computerized, automated systems to analyze and diagnose electrocardiograms and spiograms. Shows the data acquisition unit—a four-wheel cart that records the signals on tape and transmits them by telephone to the appropriate computer center. Within 15 seconds after the computer has recognized the waveforms of all the leads, it integrates the values, prints out an interpretation, and returns it to the physician or to the hospital.

**AVAILABLE:** Free short-term loan from the National Medical Audiovisual Center (Annex), Chamblee, Ga. 30005, Attention: Film Distribution. Purchase from DuArt Film Laboratories, Inc., 245 West 55th St., New York, N.Y. 10019.

**Sample Mounting Techniques—Evaporation.** *Order No. M-1342. Motion picture, 16 mm., color, sound, 7 minutes, 1966.*

**SUMMARY:** The final step in a radiological determination is the preparation or mounting of the sample for counting. This film demonstrates three methods for mounting solid samples by evaporation: pouring a slurry, pipeting a slurry, and pouring a dissolved solution.

# Uses of a Recordkeeping System to Evaluate RAT INFESTATION and to Develop Control Programs

ELDEN J. WALLER, R.S.

**A**DEQUATE BASELINE information is necessary to develop an effective program to control Norway and roof rats. In the Contra Costa County Health Department we decided to design a recordkeeping system which would clearly indicate activity or presence of Norway rats in sewers and creeks and on the waterfront. Our purpose was to obtain information that would be a sound basis for conducting control measures.

We wanted to know what kind of records aid in analyzing the effectiveness of and need for an existing program and in enlarging, if necessary, the program. Another goal was to find out if a system of records could be developed that would define actual rat infestation and be useful in evaluation. Devising a recordkeeping system was an experimental project; the recordkeeping methods and the analysis techniques we used were not the only ones available. Many other types of forms, graphs, and analyses could have been used.

Contra Costa County is a rapidly growing urban area adjacent to San Francisco and Oakland, Calif. It contains 13 cities, and in 1960 the county ranked 10th in population in the State.

In addition to heavy industry, the county has extensive port facilities. Two-thirds of the ships passing through the Golden Gate to and from foreign ports dock at the county's water-

front. Some ships come from ports that are in endemic plague areas, such as Vietnam.

Since 1907 Contra Costa County has had periodic episodes of plague in human beings and in wild rodents (1). Wild rodent populations, when encroached upon by expanding subdivisions, can introduce plague among the commensal rodents in urban areas (2). In light of these factors, the county health department was particularly concerned about rat infestations and about a system for evaluating them.

## Methodology

To define the areas of rat infestation in Contra Costa County we developed forms to record and analyze the following items:

1. Areas of rat infestation, sources of rodent breeding, harborage, and paths of migration.
2. Public concern about community rat problems.
3. Effect of health department activity in rodent control.
4. Evaluation techniques available to determine the effectiveness of poisoning and trapping in sewer manholes, creeks, and in the waterfront area.
5. Infestation rates of rodents in creeks, sewer manholes, and waterfront areas and the correlation of infestation with the complaints of the citizens and with the results of surveys.

We used acceptance of poison bait placed in manholes, creeks, and waterfront sites as a criterion for developing basic records for evaluating purposes. Also rodents were suppressed.

An initial step in focusing on areas of possi-

---

*Mr. Waller is vector control supervisor, division of environmental health, Contra Costa County Health Department, Martinez, Calif.*

ble rat infestation was to use the rates of complaints about rats per 100,000 population (fig. 1), both countywide and by individual census tracts, for a 3-month period in 1965. We recognized that basing a control program on the rate of complaints was not completely justified without considering the variables of publicity, surveys, and others, but this basis did give us some indication of the areas we should investigate (3).

### Survey

In 1965 we started on a survey of urban areas of Contra Costa County using personnel who had several weeks training in rodent and pest control methods. (The health department was training welfare recipients in pest control operations in a program conducted under title V of the Economic Opportunity Act.) Ten trainees were used in the survey. Later they helped in limited recordkeeping procedures and in setting out poison bait. More than 5,000 residents were interviewed regarding presence of rats, use of poison and traps, and location of rodent harborages. Where complaint rates had been high, nearly 90 percent of the residents were in-

terviewed. In areas with no history of rodent complaints, the interview sample was smaller. We used a modification of the Merced County Environmental Health Appraisal. (4)

Residents were asked these five questions.

1. Have you had any rat problems?
2. Have you used poison or traps?
3. Do you have garbage service?
4. Do you have a garbage can with a tight-fitting lid?
5. Do you have any penned animals or poultry?

Staff members made their own observations on these points.

6. Are there any accumulations of rubbish and debris?

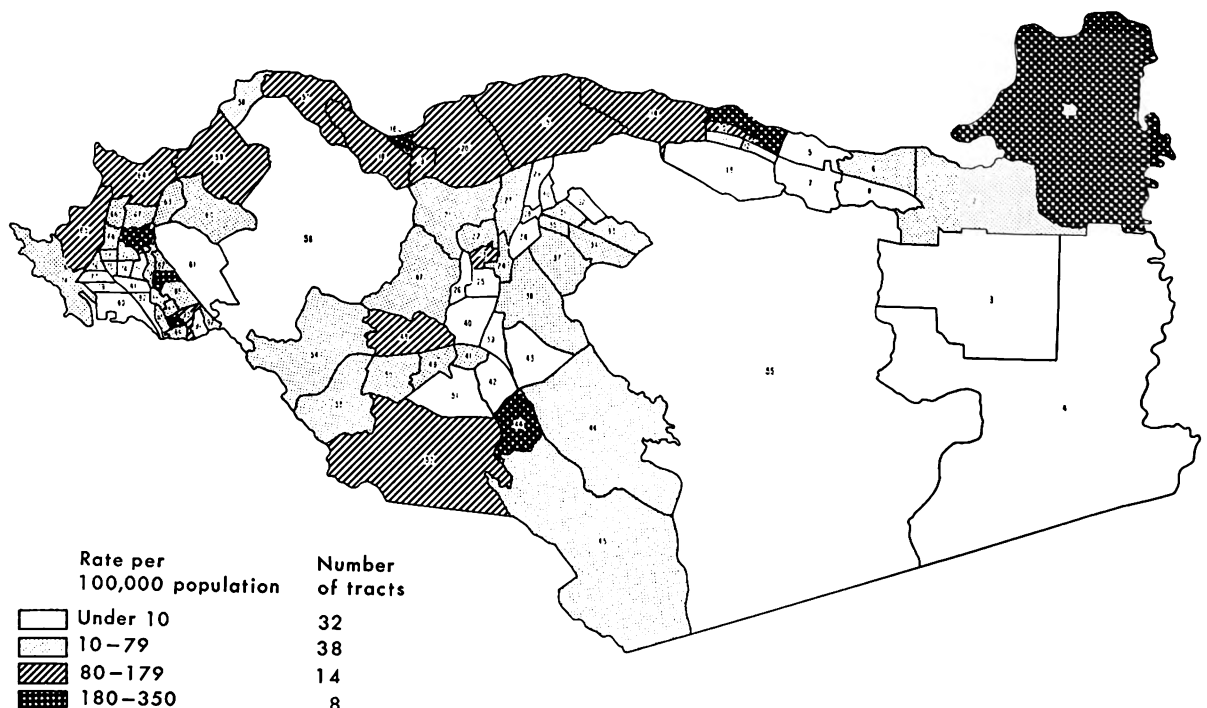
7. Is there any garbage on the ground?

8. Are there any rat burrows or signs?

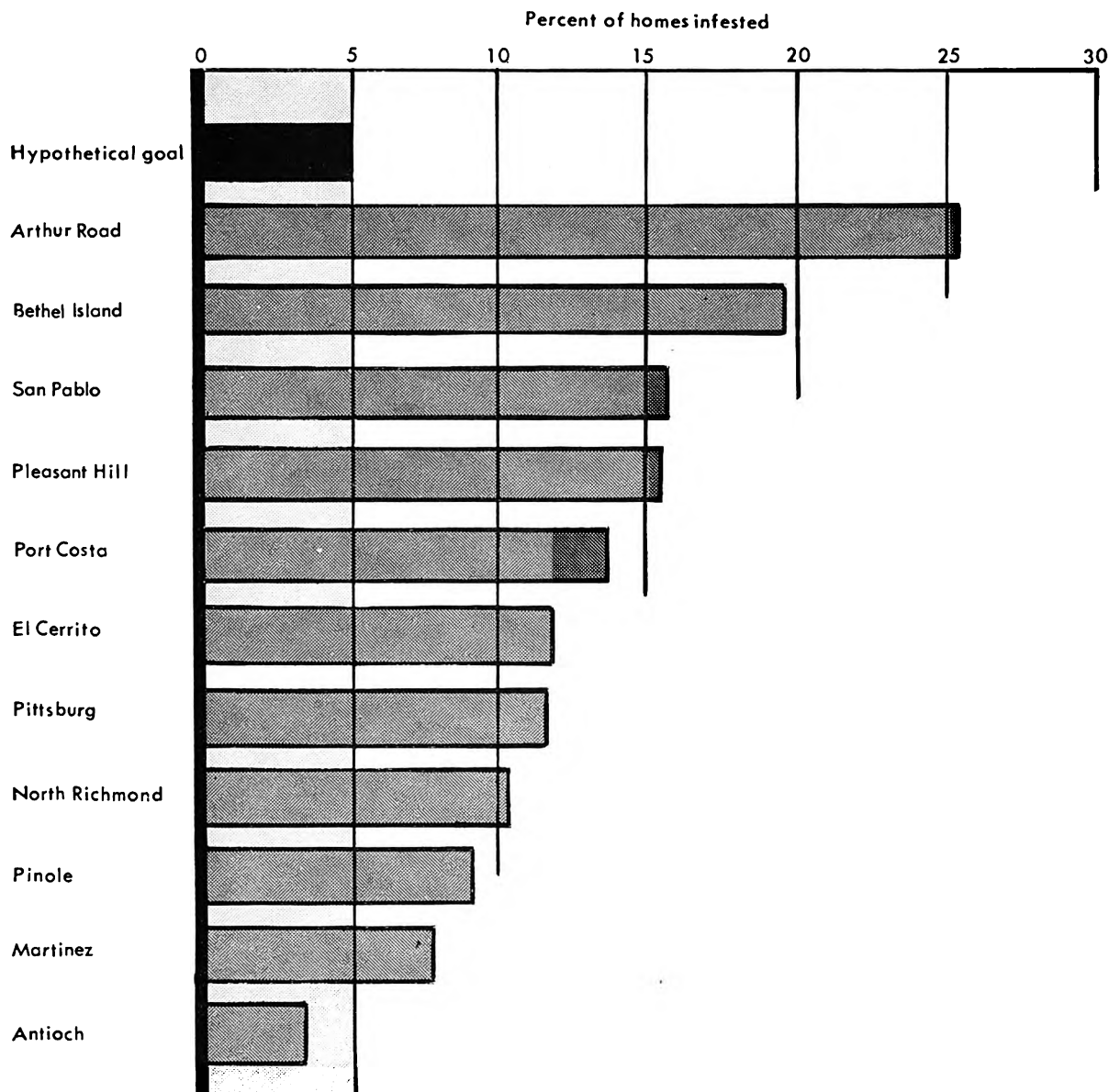
The answers and observations were recorded on a form containing checkoff boxes for "yes" and "no" replies. The date, city, street address, and census tract were also recorded on the form.

With an 80 percent sample of the homes in one area we found that 25 percent were infested with rats. The range of infestation among the

**Figure 1. Rates of complaints about rats per 100,000 population, by census tract, August 1–November 1, 1965, Contra Costa County**



**Figure 2. Percent of homes in areas of Contra Costa County infested with rats, 1965 survey**



areas was 5 to 25 percent. A total of 5,000 homes in the county were surveyed. For the entire county we found an average of 17 percent of the homes were rat infested or had a history of infestation (fig. 2).

We used the survey data and past records to plot on maps of each city or sewerage agency the blocks that had infested residences.

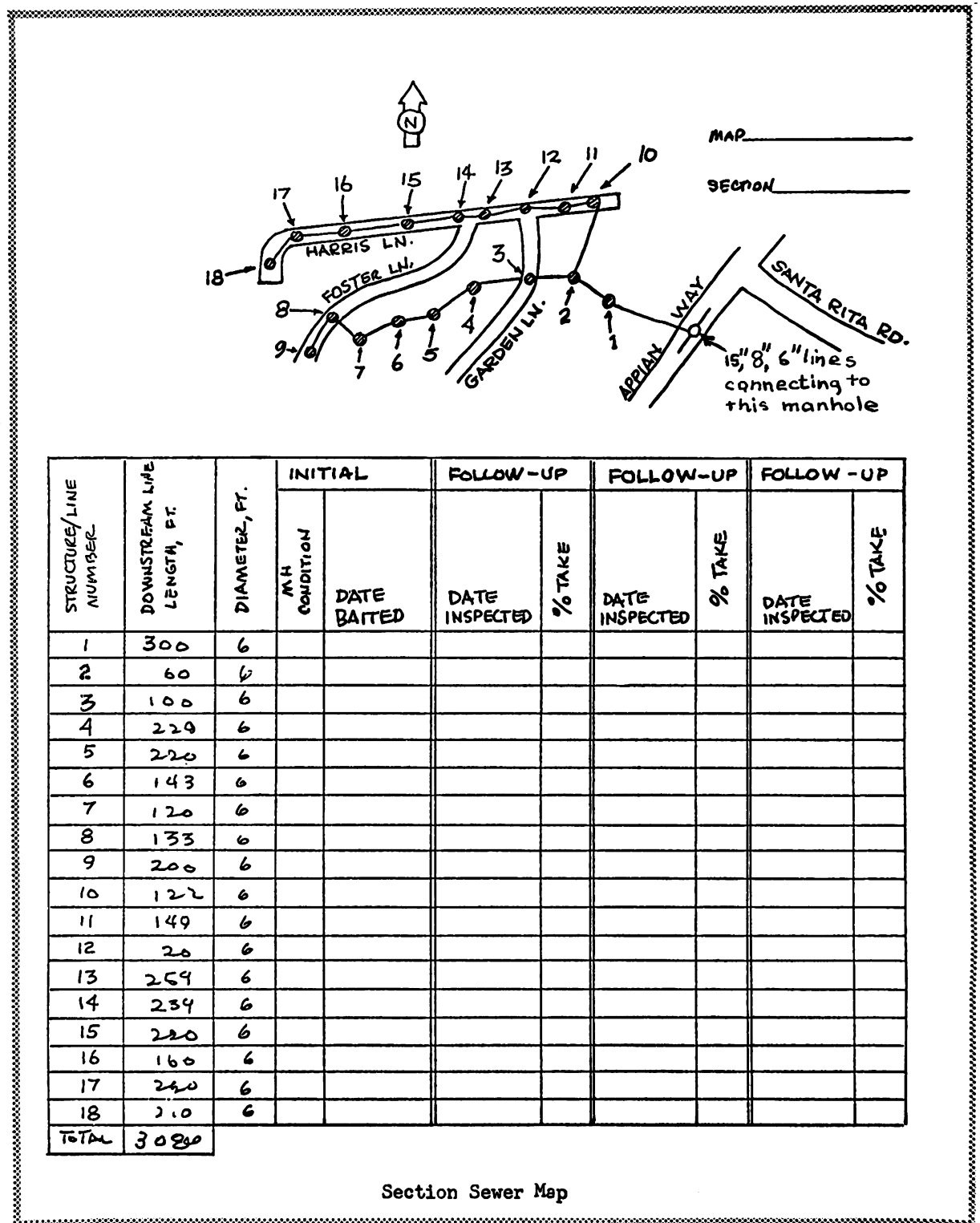
All figures and results of the survey, control measures, publicity, and complaints were also recorded by census tracts. The census tracts in

Contra Costa County were chosen because these units reflect demographically equal as well as socioeconomically similar populations. The geographic divisions reflect the industrial, densely populated sections, sprawling residential sections, and agricultural-recreational sections.

Before proceeding with the poison bait operation we investigated the creeks that transversed the areas where residential surveys had been conducted. Indications of rat harborage



Figure 3. Map and data sheet for sewer inspections



or rat infestations were noted on the residential survey map and correlated with complaints and results of the residential survey.

Poisoning

Additional field recording forms, indicating each manhole in the system by number, with accompanying index maps, were used to record our activities in sewer jurisdictions (5a). These recording forms were adopted from those used by the San Pablo Sanitary District for several years. The forms, designed to use with computers in analyzing data, also permitted analysis of variables in sewer line maintenance that might affect a sewer rat control program—such as broken laterals where rodents might burrow, nest, or tunnel to the surface and invade nearby residences. These forms

were invaluable in reinspections; we could readily reidentify the manholes, enabling us easily to correlate our data (figs. 3, 4).

The information obtained from these records was as follows:

- 1. Number of infested manholes per total number inspected
- 2. Rats in infested manholes per 100,000 population, by census tracts
- 3. Manhole condition (dry, wet, flooded, and so forth)
- 4. Number of manholes poisoned
- 5. Type of bait used
- 6. Number of manholes with bait acceptance.

The first year, August 1965 to August 1966, we put permanent paraffin bait blocks containing an anticoagulant into the sewer manholes (6, 7). Putting the poison bait in a paraffin

Figure 4. Rat poisoning record in sewer manholes

SEWER RAT POISONING RECORD

Rodent and Vector Control  
Contra Costa County Health Department

Division of Environmental Health

Sheet # \_\_\_\_\_

Area \_\_\_\_\_

#	Location of Manhole	Ct	Date				Date				Date				Date				TOTALS	
			IN	T/S	WE	BA	IN	T/S	WE	BA	IN	T/S	WE	BA	IN	T/S	WE	BA	Insp.	Take
1.																				
2.																				
3.																				
4.																				
5.																				
6.																				
7.																				
8.																				
9.																				
10.																				
11.																				
12.																				
13.																				
14.																				
15.																				
16.																				
17.																				
18.																				
19.																				
20.																				
Use these markings only: X = yes, 0 = no, L = light, M = medium, H = heavy		INIT. INSP.																		
EHVC - 2-4 68:1M		RE-INSP.																		

NOTE: IN=inspected, T/S=Take/sign, WE=wet, BA=bait placed.

block permitted later evaluation of the block and bait acceptance in the sewer environment. Paraffin bait blocks are durable and hold up well in sewers. The degree of consumption of the bait block can easily be measured. Even if the bait blocks were entirely consumed, the wire attaching the block to the manhole wall would remain. Through the evaluation we were able to obtain baseline data on the rodent population in the sewers of the county (fig. 4).

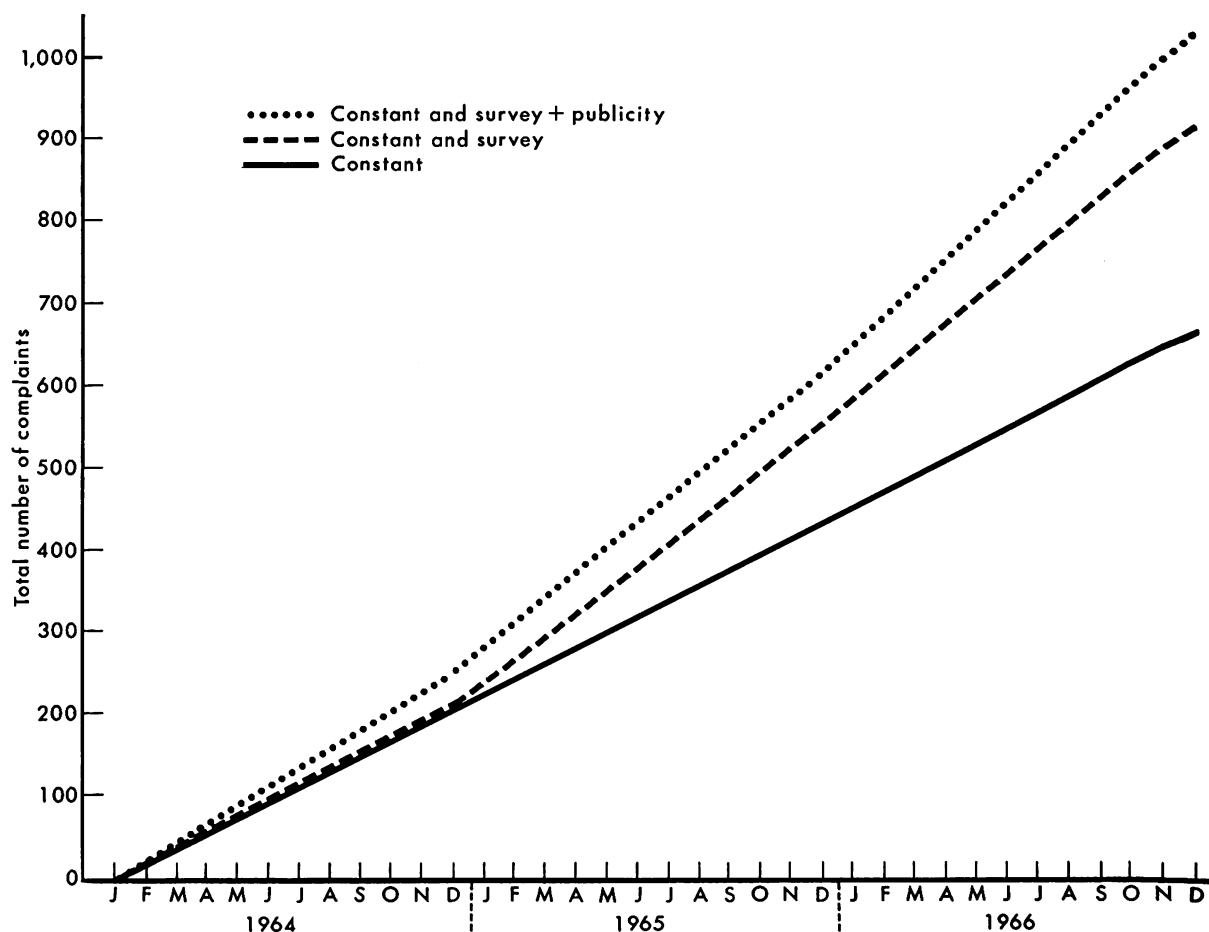
### Results

Several reinspections were made in the first 2 years of the poisoning program, and in some cities we have been able to determine the areas of heavy infestation. After reinspection, all bait stations that showed acceptance of baits were plotted on a sewer map of the sewerage agency responsible for stations showing accept-

ance. Stations that had wet manholes or were inaccessible were also recorded. These were indicated on our report.

In plotting the acceptance of bait in sewer manholes, patterns emerged which showed that certain sections of the cities had greater infestations of rodents. Comparisons between old and new sewer systems seemed to indicate that old, unrepaired systems are more conducive to rats (8). Garbage grinders feeding into poorly maintained and deteriorating sewer mains offer the food necessary for rat survival. However, some new systems serving homes with garbage grinders did provide the proper ecology for rats (8-10). The advantage of plotting information on bait acceptance on sewer maps is that, if the plotting shows that a lateral or a trunk line is infested, increased control measures can be concentrated in the area (5b).

Figure 5. Effects of survey and publicity on complaint rates



# Data Record Sheet for Multiple Regression Analysis

Date	Number of residences surveyed <i>S</i>	Inches of publicity per month <i>P</i>	Number of complaints <i>C</i>
<b>1964</b>			
January			8
February			9
March		15	6
April		10	7
May			13
June			13
July		15	14
August			18
September		20	10
October			10
November		15	8
December		24	7
<b>1965</b>			
January		16	9
February			8
March	20	20	10
April			8
May	1, 214	40	20
June	1, 214	13	24
July	1, 214	15	23
August	1, 214	25	69
September	1, 214	17	79
October	161	54	57
November	545	211	59
December		15	33
<b>1966</b>			
January	40	25	33
February	83	21	34
March	117	35	37
April		17	52
May	20	220	55
June	65	87	57
July			53
August		11	64
September		38	57
October		12	39
November	40	40	32
December		41	17

## Evaluation

A primary consideration in any public rat control program is the volume of complaints of rat infestation. In many jurisdictions, evaluation of the effectiveness of the program is based on a lessening complaint rate or on finding a great number of dead rats in the grit chamber at the sewer plant. Since we used a slow-acting anticoagulant poison, the dead rats would not be flushed down the sewer to the plant but would probably die in their nesting area. In order to test the hypothesis that complaints indicate infestation, a series of statistical comparisons were made. These comparisons were

based on the data in our records which had been gathered up to January 1967. All the data were organized in a similar fashion:

1. Monthly averages of the number of complaints

2. Inches of publicity in the newspapers

3. Number of residential and business locations surveyed

All data were listed by census tract. The various combinations of the three variables listed were compared by the chi-square test in which:

$$\chi^2 = \frac{N[(AD-BC) - N/2]^2}{(A+C)(B+D)(A+B)(C+D)}$$

$\chi^2$ =distribution of observations arranged in the following manner:

$N$ =total number of observations

$C+A$ =number of observations  $> \bar{M}$  complaint rate

$D+B$ =number of observations  $< \bar{M}$  complaint rate

$D+C$ =number of observations  $> \bar{M}$  publicity rate

$A+B$ =number of observations  $< \bar{M}$  publicity rate

Solving the equation for  $\chi^2$  shows whether the observed frequencies of publicity compared with complaints differ significantly from estimated frequencies.

All relationships that gave a chi-square value of 3.84 with 1 degree of freedom or more, which is equivalent to a 95 percent probability that the relationship was not due to chance, were treated by a more sophisticated method (11).

The next procedure was to develop a mathematical relationship between the number of complaints received and the number of locations surveyed by the least squares method. From this was developed the equation:

$$C = 21.68 + 0.03798S$$

in which  $C$  represents complaints and  $S$  the number of surveys.

The regression line (fig. 5) indicates that in any one month, 22 complaints could be predicted, with no surveys done. The curve indicates that for each 30 residences surveyed per month, one additional complaint would be predicted. The next step was to combine in one calculation the independent variable, surveys

and the inches of newspaper publicity published, in a comparison with the number of complaints received as an independent variable. This method of multiple regression analysis is essentially the comparison of the deviation from the sums of the squares and cross products of the variables being studied. The relationship is shown by the equation:

$$C = 18.17 + 0.35338S + 0.1661P$$

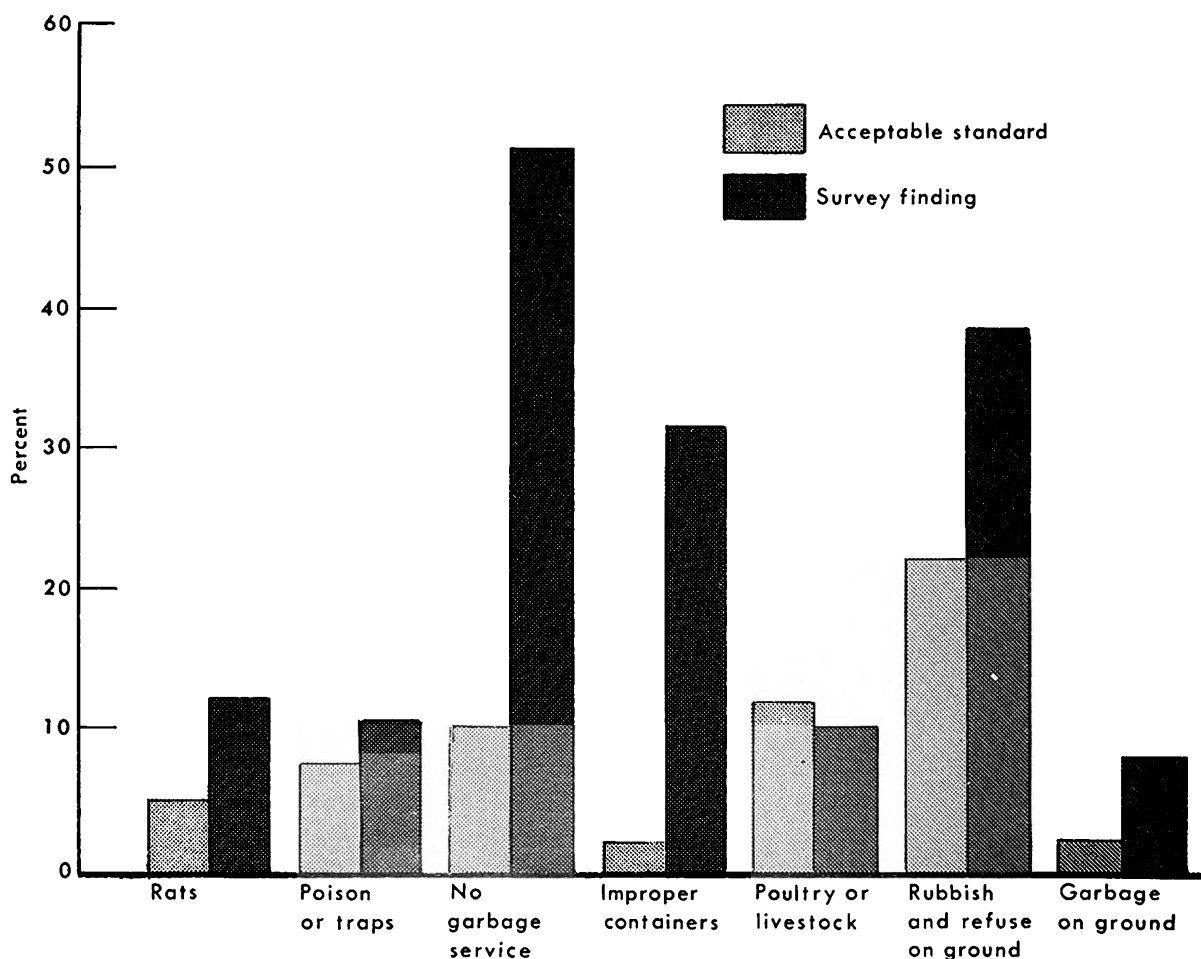
in which  $C$  represents the number of complaints,  $S$  the number of residences surveyed, and  $P$  the inches of publicity (see data sheet for multiple regression analysis).

The results of this equation can be shown by a graph which represents the cumulative complaints, surveys, and inches of publicity for the 36-month period under study. This equation fur-

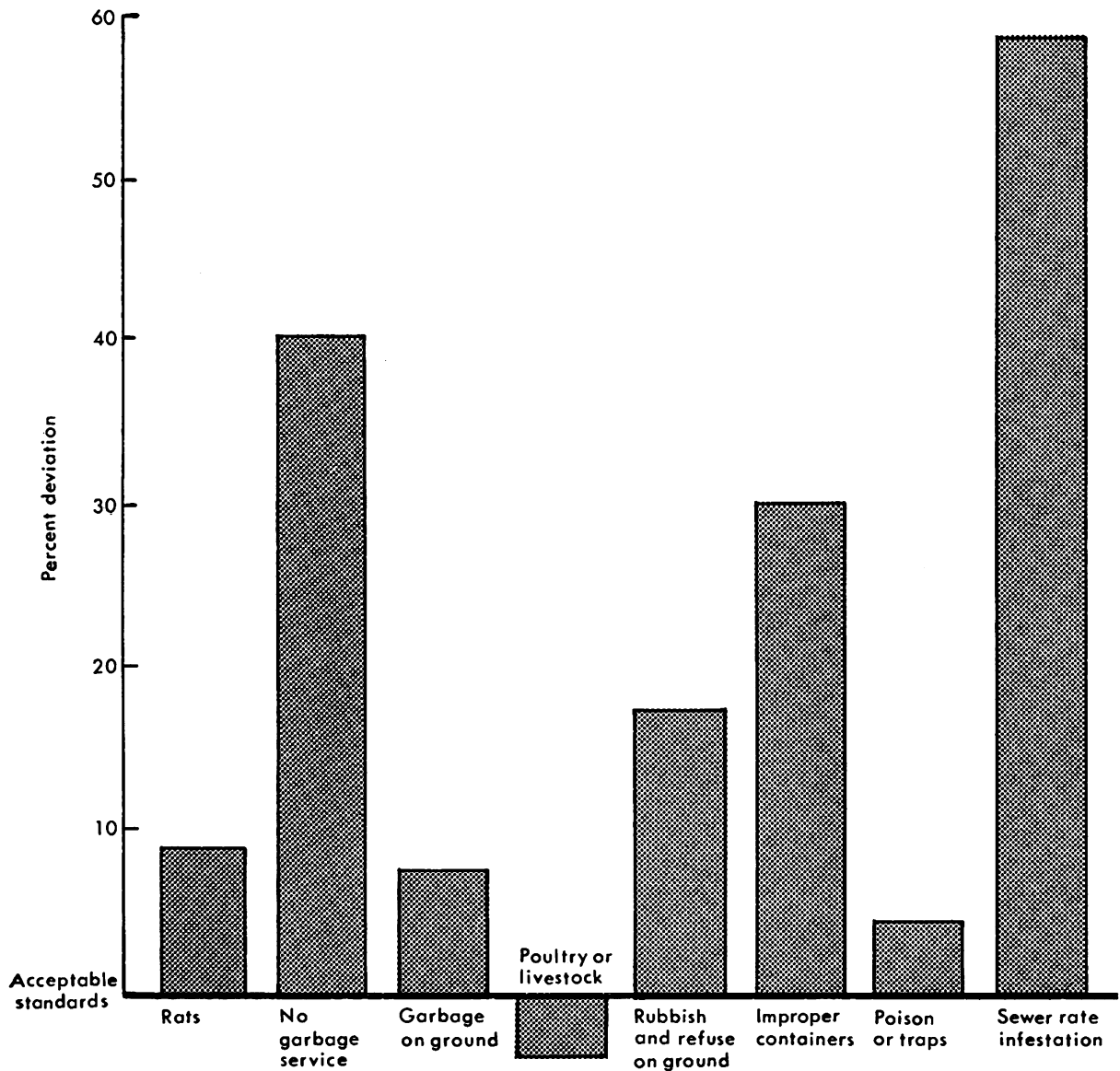
ther illustrates the fact that there is a basic backlog of complaints, in this case 18 per month, which occur regardless of surveys or publicity (fig. 5). Because of the arrangement of the recording system, variables can be added or subtracted as needed.

The next step in analyzing the data is to plot the deviation from the equation and compare it with other variables by the chi-square test to see if it is advisable to include another variable in the multiple regression analysis. This stepwise calculation method limits the amount of data handled at any one time to the volume which can be handled on a desk calculator. Putting a huge mass of data through a computer to discover that the multiple tests are correlated and the probability levels are affected so that only

**Figure 6. Sanitary conditions found in survey of one census tract compared with acceptable standards**



**Figure 7. Deviations from acceptable standards found in survey of one census tract**



two or three of the variables are significant seems considerably less efficient.

In one census tract, the variables that might affect the rate of rat infestation of sewer manholes were studied. Mean acceptable standards for several environmental health sanitary violations were based on standards in the Merced County Environmental Health Appraisal (4). Findings for sanitary violations or conditions are indicated in figure 6 as percentages compared with mean acceptable standards. The deviation from these mean acceptable stand-

ards indicates, in this particular census tract, the factors that might be important in the rodent infestation rate of manholes (fig. 7).

### Conclusions and Summary

The use of sewerage maps and records as a means of determining areas of heavy rat infestation is valid. These records permitted us to evaluate the effect of a poisoning program and to conduct an ongoing surveillance program. Statistical correlation and analysis of results

indicates the need for a solution that consists of several steps. The use of significant variables pinpoints more clearly approaches to rat control that are specific to an area.

Records were developed and kept of infestation rates of rats in sewer manholes, creek sites, waterfront areas, and residences. In addition, records of variables such as weather conditions, socioeconomic status of residents of an area, geographic data, and business activity are needed to analyze Norway rat infestations and to develop control measures adaptable to the variables.

A complete reappraisal of the signpost indicators of rat infestation is mandatory.

We used the facts accumulated from our records to compare and evaluate rat infestation and the reasons for infestation in sewer manholes throughout Contra Costa County as well as in individual census tracts. Analyzing this infestation we were able to relate, by order of importance, infestation rates with complaint rates and with other evaluation criteria in each census tract of the county. The causes of sewer infestation in one census tract are not necessarily the causes in another tract. Record analysis permitted delineation of the degree of Norway rat infestation in sewer manholes, the effect of the rats upon the residential population, and the population's response by complaints, action, or otherwise in different census tracts. This analysis was the basis for developing a countywide rodent control program which, of necessity, has different intermediate goals in various areas and census tracts.

## REFERENCES

- (1) Dickie, W. M.: Plague pathology & bacteriology: Plague in California 1900-1925. In *Proceedings of the Conference of State and Provincial Health Authorities of North America*. California State Printing Office, Sacramento, May 1926, pp. 30-78.
- (2) McMorrow, T.: Plague in Contra Costa County, California. Contra Costa County Health Department, Martinez, Calif., 1956. Mimeographed.
- (3) Best rat killing program in Boston's history. *Pest Control* 35: 10-13, 68, August 1967.
- (4) Shoemaker, J. L.: Procedure manual for the area screening method-environmental health appraisal. Final report, local project 0126. Merced County Health Department, Merced, Calif., June 1965.
- (5) Bentley, E. W.: Control of rats in sewers. Technical Bulletin No. 10, Ministry of Agriculture, Fisheries and Food, London, 1960 (a) pp. 12-13, 22; (b) p. 14.
- (6) Brooks, J. E.: Methods of sewer rat control. In *Proceedings of the Vertebrate Pest Control Conference*, Feb. 6-7, 1962. California Department of Public Health, Berkeley, 1962, pp. 227-244.
- (7) City sewer rat control across the nation. *Pest Control* 31: 14, 15-18, August 1963.
- (8) Beck, J. R., and Rodeheffer, P. W.: Causes and control of sewer rats. *Public Works* 96: 116-118, April 1965.
- (9) Whitman, G.: Wilson rids Winston-Salem of sewer rats. *Pest Control* 31: 22-24, 72, August 1963.
- (10) Mackie, R. A.: Control of the roof rat, *Rattus rattus*, in the sewers of San Diego, P.C.O. News 25: 27-29, December 1965.
- (11) Ezekiel, M., and Fox, K.: Methods of correlation and regression analysis. John Wiley & Sons, Inc., New York, 1959, pp. 170-174.



# Revaccination Against Smallpox

RAGNAR RYLANDER, M.D.

**R**EGULAR REVACCINATION against smallpox is necessary to protect persons with a higher risk of exposure than usual, such as hospital personnel. The necessity for maintaining a high degree of protection against the disease has been illustrated by several epidemics occurring almost exclusively among hospital employees.

However, regular revaccination of a group of employees induces several practical problems. The percentage of positive reactions, which strength vaccine to use, and the number and severity of complications are important factors which must be considered when a vaccination program is being planned and executed.

To determine the practical importance of these factors, a study was undertaken on the results of the continuous revaccination program against smallpox at the Hospital for Infectious Diseases in Stockholm. In this paper revaccination refers to vaccination of a person who has been vaccinated earlier. The term "repeat revaccination" is used for revaccinations when the first revaccination was unsuccessful.

## Method

All persons employed at the Hospital for Infectious Diseases are required to be revaccinated once a year. The hospital employs about 390 persons, mainly women. As the annual rate of turnover among employees is fairly large,

---

*Dr. Rylander is deputy head, Department of Environmental Hygiene, National Institute of Public Health, and staff physician at the Hospital for Infectious Diseases, Stockholm, Sweden.*

about 150 new employees with varying time periods since last vaccination are added to the regular staff which was vaccinated the previous year.

Smallpox vaccination during childhood is compulsory in Sweden, and unvaccinated persons are therefore only rarely encountered. No previously unvaccinated persons were included in this study. Persons in this study were vaccinated at the hospital from 1964 through 1967.

All vaccinations were given on the upper left arm with the multiple-pressure technique. Two vaccines with different potencies were used. One with the titer of about  $10^{7.4}$  TCID<sub>50</sub> per milliliter is referred to as ordinary vaccine, and the other with the titer of about  $10^{8.1}$  TCID<sub>50</sub> per milliliter is referred to as strong vaccine (1).

Immediately after the vaccination and before the vaccine had dried, the vaccination site was covered with a plastic film (2). The procedure did not influence the number of positive reactions as compared with the traditional gauze pad dressing. Either a staff nurse or I vaccinated all the persons in this study.

Generally, any person who had reacted positively within 5 years was vaccinated with the strong vaccine. If the vaccinee had had a strong reaction, or if the patient expressed some concern about the vaccination, the ordinary vaccine was used.

The results were read 4–8 days after the revaccination by the person who gave it. A revaccination was considered positive only if a crusta of at least 1 mm. in diameter was observed. Vesiculation or induration of the vac-

cination site was not registered as a positive reaction. Repeated revaccinations were given all persons with negative reactions.

To study complications, the number of days absent due to smallpox vaccination was obtained from the payroll department. As no deduction from salary was made for absence due to vaccination, a strong motive existed for persons absent due to complications to report this diagnosis.

I saw all persons absent due to complications from vaccination. A detailed study of the vaccination history was made for persons absent in 1966.

### Results

Of the 1,931 persons revaccinated, 1,894 returned for the results to be checked within the stipulated time. The remaining 37 persons (1.9 percent of the vaccinees) either returned at a later date or terminated their employment at the hospital.

The percentage of negative reactions to the ordinary vaccine was generally larger than the percentage of negative reactions to the strong vaccine (table 1). In the group which had been revaccinated 1 year previously, 30 percent of the persons revaccinated with ordinary vaccine and 15 percent of those vaccinated with strong vaccine had negative reactions. The group who had their last vaccination more than 5 years previously were revaccinated with the ordinary vaccine, and 26 percent of these persons had negative reactions.

The number of repeated revaccinations required to obtain a positive result is shown in table 2. The majority of persons with negative reactions required only one repeat revaccination although some vaccinees required up to four revaccinations before a positive result was obtained.

Of the 1,931 persons vaccinated, only 19 vaccinees were absent for a total of 85 workdays. The number of persons absent was very low compared with the number vaccinated, and no person was absent for more than 5 days. The proportion of vaccinations to absence days averaged 23 to 1.

When the case histories of persons absent in 1966 were studied, I observed that all absentees had been vaccinated with the ordinary vaccine

and that their last previous vaccination had occurred during childhood. The reasons for the absenteeism generally were localized swelling of the vaccination site, headache, and fever. No serious complications were observed.

### Comments

In this study the proportion of vaccinees with positive reactions was in general agreement with the observations during earlier investigations (3). The increase in the number of positive reactions observed in this study in relation to increased potency of the vaccine is also consistent with earlier reports.

Of special interest in this connection is that the percentage of negative results after vaccination with ordinary vaccine is about the same in persons vaccinated 1 and more than 5 years previously. The same was true concerning the strong vaccine if the persons vaccinated 1 year previously were compared with persons vaccinated 4 years previously.

Statistical analysis of results of repeated revaccinations show that although the majority of vaccinees had positive reactions after the first repeated vaccination, almost a fifth of the persons reacting negatively required two repeated revaccinations and about one-tenth required three or more repeated revaccinations. One person still reacted negatively when, after six revaccinations, she terminated her employment at the hospital.

The participants in this study were absent fewer days than the hospital employees in an earlier study (3). In the study I reported on in 1962, 11.9 percent of the vaccinees were absent as compared with 1 percent in this study.

The reason for this difference probably is that the study in 1962 included more persons who had not been vaccinated since childhood, whereas the majority in this study had been vaccinated the preceding year. This assumption could not be verified, however, because no histories of previous vaccinations were taken in the 1962 study. In a study of 2,417 persons reported by Smith and associates (4), the rate of absenteeism, 0.5 percent, was in accordance with the rate observed in this group.

The absence of severe complications among persons in this study probably is related to the large proportion of persons who had a recent

**Table 1. Negative reactions of hospital personnel after revaccination against smallpox, by number of years after last positive reaction**

Years since last positive reaction	Strong vaccine			Ordinary vaccine		
	Persons vaccinated	Negative reactions		Persons vaccinated	Negative reactions	
		Number	Percent		Number	Percent
1.....	1, 123	170	15. 1	96	29	30. 2
2.....	181	44	24. 3	28	5	-----
3.....	125	18	14. 4	27	6	-----
4.....	74	11	14. 9	12	3	-----
5.....	2	0	-----	16	2	-----
Over 5.....	0	0	-----	210	55	26. 2
Total.....	1, 505	243	16. 1	389	100	25. 7

successful revaccination. This observation is in agreement with the results reported by Bengtsson and co-workers in their study of 192 persons with complications after smallpox vaccinations (5). Among these patients were 68 who had been vaccinated for the first time, 90 who had been revaccinated more than 20 years previously, and only 16 who had been vaccinated within the preceding 10 years. Complications in these patients occurred at a time when approximately 300,000 persons in Stockholm were being vaccinated in a voluntary mass vaccination program in connection with the smallpox epidemic of 1963.

### Conclusion

Revaccination against smallpox can be undertaken using a vaccine with a titer of about  $10^{8.1}$

**Table 2. Repeat revaccinations required to produce positive reaction in persons with a negative reaction after revaccination with strong vaccine**

Revaccinations	Years since positive reaction			Total	
	1	2	3	Number	Percent <sup>1</sup>
Negative reactions.....	160	33	8	<sup>2</sup> 201	99
1 repeat revaccination..	115	24	6	145	72
2 repeat revaccinations..	28	7	2	37	18
3 repeat revaccinations..	11	1	0	12	6
4 repeat revaccinations..	6	1	0	7	3

<sup>1</sup> Did not add to 100 because of rounding.

<sup>2</sup> 42 persons terminated their employment and hence were lost from the study.

TCID<sub>50</sub> per milliliter without risking severe complications or absenteeism if the patient has reacted positively to vaccination within the past 5 years. Use of the stronger vaccine reduces the proportion of negative results, and hence reduces the workload of health personnel who give the vaccinations.

Complications can be expected mainly among persons vaccinated more than 5 years previously, and they will occur even when vaccine with a titer of about  $10^{7.4}$  TCID<sub>50</sub> is used. Use of still weaker vaccine might be considered for these persons, even if the percentage of negative results should increase over the rate of negative reactions reported for the participants in this study.

### Summary

Results from revaccination against smallpox were studied in 1,931 hospital employees given compulsory vaccinations 1964-67 at the Hospital for Infectious Diseases, Stockholm, Sweden. Vaccine with a titer of about  $10^{8.1}$  TCID<sub>50</sub> per milliliter was used for persons who had reacted positively to vaccination within the preceding 5 years. The vaccinator observed and recorded the vaccinee's reaction. Formation of a 1-mm. crusta was considered a positive result.

About 15 percent negative reactions were obtained with the vaccine with a titer of about  $10^{8.1}$  TCID<sub>50</sub> per milliliter compared with 30 percent negative reactions obtained with vaccine having a titer of about  $10^{7.4}$  TCID<sub>50</sub> per milliliter. The majority of complications occurred among persons vaccinated with the less potent vaccine and those who had had their last

positive reaction to vaccination during childhood.

Use of the more potent vaccine for revaccination of persons vaccinated within 5 years is recommended to decrease the number of negative reactions.

#### REFERENCES

- (1) Espmark, Å. J.: Tissue culture end-point titrations as a routine potency test for smallpox vaccine. *Arch Ges Virusforsch* 15: 35-49 (1964).
- (2) Rylander, R.: Protective plastic film dressing in smallpox vaccination. *Public Health Rep* 83: 787-790, September 1968.
- (3) Rylander, R.: Smittkoppsvaccinering av sjukhuspersonal. [Smallpox vaccination of hospital personnel.] *Svenska Läkartidn* 59: 3793-3800 (1962).
- (4) Smith, J. W., Seidl, L. G., and Johnsson, J. E., III: Smallpox vaccination in hospital personnel. *JAMA* 197: 309-314 (1966).
- (5) Ström, J., and Zetterberg, B., editors: Smallpox outbreak and vaccination problems in Stockholm, Sweden, 1963. *Acta Med Scand (suppl)* 464: 89-104 (1966).

## Decline in Births Slows in 1968

The National Center for Health Statistics has released provisional estimates on births for 1968. Births in the United States totaled 3,470,000, the fewest since 1946. Marriages continued to rise, reaching 2,059,000 in 1968.

Although the number of births in 1968 was 19 percent below the record total in 1957, it was only a little more than 1 percent lower than in 1967. This represents the smallest decline since 1963-64. The number of marriages in 1968 was the second highest on record and nearly 8 percent higher than in 1967.

The 1968 birth rate, 17.4 per 1,000 total population, continues the decline from the 1957 peak of 25.3. It is the lowest rate ever observed in the United States.

The fertility rate, the number of births per 1,000 women in the reproductive ages (15-44), was 84.8 in 1968. Although the fertility rate also has been declining since 1957, it is still well above the rates of 76-79 during the period 1933-39.

Presently, women 15-44 years old constitute only 20 percent of the entire population, as compared with 24 percent in the 1930's. As a result of the decline in this proportion, the substantially higher fertility rate of today's women is only large enough to maintain the birth rate per 1,000 total population at a level that is somewhat lower than that of the 1930's.

Another factor in the decline in the birth rate from 1957 to 1968 is a drop in the unusually high rates observed at the older childbearing ages, 30 and over, during the 1950's. These high rates were caused by the making up of births postponed by couples who were in the early childbearing ages during the late 1930's and early 1940's. The couples who followed

them are now having lower birth rates at the older childbearing ages because they tended to marry earlier and have their children sooner after marriage.

Also, there has been a drop in birth rates among younger couples. This trend is believed to be caused partly by a tendency toward wider spacing of births and partly by a decline in the total number of children wanted.

Currently the number of young women is rising rapidly. In mid-1968 there were 14.3 million aged 20-29, the age group in which childbearing is most heavily concentrated. According to projections by the U.S. Bureau of the Census, this number will rise to 15.5 million by 1970 and to 18.3 million by 1975. Unless age-specific birth rates fall well below their present levels, the projected changes in the number of women will tend to raise the number of births. But even though the decline in age-specific birth rates has slowed down, it has still been sufficient to more than offset the effects of the increasing numbers of young women thus far, and it is difficult to determine precisely when the decline in the annual number of births is likely to end.

The marriage rate of 10.3 marriages per 1,000 population in 1968 was the highest since 1951. The current "marriage boom" is related to the high numbers of marriages and subsequent births during the period immediately after World War II. As a result, the number of youths moving into the marriageable ages has increased rapidly. In the U.S. resident population there were 4.9 million more persons in the age group 15-19 in 1968 than in 1960 and 4.3 million more in the age group 20-24.

# Variables Related to a Referendum Vote on Creating a County Health Department

CHARLES O. CRAWFORD, Ph.D.

AS A RESULT of referendums, community health programs have been established in many parts of the United States. Fluoridation, particularly, is an issue that has received considerable attention in recent years (1). Regulatory measures to curb air and water pollution also are in process and, with the passage of legislation for comprehensive health planning, even more attention will be given to the dynamics of local political action on health issues.

In Pennsylvania, establishment of local and county health departments, singly or in combination, has been a goal, at least since 1948, in organizing health services in that State (2). Health departments have been set up in Allegheny, Bucks, Chester, Erie, and Philadelphia Counties. Other States have shown similar interest where units of government lower than counties have been a strong force in local political affairs (3). New York has either partial or full departments in 25 of 57 upstate counties, Illinois in 18 of 206 counties, and Michigan in 28 of 83 counties. Rationale for establishing county or multicounty health departments is the assumption that health programs designed and carried out at local levels are more flexible and better meet the needs of local citizens than programs designed for an entire State.

Analyzing the factors involved in this type of community change could shed more light on how to improve the organization and delivery of community health services, both preventive and therapeutic or rehabilitative.

## The Problem

Referendum procedures normally are used to establish county health departments in Pennsylvania, although creation of a department can be

authorized by resolution of the county commissioners. In a referendum, a simple majority must vote affirmatively.

With this political framework and the goal to establish county or even multicounty health departments, analyzing the factors related to voting behavior on this issue could be helpful to those attempting to understand the factors facilitating or inhibiting the formation of such units.

Two kinds of analyses can be undertaken in examining voting behavior: One is examination of the voter's view on the health issue and his voting behavior; that is, the investigation focuses on how residents voted on the issue and why. A second approach, and the one taken, is examination of the political, demographic, and socioeconomic characteristics of municipalities within a county or group of counties in relation to municipal voting patterns. Knowing the characteristics of municipalities likely to favor such an issue would enable persons interested in establishing county health departments to use their efforts more effectively than if they had no knowledge of voting behavior.

Analyzing voting patterns by these characteristics, however, helps only to the extent that information on such municipalities is available. Published demographic data now are available only for municipalities of counties in Standard Metropolitan Statistical Areas (SMSA's). One

---

*Dr. Crawford is director of the division of behavioral science, Pennsylvania Department of Health, Harrisburg. Dr. Samuel M. Leadley, assistant professor of rural sociology at Pennsylvania State University, contributed to the interpretation of the statistical findings.*

example is Chester County, Pa. (A SMSA is defined by the U.S. Bureau of the Census as one or more contiguous nonagricultural counties containing at least one city of 50,000 or more persons, or a pair of contiguous twin cities of at least this joint size, and having a general metropolitan character based on the counties' social and economic integration with the central city.)

Pinpointing communities likely to be for or against establishing a county health department could be accomplished through study of municipalities that have already completed referendums. Not only would such research be of practical value, but it also would contribute to the larger body of literature on community voting behavior.

### **Chester County**

In Pennsylvania a borough is a separate incorporated political entity. Under State Public Law 1656, effective February 1, 1966, a borough may be established when a majority of freeholders within the proposed borough area approves and applies to the appropriate court for incorporation as a borough. None of the proposed borough area can consist of already incorporated areas. Third-class cities may become boroughs if the city electorate votes for such status. There are four classes of cities in Pennsylvania and one class of boroughs. Few boroughs are larger than cities.

Chester County is in southeastern Pennsylvania and in 1960 was part of the Philadelphia SMSA delineated by the Census Bureau. Fifty-seven townships, 15 boroughs, and one city constitute the political subdivisions or municipalities within the county. In this study selected political, socioeconomic, and demographic variables are related to the extent to which these municipalities voted affirmatively on November 8, 1966, for a county health department.

Data from the 1960 census revealed that the average (mean) population of the 15 boroughs was 3,917 and the average (mean) population of townships was 2,438. Distribution of the 15 boroughs by population was as follows: 10,000 to 16,000, two; 3,000 to 9,999, four; 1,000 to 2,999, six; and less than 1,000, three. The City of Coatesville had a 1960 population of 12,971. Chester County therefore did not have a population center of more than 16,000.

Like other counties surrounding large metropolitan cities, Chester County has experienced considerable growth in recent decades. The percentage increase in population declined from 10 percent in the 1920's to 7 percent in the 1930's. Considerable resurgence occurred in the 1940's, with an increase of 17 percent, and this rate nearly doubled during the 1950's, with an increase of 32 percent to 210,600 persons in 1960. The Pennsylvania State Planning Board estimated that during the 1960's the increase would be 33 percent to 280,000 persons in 1970.

The eastern part of Chester County, near Philadelphia, has experienced the greatest growth, doubling in population from 1950 to 1960. The western part of the county, with more agriculture, is considerably less populated and has a lower rate of population growth. In 1960 more than half (56 percent) of the county's population was classified as rural, with 6 percent classified as rural farm. The county is clearly one of contrasts.

### **Related Variables**

Three major categories of variables were chosen to be related to voting patterns: political organization, demographic features, and socioeconomic levels. Political organization was included because it probably affects the kinds of health problems being faced. Boroughs and cities, compared with suburban and rural non-farm areas, generally have greater population densities, more disadvantaged families, and more blue collar workers. All these characteristics may be related to a strong desire for public-supported health services.

The demographic variable was used because demographic information on Chester County was available at the census tract level (4). These data were collected 6 years before the referendum but nonetheless were useful for comparative purposes, especially when updated where possible.

Two indexes were used to measure population growth and mobility: (a) average annual percentage population increase in 1950-60 and 1960-64 and (b) percentage of population 5 years old and over occupying the same residence in 1960 as in 1955. Population growth could affect the nature and severity of environmental health problems, such as water supply and solid

and liquid waste disposal, and thereby condition the residents' perception of the need for a county health department. Measure of mobility was thought to affect the extent of mobility and, through this and the often-noted relationship between mobility and conservatism, progressivism or the willingness to accept change.

Although no empirical research could be found to document the relationship between community mobility levels and degree of progressivism as reflected in community voting patterns, authors have noted that the characteristics of "moving" people are thought to contribute to a greater degree of progressivism in a community. More mobile persons, particularly those moving into suburban communities, tend to be younger and better educated, to have higher incomes, and to have lived in communities where community services were provided.

Eisenstadt (5), in citing a work of Karl Deutsch, noted that change in residence is an indicator of the extent to which older social and psychological commitments are broken down and people are more receptive to new patterns of behavior. These findings and ideas would lead one to suspect that communities with higher rates of residential mobility would reflect greater progressivism.

The two socioeconomic variables used, median family incomes and median number of years of school completed by persons 25 years old or older, were expected to condition voting patterns since residents with high socioeconomic status are known to vote differently from those with low socioeconomic status when social or cultural change is considered (6).

Percentage affirmative vote (PAV), the central variable of concern in this research, was measured by data obtained from the Chester County Board of Elections. The question was:

"Shall Chester County create a county department of health?" Data on the total number of persons voting on the issue and the number voting affirmatively were used to compute a PAV for each of the county's 73 municipalities. In the analysis, four ranges of PAV were used: less than 40 percent, 40 to 49.9 percent, 50 to 59.9 percent, and 60 percent or more. These ranges allowed distinctions between types of communities at high and low PAV levels.

Although a simple majority of affirmative votes is the minimum needed for passage of a referendum at the county level, it seemed important to identify characteristics of those municipalities with higher rates since they contribute to the county majority at a higher level than those with lower rates of PAV.

It should be made clear that the unit for analysis is the municipality and not the individual voter. The primary reason for choosing the municipality was to establish the predictability of this geographic area. Social and psychological research on the voting behavior of persons is also needed and would be of considerable value.

#### Analytic Determinations

*Political status.* One of the most clear-cut relationships obtained was that between political status of the municipality and PAV. The boroughs and city were about 2.5 times as likely to have 60 percent or more affirmative vote as the townships, or 62.4 compared with 24.6 percent (table 1). Townships, on the other hand, were nearly three times as likely as the boroughs and city to have less than 40 percent favorable vote, 17.5 compared with 6.3 percent.

*Population growth.* Data on the relationship to PAV of population growth for 1950-60 and 1960-64 revealed tendencies toward curvilinear relationships, with the fast- and slow-

**Table 1. Percentage affirmative vote, by political organization of municipality**

Percentage affirmative vote	Township		Borough and city		Total	
	Number	Percent	Number	Percent	Number	Percent
Total.....	57	100.0	16	100.0	73	100.0
60 or more.....	14	24.6	10	62.4	24	32.9
50-59.9.....	21	36.8	4	25.0	25	34.2
40-49.9.....	12	21.1	1	6.3	13	17.8
Less than 40.....	10	17.5	1	6.3	11	15.1



growing municipalities being two or three times more likely to have 60 percent or more affirmative votes than those with moderate growth rates (table 2). At low PAV levels, there were greater proportions of high and low growth municipalities than those with moderate growth.

This curvilinear relationship can be explained partly by the political status of the slow-growing counties and the characteristics of expansion in the fast-growing counties. The slow-growing municipalities are much more likely to be boroughs or cities than are the moderate and fast-growing municipalities (table 3) and, as stated previously, residents of the boroughs and cities are more likely to vote affirmatively. Municipal status, then, affects the interpretation of the curvilinear relationship between population growth and PAV. This consideration is particularly important at low growth rate levels.

The second factor affecting the curvilinear relationship between growth and PAV concerns the socioeconomic characteristics of the high growth townships, most of which are in the eastern part of the county. The data in tables 4 and 5 indicate that municipalities with high growth rates are characterized by high educational and income levels as compared with municipalities having low growth rates. The effect of educational and income levels on PAV is discussed

**Table 3. Average annual percentage increase in population of municipality, 1960-64 and 1950-60, by political organization of the municipality**

Percentage population increase	Number of municipalities by political organization			Total
	Township	Borough	City	
<hr/>				
<i>1960-64 growth</i>				
Total.....	57	15	1	73
<hr/>				
Less than 2.....	15	10	1	26
2-3.9.....	26	3	-----	29
4 or more.....	16	2	-----	18
 <i>1950-60 growth</i>				
Total.....	57	15	1	73
<hr/>				
Less than 2.....	12	13	1	26
2-3.9.....	21	2	-----	23
4 or more.....	24	-----	-----	24

later. Suffice it to say that the relationship is rather clear cut and that the higher socioeconomic levels are associated with a higher PAV.

*Population mobility.* The data in table 6 show that municipalities with a high percentage of persons occupying the same residence in 1960 as in 1955 (greater immobility) were about half as likely to have 60 percent or more affirmative votes as those with a low percentage of persons in the same residence (greater mobility). None of the 18 more mobile municipalities had

**Table 2. Percentage affirmative vote, by average annual percentage increase in population of municipality, 1960-64 and 1950-60**

Percentage affirmative vote	Percentage population increase						Total	
	Less than 2		2-3.9		4 or more			
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
<i>1960-64 growth</i>								
Total.....	26	100. 0	29	100. 0	18	100. 0	73	100. 0
60 or more.....	9	34. 6	5	17. 2	10	55. 5	24	32. 9
50-59.9.....	8	30. 8	14	48. 4	3	16. 7	25	34. 2
40-49.9.....	5	19. 2	5	17. 2	3	16. 7	13	17. 8
Less than 40.....	4	15. 4	5	17. 2	2	11. 1	11	15. 1
<i>1950-60 growth</i>								
Total.....	26	100. 0	23	100. 0	24	100. 0	72	100. 0
60 or more.....	11	42. 3	3	13. 0	10	41. 7	24	32. 9
50-59.9.....	7	26. 9	12	52. 2	6	25. 0	25	34. 2
40-49.9.....	4	15. 4	4	17. 4	5	20. 8	12	17. 8
Less than 40.....	4	15. 4	4	17. 4	3	12. 5	11	15. 1

a PAV less than 40, while a fifth (or four) of the least mobile had a rate lower than 40.

Again, however, the political organization of the municipality needs to be considered. Mobility is least among the boroughs and city and most in the townships (table 7). None of the most mobile municipalities (less than 50 percent in the same residence in 1960) were boroughs or the city; all were townships. On the other hand, almost half of the least mobile municipalities (47 percent) were boroughs or the city. The trends were very clear cut.

*Median family income.* Because municipali-

ties with high population growth rates are more likely to have higher PAV and median family incomes than low growth municipalities, one would expect that median family income considered alone would be an effective predictor of PAV. The data in table 8 support this contention, especially among the high PAV municipalities.

Municipalities with median family incomes of \$7,000 or more were a little more than twice as likely to have 60 percent or more PAV as those with median family incomes of less than \$6,000, or 54.5 compared with 26.1 percent.

**Table 4. Average annual percentage increase in population of municipalities, 1960-64, by income and education**

Income and education	Percentage increase in population						Total	
	Less than 2		2-3		4 or more			
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total.....	19	100. 0	24	100. 0	17	100. 0	<sup>1</sup> 60	100. 0
Median family income in 1959:								
Less than \$6,000.....	11	57. 9	9	37. 5	3	17. 6	23	28. 3
\$6,000-\$6,999.....	8	42. 1	9	37. 5	9	53. 0	26	43. 4
\$7,000 or more.....			6	25. 0	5	29. 4	11	18. 3
Total.....	26	100. 0	29	100. 0	18	100. 0	73	100. 0
Years of school completed by persons 25 and over:								
8-9.9.....	7	26. 9	5	17. 2	-----		12	16. 4
10-11.9.....	16	61. 5	11	37. 9	8	44. 4	35	48. 0
12 or more.....	3	11. 6	13	44. 9	10	55. 6	26	35. 6

<sup>1</sup> No income figures available in census report for 13 municipalities.

**Table 5. Average annual percentage increase in population of municipalities, 1950-60, by income and education**

Income and education	Percentage increase in population						Total	
	Less than 2		2-3		4 or more			
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total.....	21	100. 0	18	100. 0	21	100. 0	<sup>1</sup> 60	100. 0
Median family income in 1959:								
Less than \$6,000.....	8	38. 1	10	55. 5	5	23. 8	23	38. 3
\$6,000-\$6,999.....	12	57. 1	7	38. 9	7	33. 3	26	43. 4
\$7,000 or more.....	1	4. 8	1	5. 6	9	42. 9	11	18. 3
Total.....	20	100. 0	23	100. 0	30	100. 0	73	100. 0
Years of school completed by persons 25 and over:								
8-9.9.....	6	30. 0	4	17. 4	2	6. 6	12	16. 5
10-11.9.....	8	40. 0	13	56. 5	14	46. 7	35	47. 9
12 or more.....	6	30. 0	6	26. 1	14	46. 7	26	35. 6

<sup>1</sup> No income figures available in census report for 13 municipalities.

None of the high income municipalities had less than 40 percent PAV whereas, in the two lower income groups the percentages of municipalities with less than 40 percent PAV were 17.4 and 19.2, or between one-sixth and one-fifth of the total for municipalities with low income levels.

*Median years of school completed.* Consistent with the data on incomes, but not as defined, are the data on educational levels. According to table 9, municipalities with high educational levels (12 or more years of school completed)

are twice as likely to have 60 percent or more PAV as those with low educational levels. But when the 50 to 59.9 percent PAV group is examined, the reverse trend is true, and municipalities with high educational levels have a lower percentage than those with low educational levels.

When the two upper PAV groups are combined into one category of 50 percent PAV or more, the percentage PAV rises slightly with increases in educational level. The likelihood that a municipality in the highest educational

**Table 6. Percentage affirmative vote, by percentage of persons 5 years old and over in 1960 living in same residence as in 1955**

Percentage affirmative vote	Percentage in same residence						Total	
	Less than 50		50-59.9		60 or more			
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total.....	18	100. 0	36	100. 0	19	100. 0	73	100. 0
60 or more.....	9	50. 0	10	27. 8	5	26. 3	24	32. 9
50-59.9.....	5	27. 8	13	36. 1	7	36. 8	25	34. 2
40-49.9.....	4	22. 2	6	16. 7	3	15. 8	13	17. 8
Less than 40.....			7	9. 4	4	21. 1	11	15. 1

**Table 7. Percentage of population 5 years old and over in 1960 living in same residence in 1960 as in 1955, and political organization of municipality**

Percentage of population	Political organization				Total	
	Township		Borough or city			
	Number	Percent	Number	Percent	Number	Percent
Total.....	57	78. 1	16	21. 9	73	100. 0
Less than 50.....	18	100. 0	-----	-----	18	100. 0
50-59. 9.....	29	80. 6	7	19. 4	36	100. 0
60 or more.....	10	52. 6	9	47. 4	19	100. 0

**Table 8. Percentage affirmative vote, by median family income of municipality, 1959**

Percentage affirmative vote	Median family income						Total	
	Less than \$6,000		\$6,000-6,999		\$7,000 or more			
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total.....	23	100. 0	26	100. 0	11	100. 0	60	100. 0
60 or more.....	6	26. 1	10	38. 5	6	54. 5	22	36. 6
50-59. 9.....	11	47. 8	5	19. 2	3	27. 3	19	31. 7
40-49. 9.....	2	8. 7	6	23. 1	2	18. 2	10	16. 7
Less than 40.....	4	17. 4	5	19. 2	-----		9	15. 0

<sup>1</sup> Family income figures not available from census report for 13 municipalities.

**Table 9. Percentage affirmative vote and median years of school completed by persons 25 years old and over in municipalities, 1960**

Percentage affirmative vote	Years of school completed							
	Less than 10		10-11. 9		12 or more		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total.....	12	100. 0	35	100. 0	26	100. 0	73	100. 0
60 or more.....	3	25. 0	8	22. 8	13	50. 0	24	32. 9
50-59. 9.....	6	50. 0	12	34. 3	7	27. 0	25	34. 2
40-49. 9.....	2	16. 7	8	22. 8	3	11. 5	13	17. 8
Less than 40.....	1	8. 3	7	20. 0	3	11. 5	11	15. 1

level will be found in the lowest PAV category is notably less than for a municipality in the middle educational level but a little more than for a municipality in the lowest educational level.

Thus, the median years of schooling completed by persons 25 years old and over in a municipality serves as a limited predictor, and only that. In this research, the factor distinguished rather well those communities likely to have the highest PAV. Beyond this observation, not much can be said.

### Discussion

The results of this study offer several tentative guidelines for public health programers interested in encouraging the development of county health units. Further research would clarify the relationships discovered in the present study. At first glance it would appear that in counties with ecological and political structures like those of Chester County, most efforts for gaining support for a county health department should be directed toward townships rather than boroughs and cities, slow growth rather than fast growth municipalities, and municipalities with lower rather than higher education and income levels. In each comparison, the first category would have a lower PAV than the second category.

An important question, unanswered in the present research, is whether greater publicity for a "yes" vote was given in the categories of municipalities with high PAV and greater publicity for a "no" vote was given in those with a low PAV or whether publicity was given and received relatively equally among all municipi-

palities and the resulting differences in PAV were due to different inclinations among voters in the municipalities. Further research including analysis of publicity efforts, available news media, and the psychology of individual voters is needed to answer questions of behavioral dynamics.

Other research needing attention is social and psychological analysis of the voter's opinion of the issue and why he voted for or against it. This analysis focuses on communities. But what does a higher PAV signify? In terms of political ideology, it could signify conservatism and a desire to return to the county powers previously held by the State—a return to "home rule." On the other hand, it could signify progressivism or a desire to take certain powers from municipalities and give them to the county—a loss of home rule and a move toward centralization.

Still another view of the problem could assert that a higher PAV merely reflects a rational desire to have a form of health service organization that is flexible and more responsive to local health needs and that considerations of political ideologists are not important. Only a series of personal interviews during or immediately after the referendum could provide answers to such questions.

It seems plausible to conclude tentatively, though, that some rather basic differences in the inclinations of voters in different municipalities are reflected in different PAV levels.

Unfortunately, the number of counties in the present study was not large enough to introduce tabular controls and perform more refined statistical analysis. In particular, the curvilinear

relationships suggested should be explored and analyzed by using appropriate curve fitting models. As data are collected on other counties, the results can be analyzed with the Chester County data if statistical tests reveal that this can be done validly.

### Summary

The extent to which political, demographic, and socioeconomic characteristics of municipalities in Chester County, Pa., were related to percentage affirmative vote (PAV) on a referendum to establish a county health department was investigated. Chester County has 57 townships, 15 boroughs, and one city. Whether the municipality was a township, borough, or city proved to be a factor closely related to the percentage affirmative vote. The boroughs and city were more likely to vote for a department than were the townships.

Municipalities with higher and lower population growth rates had a higher PAV than those with moderate growth rates. Two intervening variables, however, were political organization and socioeconomic status. Boroughs and the city tended to have lower growth rates than townships. The municipalities with higher growth rates tended to have higher socioeconomic levels when measured by income and education.

Mobility was related to percentage affirmative

vote in that municipalities with more mobile populations had a higher PAV than those with less mobile populations. Political organization of the municipalities had to be seriously considered when examining this relationship.

Income and education were related to PAV levels, with income data yielding more distinct relationships than educational levels. Municipalities with high socioeconomic ratings were more likely to have high PAV levels.

### REFERENCES

- (1) Mueller, J. E.: Fluoridation attitude change. *Amer J Public Health* 58: 1876-1880, October 1968.
- (2) American Public Health Association: *Keystones of public health for Pennsylvania*. New York, 1948.
- (3) U.S. Public Health Service: *Directory of local health units, 1966*. PHS Publication No. 118. U.S. Government Printing Office, Washington, D.C., 1966.
- (4) U.S. Bureau of the Census: *Census of population and housing: 1960. Census tracts. Final Rep. No. PH(1)-116* (Philadelphia, Pa.-N.J. Standard Metropolitan Statistical Area). U.S. Government Printing Office, Washington, D.C., 1962.
- (5) Eisenstadt, S. N.: *Modernization: Protest and change*. Prentice-Hall, Inc., Englewood Cliffs, N.J., 1966.
- (6) Wilson, J. Q., and Banfield, E. C.: *Public regard- ingness as a value premise in voting behavior*. *Amer Polit Sci Rev* 58: 876-883 (1964).

## PHS Staff Appointments

**Dr. Harry W. Bruce, Jr.**, has been appointed director of the Division of Educational and Research Facilities and **Dr. Daniel Whiteside**, director of the Division of Health Manpower Educational Services in the Bureau of Health Professions Education and Manpower Training, National Institutes of Health. Both are career commissioned officers of the Public Health Service and will serve under Dr. Leonard D. Fenninger, director of the manpower bureau.

Dr. Bruce, formerly assistant director for manpower and education in the Bureau's Division of Dental Health, will direct a new division which will administer construction programs authorized under the Nurse Training Act, the Allied Health Professions Personnel Training Act, the Health Professions Educational Assistance Act, the Medical Library Assistance Act, and the Health Research Facilities Act.

Dr. Whiteside was deputy director of the Division of Health Manpower Educational Services from the Bureau's inception in January 1967 until February 1969 when he was designated acting director. The Division of Health Manpower Educational Services administers a wide variety of grant, loan, and scholarship programs for the education and training of students of health professions and operates the Health Manpower Intelligence Center.

The Bureau of Health Manpower was created January 1, 1967, as the Federal focus for programs to increase the quality and availability of health service personnel. It was merged with the National Institutes of Health in April 1968 and renamed the Bureau of Health Professions Education and Manpower Training in January 1969.

# Relationship Between Comprehensive and Environmental Health Planning

ALBERT METTS, M.P.H.

A TOPIC of much conversation in public health circles today is comprehensive health planning. What does it mean? What does it include? Will it work? What activities are affected? Questions like these are being asked. One may also ask what the relationship is between comprehensive health and environmental health planning.

Environmental health is an important component of comprehensive health planning because of several fundamental concepts of the health of man. One is the notion that health is an individual right, just as elementary education has rightfully been considered. Another is the ecological approach in dealing with health problems of the whole man.

In 1968 the Department of Health, Education, and Welfare was reorganized. One major entity is now called the Consumer Protection and Environmental Health Service. Thus the public's concern about the environment has received greater recognition—another indication that the environment is an important component in man's health and well-being and is considered highly significant in comprehensive health planning.

Comprehensive health planning may be the beginning of a process that if directed toward

major problems will yield the greatest returns in health benefits with the least expenditure of resources. Agencies that have some interest in health, but not necessarily a primary one, perhaps will coordinate their efforts with others for more effective and efficient results. For the professional health worker, the challenge is new but the concepts are old. They have not yet been used effectively in our society.

## Planning Defined

The health professional now is reading and hearing more about planning than ever before; therefore, definitions of planning, comprehensive health planning, environmental health planning, and environmental planning may be useful.

*Planning.* According to Gist and Halbert (1), planning is "a means of directing social change and social relationships toward the ultimate objective of orderly and harmonious community processes." In explaining the classic model, Bolan (2) takes more of a Braybrooke-Lindblom (3) incremental approach, claiming that planning is now viewed as a process, still largely undefined, and the master plan is a flexible guide to public policy. This view presents planning not as a static, closed system but as a process in which goals are changed; decision making (predicting the future) is based on incomplete or faulty information, resulting in inaccuracies; and "new values, new opportuni-

---

*Mr. Metts is a sanitarian, formerly with the Los Angeles County Health Department, Los Angeles, Calif.*

ties, and unforeseen side effects keep cropping up" (2).

A short but good definition of planning is "devising or projecting a method or course of action, procedure, or arrangement" (4). Fox (5) stated his views of planning by explaining what he understands to be the "planning process" or what it involves; namely, dealing "on the one hand with goals and on the other hand with the assessment or evaluation of ways of meeting specific goals." Briefly, a planner (anyone) first defines that which needs to be accomplished and then evaluates alternative ways of achieving the accomplishment. Not only may the alternatives change in time but the objectives also may change owing to costs, new information, values, and so on.

*Comprehensive health planning.* Recognizing a truly comprehensive health plan is difficult; it depends on variables, definitions, and persons viewing the plan. Michael and co-workers (6) define it as "a formal written commitment by the properly designated authorities for future action designed to elevate or maintain the health of all persons within the legal jurisdiction of the said authorities." These authors claim that the plan must be comprehensive geographically in population coverage and should "include comprehensive plans of action for all agencies engaged in mitigating any of the causes of death or illness or the multiple factors related to any of these causes." The goal should be stated in terms of the population's health status, and the plan should list the health objectives, which should be quantified in terms of morbidity (in its broadest sense) and mortality and projected over a specified period.

*Environmental health planning.* According to the Department of Health, Education, and Welfare, environmental health planning is defined as "the process of surveying and analyzing both present and anticipated future external conditions and influences affecting the physical, mental, and social well-being of the individual or community and then developing a method or course of action for environmental control to promote such well-being" (4).

B. L. Driver, of the School of Natural Resources, University of Michigan, claimed that the planner is primarily an information proces-

sor. He defined environmental health planning as "the gathering, organization, and processing of information to facilitate decisions that will totally or partially resolve problems associated with sources of stimuli that require man's adaptation to retain and/or maintain a healthy condition." He viewed *environmental planning* as something more than health but related to it, the totality of stimuli, future and team (rather than discipline) oriented. Driver defined environmental planning as "the planning of environments that are of such design and composition that they are both efficient and compatible with man's psycho-physiological makeup and provide the real opportunity to exercise individual choice."

The reason for planning is expressed simply by Ingraham (7), who contends that planning is a means to an end, the end point being a quality environment.

All these definitions depend on further definitions of terms like "health," "environmental," "comprehensive," and so forth; but to undertake a broad intellectual discussion of these terms would result in an unwieldy paper.

Even though these definitions are not universally accepted by everyone in the varied fields of health planning, there is every indication that we all look in the same general direction. Each sees essentially the same thing but from a somewhat different point of view.

### Comprehensive-Environmental Health

Environmental health planning as part of comprehensive health planning is not a new concept but has been practiced to some extent since the earliest recorded civilizations. The Minoans and the Cretans (3000-1000 B.C.) constructed drainage systems, water closets, and water flushing systems (8). Such facilities required planning then just as they do today. The more advanced and sophisticated Roman Empire built numerous public baths and provided for an adequate water supply through magnificent aqueducts and tunnels. Laws were enacted for the supervision of public bars, taverns, and houses of ill fame and for the regulation of building construction.

It does not seem unreasonable that these activities were considered at the time to be part of greater and more encompassing efforts to



improve the health and general welfare of at least a part of the community. Our modern society is considerably more complex and our health needs have somewhat changed, but environmental health planning remains very much a part of the total health planning concept.

*Consideration of the whole man.* The concept that has probably done more to bring comprehensive health planning to the forefront in public health than any other is the notion that health is an individual right (9). If comprehensive health planning is to be successful, the nation will have to accept this idea. Until now, health services have been compartmentalized, fragmented, and often wasteful, with few plans made that consider man as a whole person in a complex environment. Mattison (9) claims that man must be viewed as a whole man because those things that made him ill can be many and arise from "shifting balances of multiple causes."

Viewing man as a whole person leads to an ecological approach to environmental health planning. Atkisson (10) claims that the ecological approach is an attempt to "restore and maintain the quality of the environment without disrupting the economy and the culture. . . ." The ecological approach is an attempt to overcome not only fragmentation in planning but also other problems that have persisted.

Some professionals (10) claim that because we have not followed the ecological approach in planning and managing urban environments "we have failed to achieve the level of environmental quality and human health of which we are scientifically, technologically, and economically capable." Several views are given on how best to deal with urban problems by means of the ecological approach. One suggested method is the university-based environmental health management center, which apparently is an attempt to gain greater freedom and break away from traditional policies in health planning (10).

Allan Blackman, associate specialist in comprehensive health planning, University of California School of Public Health, Berkeley, in an unpublished paper claimed that in the past the health professionals have had a tendency to

focus on physical health and ignore other aspects of "life and human concern." He suggested that setting goals by classifications (for example, age groups, racial or ethnic groups, income groups, geographic units, aloneness, and education) will eliminate fragmentation. This method, he said, is a better way to identify the agencies providing the services to various age, ethnic, income, and geographic groups. Then, instead of having a program of health, education, and welfare, we would have a program of Negroes, teenagers, the poor, or Watts.

To take an ecological approach to the problems of man it is necessary, for efficiency alone, that the planning agency be concerned with the total spectrum of health activities. Effective liaison with other specialized planning groups—health and welfare councils, areawide health facility planning agencies, water pollution control boards, and others—should be maintained (11).

On November 3, 1966, Congress declared that "fulfillment of our national purpose depends on promoting and assuring the highest level of health attainable for every person, in an environment which contributes positively to healthful individual and family living. . . ." This statement is a portion of section 2(a) of Public Law 89-749 (12). According to this law, there is no question of whether environmental health planning should be considered in making health plans. To receive Federal grants-in-aid it must be included, and the plans must show how the person's health will be improved, not just his environment.

Michael and associates (6) stated: "In evaluating community programs, all assessment of problems and all planning should be conducted from the standpoint of the individual person in his total environment, even though this consideration will make it more difficult to pinpoint results to specific programs." Thus we must remember that man in his environment is the primary consideration, not pinpointing results to specific programs—even though such procedures are important to planning and administration.

*Environmental health as a factor in preventing diseases and accidents.* According to the American Public Health Association, the intent of comprehensive health planning is to "improve

the quality, availability, and efficiency of providing health services" (11). Even though this statement has a personal health service ring, it stands to reason that environmental health planning would of necessity be included. Every health department (Federal, State, and local) should engage in some environmental health planning activities that are fully coordinated with personal health services planning for physical and mental health in the framework of comprehensive health planning. But until comprehensive health planning, as defined here, really gets off the ground, environmental health planning can be organized on the basis of cooperation among health agencies, the staffs of other agencies dealing with environmental health, and local physical development planners (4).

Gordon (13) declares that the environmentalists have an opportunity to contribute a great deal to comprehensive health planning but that they may be overlooked. With continued emphasis on health facilities and personal health affairs, environmental health problems may not be properly evaluated and dealt with if the experienced environmentalists are not being appointed to State and areawide comprehensive health planning councils. To receive a planning grant from the Department of Health, Education, and Welfare, the councils must have an environmental health capability or must contract for this service; however, representation of environmentalists on the councils is not likely to be as great as that of other health professionals. This may be a costly mistake.

Areawide boards for planning health facilities have increased from five or six just 5 years ago to more than 50 today, spurred by the growing public concern over rising hospital costs and by the studies and recommendations of the American Hospital Association and the Public Health Service. For the most part, area facility planning boards have not been involved in other areas of community health planning. This situation is unlikely to continue, however, owing to (a) recommendations of the National Commission on Community Health Services, (b) legislation establishing the Regional Medical Programs that heavily stresses regional planning for coordinated programs; and (c) comprehen-

sive health planning that provides formula grants for comprehensive planning (11).

*P.L. 89-749, 89-239, and 89-754.* An unprecedented number of Federal laws have been enacted relating to the health and environment of man, which suggests to many that not only have some health problems been identified but that the traditional methods of coping with them have not been entirely satisfactory. Previous attempts to manage our environment have been "characterized by randomness, short-term orientation, irrationality, segmental properties, and lack of system" (10).

Because almost three-fourths of our population lives in metropolitan areas, the Cities Demonstration Program and the Planned Metropolitan Development Program are inherently bound together by comprehensive health care. According to Sox (14), both Public Law 89-754 and Public Law 89-749 emphasize the environment of man and provisions for improving the quality of urban life. Cooperation, enlistment of participation, and use of official and nonofficial agencies and other organizations are necessary. As part of Public Law 89-749, the consumer—considered by some to mean the poor—for the first time is included in the planning and his needs, hopefully, will be determined with greater lucidity. The law, however, is related primarily to the planning phase of health programs. The planning agency has no operational powers or local authority except the authority to allocate within the State formula grants for public health programs and project grants. Like any planning organization, the real power is its influence, competence, and ability to process information for decision making.

Willard (15) describes the Partnership for Health Program as follows.

The Partnership for Health Program provides a mechanism for relating planning involving public medical care programs; conventional public and environmental health; for relating federal, state and local planning; and for developing a focus for efforts of a variety of federal programs as they apply to specific regions—programs such as urban redevelopment, public housing and public health.

Both Public Law 89-749 and Public Law 89-239 provide for training of personnel. Many persons, including Willard, claim that the two programs complement each other and that more

will be accomplished with both than with only one. Both are considered important since many health resources will be combined that up to this time have been notoriously fragmented. It is only fair to say that Public Law 89-749 is permissive, has relatively no mandated behavior, is experimental in its approach, and "serves to make difficult the fast and forceful implementation of its aims" (16). It allows large latitude for innovation within the realities of the American political and social system and permits problem solving at the local level, but makes cooperation and coordination a prerequisite for Federal financial assistance.

*Resources.* If our ultimate goal is "... the highest level of health attainable for every person . . .," few rational people will doubt the wisdom of organizing all available health and health-related resources to function as efficiently as possible. This goal seems to be especially important because of fragmented health services and the lack of a defined health system (17).

We should keep in mind that health is only part of a larger social system. If every American accepted the World Health Organization's definition of health, all else would be subordinated to this endeavor; however, only the more idealistic health professional really views it that way. For this reason the health professional cannot expect to be blessed with unlimited resources designed to fulfill our health aspirations ("highest level of health attainable"). Because resources are limited, we must devise ways to use most efficiently what we have. Many enlightened people are studying ways to obtain the best use of all available resources. One good method, although old, is to seek ways to keep people well so that fewer people actually need personal health services (18). Investing in environmental controls may be more economical in the long run depending, of course, on circumstances.

In comprehensive health services we must not be unduly concerned about what is personal or environmental health but attack the problems in a way that maximum results can be realized with the least expenditure of resources. This concept has caused several people to re-study the classifications of health programs. Hilleboe and Schaefer have made a rather tra-

ditional classification including six items each under personal health and environmental health (19).

Michael and co-workers (20) have developed a classification of health activities as part of an information system that can be used to facilitate decision making. In this system all health services are grouped into four categories or health-service areas. The categories are normal development, repair, containment, and basic research. Each category includes services that may be related to both personal health and environmental health programs; for example, normal development includes such activities as air pollution control, multiphasic screening, and accident prevention.

It is becoming more apparent that all planning and services affecting man's health and well-being must be coordinated for efficiency, if for no other reasons. We can no longer afford the luxury of allowing everyone to go his separate way and have no coordination with other groups. All efforts must be coordinated, resources properly used, and new ones sought. The problems are great, and resources are hard to find (14).

To obtain additional resources for environmental health services, O. L. Deniston, department of community health services, University of Michigan School of Public Health, thinks it may be necessary to look beyond government. Industry has been seriously considered. Adams (21) contends that industry is a large resource in environmental health and should be further involved by (a) helping to define environmental problems jointly with government—cooperation has been obtained to some extent in air pollution problems involving sulfur dioxide and fluorides, (b) contributing to efforts in developing technical methods of studying properties of products and residual materials (waste) and development of new industrial processes for waste treatment, (c) working directly on problems of environmental pollution by developing appropriate policies and procedures for pollution control—industry could develop the same procedures for dealing with the total environment as it has for safety, industrial toxicology and hygiene, and occupational health, and (d) participating in environmental management. The scope of industrial interests must be

widened to take into consideration the overall interests of the public. Further release of information on private research is of paramount importance.

### Limits of Comprehensive Health Planning

High hopes are held for comprehensive health planning, but it is not a panacea. Expectations are great perhaps because of the almost chaotic conditions that have prevailed in the past. However, one can readily detect limitations in planning; some are naturally related to decision making, such as (3):

1. Man's limited problem-solving capabilities
2. Costliness of comprehensive analysis
3. Lack of truly comprehensive information
4. Inability to construct a satisfactory method for evaluating values or goals
5. Closeness of observed relationships between fact and value
6. Openness of systems of variables
7. Analyst's need for strategic sequences of analytical moves
8. Diverse forms in which policy problems arise

At least two very important shortcomings of comprehensive health planning also are claimed to exist: (a) there are too few people trained in health planning and (b) extensive administrative leadership will be required from health officers (16, 22).

Another important consideration in comprehensive health planning limitations is the fact that we lack national goals. At best, what may be proclaimed as national goals, but may prove to be only policies, are confusing or conflicting. In an unpublished paper, entitled *Three Views of Economic Goals*, by Peter Senn, professor of economics, Chicago City College, the point is made that "the discussion of national goals has been notoriously barren. Recent decades have been distinguished by a paucity of either radical alternatives or creative conservative constuction."

Although these claims are well founded, this state of affairs should represent a challenge to the health professional, not a pessimistic concept, of the comprehensive health planning idea. Pragmatic qualities are the hallmarks of a worthy plan. To borrow from Bolan (2), "...

planning needs to respond in a manner carefully calculated to be appropriate to circumstances."

### Outlook for Health Planning

If in any health planning activity that even suggests comprehensiveness we start with the premise that health is an individual right, it is much easier to forecast with accuracy the direction that comprehensive health planning will take in the future.

Disease and accident prevention may be emphasized and bring environmental control to the forefront. The ecological approach is likely to become the generally accepted approach to solving complex health problems. Institutes of urban ecology in the university setting may become more numerous and prominent, facilitating planned environmental changes that require cooperation, coordination of efforts, and assignment of priorities. Organizations with similar goals but other names are also likely to appear.

Area facility planning boards may become more involved in community health planning owing to recent Federal legislation and recommendations of the National Commission on Community Health Services. Greater cooperative actions are foreseen not only among the traditional health agencies but among the planning groups as well.

Planning (health included) conducted by more than one organization is another promising concept that allows for more alternatives, made possible by different value standards in society. Fox (5) sees the value of competition among ideas and proposals rather than trying to function through single planning and action organizations. Duplication of efforts, in this instance, would not necessarily mean wasted efforts.

### Conclusion

By assuming in our society that health is an individual right, the health professional is now required to look at the whole man and the environment in which he lives rather than to take a partial or fragmented view. This approach allows planning that guides the actions to bring about changes needed for providing an optimum level of health for the individual. Recent Fed-

eral legislation and recommendations from influential groups have given great impetus to this new approach, which is envisioned by some to be a great improvement over traditional efforts. Others say it is an insurmountable task.

Comprehensive health planning, regardless of the degree of comprehensiveness, is here to stay, and environmental control is very much a part of it as a means of effecting better health for man.

Emerging information systems in the field of health will allow for better decision making by those concerned with health problems in the community. It is now possible to identify with greater accuracy the principal health problems of a community, to have values expressed by the health consumers that hopefully will affect the services received, and to take actions having the greatest effect on the problem with the least expenditure of resources. Wherever environmental control is the most economical way of controlling or partially controlling health problems, as it has been in many instances, it will undoubtedly receive serious consideration.

Occasionally, it may be difficult to evaluate the efforts and effectiveness of environmental health inputs. Doing this accurately is desirable but of secondary importance; the first consideration must be the accomplishment of the predetermined objectives. What real difference does it make whether the results obtained are from environmental control, personal health services, or a packaged interwoven combination of the two—the most likely in many instances. As more comprehensive health planning is conducted and we gain maturity in this activity, it probably will be more and more difficult to distinguish one effort or accomplishment from another. To quote Michael (23): "Health care and a healthy environment—the two go hand in hand; no dichotomy can breach them. Both contribute to each other's strength."

#### REFERENCES

- (1) Gist, N., and Halbert, L. A.: *Urban society*. Ed 4. Thomas Y. Crowell Co., New York, 1956, p. 480.
- (2) Bolan, R. S.: *Emerging views of planning*. *Amer Inst Planners J* 33: 233-245, July 1967.
- (3) Braybrooke, D., and Lindblom, C.: *A strategy of decision*. Free Press, Glencoe, Ill., 1963, chs. 2 and 3.
- (4) U.S. Public Health Service: *Environmental health planning guide*. PHS Publication No. 823. U.S. Government Printing Office, Washington, D.C., September 1967.
- (5) Fox, I. W.: *The nature of planning decisions in a democratic society*. Paper presented at the national short course on elements of outdoor recreation planning, University of Michigan, Ann Arbor, May 13, 1968, pp. 1-20. Mimeographed.
- (6) Michael, J. M., Spatafore, G., and Williams, E. R.: *An approach to health planning*. *Public Health Rep* 82: 1063-1070, December 1967.
- (7) Ingraham, H. S.: *Regional planning for water supply and sewage treatment*. In *Proceedings of the fourth American Medical Association Congress on Environmental Health Problems*, New York, April 1967, pp. 88-92.
- (8) Hanlon, J.: *Principles of public health administration*. Ed. 4. C. V. Mosby Co., St. Louis, Mo., 1964, pp. 36-51.
- (9) Mattison, B. F.: *Community health planning and the health professions*. *Amer J Public Health* 58: 1015-1021, June 1968.
- (10) Atkisson, A.: *Urban ecology: The new challenge*. In *Proceedings of the fourth American Medical Association Congress on Environmental Health Problems*, New York, April 1967, pp. 128-137.
- (11) American Public Health Association: *Guidelines for organizing State and areawide community health planning*. *Amer J Public Health* 56: 2139-2143, December 1966.
- (12) U.S. Senate: *Comprehensive health planning and public health services amendments of 1966*. Public Law 89-749. 89th Cong. U.S. Government Printing Office, Washington, D.C., Nov. 3, 1966.
- (13) Gordon, L. J.: *An ecological council*. [Editorial.] *J Environ Health* 30: 477-478, March-April 1968.
- (14) Sox, E. D.: *New resources for urban health programs*. *Amer J Public Health* 58: 1030-1035, June 1968.
- (15) Willard, W. R.: *Diverse factors in regional medical planning*. *Amer J Public Health* 58: 1026-1030, June 1968.
- (16) Hilleboe, H. E., and Schaefer, M.: *Administrative requirements for comprehensive health planning at the State level*. *Amer J Public Health* 58: 1039-1046, June 1968.
- (17) Kissick, W. L.: *Planning, programming and budgeting in health*. *Med Care* 5: 201-220, July-August 1967.
- (18) Sadusk, J. F., and Robbins, L. C.: *Proposal for health: Hazard appraisal in comprehensive health care*. *JAMA* 203: 1108-1112, Mar. 25, 1968.
- (19) Hilleboe, H. E., and Schaefer, M.: *Evaluation in community health: Relating results to goals*. Paper presented at the New York Academy of

- Medicine, New York, April 1967, p. 2. Mimeographed.
- (20) Michael, J. M., Spatafore, G., and Williams, E. R.: A basic information system for health planning. *Public Health Rep* 83: 21-28, January 1968.
- (21) Adams, E. M.: Utilization of industrial resources in controlling environmental problems. In *Proceedings of the fourth American Medical Association Congress on Environmental Health Problems*, New York, April 1967, pp. 121-123.
- (22) Carter, D.: Comprehensive health planning: Creative federalism. *Amer J Public Health* 58: 1022-1025, June 1968.
- (23) Michael, J. M.: Environmental health: Accent on tomorrow. *J Environ Health* 30: 614-617, May-June 1968.

## PUBLICATION ANNOUNCEMENTS

*Address inquiries to publisher or sponsoring agency.*

*The Epidemiology of Depression.* By Charlotte Silverman, M.D., D.P.H. 1968; 184 pages; \$7.50. The Johns Hopkins Press, Baltimore, Md.

*Alcoholism and Family Casework. Theory and practice.* By Margaret B. Bailey, DSW. 1968; 162 pages; \$3. Publications Department, Community Council of Greater New York, 225 Park Ave. South, New York 10013.

*Population Studies of the Rheumatic Diseases. Proceedings of the Third International Symposium, New York, June 5-10, 1966.* Edited by Peter H. Bennett and Philip H. N. Wood. 1968; 510 pages; \$32. International Congress Series No. 148, Excerpta Medica Foundation, New York Academy of Medicine Building, 2 East 103d Street, New York 10029.

*California Health Information for Planning Service. Summary report.* Supported by PHS grant HM-00446, 1965-1968. 1968; 136 pages. Division of Patient Care Facilities and Services, State of California Department of Public Health, 2151 Berkeley Way, Berkeley 94704.

*Families on Welfare in New York City.* By Lawrence Podell, Ph.D. 1968; 117 pages. Center for the Study of Urban Problems, Graduate Division, Bernard M. Baruch College The City University of New York, 257, Park Ave. South, New York 10010.

*Professional Social Workers in Public Social Welfare.* By Lawrence Podell, Ph.D., and introduction by

Dean James R. Dumpson. 1968; 80 pages. Center for the Study of Urban Problems, Graduate Division, Bernard M. Baruch College, The City University of New York, 257 Park Ave. South, New York 10010.

*The Secret World of the Baby.* By Beth Day and Margaret Liley, M.D. 1968; 113 pages; \$3.95. Random House, Inc., 457 Madison Ave., New York 10022.

*Alameda County Blood Pressure Study.* June 1968; 216 pages. State of California Department of Public Health, 2151 Berkeley Way, Berkeley 94704.

*Coding with H-ICDA (Hospital Adaptation of ICDA). A programmed instructional manual.* Based on Programmed Instruction in the Use of ICDA, originally prepared by William H. Kincaid, John H. Griffith, and May Morrison. Revised by William H. Kincaid, Robert H. Seeman, and Karel M. Weigel. November 1968; 104 pages; \$3. Commission on Professional and Hospital Activities, First National Building, Ann Arbor, Mich. 48018.

*An Interim Guide to the Cannabis (Marihuana) Literature.* By Oriana Josseu Kalant. Bibliographic Series No. 2, 1968; 39 pages; free. Addiction Research Foundation, 344 Bloor Street West, Toronto 4, Ontario, Canada.

*Management of Nursing Care.* By Elma L. Rinhart, R.N. 1969; 242 pages; \$6.95. The MacMillan Company, 866 Third Ave., New York 10022.

*Guide to the Community Control of Alcoholism.* By Jan N. Cross, M.P.H. 1968; 128 pages; \$3. The American Public Health Association, 1740 Broadway, New York 10019.

*Health Manpower in Peru. A case study in planning.* By Thomas L. Hall. 1969; 281 pages; \$6.50. The Johns Hopkins Press, Baltimore, Md. 21218.

*Studies in Public Welfare: Effects of eligibility investigation on welfare clients.* By Harold Yahr and Richard Pomeroy in collaboration with Lawrence Podell. 1968; 83 pages. The Center for the Study of Urban Problems, Graduate Division, Bernard M. Baruch College, The City University of New York, 257 Park Ave. South, New York, N.Y. 10010.

*Hospitalization of Ophthalmic Patients in Israel. Survey and analysis of patients admitted to the ophthalmic departments of general hospitals, 1965-66.* By H. S. Halevi, Ph.D., and Z. Cochavy, A.M.R. 1968; 154 pages. State of Israel Ministry of Health, Jerusalem.

*Health Services in Israel.* Edited by Th. Grushka, M.D. 1968; 455 pages. State of Israel Ministry of Health, Jerusalem.

*Anatomy of a Coordinating Council. Implications for planning.* By Basil J. F. Mott. May 1968; \$6.95, cloth; \$2.95, paper. University of Pittsburgh Press, Pittsburgh, Pa. 15213.

*Infection Control in the Hospital.* 1968; 148 pages; \$3.75. American Hospital Association, 840 North Lake Shore Drive, Chicago, Ill. 60611.

# Health Concerns and Attitudes Regarding Fluoridation

HARLAN HAHN, Ph.D.

**A**LTHOUGH worries about sickness are common topics of popular discussion, relatively little attention has been devoted to research on the effects of personal concerns about health. One survey of attitudes concerning six serious diseases has sought to identify some sources of health anxiety (1), but few attempts have been made elsewhere to assess the impact of such apprehensions on public support of health programs.

Since the protection and promotion of public health and welfare have been important local responsibilities, health proposals that require public approval or acceptance have been common and significant issues in many communities. Unless attention is focused on the role of health concerns in shaping opinions on public health issues, an important variable in efforts to adopt preventive health programs will be overlooked. The purpose of this investigation, therefore, is to examine the effects of expressed health concerns on attitudes and behavior regarding an important community health program.

---

*Dr. Hahn is associate professor, department of political science, College of Letters and Science, University of California, Riverside. The study, conducted while he was research associate at the University of Michigan School of Public Health, was supported by Public Health Service grant DH 00079 and by a general research support grant from the University of Michigan School of Public Health.*

Despite relative neglect in prior research on public opinion, anxiety or fear has occupied a prominent role in experimental studies of techniques for securing the adoption of recommended health practices. In a classic study, Janis and Feshbach found that communications which aroused minimal fears were more likely to be successful in persuading students to adopt recommended dental health procedures than were strong or moderate fear-arousing messages (2). Although the results of the original study were modified by subsequent investigations (3, 4), the belief generally has been accepted that fear or anxiety is an unsuccessful basis for encouraging people to take preventive health action (5).

Recently this assumption has been challenged by the finding that the association between fear or anxiety and preventive health behavior is affected by socioeconomic status. In a replication of the Janis-Feshbach experiment, Haefner discovered that the minimal fear-arousing message was most effective in encouraging children from high-status families to adopt endorsed practices in toothbrushing and oral hygiene and that the strong fear-arousing message was most successful with low-status students (6). Rosenstock noted (7):

If, as seems likely, Janis and Feshbach's sample in Greenwich, Connecticut, was primarily drawn from upper class families, the apparent discrepant findings of the two studies are readily reconciled. . . . If Haefner's findings can be replicated, especially in settings



using other health content, and with other age groups, the attempts to induce fear might, for certain subgroups of the population, be much more effective than a more neutral . . . approach.

In another study, Robbins, who found no relation between anxiety and the acceptance of influenza vaccinations or the use of employee health units, concluded: "It is also possible, if not probable, that the relationship between anxiety and behavior is very complex and a simple linear relationship is not to be expected (8a)." This investigation, therefore, will seek to explore the impact of expressed health concerns on a major public health issue at different socioeconomic levels as defined by income, education, and occupation.

One of the most important and controversial health issues in recent years is the fluoridation of community water supplies. While public attitudes on fluoridation have been related to concepts of "powerlessness" (9), "relative deprivation" (10), and "anti-scientism" (11,12), as well as social and economic variables (13), little information has been available on the association between beliefs about fluoridation and basic health concerns. The fluoridation issue, therefore, presented an unusual opportunity to explore the association between expressed health concerns and attitudes regarding public health proposals.

#### **Expressed Health Concerns**

In November 1965, Detroit—the largest city to do so—held a referendum on fluoridation. To identify characteristics associated with attitudes and voting behavior regarding this important public health proposal, 596 Detroit adults, chosen in a multistaged area probability sample, were interviewed by professional interviewers, under the direction of the author, shortly after the referendum. Results of the study reflected, within a few percentage points, the social and economic characteristics of the city reported in the 1960 U.S. census as well as the outcome of the referendum, which resulted in the passage of fluoridation by a narrow margin.

As part of this survey, the respondents were questioned concerning six diseases: lung cancer, tooth decay, heart disease, stomach ulcers, food poisoning, and bone disease. After a series of queries on the attitudes of other people, the

respondents were asked, "Have you ever worried about (each disease)?" From the responses to the questions, a Guttman-type scale was developed having a coefficient of reproducibility of 0.92. With this scale, which has been termed the "scale of expressed health concerns," a score was computed for each of the 596 respondents by totaling the number of diseases about which the respondents admitted a worry. To examine attitudes among respondents with both low and high concerns as well as among those who expressed no anxieties about diseases, the scale was dichotomized between worry about one to three and four to six diseases.

Both the question and the items used to develop this scale were essentially similar to the measure of experienced concerns used by Robbins, who asked his respondents, "Have you, personally, ever felt worried about (each disease) in your own case?" His study also demonstrated that the index of experienced concerns, based on the "number of those serious diseases reported as having been a source of worry," is highly related to general dimensions of affective anxiety regarding illness (8b).

Although the Detroit study focused primarily on the association between expressed health concerns and positions on fluoridation, the scores on the scale were related to basic demographic attributes such as age and socioeconomic status. Neither variable was strongly associated with general health concerns nor with worries about any particular disease.

A relatively direct measure of the relationship between expressed concerns and preventive health behavior was provided by responses to a uniform series of questions concerning steps that can be taken "to prevent tooth decay from happening." A simple index of dental health information was constructed from answers to this question by totaling the number of methods that each respondent suggested to reduce dental caries. Positions on the index of dental health information were related to levels of expressed health concerns (table 1).

Although most respondents possessed only a moderate amount of information on dental health—as indicated by two suggestions they offered for preventing tooth decay—growing health worries were strongly related to increasing information about methods of reducing

**Table 1. Expressed health concerns and index of dental health information**

Number of methods suggested for preventing tooth decay	Expressed health concerns (percent)		
	None (N=131)	Low (N=354)	High (N=108)
None.....	25	14	13
1.....	28	23	19
2.....	31	42	31
3 or more.....	15	20	36

NOTE:  $X^2=27.376$ , 6 degrees of freedom, significant at 0.001 level.

dental disease. With the possible exception of persons who mentioned only one preventive dental health practice, the patterns were relatively clear at each level of dental information. A majority of the respondents with no health worries offered none or one suggestion, the largest group with low anxiety advanced one or two methods, and most persons with high anxiety suggested two or more ideas for preventing dental caries. The responses indicated that health concerns were related to preventive behavior regarding at least some personal health problems.

### Health Concerns and Fluoridation

Expressed health concerns, however, were not related to responses to the question, "Would you say that you strongly support, support, oppose, strongly oppose, or are you undecided about fluoridation?" Persons with high apprehensions about illness were no more likely to support fluoridation than respondents who voiced worries about few or none of the diseases. Similarly, no discernible or significant association was found between expressed health concerns and knowledge about fluoridation.

To some extent, the absence of a direct correlation between worries about diseases and attitudes on fluoridation was affected by a disposition to regard the proposal as a political rather than a public health issue. Although a large proportion of the respondents identified fluoridation as a method of reducing dental caries, a nearly identical percentage did not perceive it as a recommended health procedure. Lack of familiarity with the position of most dentists on the fluoridation issue was admitted

by 63 percent of the people interviewed. Of the remainder, who guessed, 27 percent believed that most dentists supported fluoridation, and 10 percent thought they were generally opposed or neutral. Popular confusion regarding the agreement or disagreement of medical and dental authorities about the merits of fluoridation probably has produced different evaluations of the proposal. Perhaps assessments of the costs and benefits of fluoridation have been influenced by personal positions in the social structure of the community.

Since research has indicated that the effects of anxiety or fear on health behavior have been modified by social status, the associations between health concerns and positions on fluoridation were examined separately at different levels of socioeconomic status. For this purpose, a special index of socioeconomic status was constructed from a three-dimensional matrix including the traditional measures of social class: income, education, and occupation of head of household. Combined scores of the variables weighted equally were compiled for each person and divided into three socioeconomic levels.

The associations between expressed health concerns and positions on fluoridation at different socioeconomic levels are presented in table 2. As the table indicates, support of fluoridation was inversely related to socioeconomic status.

**Table 2. Expressed health concerns and positions on fluoridation, by socioeconomic status**

Expressed health concerns by socioeconomic status	Number	Position on fluoridation (percent)		
		Support	Oppose	Undecided
Low status.....	175	63	22	15
None.....	35	54	29	17
Low.....	108	63	22	15
High.....	32	75	12	12
Medium status....	150	43	25	33
None.....	34	29	38	32
Low.....	89	46	20	34
High.....	27	48	22	30
High status.....	194	39	27	33
None.....	43	46	26	28
Low.....	112	39	29	32
High.....	39	33	26	41

NOTE:  $X^2=76.032$ , 16 degrees of freedom, significant at the 0.001 level.

Approval of fluoridation declined, while both opposition and uncertainty grew, as social status increased.

Perhaps even more striking were the associations between health concerns and positions on fluoridation within socioeconomic groups. Among persons of low socioeconomic status, support of fluoridation increased and both opposition and indecisiveness declined at successively higher levels of expressed health concerns. Although the strongest overt opposition to fluoridation was found among people of moderate socioeconomic status who had no worries about the diseases, most of those respondents occupied an intermediate position between high- and low-status groups. At the upper end of the socioeconomic spectrum, support of fluoridation dwindled as health concerns increased. Opposition did not gain simultaneously, but indecision about fluoridation grew directly with the number of diseases about which concern was expressed among adults of high socioeconomic status.

### Discussion

Perhaps the impact of health concerns has been shaped by the perceived benefits and disadvantages of a comprehensive health program such as fluoridation. For respondents at low socioeconomic levels, who perhaps could not afford extensive private treatment, the degree of concern about diseases was directly related to opinions of fluoridation. Low status persons who expressed numerous health worries were more favorable toward a program to reduce a prevalent and expensive disease than those who were relatively indifferent to the threat of illness.

On the other hand, the association between health concerns and support for fluoridation was reversed among people at high socioeconomic levels, who could afford the costs of private dental care. Resistance to fluoridation among high-status persons with relatively intense health concerns, however, was more likely to be expressed as uncertainty or skepticism than as direct opposition. Perhaps attitudes on fluoridation, particularly among the relatively affluent, were influenced by the alleged disagreements between medical and dental authorities on the safety or value of fluoridation. People

who could afford the expense of preventive or remedial health care were apt to translate their worries into skepticism about fluoridation, but the potential benefits of fluoridation seemed to outweigh the possible disadvantages for people with strong health concerns, who may have lacked the economic resources for private health care.

### Conclusions

Under some conditions, worries about health have had an important effect on attitudes regarding public health issues. Expressed concerns about six serious diseases formed relatively clear and consistent patterns that not only satisfied the criteria for a cumulative scale but also existed in an independent dimension apart from the effects of relevant demographic attributes. A strong correlation was found between increasing health concerns and growing information about dental health procedures or methods of preventing tooth decay.

Results of the Detroit survey suggested that levels of health concerns were not directly related to attitudes about fluoridation. When the influences of socioeconomic status were removed, however, clear and meaningful patterns between health concerns and the approval or disapproval of fluoridation were revealed. Whereas skepticism about the acceptability of fluoridation increased in relation to health concerns among high-status adults, growing health anxieties among respondents at low socioeconomic levels produced a greater willingness to repress doubts about fluoridation in favor of its potential benefits. The opportunity to reduce a widespread and financially burdensome disease at little personal expense was more attractive to low-status persons with numerous worries about health than to their counterparts at upper socioeconomic levels.

This investigation, which has focused largely on attitudes and behavior toward an important public health measure, has indicated that, under certain conditions, expressed health concerns were associated with preventive health actions. A direct association between health concerns and personal behavior was found on the question of information about dental health practices. On other issues, the relationship was influenced by intervening characteristics, such

as socioeconomic status, which may have inspired different evaluations of the benefits to be derived from community health programs such as fluoridation. Clearly, there is a need as well as an opportunity for additional research to specify the conditions under which health anxieties impede or promote the adoption of public health programs.

### Summary

In November 1965 a multistaged area probability sample of 596 Detroit adults was surveyed soon after a major referendum on fluoridation was held in the city. A scale of expressed health concerns was derived from a series of questions relating to personal worries about six serious diseases: lung cancer, tooth decay, heart disease, stomach ulcers, food poisoning, and bone disease. Levels of health concerns were directly and significantly related to positions on an index of dental health information that had been developed from questions about methods of preventing dental caries.

Although expressed health concerns were not directly associated with attitudes on fluoridation, the positions of the respondents on the referendum issue were examined at three socioeconomic levels. Support for fluoridation was inversely related to increasing socioeconomic status. Moreover, persons at low socioeconomic levels with numerous health concerns favored fluoridation, but high-status respondents with strong health concerns were undecided about the issue. Perhaps this relationship was influenced by perceived disagreements about the merits of fluoridation and by different evaluations of the costs and benefits of the program.

### REFERENCES

- (1) Levine, G. N.: Anxiety about illness: Psychological and social bases. *J Health Hum Behav* 3: 30-34 (1962).
- (2) Janis, I. L., and Feshbach, S.: Effects of fear-arousing communication. *J Abnorm Psychol* 48: 78-92 (1953).
- (3) Goldstein, M. J.: The relationship between coping and avoiding behavior and response to fear-arousing propaganda. *J Abnorm Psychol* 58: 247-252 (1959).
- (4) Leventhal, H., and Niles, P.: A field experiment on fear-arousing with data on the validity of questionnaire measures. *J Personality* 32: 459-479 (1964).
- (5) Society of Public Health Educators Research Committee: Review of research related to health education practice. *Health Educators Monogr* 1: 70 (1963).
- (6) Haefner, D. P.: Arousing fear in dental health education. *J Public Health Dentistry* 25: 140-146 (1965).
- (7) Rosenstock, I. M.: Why people use health services. *Milbank Mem Fund Quart* 44: 116 (1966).
- (8) Robbins, P. R.: Some explorations into the nature of anxieties relating to illness. *Genet Psychol Monogr* 66: 76-131 (1962); (a) p. 135; (b) pp. 101, 126-127.
- (9) Gamson, W. A.: The fluoridation dialogue: Is it an ideological conflict? *Public Opinion Quart* 25: 526-537 (1961).
- (10) Simmel, A.: A signpost for research on fluoridation conflicts: The concept of relative deprivation. *J Soc Issues* 17: 26-36 (1961).
- (11) Mausner, B., and Mausner, J.: A study of the anti-scientific attitude. *Sci Amer* 192: 35-39 (1955).
- (12) Kirscht, J. P., and Knutson, A. L.: Fluoridation and the "threat" of science. *J Health Hum Behav* 4: 129-135 (1963).
- (13) Metz, A. S.: An analysis of some determinants of attitude toward fluoridation. *Soc Forces* 44: 477-484 (1966).

# Federal Publications

**Hospital Electrical Facilities.** *PHS Publication No. 930-D-16; 1969; 36 pages; 50 cents.* Gives guidelines for installation of the latest electrical systems in the construction of hospital and health facilities. The 1969 revision reflects changes in current practices, provides up-to-date references to applicable codes and standards, and recommends design practices that will provide optimum hospital electrical system facilities.

**Manual of Tests for Syphilis, 1969.** *PHS Publication No. 411; revised; 81 pages; \$3.* Assembles technical procedures for tests for syphilis that are most widely used and have been published previously in reputable journals and adequately evaluated. Includes darkfield microscopy, FTA-ABS test, RPR (circle) card test, USR test, and VDRL slide tests. Also includes an addendum which lists the less widely used tests, incompletely evaluated and experimental procedures, and tests of historical interest. Contains an appendix with sections on collecting and processing specimens, equipment and glassware, preparation of control serums, check testing of antigens and other reagents, and total protein determination on spinal fluid specimens.

**Regulations, Standards, and Guides for Microwaves, Ultraviolet Radiation, and Radiation From Lasers and Television Receivers.** An annotated bibliography. *PHS Publication No. 999-RH-35. By Lloyd R. Setter, David R. Snavelly, Duane L. Solem, and Rodman F. Van Wye; April 1969; 77 pages.* Presents an annotated bibliography of guidelines, standards, and regulations pertain-

ing to public health protection against electromagnetic radiation from television receivers, lasers, ultraviolet radiation, and microwaves. Designates the annotated documents as Class A (established or adopted by a governmental body acting under the authority of an act, law, or statute), Class B (adopted by consensus of a committee or commission of technical competence in standards-setting organizations), and Class C (not adopted by a standards-setting organization, but contains information pertinent to the preparation of suitable standards or regulations). Annotations include identification of the documents, type of standard, intended compiler, intended benefiter, limits and specifications, and general guidance.

**Smoking and Health Experiments, Demonstrations, and Exhibits.** *PHS Publication No. 1843; 1968; 21 pages; 20 cents.* Contains materials compiled from various teachers' guides. Presented in three parts, Part I illustrates experiments, most of which require some kind of laboratory equipment. Students should consult with science teacher or adviser before attempting the more complicated demonstrations. Part II includes demonstrations which can be performed by one or two persons. Part III contains suggestions for exhibits.

**Utilization of Psychiatric Facilities by Children: Current status, trends, implications.** *PHS Publication No. 1868; 1968; 77 pages; 75 cents.* Offers extensive data on the age, sex, diagnosis, and other characteristics of children cared for at outpatient psychiatric clinics, State and county

mental hospitals, private mental hospitals, and psychiatric services in general hospitals. Points out that two-thirds of the children receiving care were boys. Notes also that admission rates for children to both outpatient and inpatient psychiatric facilities have at least doubled during the last decade.

**Current Research in Chronic Respiratory Disease. Proceedings of the Eleventh Aspen Emphysema Conference.** *PHS Publication No. 1879; 1968; 355 pages; \$2.25.* Presents reports, abstracts, and discussions of the conference at Aspen, Colo., June 12-15, 1968. Topics included cell biology, physiology, vascular studies, pathology, lung morphology, epidemiology, and special physiology.

**Current Research in Chronic Obstructive Lung Disease. Proceedings of the Tenth Aspen Emphysema Conference.** *PHS Publication No. 1787; 1968; 531 pages; \$2.75.* Includes reports on major pulmonary research findings in the United States and abroad that were discussed at the conference in Aspen, Colo., June 7-10, 1967. Subjects covered are airways function, gas transport, vascular studies, bronchial hyperactivity, morphology, and physiology techniques.

---

This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared with Federal support.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington D.C., 20402. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington, D.C., 20201.

The Public Health Service does not supply publications other than its own.

---

## AVERAGE AGE AT DEATH OF SCIENTISTS IN VARIOUS SPECIALTIES

S. M. Luria, M.A., Ph.D.

THE LACK of information about the longevity (length of life) of scientists and about differences among the various scientific specialties seems to point to a promising area for investigation. Although the National Center for Health Statistics, formerly the National Office of Vital Statistics, published a detailed breakdown in 1950 of the death rates for the manual trades (1), its breakdown for scientists was much less complete. The National Academy of Sciences-National Research Council has also published a statistical analysis of scientists which contained a great deal of information, but life expectancy and mortality tables were lacking (2).

An analysis has been made of the deaths reported in *Science* from January 1958 through January 1968. The death notices were categorized by sex and major field of concentration.

Some differences in longevity of different groups of scientists have already been documented. A number of studies of physicians have indicated that their longevity is greater than that of the general population (3), and dentists have even greater longevity (4). In recent years several studies have shown that radiologists die earlier than physicians in other medical specialties (5-7).

Some obituaries were excluded in the tabulation because of lack of information as to the specialty of the deceased, the inability to make a selection of his main occupation from among several listed specialties, or the omission of his age.

The inclusions of specialties in a few categories require some explanation. For example, the medical category is a broad one, and it included all persons except psychiatrists who had some

connection with the practice of medicine—veterinary medicine, hospitals, or medical schools. Although this broad grouping may not be as informative as hoped, this loss is not great, because the longevity of physicians has been studied more than that of any other professional group.

The agriculture category included agricultural science, forestry, conservation, and wildlife management. The earth sciences included persons working in geology, metallurgy, mining engineering, oceanography, and meteorology. Education included administrative positions at schools without any other information as to the person's original field. Engineering included engineers and inventors. The administration category was composed of men who had held administrative positions in private industry—but not in government or universities—regardless of their specialty.

From time to time, *Science* notes the death of prominent men who were not scientists. These persons together with three economists were tabulated in the nonscience category.

A number of men might well have been placed into more than one category. Typically, once a man had been tabulated in one category, however, he was not listed in any other. The one exception was the scientists listed in the radiation category. Each person in this group is also listed under another specialty, such as physics, biology, or medicine. No one was included in this category unless his obituary specifically indicated laboratory work with some form of radiation.

### Results

The mean ages at death of the men in the various specialties are ranked in table 1 together with the number in each category and the standard deviations of the means. Archeologists had

---

*Dr. Luria is a research psychologist at the Naval Submarine Medical Center, Groton, Conn.*

the highest average age at death, while administrators and men working with some form of radiation had the lowest average age at death. The difference between these extreme means was nearly 15 years, which was larger than the standard deviations associated with these means. The mean age at death for the entire sample of 2,224 men was 67.7.

The tabulations for women are given in table 2. Although there are few women in any given category, every specialty is represented except pharmacy. Despite the low correlation obtained between the rankings for men and women, the mean age at death for the three women who held administrative positions was 59.3; the one woman cited as having worked in a radiation laboratory died at 42; the women who lived the longest worked in the agricultural sciences, archeology, and engineering—specialties in which men also ranked high in longevity.

But of most interest is that the mean age at death for the 93 women in the sample was 68.1, virtually the same as that for the men. The longevity of 20-year-old white women is now 76.6 years compared with 70.2 for 20-year-old white men, a difference which declined little because the sample was restricted to much older persons (8). Interestingly, the average for the nonscientific group agrees with the average reported for the general population.

#### Comments

There seem to be sizable differences in the average longevity of the men in different scientific specialties whose deaths were reported in *Science*. The low average longevity of physicists may be the result of the inclusion of a large proportion of men working with radiation. What has caused the low averages for the psychologists and pharmacists? One possible factor may be an unusually high suicide rate among pharmacists. Powell (9) noted one study which showed the suicide rate of pharmacists was 120 per 100,000 compared with only 15 per 100,000 for engineers.

A sedentary occupation may result in a shorter life. In table 1 persons with the greatest longevity worked in such specialties as archeology, anthropology, earth sciences, and agricultural sciences—professions in which the essential business is conducted out of doors.

**Table 1. Mean age at death and standard deviations of the means for male scientists, by specialty, 1958-68**

Specialty	Number	Mean age (years)	S.D. ±
Archeology.....	12	76.7	10.7
Astronomy.....	41	75.8	11.8
Anthropology.....	18	72.2	11.3
Engineering.....	192	71.1	13.0
Sociology.....	23	71.0	12.0
Nonscience.....	70	70.0	14.1
Earth science.....	109	69.6	14.6
Agriculture.....	130	68.9	13.2
Medicine.....	493	68.8	12.9
Biology.....	322	68.5	15.2
Education.....	96	67.5	11.3
Chemistry.....	179	66.0	13.6
Psychiatry.....	47	65.9	10.5
Mathematics.....	51	65.5	13.5
Physics.....	176	64.4	16.0
Psychology.....	51	62.7	13.6
Pharmacy.....	34	62.3	13.9
Administration.....	180	61.8	12.4
Radiation.....	33	61.8	14.2
Total.....	2,224	67.7	-----

To examine this hypothesis further, the death notices from 1958 to 1962 were retabulated for the biologists. They constituted the largest sample except for medicine. Because biology is a diverse field, it is easily divided into outdoor and indoor groups. Persons specializing in botany, entomology, limnology, and zoology, for example, would seem to be out of doors more than persons working in such specialties as embryology, physiology, histology, or cytology. In fact, the mean age at death of the 114 biologists listed in the outdoor group was 70.0 (S.D.=14.2) while that for the 81 persons in the indoor group was 64.8 (S.D.=16.3). If this difference in longevity is valid, we still cannot say, of course, whether outdoor life leads to a longer life or whether healthier people gravitate toward outdoor occupations.

In a final analysis, the physicists, chemists, biologists—including the agricultural scientists—and the earth scientists who died between 1958 and 1962 were divided according to whether or not they had been employed primarily by universities. Table 3 shows that the university physicists, chemists, and earth scientists—but not the biologists—lived longer, on the average, than their nonuniversity counterparts.

These results conform to U.S. Government statistics which indicate that professional-tech-

nical people have higher mortality rates between the ages of 30 and 55 than the average for all the white occupational groups, while managers have slightly higher mortality rates than both of these after the age of 45 (1a). These results also conform to the various reports that radiologists have shorter lives. The differences are much greater than those previously observed, but the reason may be that the sample was composed mostly of physicists who are, presumably, working with some form of radiation of much higher energy than the medical radiologists in the previous studies.

**Table 2. Mean age at death of female scientists, by specialty, 1958-68**

Specialty	Number	Mean age (years)
Agriculture.....	1	84.0
Archeology.....	1	83.0
Engineering.....	1	82.0
Education.....	5	76.8
Psychiatry.....	2	74.5
Physics.....	5	73.6
Sociology.....	3	72.7
Medicine.....	24	69.2
Psychology.....	6	67.8
Chemistry.....	6	66.5
Biology.....	28	65.6
Earth science.....	3	64.3
Anthropology.....	1	62.0
Astronomy.....	1	61.0
Administration.....	3	59.3
Mathematics.....	2	56.2
Nonscience.....	1	56.0
Radiation.....	1	42.0
Total.....	93	68.1

**Table 3. Mean age at death and standard deviations of the means for scientists in universities compared with those employed elsewhere, 1958-62**

Specialty	Number	Mean age (years)	S.D. $\pm$
University:			
Physics.....	55	69.2	13.9
Chemistry.....	47	67.4	13.2
Biology.....	152	67.5	15.5
Earth sciences.....	26	72.2	13.5
Nonuniversity:			
Physics.....	40	58.7	16.4
Chemistry.....	76	63.1	13.5
Biology.....	67	68.4	15.3
Earth sciences.....	38	66.8	12.4

Nevertheless, no validity or significance can be claimed for these differences without further information. A conclusive study would, first of all, have to be based on a more definitive examination of death notices. The basis for reporting deaths in *Science* was not determined. Other factors not determined were completeness of coverage and whether the likelihood of a death being reported was the same for those in different specialties, for active and retired persons, and for university and nonuniversity personnel.

There is, presumably, a tendency to report the deaths of the more notable persons. If physicists tend to become eminent earlier in their careers than do men in the earth sciences, then the death of a young physicist would be more likely to be noted than that of a young geologist.

What is more, one would expect to find different distributions for the specialties, since the earliest age at which a man would probably qualify for a given specialty will vary. For example, a man is considered to be an engineer after he has completed 4 years of college, but a physician must have an additional 4 years of education, and a psychiatrist must have had still more training.

A person generally does not become an administrator until he has had several years of experience, and not many men would achieve this position at an early age. Thus deaths would not be reported for psychiatrists or administrators as early in life as for engineers, simply because it is unlikely that many would have become psychiatrists or administrators that soon.

Conversely, physicists and psychologists may have a low average age at death because there are relatively large numbers of young men going into these specialties, increasing the chances that a young scientist in this age group would die. These examples make clear why the significance of the differences cannot be assessed without knowing the proportion of men and women in each age group for each specialty.

Although the results of this study are not conclusive, they do suggest an interesting area for inquiry.

### Summary

Analysis of the average age at death of scientists whose death notices appeared in *Science*



from 1958 to 1968 showed great differences among the various specialties. They range from 76.7 for archeologists to 61.8 for men working with some form of radiation. The average age at death for the sample of 2,224 men was 67.7 years, and for the sample of 93 women, 68.1.

The average age at death was higher for biologists in outdoor specialties than it was for those in indoor specialties, and it was higher for physicists, chemists, and earth scientists—but not for biologists—working for universities than for their nonacademic counterparts.

More accurate death statistics and detailed information about the proportion of people in various age groups for each specialty are needed to determine whether or not these suggestive results are valid.

#### REFERENCES

- (1) Guralnick, L.: Mortality by occupation and cause of death among men 20 to 64 years of age: United States 1950. Vital Statistics Special Reports, Vol.

- 53, No. 3. U.S. Government Printing Office, Washington, D.C., 1963; (a) pp. 105-111.
- (2) National Academy of Sciences-National Research Council: Profiles of Ph. D.'s in the sciences. Publication No. 1293. U.S. Government Printing Office, Washington, D.C., 1965.
- (3) Dickenson, F. G., and Martin, L. W.: Physician mortality, 1949-1951. JAMA 162: 1462-1468 (1956).
- (4) Luria, S.: Mortality among dentists: A four-year cohort study. Thesis. Yale University School of Medicine, New Haven, Conn., 1963.
- (5) Warren, S.: Longevity and causes of death from irradiation in physicians. JAMA 162: 464-468 (1956).
- (6) Lewis, E. B.: Leukemia and ionizing radiation. Science 125: 965-972 (1957).
- (7) Seltzer, R., and Sartwell, P. E.: The influence of occupational exposure to radiation on the mortality of American radiologists and other medical specialists. Amer J Epidem 81: 2-22 (1965).
- (8) Institute of Life Insurance: Life insurance fact book, 1967. New York, 1967, p. 94.
- (9) Powell, H.: Occupation, status and suicide: Toward a redefinition of anomie. Amer Sociol Rev 23: 131-139 (1958).

## ph synopses

**COMPTON, ARIEL S.** (Santa Clara County Health Department, San Jose, Calif.): *Health study of adolescents enrolled in the Neighborhood Youth Corps. Pilot screening program. Public Health Reports, Vol. 84, July 1969, pp. 585-596.*

A study of the health of 269 Neighborhood Youth Corps adolescents was made by the San Jose City Health Department between December 1966 and May 1967. The primary objective of this study was to identify health problems and provide the type of followup which would achieve medical care as well as to evaluate the need for future health programs for these youngsters.

Screening procedures consisted of a review of a medical history questionnaire, brief physical examination (school dropouts routinely and enrollees in school only as indicated), check of blood pressure and pulse, vision and hearing tests, dental inspection, blood and urine tests, tuberculin and histoplasmosis skin tests, and mental health interview.

The data from in-school enrollees were compared with that of school dropouts and, whenever possible, screening results were also com-

pared with those from a health study of middle class high school students in Dormont, Pittsburgh.

Screening procedures revealed that among youth corps enrollees 34 percent of the girls and 17 percent of the boys had a significant hearing loss, 50 percent of enrollees needed immediate dental care, 13 percent were anemic, 18 percent had abnormal results for urine tests, approximately 10 percent had positive tuberculin skin tests, and 34 percent had emotional problems serious enough to warrant professional help. Observations during physical examinations identified 91 conditions among the 131 school dropouts which warranted medical attention. Among in-school enrollees, who were examined only when indicated by answers to the medical history questionnaire, 53 medical referrals were made.

For those procedures for which it was possible to compare results—vision and hearing tests, dental in-

spection, hematocrit value determination, tuberculin skin test, and nutritional evaluation—the health of youth corps enrollees was significantly below that of Dormont students. Examination of adolescents in the Dormont study did not reveal serious diseases; however, many youth corps enrollees had serious health problems.

School dropouts had a greater percentage of obesity, significant hearing and visual defects, urinary abnormalities, and anemia than did those in school. In some instances a health problem had been a primary factor in causing a youngster to become a dropout, and among in-school enrollees several health conditions were identified which directly affected academic performance.

Community services were not found adequate to meet the health needs as demonstrated by this study. If the goal of improving the health of these young people is to be achieved, a health program must do more than merely screen for health abnormalities; it must also provide services for treatment which are both acceptable and readily available to those who need them.

**MARTIN, DAN A.** (Acting Health Officer, Hopkins County, Ky.), **FLEMING, SALLY J.**, **FLEMING, TIMOTHY G.**, and **SCOTT, DEANNA C.**: *An evaluation of immunization status of white children in a Kentucky county. Public Health Reports, Vol. 84, July 1969, pp. 605-610.*

The 453 infants that could be located among the 487 born to white residents in Hopkins County, Ky., in a recent 1-year period were divided into two groups. Parents of one group received mailed notices urging DPT (diphtheria-pertussis-tetanus) and poliomyelitis immunizations; parents of the other group did not. When the babies were 4 months old, the two groups did not differ in the percent of immunizations started. For approximately 20

percent of the 453 infants, neither DPT nor poliomyelitis immunizations had been initiated.

Study of a subgroup of 231 babies at 12 months of age showed that only 5 percent more received immunizations between 4 and 12 months of age than had received them by 4 months. Thirty-four infants of this subgroup had received no immunizations of any kind. A home visit by a public health nurse and a clerk resulted in completion of immuniza-

tions in eight of the 34; one mother refused to have her child immunized. The parents of two children had already voluntarily had them immunized before the visit. Families of 13 infants could not be located. A second home visit was planned to try to persuade the parents of the remaining 10 infants to provide the protection their children needed.

Families unlikely to have babies immunized by an acceptable time were characterized by poverty, rural residence, a mother with an education of 9th grade or less, and three or more children.

**HOFF, WILBUR** (California State Department of Public Health): *Training the disadvantaged as home health aides. Programing success achieved by the Alameda County (Calif.) Health Department. Public Health Reports, Vol. 84, July 1969, pp. 617-623.*

The purpose of a project conducted during 1968 in the Alameda County Health Department, Oakland, Calif., with a 1-year grant from the Federal Office of Economic Opportunity, was to demonstrate how older unemployed men and women—most were 45 to 62 years old—in poverty areas could be trained to become effective home health aides.

An 11-week training program was designed to teach specific knowledges and skills of home nursing care. In developing the course, principles of

programed learning were followed to (a) determine the characteristics of the trainees, (b) identify behavioral objectives, (c) break subject matter into small discreet steps, (d) arrange learning in a progressive sequence, and (e) allow trainees to progress at their own speed.

Of the 92 adults selected for the program, 83 (90 percent) successfully completed the course and were certified as home health aides. Results of the basic education instruction given to 65 percent of the

trainees showed that after instruction the average increase in mathematics grade levels was 1.6. The range of increase for the trainees was from 1 to 3 grade levels.

A behavior-rating instrument, constructed to measure performance on the job, was used to evaluate the performance of 24 graduates of the program after 15 weeks of employment. Aides were rated by their nurse supervisors on 22 items in three important work-skill categories: technical home care, work habits, and interpersonal relations. The results of this evaluation showed that all the aides were performing at satisfactory or above-satisfactory levels.

**CRAWFORD, CHARLES O.** (Pennsylvania Department of Health): *Variables related to a referendum vote on creating a county health department. Public Health Reports, Vol. 84, July 1969, pp. 639-646.*

The extent to which political, demographic, and socioeconomic characteristics of municipalities in Chester County, Pa., were related to percentage affirmative vote (PAV) on a referendum to establish a county health department was investigated. Chester County has 57 townships, 15 boroughs, and one city. Whether the municipality was a township, borough, or city proved to be a factor closely related to the percentage affirmative vote. The boroughs and

city were more likely to vote for a department than were the townships.

Municipalities with higher and lower population growth rates had a higher PAV than those with moderate growth rates. Two intervening variables, however, were political organization and socioeconomic status. Boroughs and the city tended to have lower growth rates than townships. The municipalities with higher growth rates tended to have higher socioeconomic levels when

measured by income and education.

Mobility was related to percentage affirmative vote in that municipalities with more mobile populations had a higher PAV than those with less mobile populations. Political organization of the municipalities had to be seriously considered when examining this relationship.

Income and education were related to PAV levels, with income data yielding more distinct relationships than educational levels. Municipalities with high socioeconomic ratings were more likely to have high PAV levels.

**CASPER, ELIZABETH A.** (Public Health Service), and **PHILIP, ROBERT N.**: *A skin test survey of tularemia in a Montana sheep-raising county. Public Health Reports, Vol. 84, July 1969, pp. 611-615.*

Three hundred and sixty-five persons from sparsely populated, sheep-ranching Garfield County in eastern Montana were skin tested for sensitivity to *Francisella tularensis*. Twenty-four persons (6.6 percent)

were reactors: 19 (10 percent) of 194 males and five (3 percent) of 171 females. Only four reactors had a history of prior tularemia infection.

Although clinical tularemia had been consistently diagnosed and re-

ported in Garfield County, the true incidence of tularemia infections had not been reflected. Most infections were unrecognized or subclinical. Tularemia skin tests were useful for determining the prevalence of infection in this county, and evidence of the risk of tularemia is sufficient to warrant consideration of preventive vaccination of sheepworkers.

**RYLANDER, RAGNAR** (National Institute of Public Health, Stockholm): *Revaccination against smallpox. Take and complications. Public Health Reports, Vol. 84, July 1969, pp. 635-638.*

Results from revaccination against smallpox were studied in 1,931 hospital employees given compulsory vaccinations 1964-67 at the Hospital for Infectious Diseases, Stockholm, Sweden. Vaccine with a titer of about  $10^{8.1}$  TCID<sub>50</sub> per milliliter was used for persons who had reacted positively to vaccination within the pre-

ceding 5 years. The vaccinator observed and recorded the vaccinee's reaction. Formation of a 1-mm. crusta was considered a positive result.

About 15 percent negative results were obtained with the vaccine with a titer of about  $10^{8.1}$  TCID<sub>50</sub> per milliliter compared with 30 percent

negative results obtained with vaccine having a titer of about  $10^{7.4}$  TCID<sub>50</sub> per milliliter. The majority of complications occurred among persons vaccinated with the less potent vaccine and those who had had their last positive reaction to vaccination during childhood.

Use of the more potent vaccine for revaccination of persons vaccinated within 5 years is recommended to decrease the number of negative reactions.

**HAHN, HARLAN** (University of California): *Health concerns and attitudes regarding fluoridation. Public Health Reports, Vol. 84, July 1969, pp. 655-659.*

In November 1965 a multistaged area probability sample of 596 Detroit adults was surveyed soon after a major referendum on fluoridation was held in the city. A scale of expressed health concerns was derived from a series of questions relating to personal worries about six serious diseases: lung cancer, tooth decay, heart disease, stomach ulcers, food poisoning, and bone disease. Levels

of health concerns were directly and significantly related to positions on an index of dental health information that had been developed from questions about methods of preventing dental caries.

Although expressed health concerns were not directly associated with attitudes on fluoridation, the positions of the respondents on the referendum issue were examined at

three socioeconomic levels. Support for fluoridation was inversely related to increasing socioeconomic status. Moreover, persons at low socioeconomic levels with numerous health concerns favored fluoridation, but high-status respondents with strong health concerns were undecided about the issue. Perhaps this relationship was influenced by perceived disagreements about the merits of fluoridation and by different evaluations of the costs and benefits of the program.

**LURIA, S. M.** (Naval Submarine Medical Center, Groton, Conn.): *Average age at death of scientists in various specialties. Public Health Reports, Vol. 84, July 1969, pp. 661-664.*

Analysis of the average age at death of scientists whose death notices appeared in *Science* from 1958 to 1968 showed great differences among the various specialties. They range from 76.7 for archeologists to 61.8 for men working with some

form of radiation. The average age at death for the sample of 2,224 men was 67.7 years, and for the sample of 93 women, 68.1.

The average age at death was higher for biologists in outdoor specialties than it was for those in in-

door specialties, and it was higher for physicists, chemists, and earth scientists—but not for biologists—working for universities than for their nonacademic counterparts.

More accurate death statistics and detailed information about the proportion of people in various age groups for each specialty are needed to determine whether or not these suggestive results are valid.

*Public Health Reports*, published since 1878 under authority of an act of Congress of April 29 of that year, is issued monthly by the Public Health Service pursuant to the following authority of law: United States Code, title 42, sections 241, 245, 247; title 44, section 220. Use of funds for printing this publication has been approved by the Director of the Bureau of the Budget, August 26, 1963.

**ORDER BLANK FOR PHR**

**To: Superintendent of Documents  
Government Printing Office  
Washington, D.C. 20402**

Please enter my Subscription for Public Health Reports. I am enclosing Money Order ☐ Check ☐ for this subscription. (\$6.50 a year; \$1.75 additional for foreign mailing. A discount of 25 percent is allowed for orders of 100 or more subscriptions. Subscriptions are accepted also for 3-year periods, for the convenience of subscribers, at the established annual rate.)

Please address the PHR as follows: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



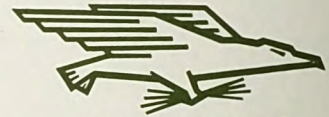
UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON, D.C. 20402. 1969

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.  
Subscription price \$6.50 a year, \$1.75 additional for foreign mailing.  
Price for a single copy of this issue is 55 cents.

Digitized by Google

U. S. DEPARTMENT OF  
HEALTH, EDUCATION AND WELFARE  
PUBLIC HEALTH SERVICE  
BETHESDA, MD. 20014

OFFICIAL BUSINESS



POSTAGE AND FEES PAID  
U. S. DEPARTMENT OF H. E. W.

If you do not desire to continue receiving this publication, please **CHECK HERE** ☐;  
cut off this label and return it to the above address. Your name will then be  
promptly removed from the appropriate mailing list.

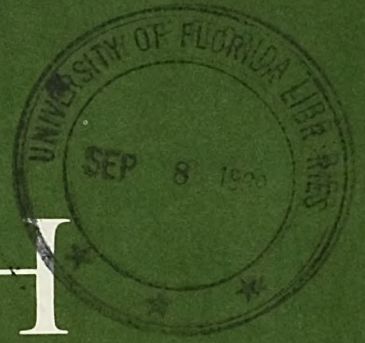
Public Health Reports

ph  
r



AUGUST 1969 Volume 84 Number 8

# PUBLIC HEALTH REPORTS



## *In this issue*

Dollar Benefits of the Measles Vaccine

A National Nutrition Program

Health Care for Migrant Farmworkers

Health Defects of Adolescents

Health Professionals in NYC Schools

Salmonellosis in Man in Poland



U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE  
Public Health Service

Digitized by Google







CONTENTS	PAGE
Toward a comprehensive food and nutrition program.... <i>Robert H. Finch</i>	667
Benefits due to immunization against measles..... <i>Norman W. Axnick, Steven M. Shavell, and John J. Witte</i>	673
Experiences of the Public Health Service in training and using health auxiliaries..... <i>Jerrold M. Michael</i>	681
A comprehensive care program for migrant farmworkers.. <i>George L. Harper</i>	690
Health systems research to deliver comprehensive services to Indians..... <i>Irving H. Schlafman</i>	697
Health defects and need for treatment of adolescents in low income families..... <i>Arthur J. Salisbury and Robert B. Berg</i>	705
Salmonellosis in man in Poland, 1957-66..... <i>K. Pietkiewicz and Z. Buczowski</i>	712
Racial similarities and differences in family dental care patterns..... <i>Jane Moosbruker and Anthony Jong</i>	721

continued

### frontispiece

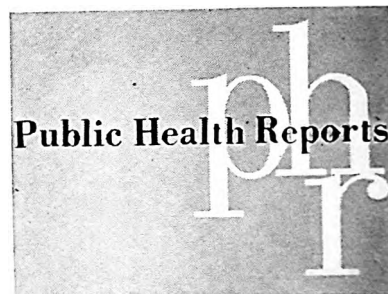
Licensed practical nurse gets supplementary training in public health in a program at the Indian Health Service hospital, Shiprock, N. Mex. Report on Public Health Service experiences in training and using health auxiliaries appears on pages 681-689.



**CONTENTS—continued**

Better use of health professionals in New York City schools. Summary of the final report on the school health personnel utilization project. . . . .	729
<i>Lester J. Rosner, Olive E. Pitkin, Grace M. McFadden, Lucille Rosenbluth, and Margaret J. O'Brien</i>	
U.S. and Mexican medical students draft and pretest questionnaires for border health resources survey. . . . .	736
<i>Richard E. Kettler, Norman C. Ahl, and Carl N. Muchnick</i>	
12-State survey of needs and interests in continuing education in public health. . . . .	741
<i>Laurence B. Callan, Nicholas Parlette, and Alvin R. Leonard</i>	
Short reports and announcements:	
Research in early childhood development. . . . .	672
The emergency medical identification symbol. . . . .	680
\$2.5 million in grants awarded to 6 comprehensive health projects. . . . .	689
Hill-Burton grants reach 10,000. . . . .	696
Community health aspects of physical therapy education. . . . .	704
National Library of Medicine bibliographies. . . . .	711
Publication announcements. . . . .	728
Dr. Egeberg, Assistant Secretary for Health and Scientific Affairs. . . . .	755
Education notes. . . . .	756
Federal publications. . . . .	758
Synopses. . . . .	759

PAGE



**MANAGING DIRECTOR**

**EDWARD J. McVEIGH**

*Assistant Administrator for Information,  
Office of Information, Health Services  
and Mental Health Administration.*



**STAFF**

Keith Kost, M.P.H.	<i>Editor</i>
Marian K. Priest	<i>Managing Editor</i>
Esther C. Gould	<i>Asst. Managing Editor</i>
Eugene Fite	<i>Art Editor</i>

*Address correspondence to Editor, Public Health Reports, Public Health Service, Department of Health, Education, and Welfare, Lee Building, 6935 Wisconsin Avenue, Chevy Chase, Md. 20015.*

Opinions expressed are the authors' and do not necessarily reflect the views of *Public Health Reports* or the Public Health Service. Trade names are used for identification only and do not represent an endorsement by the Public Health Service.

**For subscriptions to *Public Health Reports*, please use the order form on the inside back cover.**

**U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE**

**ROBERT H. FINCH, Secretary**

**ROGER O. EGEBERG, Assistant Secretary for Health and Scientific Affairs**

**PUBLIC HEALTH SERVICE**

**HEALTH SERVICES AND MENTAL HEALTH ADMINISTRATION**

**JOSEPH T. ENGLISH, Administrator**

# TOWARD A COMPREHENSIVE FOOD AND NUTRITION PROGRAM

ROBERT H. FINCH

In testimony before the Senate Select Committee on Nutrition and Related Human Needs, the Secretary of Health, Education, and Welfare outlined the Department's plans to combat malnutrition in the United States. The following paper is excerpted from his address to the committee on May 7, 1969.

**T**HE DEPARTMENT has a number of programs directed specifically to the problems of malnutrition and its medical consequences. I will concentrate on steps which we propose to take in the coming weeks and months.

## **National Nutrition Surveillance System**

We feel that we now know enough from the 10 State studies conducted by the National Nutrition Survey to move into a new phase of activity. The initial State surveys have established a data base which, when fully analyzed, should give us a scientifically sound set of conclusions about the extent of malnutrition and the related medical consequences. The difficulty with the State-by-State approach is that it is somewhat expensive, it provides a look at the problem at only one point in time and, while it has not been able to blanket the whole country, the sample is adequate to permit conclusions of national validity.

We are now ready to move into the next phase of an expanded national nutrition survey. We

now must move beyond the goal of simply determining whether and to what extent undernutrition exists in this country. The next phases of activity must relate the findings of the survey to action programs and to establishing procedures for monitoring the national nutritional status. There is a need to evaluate the effectiveness of such programs as commodity distribution, food stamps, and welfare in relation to health status.

As our targets we propose:

1. The development and implementation of a survey design which will permit the use of health data as an objective test of programs to improve nutritional status.
2. A continuing monitoring of national nutritional status and related health problems so that the evaluation of trends and progress over time will be possible and so that we will have some better basis for allocation of scarce program resources.

I am, therefore, proposing the establishment of a continuing National Nutrition Surveillance System, under the authority of the existing National Health Survey Act of 1956. It would be added to the family of surveys that now make up the National Health Survey. This will be a scientifically reliable system for continuous monitoring of the health effects of and the prevalence of malnutrition. We should not again be forced, in order to define the nutrition status of the nation, to launch a difficult and costly national survey at such short notice.

The plan would set up continuing representative sampling of the high-risk population throughout the country, making maximum use of existing health care and welfare systems to identify and examine target populations. Special emphasis would be given to the child population. The examination would be concentrated on the clinical variables indicative of the health problems created by malnutrition. This survey would be conducted on a 2-year cycle so that results would be available for each 2-year period. Individual persons in the sample would be invited to convenient central locations for examinations. To the extent possible, the sample would involve families now participating in programs such as Head Start, Follow Through, title I of the Elementary and Secondary Education Act, and the Maternal and Child Health Program by intensifying the nutritional aspects of the medical examinations now being given.

The number of people examined each year would not need to be so large as in the National Nutrition Survey, but they would be chosen to be representative of the population at most risk of malnutrition throughout the country. To the extent possible, we will build on technical resources which have been created in the 10 States through the National Nutrition Survey.

Accumulated results from this continuing survey, together with demographic and economic data for each county in the United States, would be used to project the survey results into the counties, estimating for each the likely burden of health problems due to malnutrition within that county. Periodic results from the survey would be used to measure national progress in overcoming the health problems produced by undernutrition.

The analysis and data reporting of the biochemical samples obtained throughout the nation by the surveillance system must be accomplished in a uniform and consistent fashion in a laboratory of high quality and capacity. The heart of such a laboratory already exists in the National Communicable Disease Center, Public Health Service. A major part of this proposal involves increased utilization and expansion of the extensive laboratory resources of the National Communicable Disease Center. With relatively inexpensive physical expansion it would

serve as the national laboratory for the surveillance system.

In addition to the data which will be coming in through the specific examinations, we will integrate into the National Nutrition Surveillance System other sources of data which we have relating to the health problems of undernutrition. For example, our Department is responsible for the national birth and death statistics. We find that the morbidity statistics by cause of death must be interpreted with great caution, because it is not always possible to tell whether the cause of death entered by the physician on the death certificate is clearly related to nutritional problems. There are undoubtedly deaths in which a nutritional disease was a contributing cause, but we will not know how many until we complete the analysis of contributory causes through a new statistical program just now getting underway.

### **Community Nutrition Programs**

New community nutrition projects will focus on the medical consequences of malnutrition. The goal of these projects will be the stimulation of community efforts to meet the health needs of the malnourished. They will not be aimed at the direct provision of food to the malnourished except when part of medical treatment. We assume that the necessary food supplies can be made available through close cooperation with the food programs of the Department of Agriculture and the emergency food activities of the Office of Economic Opportunity. In addition to the immediate benefit of these community projects, the longer term results should be an increased response of the community's health resources to the health needs of the poor, including not only adequate nutrition but also improved availability of primary medical services.

The Federal funds and personnel involved will serve as a catalyst to bring together the local health department, the practicing physician, the voluntary efforts of interested citizens, and community leadership in a concentrated campaign to find, feed, and treat the malnourished in the community.

The National Communicable Disease Center will provide for each project a staff person trained in mounting effective community health

programs. NCDC personnel have an outstanding record of assisting communities in developing community campaigns to combat specific health problems, such as poliomyelitis and measles vaccination campaigns. The NCDC staff person will work with the local health department, the medical society, schools, and other community institutions in the design and implementation of a community survey to identify those families and individual persons with a problem of malnutrition. He will also have at his disposal the entire resources of the nutrition program of the Public Health Service.

This survey will utilize the epidemiologic expertise of the NCDC worker to define the demographic pattern of malnutrition in the community. Simple indices will be used which will identify within the population surveyed those persons with nutritional deficiencies. These indices include (a) the height and weight of children, (b) hematocrit and hemoglobin values, (c) dietary histories, and (d) simple examinations for clinical signs of malnutrition. Experience with other community health campaigns has shown that local volunteers can be enlisted and trained to augment and enhance the casefinding effort.

The survey will identify a number of persons in need of specific medical treatment relating to malnutrition. To meet this need the project will seek to mobilize local physicians and other health professionals to diagnose and prescribe specific treatment for those persons identified as nutritionally deficient or with other medical problems. Medical diagnosis is necessary to establish the specific causation of the nutritional deficiency so that the appropriate treatment can be prescribed. For example, the survey will probably identify a number of persons with anemia, a condition frequently identified in a malnourished population. But there are many causes of anemia, including inadequate iron in the diet, lack of vitamin B<sup>12</sup> or folic acid, inadequate absorption of these nutrients, lack of essential protein or amino acid precursors for blood formation, or non-nutritional causes, such as abnormal bleeding. Each of these causes requires a different treatment, only one of which may be food.

To insure the availability of adequate medical followthrough necessary for this specific

diagnosis and treatment, the support and participation of local physicians must be elicited. The stimulation of their interest is the essential ingredient in making the needed medical services available through voluntary participation. The Regional Medical Programs Service will take the lead in developing the involvement of practicing physicians, including contracts with professional societies.

Approximately 50 communities will be selected for these initial projects on the basis of the likelihood of the presence of malnutrition and representation of different social and economic situations. Officials of the Office of Economic Opportunity emergency food program have indicated a willingness to coordinate the location of OEO projects with the selection of communities for the Health Services and Mental Health Administration community nutrition projects. This coordination could make possible the prescription of food by local physicians involved in the projects.

The National Communicable Disease Center will monitor these projects and carry out a continuing evaluation of their effectiveness in reducing the effects of malnutrition.

#### **Technical Assistance**

The Department of Health, Education, and Welfare will expand its efforts to provide technical assistance to the States, local governments, and the private food industry in the nutrition area.

Twelve States not included in the National Nutrition Survey have requested technical assistance to prevent malnutrition. We propose to mount such a technical assistance program to assist the States in the following types of activities:

1. Development of a State surveillance capacity to identify the nature and extent of the problem in terms of families and individuals.
2. Development of a nutrition component in the State public health service to coordinate State activities in nutrition and health, giving special consideration to the coordination of the Medicaid programs with the special package and pilot voucher programs as requested in President Nixon's message of May 6, 1969.

We will be holding certain funds in reserve for this type of technical assistance activity so

that we can respond flexibly as requests come in from public and private groups. In particular, we will seek to assist medical schools with curriculum improvements so that students are better taught to diagnose and deal with the health-related aspects of malnutrition.

### **Fortification of Foods**

Using data from the National Nutrition Survey and other reports, we will be working closely with the food industry, the Food and Drug Administration, and the Department of Agriculture to insure that necessary nutrients are carried in our foods. Guidelines must be established outlining the amount of nutrients essential in food additives and substitutes. In particular, we will be launching a special study of how food products might be fortified in acceptable ways to deliver basic vitamins and mineral products.

With regard to the nutritional enrichment of staple foods, the utility of our present food fortification program must receive intensive scrutiny to insure that it fulfills its purpose under today's conditions. The existence of food enrichment programs may give us a false sense of security. For example, vendors can sell bread and bakery goods that are not enriched, and plain salt rather than iodized salt. The consumption of iodine-fortified table salt is on the decline. This voluntary fortification program to prevent goiter was probably the cheapest and most efficacious public health measure ever instituted. The largely unjustified difference in cost between vitamin D-enriched milk and plain milk is a definite deterrent to the attainment of an adequate vitamin D intake, especially for those with a limited food budget.

The vigor and effectiveness of food enrichment has not kept pace with the changing patterns in our food habits. Our experience with enriched flour is a good illustration. Years ago, bread and flour were chosen as vehicles for enrichment with thiamine, riboflavin, and niacin; at that time bread accounted for 40 percent of the average daily caloric intake. At present only half as much bread is consumed, and the sale of products made with enriched flour has declined to an all-time low. For that reason, and because of voluntary calorie restriction (especially among women of childbearing age),

today bread can no longer be relied upon to supply adequate amounts of these nutrients. Thus, serious thought should be given to an upward revision of the level of fortification in flour and other farinaceous products and to the introduction of a readily available source of iron-enriched food.

### **Education**

A second basic line of attack on the nutrition problem is through educational channels and, specifically, nutrition education. One cause of malnutrition in this country is ignorance of what constitutes good nutrition and what foods will lead to it. While it must be emphasized that in general no specialized knowledge of nutritional principles is needed in the United States today to obtain a balanced food intake, knowledge of nutrition is necessary if consumers are to use their food dollars to best advantage. We must, in addition, prevent malnutrition which results from simple lack of basic knowledge of food values. Particular attention will be given to feeding of infants and small children.

Because our population is mobile, families in new locations must be helped to develop new buying habits and assisted in obtaining a nutritious diet. For example, grits, a staple of many families, is fortified with iron in the South but not in the North. This fact explains the rarity of iron deficiency anemia in children in certain southern rural areas, and the commonness of this anemia among children in families from these areas that have moved to the North.

We are in the process now of reviewing our effort on nutrition education and working out new program directions. On April 21 and 22, 1969, a special departmental Planning Subcommittee on Nutrition and Food Education met to discuss three related subjects: (a) the role of the school as a delivery system for food, (b) the role of the school in nutrition education, and (c) the role of the private sector in nutrition education. The 45-member subcommittee included representatives of the Department of Agriculture, Bureau of the Budget, private food producers, and a variety of interested private organizations.

Several conclusions have emerged.

First, it is clear that nutrition education can

only be a part of a comprehensive program and that no amount of instruction on food buying and preparation can suffice if adequate food is not available.

Second, we have lacked a focus in the Office of Education on feeding programs for children or on nutrition education. We have now assigned, apparently for the first time, a full-time staff person to provide coordination between the several nutrition education and feeding programs funded by the Office.

Third, nutrition education in the schools needs redirection toward the more complicated products on today's grocery store shelves. Materials are out of date in view of the new technology, and nutrition education itself is rarely taught as a formal course or in ways which are relevant to a disadvantaged child and his family.

Fourth, it is apparent that if the schools are to play a useful role in this area, they will have to take on a community orientation which will help them reach parents and deal with consumer problems in their own neighborhoods. We have already proposed a special program of \$25 million for experimental schools as part of the Administration's budget revisions, and I would anticipate working with local school districts within the framework of that experimental program on new, community-based methods of nutrition and consumer education. The Department's increased focus on community colleges should also make possible the creation of more opportunities for training of community residents in nutrition-related fields such as consumer education and food service occupations.

Finally, there is a strong consensus on the need for greater private sector involvement in furthering nutrition education. We hope to work closely with organizations such as the Advertising Council and with the private food industry to develop imaginative ways to communicate basic information on good nutritional practices.

### **Welfare**

In our welfare programs, two sets of program initiatives are currently planned, with the program review still continuing.

First, State and local departments of welfare operate the Food Stamp Program on contract with the Department of Agriculture. In the past, however, HEW has not been a participant in the

development or issuance of regulations and contracts pertaining to the administration of these programs. This has been true despite the obvious interest of the two Departments in evolving common policies between the Food Stamp and Welfare Programs on such matters as eligibility determination, fair hearings, and appeals mechanisms.

The Secretary of Agriculture and I recognized some time ago that this arm's-length kind of relationship should not be permitted to continue, and in early February we signed a Memorandum of Agreement providing a framework for close cooperation on all matters having to do with nutrition programs. This cooperative relationship has continued between the two Departments under the auspices of the Urban Affairs Council where HEW has been able to contribute fully to the development of the Administration's Food Stamp proposals, and USDA has collaborated with us on the development of welfare reform proposals.

Second, I have ordered the Social and Rehabilitation Service to launch a national effort through the social services programs under the Social Security Act to bring nutritional education and homemaking services to families in their own homes. The teaching of nutritional practices and homemaking can be advanced by the use of neighborhood workers under the 1967 Social Security Amendments, and we will be seeking full implementation of those provisions. HEW can and will provide advisers, educational materials, and consultative assistance in planning such programs. Special efforts will be made to involve mothers receiving aid for dependent children who have shown an aptitude in these areas to teach others receiving assistance.

In addition to improving and expanding its internal capabilities to deal with the problems of malnutrition, HEW is also working with other Federal Departments through the Model Cities Program to assist Model Neighborhoods in planning nutrition programs. Although HEW has no direct responsibility for the operation of food programs, it is able to provide technical assistance to cities that wish to include nutrition components in their comprehensive plans.

In the fall of 1968, a food demonstration

project was conducted by representatives from HEW, Agriculture, and OEO in four Model Cities—Athens, Ga., East St. Louis, Ill., San Antonio, Tex., and Richmond, Calif. The goal was to expand as many sources of food and nutritional services in each city as was possible in order that residents of all ages would have the opportunity to obtain an adequate diet. A total of 26 different food-related projects were initiated, ranging in magnitude from a full-coverage school lunch and breakfast program to a demonstration kitchen for nutrition education work.

The success of this pilot program represents

a comprehensiveness of approach in urban planning for food which rarely, if ever, has been achieved. Practically all of the Model Cities have indicated strong interest in investing some resources in food- and nutrition-related programs. Based on the results of this pilot program, HEW is continuing to work with the interested agencies so that cities planning nutrition programs will be aware of the types of Federal resources available to them.

I think that we, together with the Department of Agriculture, are now on the track of a comprehensive and workable nutrition program.

## Research in Early Childhood Development

To close the gap between the present inadequacy of knowledge concerning early childhood development and the demonstrated needs of children during the crucial years 1 to 5, the Children's Bureau, Social and Rehabilitation Service, Department of Health, Education, and Welfare is sponsoring five experimental studies among this age group.

Under grants from the Bureau, research is being carried out on the most effective ways of using mother-substitutes in, for example, a day care setting, offering the kinds of supplementary experiences children need when it is necessary for them to be out of their homes for part of every day. The studies have already disproved the theory, held by some social scientists, that children will be severely damaged unless they are cared for at home by their mothers until they are 3 years old.

Further research is examining ways to provide an environment which will help the child to develop even if he has more than one mother-substitute during much of the day. At Syracuse University in New York, children from low income families are enrolled in a day care center for infants through 5 years of age. Based on the Head Start experience, the project is examining ways in which the development of these younger children can be fostered.

At the Yale University Child Study Center, a project still in the early stages aims to establish what differences exist among disadvan-

taged children who are subjected to three environments: their own families, foster families, and group residential care. Among the major services to be provided are social work, health care, and a program of day care and education. The research study is being beamed to children from early infancy to 7 years of age.

At the Institute for Child and Family Development, University of North Carolina at Greensboro, research has proved that there is no substantial difference in the illness rate between children from low income families in a nursery center and a matched group receiving home study.

At the University of Florida, a group of 21 women from disadvantaged backgrounds are learning a new career as parent educators. They are part of an effort to meet the fast-growing need for trained adults to help children learn how to respond to the physical, intellectual, and environmental influences around them. The women help mothers learn how to give their own young children the kinds of experiences which will enhance their intellectual development.

Another study which also is testing how to use nonprofessional personnel effectively in helping the intellectual growth of disadvantaged preschoolers is underway at the Family Service Association of Nassau County, Inc., Mineola, N.Y.



# Benefits Due to Immunization Against Measles

NORMAN W. AXNICK, M.S., STEVEN M. SHAVELL, B.A., and JOHN J. WITTE, M.D.

**I**N THE PAST, measles has been an almost universal childhood disease. Although many consider it to be rather benign, it sometimes has serious complications, such as encephalitis, otitis, and pneumonia.

Before vaccines were widely used, this disease represented a major public health problem in the United States; an estimated 4 million cases of measles, 4,000 cases of measles encephalitis, and 400 deaths occurred each year.

The isolation of measles virus in 1954 (1) led to the development of effective vaccines. With the licensure of the live virus vaccine in 1963, a means of protecting susceptible persons in the population through vaccination became available.

When in 1966 it became apparent that measles could be eradicated in the United States, private medicine and Federal, State, and local governments collaborated on a major program to eliminate the disease (2, 3). This nationwide effort has had an unmistakable effect on the incidence of measles. In 1968 the estimated number of measles cases was 250,000 or about 6

percent of the estimated mean for the 10-year period (1953 through 1962) preceding immunization.

Our objective is to quantify the national impact of immunization against measles. The benefits derived from immunization can be translated into savings in school days, hospital days, dollars, morbidity, and mortality. This kind of information is particularly relevant today, when decision makers in the \$50-billion health services industry—now one of the largest and most sensitive segments of the national economy—are all too often forced to base decisions on seriously inadequate data.

## Methodology

For the period 1963 through 1968, we estimated (a) costs that the nation would have sustained without immunization against measles and (b) the actual costs of measles. The difference between these costs is the immunization benefit; that is, (a) estimated measles costs without immunization minus (b) actual measles costs equals (c) benefits due to immunization.

To illustrate these ideas, consider measles deaths. Suppose that in a certain period  $X$  number of persons would have died of measles had there been no immunizations. Assume in addition that only  $Y$  persons died of measles during this time. The benefit due to measles immunization is therefore  $X$  minus  $Y$ , or  $Z$  lives saved.

---

*All the authors are with the National Communicable Disease Center, Public Health Service, Atlanta, Ga. Mr. Axnick is chief, and Mr. Shavell is an economist, Office of Program Planning and Evaluation. Dr. Witte is chief of the Field Services Branch, Epidemiology Program, and assistant chief, Immunization Branch.*

When determining the net economic or dollar savings due to immunization, the cost of immunization itself must be considered. In other words, net dollar savings equal dollar benefits minus dollar costs of immunization. This relationship between costs, benefits, and net savings is depicted in figure 1.

### Definition of Terms

The costs of measles must be more carefully described. They can be measured in terms of "health" and "resources" and then translated into dollars.

The items that comprise health and resource costs include morbidity, mortality, incidence of mental retardation, number of lost days in the hospital, and number of lost workdays and schooldays. Not included are important but difficult-to-measure costs such as misery and unhappiness. A few of the listed costs require minor elaboration: One measles death occurs for every 10,000 cases and is usually attributable to measles encephalitis. Encephalitis sometimes causes mental retardation and accounts for one-sixth of the measles cases requiring hospitalization of patients. Measles may

result in lost workdays for the reasons mentioned, and the disease clearly results in lost schooldays.

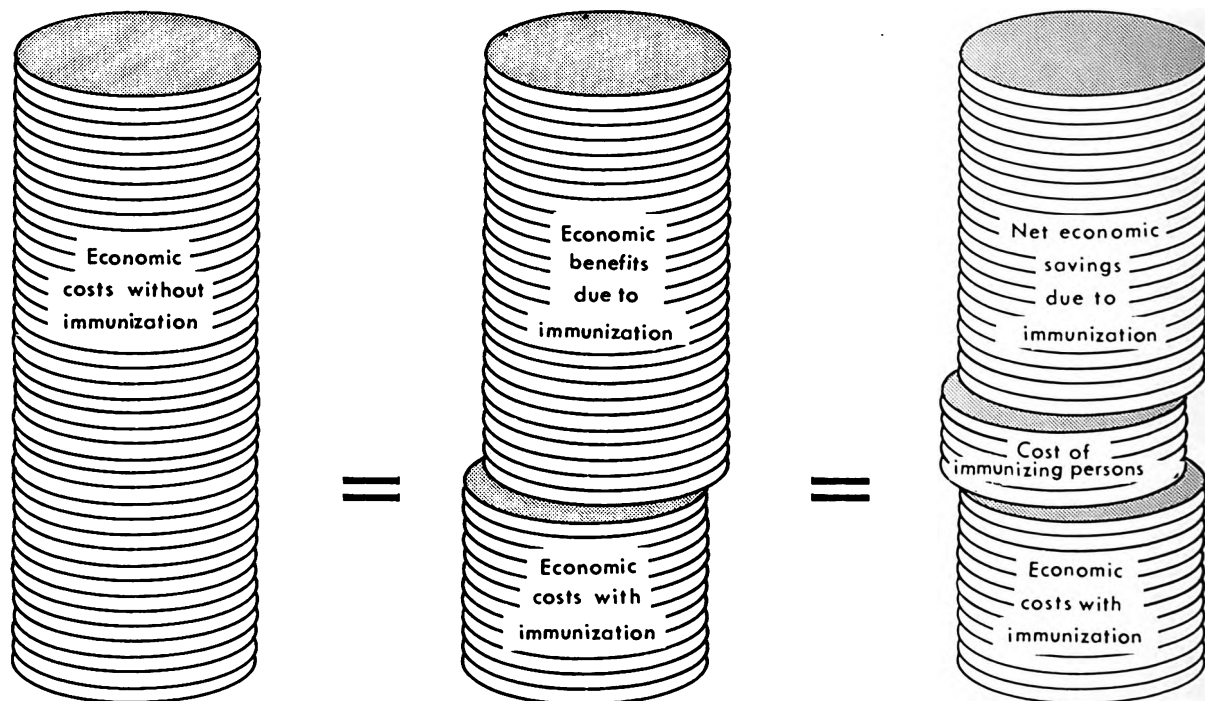
The economic costs, measured in dollars, are either direct or indirect. Direct economic costs include medical expenses connected with measles cases and charges for institutional care of patients who are mentally retarded as a result of measles encephalitis. Indirect economic costs are an approximation of the dollar value of productivity losses related to measles. Productivity losses may arise from premature death or from mental retardation, since both prevent persons from joining the labor force. The disease can and does strike employed adults, and work losses result. In addition, parents sometimes miss work to care for their sick children.

### Calculation of Benefits and Costs

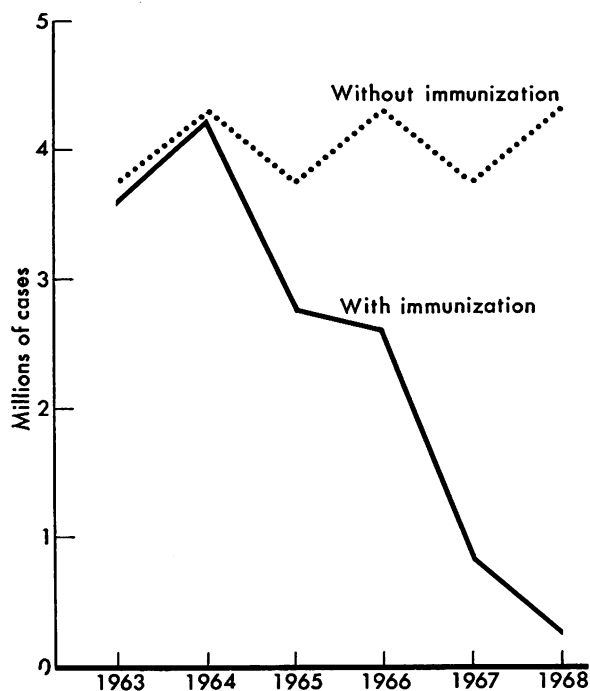
We calculated benefits and costs on admittedly crude data. Our estimates are also conservative in the sense that, if anything, they understate the true magnitude of measles costs and, therefore, of savings due to immunization.

*Health and resource costs.* Estimates of what the annual magnitude of measles incidence

Figure 1. Economic cost and savings relationships



**Figure 2. Estimated measles incidence in the United States, 1963 through 1968**



would have been without immunization are crucial to this analysis. We considered both the magnitude of and the variance in measles incidence during the decade (1953 through 1962) preceding the immunization effort. During that decade approximately 4 million people had measles each year in the United States. This number of cases must have occurred to explain the 90 to 95 percent level of natural immunity that the U.S. population achieved regularly by young adulthood (4). Presumably then, during 1963–68 the average annual incidence would have been about 4 million cases if measles vaccine had not been used. We also considered the past periodicity of measles (fig. 2). Estimates of the actual incidence of measles are based on projections from reported morbidity and mortality statistics for measles.

For every 100,000 cases of measles, 100 cases of measles encephalitis can be expected to occur. Ten of the 100 encephalitis patients will die and 33 will be mentally retarded or have other central nervous system damage (4). Long-term intensive care or institutionalization is assumed for this group. In addition, according to unpublished data of the Immunization Branch, Na-

tional Communicable Disease Center (NCDC), Public Health Service, an average of 500 more measles patients will have pneumonia, otitis, or other illness severe enough to warrant hospitalization.

Based on an estimated mean hospital stay of 14.6 days for encephalitis patients and 8.5 days for other hospital patients, the estimated number of hospital days per 100,000 cases of measles is 5,710–1,460 for encephalitis patients and 4,250 for other patients (5).

Calculations to determine the number of workdays lost per 100,000 cases take into account such factors as usual duration of illness from measles and distribution of measles morbidity among currently employed adults (6–10 and unpublished data from C. S. Wilder, National Center for Health Statistics, Public Health Service). We considered similar factors in estimating the number of lost schooldays.

*Economic costs:* Charges for physicians' services, hospitalization, gamma globulin, and care for the mentally retarded comprise the direct economic costs associated with measles. Costs are expressed in terms of dollar values at the specified time; for example, 1963 costs are expressed in 1963 dollars, 1964 costs in 1964 dollars, and so on. If costs and benefits had been put in terms of 1968 dollars, the difference in savings would have been less than 10 percent.

We assumed that half the number of patients who were not hospitalized were attended by physicians—half of these in the physician's office and half in the patients' homes. Unpublished data from the Division of Health Interview Statistics, National Center for Health Statistics, indicated that 51 percent of measles patients were medically attended in 1964 and 65 percent in 1965.

Physicians' charges for house calls, office visits, and hospital visits are based on data from the Consumer Price Indexes (11) published by the Bureau of Labor Statistics (BLS). In 1962, the average charge for an office visit was \$5 and for a house call \$8 (12). We adjusted these figures by the BLS Physician Fee Index (11) to reflect rising medical costs for subsequent years.

A comment about the Physician Fee Index and other BLS indexes on the prices of medical care may be in order at this point. Some economists believe that the actual increase in the cost

of medical services has been even more dramatic than BLS surveys indicate. They contend that BLS probably underestimates increases in prices of medical goods and services included in its index and that these goods and services may not be truly representative of medical care today (13). Therefore, our adjustments in the rising costs of medical care are likely to be conservative.

Estimates of physicians' charges to patients who were hospitalized with nonencephalitic acute measles are based on the assumption that the typical patient had an initial limited hospital examination and thereafter saw his physician daily. In 1963 the charge for the hospital examination was \$15 and for each followup visit, \$5 (14). According to a study of St. Louis encephalitis (15), hospitalized encephalitis patients were charged \$190 per patient in 1966 for physician services. To reiterate, we adjusted all physicians' charges to account for the rising cost of medical services.

Hospital expense estimates for encephalitis patients also are based on the study of St. Louis encephalitis. The 1966 daily hospital cost of \$73 was adjusted appropriately for other years.

The following average daily charge at short-stay community hospitals (16) was used to estimate hospital expenditures of patients with non-encephalitic acute measles:

1963 -----	\$38.91	1966 -----	\$48.15
1964 -----	41.58	1967 -----	54.08
1965 -----	44.48		

The 1968 estimate was based on the change from 1967 to 1968 in the BLS index of Hospital Room Rates. The daily expense figure was then multiplied by the number of patient days. We assumed that the cost of gamma globulin for measles contacts would have been \$276 per 1,000 cases with no immunization program (5).

The cost, in excess of normal maintenance cost, of custodial care for the institutionalized has been estimated at \$3,000 per year per patient and is assumed to recur each year for the next 40 years. This figure is based on unpublished NCDC data and a personal communication from Donald R. Calvert, Bureau of Education for the Handicapped, Department of Health, Education, and Welfare.

Paradoxically, it is incorrect to say that the cost to society of institutionalizing one person

for 40 years at \$3,000 per year is \$120,000. The present value of the cost actually is \$61,890 when discounted at 4 percent for the reason that a sum of money to be received or spent years into the future is less valuable or costly than that same sum today. This phenomenon only reflects the fact that money represents a claim on resources, which, if efficiently used, produce still more resources over a period of time.

Putting this in terms of dollars, one knows that if the current interest rate is 4 percent, then \$100 invested on the spot will become \$104 at year's end or \$108.16 in 2 years. Alternatively, \$100 is the present value of \$104 in 1 year or of \$108.16 in 2 years if discounted at 4 percent. Hence, the present value of \$3,000 a year for the next 40 years is

$$\begin{aligned}
 & \$3,000 + \frac{\$3,000}{1.04} + \frac{\$3,000}{(1.04)^2} + \dots \\
 & \qquad \qquad \qquad + \frac{\$3,000}{(1.04)^{39}} = \$61,890
 \end{aligned}$$

An interest rate of 4 percent, rather than the 5 percent suggested by the Joint Economic Committee of Congress, is used because some data (for example, lifetime earnings) have not been compiled at the 5 percent rate.

The dollar loss due to mortality—an indirect economic cost—is comprised of current and future earnings, representing the value of goods and services, foregone as a result of the premature death of persons who otherwise would have been expected to join the labor force. As explained, since losses reach into future years, the proper way to evaluate them is to discount them at 4 percent. We followed the outline described by Rice for computations (10). Factors such as distribution of measles deaths by different age and sex groups, participation rates in the labor force, earnings, and life expectancy were considered.

For those who would never join the labor force because of mental retardation, the economic value of the losses involved were calculated as described previously. The value of time lost from work because of measles in the adult population takes into account the distribution of measles morbidity and earnings in that group (6-10 and unpublished data from Wilder).

*Cost of immunization.* We estimated the public and private cost of immunizing persons—in

the public sector, this cost includes promotion expenses as well as the cost of producing, distributing, and administering vaccine—at \$3 per dose of vaccine distributed. Multiplying this figure by the number of doses distributed produces the estimated cost of immunizing persons (unpublished data of the Immunization Branch, NCDC).

## Results and Discussion

A sharp decline in estimated incidence of measles (fig. 2) shows most directly the salutary effect of immunization. The estimated incidence dropped steadily from a 1963–64 level of about 4 million cases to a low of one quarter of a million cases in 1968. Reduction in other health and resource costs (tables 1 and 2) was equally dramatic.

Results of the study clearly indicate that the immunization program, in addition to improving health in the nation, released substantial medical, educational, and economic resources for other uses. The medical resources included more than half a million hospital days and more

than 5 million physician visits. Among the savings in educational resources were 32 million schooldays; and because the program prevented 3,244 cases of retardation, it saved the large amounts of money associated with special schooling for the mentally subnormal. The immunization program also saved the nation 1.6 million workdays and, by preventing premature deaths and mental retardation, insured that more than 4,000 persons would be able to lead about 291,000 additional years of normal and productive life.

Significantly, about nine-tenths of the reduction in incidence was during 1966–68, the period of intensive national effort to eradicate measles by immunization. During this time many of the urban poor who could not afford to pay for the vaccine were immunized (17).

As with reduction of incidence, the savings in lives, cases of mental retardation, hospital days, and school days (table 1) were six times greater in the second 3-year period (1966–68) than in the first (1963–65). And the net economic savings jumped 2,000 percent between

**Table 1. Summary statement of savings due to immunization against measles**

Type of savings	1963–65	1966–68	Total
<b>Health and resource:</b>			
Cases averted.....	1, 140, 000	8, 590, 000	9, 730, 000
Lives saved.....	114	859	973
Cases of retardation averted.....	380	2, 864	3, 244
Hospital days saved.....	65, 000	490, 000	555, 000
Workdays saved.....	189, 000	1, 435, 000	1, 624, 000
Schooldays saved.....	3, 775, 000	28, 450, 000	32, 225, 000
<b>Economic:</b>			
Economic benefits.....	\$63, 192, 000	\$468, 351, 000	\$531, 543, 000
Cost of immunizing persons.....	43, 500, 000	64, 800, 000	108, 300, 000
Net economic savings.....	19, 692, 000	403, 551, 000	423, 243, 000

**Table 2. Estimated health and resource costs due to measles and benefits due to immunization, United States, 1963 through 1968**

Item	Without immunization	With immunization	Benefits due to immunization
Incidence of acute cases.....	24, 000, 000	14, 270, 000	9, 730, 000
Deaths.....	2, 400	1, 427	973
Cases of mental retardation.....	8, 000	4, 756	3, 244
Patients hospitalized with encephalitis.....	24, 000	14, 270	9, 730
Other hospitalized patients.....	120, 000	71, 350	48, 650
Hospital days.....	1, 368, 000	813, 000	555, 000
Workdays.....	4, 013, 000	2, 389, 000	1, 624, 000
Schooldays.....	79, 487, 000	47, 262, 000	32, 225, 000

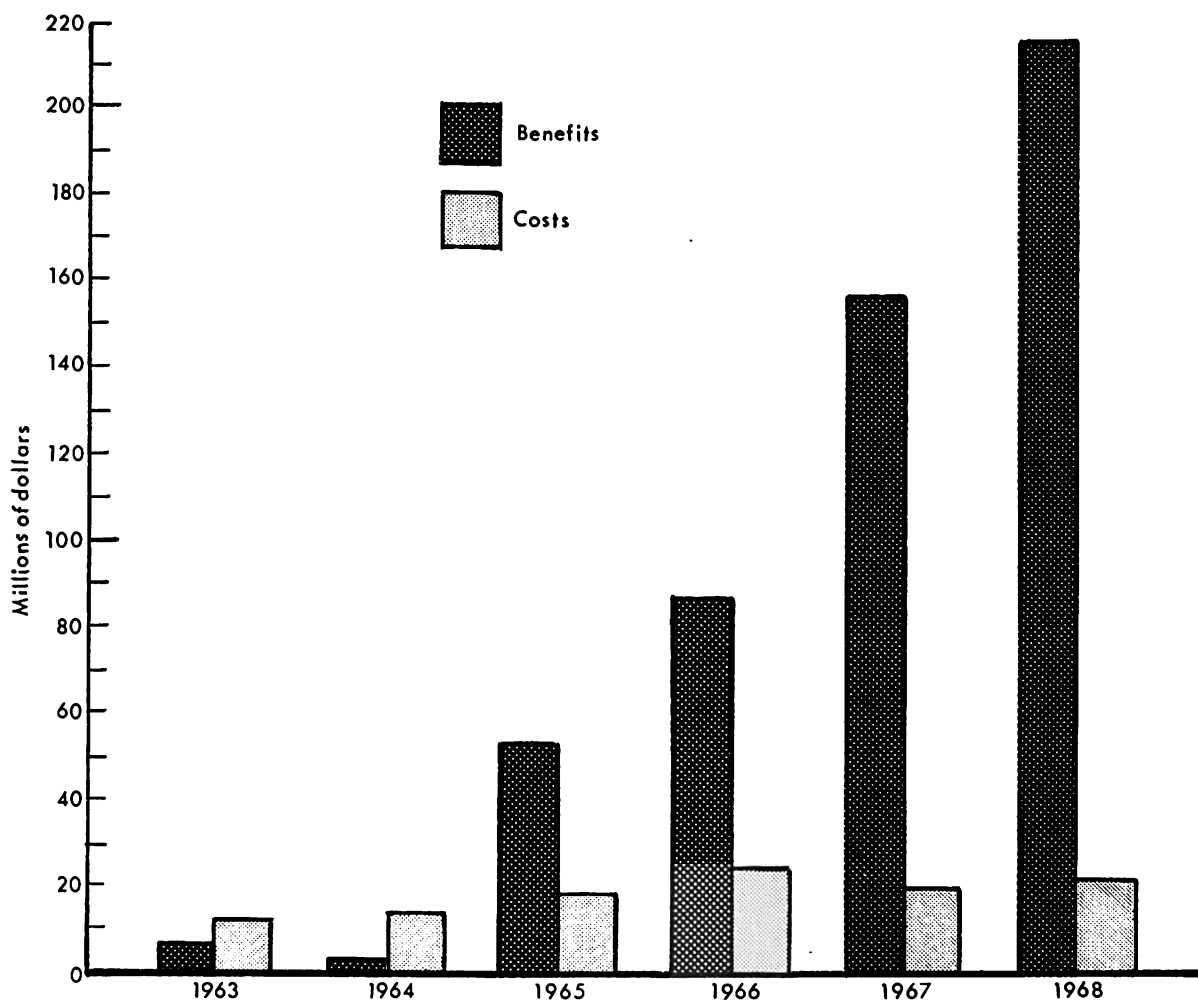
the end of the first 3-year period and the end of the second (fig. 3).

The fact that benefits appear to have increased with time cannot be completely ascribed to a more efficient use of resources: the proportion of immune persons in a population depends partly on the number of immunizations given in the past. As this proportion increases, the probability of a measles outbreak among a susceptible population decreases because of the diminished number of persons capable of spreading infection. In this way, the protective immunity that inoculation against measles confers on susceptible populations increases as time passes. The benefits therefore would also be expected to increase with time.

The relative size of indirect economic benefits is a salient aspect of the statistics on economic benefits. The indirect costs (table 3) constitute almost half (48 percent) of the total economic benefits. These costs are usually significant but nevertheless have been frequently overlooked as a part of the costs or benefits associated with a certain disease or control measure.

Possibly the most important aspect of the statistics is that they make explicit the full magnitude of the harm that can be done by a "mild" children's disease. For a long time, a bout with measles was regarded by many physicians as an unpleasant but not very dangerous part of life (18). They probably did not con-

**Figure 3. Annual benefits and costs of immunization against measles in the United States, 1963 through 1968**



**Table 3. Estimated economic costs due to measles and benefits due to immunization, United States, 1963 through 1968 (in thousands of dollars)**

Costs	Without immunization	With immunization	Benefits due to immunization
<i>Direct, medical</i>			
Total.....	\$673, 990	\$395, 592	\$278, 398
Physician services in office:			
Encephalitis cases.....	402	229	173
Other acute cases.....	86, 701	49, 442	37, 259
Physician services in hospital:			
Encephalitis cases.....	4, 523	2, 552	1, 971
Other acute cases.....	6, 892	4, 137	2, 755
Hospital services:			
Encephalitis cases.....	26, 334	13, 975	12, 359
Other acute cases.....	43, 927	26, 437	17, 490
Gamma globulin for contacts.....	5, 558	-----	5, 558
Lifetime care for mentally retarded.....	499, 653	298, 820	200, 833
<i>Indirect, loss of productivity</i>			
Total.....	604, 667	351, 522	253, 145
Premature death.....	105, 944	56, 040	49, 904
Mental retardation.....	407, 753	241, 320	166, 433
Work losses.....	90, 970	54, 162	36, 808
Grand total.....	1, 278, 657	747, 114	531, 543

sider that since the disease struck so many persons it did great damage and therefore would make an especially good candidate for eradication.

Measles has been a good candidate for an eradication effort. The results of systematic studies like this one should be used in the future not only to determine whether success or failure characterizes certain programs but also to help an administrator identify and evaluate the various ramifications of the options open to him.

### Summary

The immunization effort against measles in the United States was initiated in 1963. It has resulted in a sharp decrease in incidence of the disease—from 4 million cases in 1963 to one-quarter of a million cases in 1968—and in associated costs.

A study by researchers of the National Communicable Disease Center shows that during the years 1963 through 1968 the immunization effort is estimated to have averted 9.7 million acute cases of measles and 3,244 cases of mental retardation. It also is estimated to have saved 973 lives, 555,000 hospital days, 291,000 years

of normal life, more than 1.6 million workdays, 32 million schooldays, and \$423 million.

About nine-tenths of the savings in each of these categories has been realized in the last 3 years—the period of intensive national effort to eradicate measles.

### REFERENCES

- (1) Enders, J. F., and Peebles, T. C.: Propagation in tissue cultures of cytopathogenic agents from patients with measles. *Proc Soc Exp Biol Med* 86: 277-286 (1954).
- (2) Sencer, D. J., Dull, H. B., and Langmuir, A. D.: Epidemiologic basis for eradication of measles in 1967. *Public Health Rep* 82: 253-256, March 1967.
- (3) Dull, H. B., and Witte, J. J.: Progress of measles eradication in the United States. *Public Health Rep* 83: 245-248, March 1968.
- (4) U.S. National Communicable Disease Center: Immunization against measles, 1966-1967. Atlanta, Ga., October 1967.
- (5) U.S. National Communicable Disease Center: Measles eradication, 1967. *Morbidity and Mortality Weekly Report*, vol. 16, No. 15 (supp), April 15, 1967.
- (6) U.S. National Center for Health Statistics: Acute conditions, incidence and associated disability, United States, July 1963-June 1964. *PHS Pub-*



- lication No. 1000, ser. 10, No. 15. U.S. Government Printing Office, Washington, D.C., April 1965.
- (7) U.S. National Center for Health Statistics: Acute conditions, incidence and associated disability, United States, July 1964–June 1965. PHS Publication No. 1000, ser. 10, No. 26. U.S. Government Printing Office, Washington, D.C., December 1965.
  - (8) U.S. National Center for Health Statistics: Acute conditions, incidence and associated disability, United States, July 1961–June 1962. PHS Publication No. 1000, ser. 10, No. 38. U.S. Government Printing Office, Washington, D.C., June 1967.
  - (9) U.S. National Center for Health Statistics: Acute conditions, incidence and associated disability, United States, July 1966–June 1967. PHS Publication No. 1000, ser. 10, No. 44. U.S. Government Printing Office, Washington, D.C., March 1968.
  - (10) Rice, D. P.: Estimating the cost of illness. PHS Publication No. 947-6 (Health Econ. ser. No. 6). U.S. Government Printing Office, Washington, D.C., May 1966.
  - (11) U.S. Department of Labor: Consumer price indexes for selected items and groups. Bureau of Labor Statistics, Washington, D.C., December 1967 to June 1968.
  - (12) Rice, D. P.: Economic costs of cardiovascular diseases and cancer. PHS Publication No. 947-5 (Health Econ. ser. No. 5). U.S. Government Printing Office, Washington, D.C., 1962, p. 573.
  - (13) Scitovsky, A. A.: Changes in the costs of treatment of selected illnesses, 1951–1965. *Amer Econ Rev* 57: 1182–1195, December 1967.
  - (14) California Medical Association, Committee on Fees: Relative value studies. San Francisco, 1964.
  - (15) Schwab, P. M.: Economic cost of the 1966 St. Louis encephalitis epidemic in Dallas, Texas. *Public Health Rep* 83: 860–866, October 1968.
  - (16) American Hospital Association: Guide issues. Hospitals, August 1964; August 1965; August 1966; August 1967; August 1968.
  - (17) U.S. Department of Health, Education, and Welfare: Program analysis: Delivery of health services for the poor. Pub. No. 1967-12. U.S. Government Printing Office, Washington, D.C., December 1967, p. 15.
  - (18) Langmuir, A. D.: Medical importance of measles. *Amer J Dis Child* 103: 224–226, March 1962.

## The Emergency Medical Identification Symbol



AS PART of a campaign to familiarize emergency medical care personnel with the universal Emergency Medical Identification (EMI) symbol, the American Hospital Association, in cooperation with the Public Health Service's Division of Emergency Health Services, is distributing EMI posters, individual EMI cards, and other related material to all general hospitals in the United States.

The American Medical Association estimates that more than 200 health conditions may require special handling in emergencies, and that these conditions affect more than 40 million Americans.

The EMI symbol, developed by the AMA, can be worn as a bracelet, necklace, or anklet by persons with preexisting health problems, such as diabetes, epilepsy, and drug or antibiotic sensitivities. If they recognize the symbol, persons giving emergency care will check the patient's pockets or purse for the EMI card which explains the patient's special health problems. Thus the symbol is a silent spokesman. Without it, emergency personnel might destroy a person's life in attempting to save it.

To be prominently displayed in hospital emergency departments, the posters feature the hexagonal EMI symbol which bears a snake-entwined staff of Aesculapius—the Greco-Roman God of medicine—on a red six-pointed star. The poster has been tested in hospitals in New Mexico and Texas and proved an effective attention-getting device.

# Experiences of the Public Health Service in Training and Using Health Auxiliaries

JERROLD M. MICHAEL

FOR BROAD planning purposes, we can project long-range trends in health manpower supply and demand. We have some understanding of social, economic, and intellectual changes, and we have limited indices for measuring the implications of these changes for health and health planning. What we see is a stunning set of contrasts.

On the one hand, there are the remarkable scientific and technological advances, which are not only providing new weapons for the conquest of disease but also are creating intense public expectations that this battle will be won. Bolstering these expectations is the level of U.S. productivity, which promises to make available the resources to provide quality health care to those who need it. To assure that those who need care obtain it, the people of the United States have made a social decision that financial barriers and barriers of race, creed, and cultural difference should not exclude anyone from receiving health care—a decision implemented in titles XVIII and XIX of the Social Security Act that Congress has enacted.

In contrast to our scientific and economic successes and people's expectations based upon

---

*Mr. Michael, an Assistant Surgeon General of the Public Health Service, is assistant administrator of the Consumer Protection and Environmental Health Service. The concepts underlying this paper were originally presented on February 10, 1968, at the annual meeting of the Association of Hospital Directors of Medical Education in Chicago, Ill.*

them, we see, on the other hand, gross inadequacies in trained manpower. Professional health manpower is at present not only inadequate in quantity but in some instances so ineffectively used that the full opportunities of the professional are reduced and the hopes of the public are left unfulfilled. In an age when more effective treatment of illnesses is possible and when new proposals for facilitating the delivery of services are regularly put forward and enthusiastically discussed by planners and practitioners alike, a great many people in a great many communities believe that the existing avenues to care continue to be full of roadblocks. The quality of the care they receive falls short of their expectations. Yet spiraling hospitalization costs have increased the costs of hospitalization insurance until medical care has become a major item in the average family's budget.

The growing impatience and dissatisfaction with current health services is a measure of the acute public awareness of the difference between what is and what should be. Certainly we in the health professions, in the light of all the knowledge and experience at our command, cannot ignore the fact that some inequalities do indeed exist.

## Meeting Needs

Undoubtedly, the primary difficulties stem from shortages of resources, in particular the shortages of well-prepared and dedicated people who will protect health and assure normal de-

velopment as well as render care to the sick. Because we have had too little to work with, we have had to spread ourselves and our services too thin. The spread, however, is uneven among socioeconomic groups as well as geographically. Both the public and the professions recognize these inequities. And both understand that it is essential to shore up our manpower resources, not only in quantity but also in quality.

Out of this concern has come the Health Professions Educational Assistance Act. Upon the expansion of training facilities which will be realized through the nationwide school construction program, we can, over time, improve the availability of well-qualified men and women practicing the health professions. But it is unlikely that increasing the professional manpower supply will ever suffice in itself.

Because the adequacy of manpower resources is the foundation for everything we undertake in our society, the importance of continued efforts to strengthen these resources cannot be overstated. At the same time, it would be unrealistic to define adequacy solely in terms of the numbers of practitioners that the several professions command or the quantity of services these practitioners provide. The meaning of adequacy also derives, in large part, from the effectiveness with which the skills of practitioners are used.

Now effective use entails a great deal. It connotes an education which provides not only scientific knowledge and technical skills, but also an understanding of the force and direction of social change and of its impact on the lives of people and on professional responsibility and action.

Effective use involves such practical matters as the broader employment of existing and new types of health auxiliaries and the creation of new categories of skills. It also means the development of new working patterns and interrelationships—patterns which will permit both the professionals and the auxiliaries the greatest and most productive realization of their talents while assuring patients the finest quality of care.

Effectiveness also connotes relevance—the relevance that the prevailing modes of professional practice and the accepted systems for delivering health services have to the changing character and the changing needs of contem-

porary society. To be effective, inevitably we must be adaptable and continue our intellectual growth. Not only must health professionals exercise the sort of intellectual curiosity which leads them to determine the usefulness of advancing technology, such as computers in diagnosis or in national manpower inventories, but they must also be willing and able to adapt or redesign the pattern of their professional actions so that they can be reasonably sure they are serving the public's interests as well as their own. With that in mind, effective use must include an unremitting effort to assure the quality of all they undertake and, most certainly, the quality of the health care they provide.

Within this context, this paper reviews some experiences we in the Public Health Service have had in training and utilization of auxiliary

---

#### **Selected References on Training Auxiliaries**

U.S. Public Health Service, Division of Indian Health: Health auxiliary training—instructors guide. PHS Publication No. 1543. U.S. Government Printing Office, Washington, D.C., 1966.

U.S. Public Health Service, Division of Indian Health: Dental assistant training—student course outline. August 1966.

U.S. Public Health Service, Division of Indian Health: Curriculum guide of the advanced practical nurse training program. 1969.

U.S. Public Health Service, Division of Indian Health: A curriculum guide to public health training for the Indian licensed practical nurse. January 1968.

U.S. Public Health Service, Division of Indian Health: Indian health home nursing course—instructors guide. PHS Publication No. 1339. U.S. Government Printing Office, Washington, D.C., 1965.

Reese, D. E.: How to be a nurse's aide in a nursing home—student's manual. American Nursing Home Association, Washington, D.C., 1966.

U.S. Public Health Service, Division of Medical Care Administration: How to be a nurse's aide in a nursing home—instructors manual. PHS Publication No. 1426. U.S. Government Printing Office, Washington, D.C., 1966.

U.S. Public Health Service, Federal Health Programs Service: Purser-pharmacist mate course outline. Revised, 1969.

U.S. Public Health Service, Health Services and Mental Health Administration: Training the auxiliary health worker. PHS Publication No. 1817. U.S. Government Printing Office, Washington, D.C., May 1968.

---



**Community health representatives receiving field training at the Public Health Service Indian Hospital, Gallup, N. Mex.**

health workers in both hospital and community settings.

Several of our programs have involved such activities for a number of years. Much of this activity is direct; that is, the specific Public Health Service program actually funds, plans, and conducts the training activity, employs the worker at the end of training, and evaluates that training in terms of the worker's performance.

Other efforts of the Service in training auxiliaries are more indirect. We support health agencies and educational institutions which develop, conduct, and evaluate training for specified types of auxiliary health workers.

#### **Direct Public Health Service Programs**

Those programs which have been called "direct" were established to meet our immediate needs in providing health care to the legal beneficiaries of the Federal Government. The purposes of these training efforts are inward looking—not intended to relieve manpower pressures in the "larger world." Nevertheless, a specific intent is to create a model that can be

observed and replicated in the larger world if it seems beneficial.

In the staffing of the direct care programs which discharge our legal responsibilities for the provision of health care to designated groups such as merchant seamen, American Indians and Alaska Natives, selected members and dependents of the uniformed services, inmates of Federal prisons, Peace Corps volunteers, and employees of the Federal Government, we have conducted a wide variety of these auxiliary training programs.

In the Indian Health Service, the following 11 categories of auxiliaries are trained and used.

*Licensed practical nurses.* Since 1936 more than 1,100 Indian students have completed the course for practical nurses conducted at the Indian Health Service School of Practical Nursing in Albuquerque, N. Mex. Twenty-three students are currently in training. This 12-month program equips the students to perform routine nursing tasks under the supervision of a professional nurse, including giving treatments and administering certain medications.

*Licensed practical nurses (public health).*

Eighty-six licensed practical nurses have been trained in public health since 1961 in 3-month supplemental training programs conducted at an Indian Health Service hospital in Shiprock, N. Mex. The training prepares these women to perform routine public health nursing functions in school health programs and field clinics and to make home visits to selected families.

*Licensed practical nurses (advanced clinical).* Since November 1963, a total of 164 licensed practical nurses have been trained in 3-month advanced training programs conducted at the Indian Health Service health facility in Rapid

City, S. Dak. This training prepares the licensed practical nurses to perform, under supervision, some of the more complex nursing procedures for acutely ill patients.

*Dental assistants.* A total of 142 dental assistants have been trained since 1962 in 10-month programs conducted at permanent schools in Lawrence, Kans., Brigham City, Utah, and Mt. Edgecumbe, Alaska. This training prepares the person to assist the dentist at chairside, provide laboratory service, maintain records, and develop X-rays, among other tasks.

*Sanitarian aides.* Since 1952, a total of 286



Alaska Native dental assistant receives clinical training

sanitarian aides have been trained in 1-month programs conducted in Sandia, N. Mex., and Phoenix, Ariz. These men are trained to carry significant responsibility in the general sanitation programs of their reservations, including aspects related to both inspection and education. The sanitarian aide training programs have now been transferred to the Indian Health Service Training Center in Tucson, Ariz.

*Alaska Native community health aides.* Formal training for Alaska Native community health aides was initiated as a pilot project in 1964 with 30 aides participating. From 1965 through 1967, about 90 aides received some form of organized training. In 1968, a permanent training site was established in Anchorage, where aides are brought in and given a 3-week course. Since then and through 1969, more than 200 aides will have received training. Upon completion of the training, the aides are employed by the Indian Health Service. These employees, unique to the Alaska situation, work under the direction of physicians via radio telephone. Ultimately, it is planned to have one aide per 200 population, or from one to three aides per village.

*Accredited record technicians.* The first class of nine accredited record technicians was graduated May 30, 1968. In 1969, 10 more record technicians will be graduated. Fifteen to 20 new record technicians will be trained each year. This program is conducted in conjunction with the Bureau of Indian Affairs. The students follow an associate degree course for accredited record technicians approved by the American Association of Medical Record Librarians. This 2-year program is presently conducted at the Phoenix College, Phoenix, Ariz. A similar program is being planned with Anchorage Junior College in Alaska.

*Community health representatives.* The Indian Health Service initially planned and conducted training for about 70 community health aides. The 70 aides were trained under pilot projects, funded by grants to the tribes from the Office of Economic Opportunity. The Indian Health Service, in 1968, established a permanent training site in Tucson, Ariz., and initiated the community health representative training program. As of June 30, 1969, 185 persons have been trained in this program.

This program represents a new and unique concept for provision of health services within the Indian Health Service. The position of community health representative provides for the first time a health auxiliary who is not an employee of the local, State, or Federal Government nor a representative of an outside agency. The representative is a tribal member residing within his (or her) tribal community. The community health representative is an employee of the tribal group that he represents and is responsible to that group.

The program is based on agreements between tribes or tribal groups and the Indian Health Service. A tribe drafts and submits a proposal for one or more community health representatives. Upon acceptance of the proposal by the Indian Health Service, funds are given to the tribe, which selects, hires, and supervises the employee or employees. The only stipulation is that the community health representative receive 4 weeks of basic training at the Indian Health Service training center at Tucson, Ariz., plus field training experience at an Indian Health Service Unit or at other health resources—State, county, city, or private. The Indian Health Service plans to train at least 200 community health representatives each year.

*Social work associates.* A training program for social work associates was initiated in 1968 with two trainees at Gallup, N. Mex., and two in Anchorage, Alaska. This program has a threefold purpose. It will give the professional Indian Health social worker another resource so that needed social services can be extended to more patients. Second, it provides a work and training experience for Indians and Alaska Natives. Third, it places these people on the beginning step of a career ladder leading to advanced social work practice and opportunities for higher education. The program is a 2-year apprenticeship, consisting of on-the-job training supplemented by additional schooling in a college or junior college. It is anticipated that 12 persons will be trained each year as social work associates.

*Medical laboratory and X-ray technicians.* A school for certified laboratory assistants was organized during 1968 at Gallup, N. Mex. The training consists of a 2-year program with both academic work and on-the-job training. As

of May 1969, six students were enrolled. It is expected that at least seven new technicians per year will be trained until the Indian Health Service's laboratory needs are met.

*Supervisory food service training.* Training of food service supervisors was begun in October 1968 at Santa Fe, N. Mex. The first class, of seven members, completed 4 months of training in February 1969. Plans call for conducting two classes a year with eight students per class. Training will also be extended to food service workers below the supervisory level.

In connection with auxiliaries, I cannot emphasize too strongly that the value of any auxiliary health worker is directly proportional to the quality of his training and the quality of his supervision. Quality training and quality supervision are essential. It is also essential to determine just what jobs the workers are to

do—and where—and to train them for the specific jobs. These precepts are so elementary that it is almost redundant to state them, yet we see all too many instances in which these obvious first steps have been forgotten or overlooked.

Not long ago, a number of newspapers carried an article concerning 1,000 persons who had been trained in health occupations under a poverty program activity, none of whom were found to be employable at the end of the training. The training agency either had not designed its training to meet the needs and interests of the employing agencies within the community or had not given the true demand for auxiliary manpower sufficient evaluation. The health industry cannot afford many such mistakes—either economically or politically.

Undoubtedly, a major reason for the success of the Indian Health Service in this business of



Sanitarian aide learns to use engineering equipment at Sandia, N. Mex., school



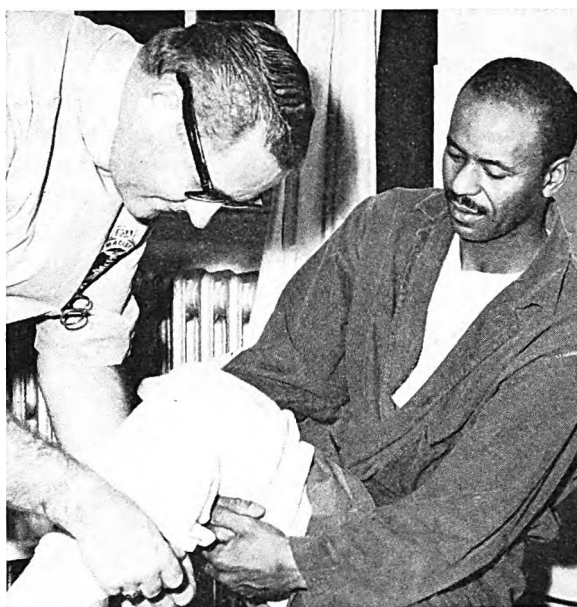
training and using auxiliary health workers is that its health care system promotes—in fact, demands—a careful determination of how auxiliaries will be used and how they will be supervised. Given this requirement, the determination of the content and the design of the training methodologies becomes self-evident.

What of some of the other programs such as the Federal Health Programs Service, formerly the Division of Hospitals? Like the Indian Health Service, this program trains principally to meet its own manpower needs. Training in 25 categories is currently underway.

Included in these 25 categories are such professional training programs as medical and dental internships and residencies and the post-graduate training of staff officers in nursing, pharmacy, physical therapy, and dietetics. Also included, however, are training programs for auxiliaries such as laboratory technologists and licensed practical nurses, plus a wide variety of training in the specific skills needed in the laundry, buildings and grounds, and housekeeping areas of hospitals. Many of the programs in the latter group are supported by the Office of Economic Opportunity. A 1968 inventory of professional and technical training in the Federal Health Programs Service disclosed a total of 173 affiliation training agreements, including 119 with universities, 30 with nongovernment hospitals, and 24 with other related medical training institutions.

*Housekeeping aides training course.* Recently the Public Health Service Hospital in Staten Island, N.Y., introduced a new training course for housekeeping aides directed at all incoming housekeeping employees as well as those already on the staff. Its purpose is to make the work of these employees more effective and thus improve the hospital's sanitation program. The course was presented 2 hours a day for 2 weeks and covered subjects to help the housekeeping aides to gain knowledge and develop skills related to their work. At its conclusion the trainees were given both a written and practical examination. This training course has been planned as a continuing activity at the hospital.

Undoubtedly, this study will have far-reaching effects in improving the delivery of health care. The results should give major impetus to the formulation of a logical method-



**Purser-pharmacist mate instruction on the dermatology service, Public Health Service Hospital, Staten Island, N.Y.**

ology for determining which health functions in which situations are best handled by which health worker.

*Purser-pharmacist mate training.* The Service's Staten Island hospital is engaged in training another type of worker which may be of interest, a "purser-pharmacist mate." This training, begun in 1966, is a cooperative effort of the Purser's Union, the Staff Officers' Association of America, the Department of Labor, and the Public Health Service. The course is designed to provide medical competency aboard vessels of the merchant fleet, vessels which traditionally have not had this capability. This ship's officer, being on independent duty, has only his own knowledge and skill, supported by radio communication with a Public Health Service Hospital medical officer, to serve the health needs of his vessel. The training course is of 9 months' duration and consists of 660 didactic instructional hours and 420 hours of practical experience. Graduates are certified by the U.S. Coast Guard as having met the standards necessary to qualify as a purser-pharmacist mate. As of June 1969, 86 graduates were serving aboard U.S. flag vessels.

Recently, a graduate of the first class of the pharmacist mate training school called at union

headquarters to clarify personal business and incidentally described some of the medical cases he had handled on his first trip as a pharmacist mate. He had treated a patient with hepatitis and a seaman with an infected appendix, both serious medical incidents. He told how he isolated the hepatitis patient, thus preventing the spread of a serious contagious disease, and how he cared for the man with appendicitis until he could be put ashore for an operation. The pharmacist mate chalked off both cases as routine, but actually both incidents proved the effectiveness of the pharmacist mate training.

Perhaps, however, the most important health auxiliary activity of the Federal Health Programs Service, in terms of long-term effects, is a joint effort underway with the Public Health Service's manpower program and the Department of Labor to develop a methodology for performing task analyses on the various health occupations. The health field has the only major occupations for which such analyses have never been done. As a result, there is apt to be little comparability in training programs offered in different places for the same job title and, since there is no uniform way of arriving at what tasks the job title calls for, no assurance that the training provided will qualify the person to meet the task requirements.

### **Model Program Concept**

To return for a moment to model programs. We believe that in the Public Health Service we have an excellent opportunity to serve a national need through our intramural laboratory capability.

By establishing a training program that can be observed at all times through an educational one-way mirror, we provide a mechanism for observation and critique of the content and methodology of the training. Such a training forum, under the scrutiny of the health profession, can serve the same kind of valuable need that is being met by certain West Coast pioneers in multiphasic screening, who encourage review of their methodologies by the health industry at large for possible replication where applicable.

This model is practical within the Service because the persons who are trained are trained only because of a reasoned and definitive need

and, once trained, are placed in an operating situation under supervision.

The Service has published a pamphlet entitled, "Training the Auxiliary Health Worker," in which the functions of the auxiliaries, the content and cost of their training, and the training facilities needed are analyzed. If training programs along these lines become more widespread, health manpower needs could be alleviated and health services improved.

### **Emphasis on Planning**

The skyrocketing of medical care costs, particularly for hospitalization, prompted the Public Health Service to conduct a program analysis study of health care facilities. Serving on the Program Analysis Committee on Health Facilities were staff experts of various agencies of the Department of Health, Education, and Welfare, who met with consultants from various health institutions including medical schools. One result of these meetings was the publication of a report by the Program Planning Office of the Service's Bureau of Health Services entitled "Program Analysis of Health Care Facilities" (1). This report presented 10 recommendations of the committee, in all of which planning, training, and education were stressed.

Another committee was appointed by the Secretary of Health, Education, and Welfare to study hospital effectiveness. Here, too, staff experts were called upon to meet with professional authorities in the field. The committee's conclusions were presented in a 1968 report entitled "The Report of the Secretary's Committee on Hospital Effectiveness," which likewise emphasized the need for better planning, among other recommendations (2).

### **Tasks for the Future**

Since the experts agree that the keystone in better utilization of health care facilities is improved planning, training, and education, it would follow that these elements are equally crucial in the utilization of health personnel. In addition, planning aimed at the most effective use of health manpower must also be responsive to changing knowledge and social changes and to the increasing expectations of health service consumers.

This review of what has already been done

by no means covers the entire range of efforts by the Public Health Service in auxiliary manpower development. I would like to review some of the things which it seems logical must still be done if we are to meet our immediate need for more health manpower. I believe we can agree that nothing is more important than using the existing manpower supply—professional, technical, and auxiliary—more effectively, and also examining carefully how our limited supply of health personnel now functions. The scarcity of health manpower must be viewed as both a national and a local problem, and the approach to its solution must be systematic, based on sound knowledge of the makeup of the health system and with the needs of the patient identified and kept paramount.

It would be well to plan in terms of adequately

training all auxiliary personnel, even the house-keeping aides, for the specific needs of each institution. Also, analysis and on-the-spot observation and experiment will enable us to identify those functions which can be performed satisfactorily by the technician or auxiliary worker under appropriate supervision.

#### REFERENCES

- (1) Department of Health, Education, and Welfare, Program Planning Office, Bureau of Health Services: Program analysis of health care facilities. U.S. Government Printing Office, Washington, D.C., 1968.
- (2) Department of Health, Education, and Welfare, Office of the Secretary: The report of the Secretary's Committee on Hospital Effectiveness. U.S. Government Printing Office, Washington, D.C., 1968.

## \$2.5 Million in Grants Awarded to 6 Comprehensive Health Projects

Grants totaling more than \$2½ million have been awarded by the Health Services and Mental Health Administration, Public Health Service, to six comprehensive health services projects as follows: \$124,354 to the University of Miami, Coral Gables, Fla., for the Demonstration Project of Comprehensive Family Health Care in a Municipal Teaching Hospital; \$667,851 to the Meharry Medical College, Nashville, Tenn., for the Comprehensive Health Services Program; \$300,000 to the Community Health Care Center Plan, Inc., New Haven, Conn., for the Community Program for Prepaid Family Health Care; \$1,050,000 to the Hunts Point Multi-Service Center, Inc., Bronx, N.Y., for the People's Health Clinic; \$350,000 to the North East Neighborhood Association, Inc., New York, for the NENA Comprehensive Services; and \$400,000 to the Kate Bitting Reynolds Memorial Hospital, Winston-Salem, N.C., for the Community Health Center Program.

In keeping with the intent of the Partnership for Health Program under which these monies were awarded, the ultimate objective of these projects is to improve the general health of the target populations by making high-quality comprehensive health services available and ac-

cessible. All are designed to provide at least comprehensive family-centered primary care in their communities. More than 200,000 people will be served; the majority are low income or medically indigent, or both.

These projects are based on the concept of family-oriented primary health care. Health teams of professional and auxiliary personnel will provide a broad range of health services, linked to other local social, economic, and environmental services. Both the providers and consumers of these health services will participate fully in the development and operation of these projects.

Two of the projects, the Kate Bitting Reynolds Memorial Hospital in Winston-Salem, and the George H. Hubbard Hospital of Meharry Medical College in Nashville, are instituting a new concept in outpatient care through an innovatively organized hospital-based outpatient department. Unlike traditional out-patient clinics, comprehensive health services will be available on an appointment basis at these hospitals, and people will have their own family physician as head of a team concerned with all the patient's health needs. Both projects are also being coordinated with Model Cities programs in their areas.

# A Comprehensive Care Program for Migrant Farmworkers

GEORGE L. HARPER, M.D.

A RELATIVELY simple traditional public health activity for migrant farmworkers and their families in 1963 evolved into a complex program of comprehensive care by 1968, largely through the efforts of highly motivated and imaginative personnel. In essence, field services were integrated with the operation of a clinic center and referral system developed by the San Luis Obispo County Health Department in California. In view of the current interest in comprehensive care and effective delivery systems, the process of this evolution may provide clues to some of the principles, methods, and techniques required to effectively reach a specific population and provide health care in the face of cultural, political, administrative, and physical obstacles.

Funded primarily by Federal appropriations (under the National Migrant Health Act of 1962) and administered by the Public Health Service, the program was started in the southern coastal part of San Luis Obispo County and later extended to the contiguous northern part of Santa Barbara County.

The area's economy is predominantly agricul-

tural, with crops such as strawberries, beans, and celery that require seasonal workers for harvesting and packing. For many years Mexican braceros (farm laborers) were contracted as needed and supplemented by migrant workers from the California "migrant stream" until the bracero program was discontinued by Congress. Subsequently, large numbers of migrant families moved into California from Mexico (using other means of entry) and from southwest Texas.

In 1967 the distribution of the origins of 375 of the migrant families by "home base" (roughly defined as continuous residence of 3 months or longer) was California 20.8 percent, Texas 51.3 percent, Mexico 23.3 percent, and other western States 4.6 percent. Those from Mexico had arrived so recently that even an interim stopover in Texas or other waypoints en route was too brief to qualify as a "home base."

The distribution by race and ethnic background of these families was 93.4 percent white Mexican, 5.1 percent white Anglo-American, 0.5 percent American Indian, 0.3 percent Negro, and 0.7 percent unknown.

Before the program was developed specifically for the seasonal farmworkers' families, they had obtained fragmentary health services from a county hospital 30 miles away, from private physicians (if finances permitted) 5 or

---

*Dr. Harper, formerly health officer of San Luis Obispo County, Calif., is now associate professor of community medicine, University of Arizona College of Medicine, Tucson.*

more miles away, and from a public health nurse and a sanitarian who worked out of a health department district subcenter 10 miles away. The health department's well-baby clinic had been held in a local school and the family planning clinic at the subcenter.

### The Program Starts

A modest project, intended primarily to survey the health problems of the migrant families, began in 1963 when a full-time public health nurse was hired to apply herself exclusively to these families. In 2 years, by exceptionally vigorous work, the project nurse defined the health problems in reliable qualitative terms and obtained a rough quantitative appraisal of the numbers of migrant farmworkers in the area and the scope of their health "needs" (the care requirements as seen by the staff and those expressed by the families to the staff).

The families' residences were scattered throughout a 40-square-mile area of sandy soil and eucalyptus trees interspersed with farms. Including the persons eventually served in Santa Barbara County, the specific beneficiary population was estimated to be 7,000 annually and 4,000 at peak harvesting season.

The nurse used various approaches to locate these families—contact with farmworker employment channels, visits to farms, the files of the district public health nurse and sanitarian, by scouting likely residential areas, and eventually by self-referral of the clients when the nurse became known. She noted that personal health problems were common and almost uniformly neglected; knowledge of hygiene and health was poor. Frequently, the persons with health problems also had crucial socioeconomic problems. For example, in some situations both parents worked in the fields all day and left children of all ages unattended at home. Thus the children's nutrition and general care were neglected. The lack of money for the essentials—food, shelter, clothing, medical care—was sometimes a result of inability to go to work for lack of an automobile or lack of a driver's license because language or other cultural barriers (such as administrative procedures) interfered with obtaining a license. Much hardship was caused also by lack of continuous work

opportunities—seasonal crop work is notoriously sporadic and unreliable as a dependable source of adequate income.

*Backup resources.* Health service backup resources initially were inadequate; referral was limited to various health department and county hospital clinics and to the county's mental hygiene clinic. Care at the 30-mile-distant county hospital was unsatisfactory because of staff attitudes and administrative barriers. During this time, the health department set up the area's first Head Start program, and the project nurse had a major role in organizing and coordinating the program. In addition to screening workups by a pediatrician, supported by health department nurses and laboratory services, a precedent was established by the Office of Economic Opportunity (arranged by telephoning headquarters in Washington) authorizing purchase of further diagnostic and therapeutic services with Head Start funds. (This became a standard provision nationwide in the Head Start programs in ensuing years.)

Many of the migrant children were enrolled in Head Start and completed the course. Teachers, aides, and nurses were enthusiastic about the children's progress. The most spectacular case was that of 4-year-old Pancho, who was severely retarded due to hypothyroid function. Responding dramatically to treatment and named national Head Start Child of the Year, Pancho visited the President and other dignitaries at White House ceremonies.

*The culture barrier.* Barriers to effective care generally were financial, administrative, cultural, and geographic (distance and difficulty with means of transportation). Cultural problems involved the language barrier to communication and those attitudes and habits derived from a Mexican system of values translocated into an alien Anglo society. For example, many of the migrants cling to their primitive Mexican folk-culture concepts such as the belief in "Ojo de Venado"—eye of the deer or evil eye. The nurses and their helpers frequently encountered resistance and covert noncompliance because clients suspected them of using the evil eye. By contrast, although most professed to be of the Catholic religion (at that time still conservative on birth control policy at the parish level as well as at the Vatican), birth control

efforts were usually successful with acceptance of the pill or intrauterine contraceptive device. This success, needless to say, required intensive personal contact by the nurses and aides and rigorous home followup. However, among these people the husbands' attitudes sometimes seriously interfered with birth control efforts.

### **The Program Adapts and Expands**

After the first 2 years, an equally dedicated and resourceful nurse replaced the original project nurse. The subsequent results of the program confirmed the cardinal importance of the quality of the key personnel in a situation where previously unknown needs are constantly surfaced and require creative and substantive response in terms of action, personnel, organization, facilities, and equipment.

At her request, a 4-wheel-drive vehicle was provided the new project nurse for improved access to the migrant families in their out-of-the-way homesites, and a full-time Spanish-speaking aide of Mexican descent was employed to help bridge the culture gap and to serve as an auxiliary to the nurse. This proved to be a very important addition, with end results of the nurse's efforts enhanced by a factor estimated at two to three times that previously yielded.

The aide soon became invaluable as a confidant and counselor to the clients, filling the culture gap much more broadly than the linguistic bridge. She also made a major contribution by driving a large station wagon especially purchased to provide transportation for the program beneficiaries. Almost daily, the aide transported people from their homes to clinics, hospitals, physicians' and dentists' offices, and social service facilities and back. Mileage for these services was about 1,600 to 2,000 miles a month. Later, more aides of similar background were employed. During this period the nurse also averaged 1,500 miles a month mileage, an indication of the intensity of fieldwork necessary. For a 9-month period nursing referrals to care resources numbered 1,218, of which 1,125 were completed.

Because of the apparent need for a local base and clinic, in 1966 the governing body of the county was persuaded to purchase a residential building in the vicinity of the migrant residence

area. A zoning use-exception permit was obtained for operation of a public facility, and the building was remodeled to serve as a clinic, as a local staff base, and as a center for other needed services discussed later.

*Personnel and organizational changes.* Another nurse was added to the staff, more aides were hired, Neighborhood Youth Corps girls served as clerks, and several nurses gave volunteer time to the clinics. However, the chief project nurse (a registered nurse) found it difficult to search out new ways to meet the needs encountered because of the restraints of the traditional public health nursing program.

To allow the chief project nurse greater flexibility, the health department's hierarchy was reorganized so that the project nurses and aides were removed from the public health nursing division, with the chief nurse reporting directly to the health officer. A new position, "coordinator for migrant health," with specifications appropriate to a comprehensive socially oriented medical program, was created for the chief project nurse. She and her staff were then given only general supervision by the health officer, with freedom to adapt, innovate, and seek out new avenues of care. Their requests for new facilities, equipment, personnel, procedures, and supporting services were given careful attention—usually with positive results.

*Intercounty coordination.* By arrangement with operators of the migrant project in adjacent Santa Barbara County, migrant families there were referred to the clinic, and referral and followup were carried out by the field staff of that project. Through this arrangement a number of Spanish-speaking aides from the Santa Barbara project worked each clinic session and contributed substantially as interpreters and clinic assistants—explaining the patients' backgrounds, recording, weighing, taking blood pressures, and similar tasks. This working arrangement facilitated liaison between the projects and assured followup on clinic findings and recommendations for the area covered by both projects.

*The clinic.* A weekly evening general clinic was opened in the center building in the fall of 1966, with a generalist physician, nurses, and aides in attendance. A well-baby clinic previously held at a school nearby was transferred to

the center, and the nurses and aides were available for continuous "drop-in" service at the center. To illustrate the magnitude of this consultative and paramedical care, the records show 1,490 nursing "visits," in the center and elsewhere, for a 9-month period and 1,860 "primary conditions" diagnosed during actual clinic hours for a comparable 9-month period. The 1,490 figure does not include "visits" tallied for well-baby and similar traditional public health clinics. This means that, in addition to traditional activities and the collaborative physician-nurse services for the 1,860 clients, the nurses for this period consulted with and treated patients 1,490 times without direct physician involvement.

The clinic was equipped with X-ray and automatic film processing equipment, a new electrocardiograph instrument, a basic clinic laboratory fitted into the former kitchen, a pharmacy, customary clinic room gear including gynecologic instruments, and a large waiting room which was also used for health education purposes. The X-ray machine was an innovation for a general clinic—for economy and space, a portable compact model of modest cost served well.

A qualified laboratory technician was hired on an hourly basis to perform basic blood and urine analyses while clinics were in session. Specimens for microbiological examination and serologic tests for syphilis were sent to the health department laboratory, and specimens for chemical determinations were sent to a nearby private laboratory. The nurses, and to a lesser extent the aides, operated the X-ray machines and the electrocardiograph. The nurses were readily trained to screen-read for normal and abnormal electrocardiograms.

A gynecologic clinic, attended by an obstetric-gynecologic specialist, was scheduled at the facility two evenings a month. A pediatric clinic was held simultaneously with the general clinic. Soon another weekly general and pediatric clinic was started so that patients seen at clinics previously in the week could be followed up before the weekend.

The team approach to care is revealed by the following breakdown of 1,860 clinic visits for a 9-month period to April 1968; 1,454 visits or almost 80 percent were recorded in which both a nurse and physician saw the patient.

<i>Patient seen by—</i>	<i>Patients</i>	
	<i>Number</i>	<i>Percent</i>
Physician and nurse.....	1,454	78.2
Physician only.....	60	3.2
Nurse only.....	318	17.1
Not recorded.....	28	1.5

Source of referral to clinics was studied for the same 9-month period. As shown below, the availability of the clinic became well known to the client population; word-of-mouth recommendation accounted for 42.4 percent, or more than twice as many as any other category, of referrals.

<i>Source</i>	<i>Percent patients</i>
Family or friends.....	42.4
Nurse.....	18.6
Aide.....	16.9
Health educator.....	10.0
Self.....	6.1
Other.....	6.0

Night and weekend coverage was provided by the nurses and aides by responding to telephone calls from distressed clients. Home telephone numbers of the staff had been given to the patients, and quite often aides and occasionally nurses were called out nights or weekends to appraise a patient's condition and arrange for emergency transportation to the hospital, if necessary.

*Scope of care.* Eventually, the full spectrum of preventive and firstline therapeutic care became available at the center: well-baby clinics, preschool examinations, immunizations, counseling, and screening of all patients for hypertension, diabetes, tuberculosis, syphilis, anemia, and kidney disease. All types of birth control methods were made available—the most commonly used was the Lippes loop intrauterine device. Each family planning patient received a complete physical examination initially and a Papanicolaou test annually, and incidental gynecologic conditions were treated.

Most patients, with either acute or chronic conditions, were treated at the clinics. Drugs were obtained from the center's pharmacy and were dispensed by the physician at the time of treatment. For economy, the formulary was stocked chiefly with generic drugs. For many patients treatment was continued at home, usually by the program's nurses or aides, sometimes by referral to the health department's



home therapeutic care program (entitled "home health service" under Medicare).

*Referral system.* It was necessary to refer all patients who needed dental care to other resources, and many patients needed specialists for further diagnostic study and treatment. In addition to resources previously used, a complementary network of referral services was developed and frequent calls were made on internists, pediatricians, surgeons, urologists, and other specialists. Patients were often transported by an aide using the program's vehicle. Generally, a reduced-fee schedule was obtained from these private resources; Medicaid had never significantly come into play for these people because of eligibility requirements. The criteria used for selecting physicians for clinics and as referral specialists were sympathy for the beneficiary population and professional competence. However, it was difficult to find physicians interested in serving this population.

*Environmental health.* An important part of the program was a systematic effort by a Spanish-speaking sanitarian from the health department to improve living conditions. Funded by the project, the sanitarian's activity was concentrated on housing, and he consulted frequently with the nurses and aides. Most of the houses occupied by the migrants were substandard, many extremely dilapidated, with water supplies and sewage disposal systems frequently defective and screening often lacking. While some dwellings were condemned and razed, many substandard conditions were corrected as a result of the sanitarian's counseling approach. This required pressuring landlords, which occasionally had political repercussions despite the tactful manner used.

A typical hygiene problem was that of families using pages from periodicals for toilet paper. On the landlord's instructions, the paper was collected and taken outside twice a week for burning in order to avoid clogging the sewage drains. A drive to educate the people on the importance of using toilet paper was undertaken and supplies were dispensed. Moderate success was ultimately accorded this campaign. The sanitarian's report states "in one instance

we traced a dysentery outbreak to flies in the toilet area contaminating food in the kitchen. Adequate screening and fly control with proper disposal of toilet paper eliminated this problem."

*Community support and ancillary aspects.* Through intensive public relations activities—chiefly the project nurses working closely and vigorously with women's clubs and similar community organizations—the program obtained a surprising degree of sustained public interest. There were many articles in the local press and, as intended, a coming-out by voluntary organizations and individual persons to help with drives for clothing, food, household utensils, and to participate personally.

As a parallel process, the county board of supervisors responded positively to all requests for locally funded components—the special vehicles, clinic equipment, and remodeling and furnishing the center. Later, adjacent property was acquired and made into additional parking space, at cost, by the county public works department.

To make available comprehensive social services, other agencies were offered space on a part-time basis in the center. Employment and rural legal-aid services were thereby accessible regularly, and the welfare department established a local office one block away at the invitation of the health department to occupy the district public health nurse's office vacated as a result of the consolidation of services at the new clinic-center. Previously, the nearest welfare office was 30 miles distant at the county seat, for practical purposes inaccessible to many of the center's clients. A variety of other services became available at the center, such as driver training by local citizens, English-language classes in the evenings by a social worker who volunteered her time, and sewing classes 2 evenings a week by volunteer home economics students from a local college.

The spirit of the facility was expressed in a report by the nurse-coordinator as follows:

We have found that since we have established our new Migrant Center that it has become a town hall, a dog pound, a legal-aid office, a sewing center, a driver training school, a dental health education center and an emergency care center for medical needs. People

come to the clinic with many different problems that must be solved by a variety of agencies in the community. They come for advice and to gain sense of direction. Since the clinic has become established, it has put the area on the map and acted as a catalyst so that other agencies have been induced to extend services there. Recently established are new welfare, social security and employment offices.

For the migrant families who arrived in the area without food or shelter, food was stocked at the center and help was given in locating a place to live. The food stock was limited to canned milk, peanut butter, and oatmeal cereal, but occasionally it made the difference between hunger and sustenance.

### Discussion

Developmentally, the approach was empirical, with new program components originating as responses and fitting into place as organic outgrowths. This is in contrast to theoretical prestructured planning attempting to anticipate demands, needs, and wants, and the myriad intricate relationships involved in the dynamics of delivery of services. Parenthetically, it has been our experience that, even with categorical programs such as infectious disease control and family planning, the carefully planned approach converts in the developing operational stages to empiricism because so many variables cannot be anticipated or, if anticipated, quantified accurately in advance.

Of salient importance in the project were the principles of organizational flexibility and of establishing a working atmosphere conducive to the entire staff's responding creatively to needs without arbitrary or traditional restraints. In the area of personal health service, the traditional restraints of public health nursing have been particularly troublesome. The immediate solution in our project was to remove the medical program from the direct influence of the regular public health nursing staff and to employ nurses not inhibited by traditional training or experience.

The bridging of the culture gap by involving a concept of communication encompassing more than language greatly facilitated access to the clientele. Establishment of a local multipurpose facility made delivery of care far more efficient and effective and provided a focus of community

identity for the migrant families. The location of the center coupled with provision of transportation overcame the barrier of distance. Further, the adaptive methods of providing services by the staff surmounted the cultural and administrative barriers imposed by various agencies.

By incorporating into this facility a laboratory, X-ray equipment, and a pharmacy, it was made as complete a frontline clinic service as possible and minimized problems attendant to referral for laboratory service and filling of prescriptions and effectively controlled costs for these services.

The team approach with the nurse as coordinator of the team and the nurses and aides respectively performing "physician assistant" and nursing-level tasks contributed significantly to effectiveness and efficiency. Close liaison with welfare department social workers was maintained through the sharing of office and interview space. Public relations activities, volunteer participation, news media interest, and community support with the resultant political backing were all crucial determinants of the buildup and success of the enterprise. Coordination of the two projects under separate political control in the two counties was accomplished chiefly by establishing meaningful cooperative working procedures involving interchange of operational personnel.

As of 1968 several important problems remained unresolved. Because of restrictions imposed by California law, only physicians and pharmacists can legally dispense prescription drugs. However, if the nurses could have been so authorized, program efficiency and effectiveness could have been enhanced. The rationale for this position is that nurses are clinically trained (in contrast to pharmacists), that field duty nurses are in a much better position to follow up and observe patients receiving drugs, and that nurses generally maintain a close working relationship with the prescribing physician. For an effective family planning program, it is essential that nurses, and perhaps aides as well, dispense pills at clinics and at clients' homes.

Another serious program deficiency was the inability to obtain funds for underwriting hospitalization at nearby facilities. The only available facilities for inpatient care, the county hos-

pitals, were severely inadequate in terms of distance, admission barriers, poor care, and failure to supply records.

## Conclusions

Use of outreach techniques by the San Luis Obispo County Health Department helped to locate and introduce non-English-speaking migrant families to health care services and performed a two-way interpretation of what services were required as well as how patients might follow through on health advice.

The combination of useful services and a growing perception by this subcultural population of indigent and medically indigent families of their own importance led to the development of a sense of community among this group and movement toward meaningful relationships with the larger community.

A particularly important result of the outreach program is that the power structure of the county is now concerned about equality of opportunities for the migrant families and, by inference, has greater awareness and concern for other disadvantaged groups.

## Hill-Burton Grants Reach 10,000

The Hill-Burton program, which for nearly 23 years has been assisting the nation in filling its health facility needs through a Public Health Service grant and consultation program, has awarded its 10,000th grant.

The 10,000th grant was an award of \$549,817 to help construct a comprehensive rehabilitation pavilion to be part of the Villa Rosa Rehabilitation Center in San Antonio, Tex. The pavilion, which will be one of the 10 structures comprising the rehabilitation center, will cost an estimated \$1.8 million. Other structures in the rehabilitation complex, to be located on a 50-acre site adjacent to the new University of Texas South Texas Medical School, will bring the total cost of the project to an estimated \$6.5 million.

The new center will be a satellite of the 830-bed Santa Rosa Medical Center, one of the largest privately owned nonprofit hospitals in the United States. With the addition to the Villa Rosa center, the medical center will become the focal point for comprehensive health care for San Antonio and southern Texas. In addition to care for acute conditions, the hospital presently provides services ranging from dental to psychiatric care.

Plans for the new 286-bed center call for treatment and rehabilitative services for both the physically and mentally handicapped; for example, patients suffering from drug addic-

tion, alcoholism, amputation, blindness, mental illness, cancer, heart disease, cerebral palsy, deafness, or paraplegia.

The Hill-Burton program is now placing special emphasis on aiding facilities that can reduce the pressure on hospitals and thus help curb skyrocketing medical costs.

A total of \$3.3 billion has been awarded to private and public nonprofit community hospitals and related facilities through the Hill-Burton program, administered by the Health Facilities Planning and Construction Service, since its inception in 1946. In addition to hospitals and rehabilitation facilities, other types of health facilities aided by the program include long-term care facilities (including nursing homes), public health centers, diagnostic or treatment centers (outpatient facilities), and public health laboratories.

The Hill-Burton program has reflected a strong shift over the years from construction of new facilities to the remodeling and replacement of existing facilities. During the past year approximately 90 percent of the Hill-Burton funds have been used for this purpose. Hill-Burton State agencies have collectively reported that half of the nation's hospitals require modernization. To fill this need and the modernization need of other health facilities will cost about \$11 billion. Additional health facilities needed are expected to cost \$6 billion.

# Health Systems Research to Deliver Comprehensive Services to Indians

IRVING H. SCHLAFMAN, M.S.

**A** CONCEPT of community medicine and an organization of health services and practices that does not separate prevention, cure, containment, and rehabilitation are envisaged by the staff of the Indian Health Service (IHS), Health Services and Mental Health Administration, Public Health Service.

Since 1955 the Indian Health Service has been responsible for administering a comprehensive program for individual and community health that benefits approximately 400,000 geographically and culturally isolated American Indians and Alaskan Natives (1). The prime mission of the service is to elevate the health status of these people to the highest possible level through optimum allocation of all available human and physical resources. The service's mission is carried out through health programs encompassing disease intelligence and control, screening, diagnosis, treatment, preventive services, sanitary facilities construction, home care, and education.

Today, the Indian Health Service operates 51 hospitals, 55 large health centers, and more than 300 health stations in 23 mainland States and Alaska. It also contracts with 300 community hospitals, 18 State and local health departments, and with more than 400 private

practitioners to provide a variety of health services where the service does not have facilities to deliver required special care.

The experience of the Indian Health Service has highlighted the fact that, as beneficiary demands and needs for health services continue to burgeon and the gap between them and available resources continues to widen, systematic management, training, and research are mandatory to assure the wise use of such resources. IHS's comprehensive health programs must compete successfully with other demands for the tax dollar.

## Health Program Systems Center

The service has recognized its unusual opportunities to study the total dynamics of a comprehensive health delivery system that is relatively closed; to evaluate community and program data required for meaningful health planning; to develop, test, and refine management-by-objectives concepts in an operating system; and to demonstrate the effective participation of the consumers of health services—the Indians themselves—in the direction and implementation of a health program which is, after all, their program.

Strengthened by the recommendations and encouragement of many IHS subcommittees of various medical academies and public health associations, the service in July 1967 established, with congressional recognition and approval, the Health Program Systems Center (HPSC)

---

*Mr. Schlafman is chief, Epidemiology and Management Training, Indian Health Service Training Center, Health Services and Mental Health Administration, Public Health Service, Tucson, Ariz.*

on the San Xavier Indian Reservation, Tucson, Ariz., to analyze, test, and evaluate alternate methods of allocating individual and community resources to maximize the health status of American Indians and Alaskan Natives. The systems center, known as Operation SAM (Systems Analysis Module) in its early developmental period, is an applied research activity of significance for the following reasons.

*Comprehensive health services.* The center's staff of researchers in many disciplines are part and parcel of a day-to-day health services operations team. The Sells Service Unit, one of IHS's 90 basic health units and under the administrative control of the center, currently provides comprehensive health services to a discrete community of approximately 8,000 Papago and other Indians residing on, and adjacent to the Papago Reservation—the second largest reservation in the country.

Diversified operations research and systems-analyses methods are being used to develop objective descriptions of health problems and priorities; responsive health information systems; health services models and simulations; allocation methods for maximizing available resources and for efficient use of professional and auxiliary manpower; and meaningful planning and evaluation methods. As the practicality and effectiveness of procedures and methodologies are demonstrated, those systems and subsystems that are successful will be recommended for use throughout the Indian Health Service.

*Research and training.* The Health Program Systems Center's research in applied health services is intertwined with the daily operations of the Sells Service Unit. The staff is also participating in the programs and activity of the IHS training center 25 miles northeast of the San Xavier Reservation.

As new operations, management, concepts, and methodologies are successfully demonstrated by the systems center, they must be translated into service-wide practice. The training center develops and presents topical training courses in systematic management principles, problem-solving techniques, resource-allocation schemes, and program planning methods to all levels of IHS and tribal managers of health services.

The personnel of the systems center are skilled in behavioral science, systems analysis, information sciences, and statistics, among other specialties. They routinely participate in orientation courses, seminars, and training programs mutually planned and conducted with the staff of the training center. Additionally, methodologies and models developed at the systems center are being incorporated in the curriculum of the training center.

*Technical and consultative assistance.* The systems center provides technical and consultative assistance in systems research to all operating levels of the Indian Health Service. The center, on request, gives onsite assistance to area offices and service units in resolving practical systems difficulties.

The center stimulates field suggestions for applied research activities and assists field office personnel in designing and implementing their study projects. It additionally coordinates and refines field-implemented systems moving from the demonstration phase to the application phase.

The interrelationship of the systems center and the training center provides strong bases for an Indian Health Service staff college. The staff and curriculum of this college would be committed to inservice education, research, and Indian community service. Such a college would undoubtedly strengthen the quality and continuity of IHS services and personnel and facilitate the training of Indian leaders in the ultimate management and direction of their own health programs.

### **Health Services Delivery Difficulties**

The systems center is currently studying difficulties in delivering services experienced by IHS and is attempting to find rational ways to make wise decisions in allocating limited resources of personnel, money, facilities, and equipment. Such difficulties include the following: (a) understanding the relationship between health program effort and individual and community health impacts (results); (b) meaningful methodologies for grassroots planning; (c) definitive assessments of individual and community health problems and priorities; (d) application of cost-finding and cost-effec-



**Figure 1. Main building, Health Program Systems Center, Indian Health Service, San Xavier Reservation, Tucson, Ariz.**

tiveness procedures; (*e*) acquisition, storage, transmission, and retrieval of useful operational, monitoring, and planning data; (*f*) efficient use of manpower resources; (*g*) understanding the society, culture, and attitudes of the population served; (*h*) effective coordination and integration of comprehensive health services; and (*i*) constructive participation of the tribal people in the planning and evaluation of their health problems.

#### **Staffing Pattern**

The systems approach and the tools of operations research associated with it are used in the

best interests of the entire organization to give decision makers a scientific basis for solving difficulties that arise during the interactions of components of the organization. The essential concern of systems analysis is to find the optimum decision, policy, or design. One way to reach optimum decisions is to use scientist teams whose members have been drawn from various scientific and engineering disciplines. A mathematician, physician, anthropologist, and economist, for example, may work together to devise an optimal transportation system for a health clinic.

The interdisciplinary team approach is essential. A major reason for systems analysis teams

is to bring the most advanced scientific procedures to bear on the problem at hand or to develop new and more fruitful procedures. No one mind can hold all the potentially useful scientific information, but a team mind may. Although most man-machine systems have physical, biological, psychological, sociological, economic, and engineering components, the total system studied can best be understood and analyzed by those trained in the appropriate fields. A mixed team increases the number of aspects of the operation which can be examined in detail, and the team can pool ideas of possible approaches to resolve given program difficulties.

Accordingly, the full-time research staff of the Health Program Systems Center currently includes, in addition to clerical and data management support personnel, the following persons:

- 3 operation research specialists
- 2 statisticians
- 1 mathematician
- 1 anthropologist
- 3 physicians
- 1 research nurse
- 1 research director
- 1 social science analyst
- 1 program analyst
- 2 information science specialists
- 1 management specialist
- 2 health service administrators
- 1 systems analyst

They work side-by-side with the traditional preventive health and medical care team of the Sells Service Unit. Direct health services are given to approximately 1,500 Indian families. This delivery system consists of a 50-bed hospital, three health centers, and one health station on the reservation. Auxiliary service resources are the IHS medical center in Phoenix and facilities and specialists in private practice in Tucson.

Expertise of staff of the Phoenix Indian Health Area Office, the Papago Tribal Council, the Bureau of Indian Affairs, the University of Arizona, the system center's inservice advisory board, and consultants provide additional support to the center.

During its initial operational experience, the systems center has completed these tasks: (a) the documentation of individual and community baseline information; (b) descriptions and

analyses of current health delivery subsystems, procedures, and interrelationships; and (c) the preliminary development of a responsive automated management information system (2, 3).

#### Documentation of Baseline Data

In documenting the baseline data pertinent to the population under study, the center, in effect, was "calibrating the environment." Since the center will be systematically manipulating discipline mixes and program actions to measure precisely changes in health status, the need to measure the original base is evident. Examples of baseline studies undertaken by the systems center follow.

*Demographic census.* An enumeration has been completed of all Indians living on the Papago Reservation and in those urban communities contiguous to the reservation. Denominator parameters, previously unobtainable, will contribute to more precise measurements of health status. Enumeration and analyses of the data collected included age, sex, district of current residence, marital status, blood quantum, household size and composition, religion, education, occupation, employment, school enrollment, health facility utilization, and means of transportation.

*Premise and home environmental health survey.* The environmental sanitation status of each Indian home has been evaluated and documented. Indices of housing, outside environment, and sanitation facilities have been enumerated, including evaluations of food facilities, accident hazards, toilet facilities, bathing and washing facilities, water supply, waste facilities, vector infestation, housing construction, heating and ventilation, room sizes, occupancy, and lighting. Information accrued is providing a potential, previously unavailable, for studies that correlate disease with ecology, for precise identification of individual and community environmental sanitation deficiencies, and for meaningful planning and budgeting of programs.

*Transportation and communications study.* An assessment of the communication and transportation resources on the reservation has been completed. Road conditions, automobile ownership, driving time between villages and the





**Figure 2. Key punch operators, Management Information System, Health Program Systems Center.**

nearest health facilities, location of telephones, IHS bus routes, passenger loads, and transportation costs have all been documented. Analyses of such data, now underway, coupled with that of demographic data and other surveys will permit, through operations research techniques, the optimization of field health schedules, transportation services to health facilities, and facilities and services planning.

*Papago health concepts and attitudes.* Concepts of health and illness contained in Papago language and beliefs have been thoroughly analyzed. This study was designed to develop methodology for categorizing the attitudes of a discrete population group towards health and illness. Information from this study will provide helpful guidelines to medical and health care practitioners in their daily interactions with the people they serve, and provide a taxonomy of terms used by the consumers of health services in describing symptoms and conditions.

### **Systems Analyses**

The center is documenting and analyzing the activities, staffing patterns, costs, impacts, and interrelationships of various components of the total health delivery system to identify fruitful areas for testing alternate actions to effect health status improvements. Following are descriptions of several such studies.

*Public health nursing activities.* An analysis of the activities, accountability, and interaction patterns of public health nursing on the Papago Reservation has been completed. Scope and location of services provided, origin of service activities, and the communication and interaction patterns within the total health care system were studied. Studies to identify meaningful statistical information necessary to plan and evaluate public health nursing services effectively and to develop practical field procedures that will facilitate collection of this information are currently underway.

*School health services.* The center is studying the various approaches to providing school health services for Indian children now used by the IHS. These approaches are services provided exclusively by IHS personnel, services provided solely by contract with outside resources, and services provided by a combination of IHS and contract personnel.

The services—health screening, treatment or referral, followup, health education, and environmental control—are being evaluated in relationship to inputs (professional and non-professional efforts), outputs (health impacts), and costs. Preliminary simulation models of these alternative approaches have been devised to facilitate evaluation efforts.

*Sanitary facilities construction.* The relative impact of the IHS water supply and waste facility construction program (P.L. 86-121) on the health status of the population served has been studied. Selected morbidity experiences of 647 persons residing in communities served by water supplies and waste disposal facilities constructed under the program, and those of 688 persons in similar communities not so served were studied retrospectively for 2 years before and 2 years after the introduction of the facilities. Variables were carefully controlled.

Results of the study indicated significant improvement in the health status of families having these sanitary facilities. The study also highlighted the need for more intensive instruction in operating and maintaining the facilities and the need for a balanced environmental sanitation program.

*Resources allocation.* The development of a model to assist in the optimal allocation of both operational and planning resources is underway. Coded MASROP (Master Allocation System for Research and Operations Planning), the objective of this project is to develop a general mathematical model to assist in planning the resource requirements for health services and in selecting the best areas for research. The model will additionally assist in budget preparations and justification.

The methodology includes the enumeration of a standard list of patient needs by diagnoses, determining resource requirements by diagnoses, establishing minimum treatment levels, developing a measure of the increase in health

status experienced, developing computer programs to process the data, testing models on the data for the Papago Reservation, and evaluating and refining the model until specific guidelines for resource allocation can be recommended.

### **Management Information System**

To support medical and management functions of a comprehensive health program, the Management Information System (MIS) is being developed as a tool for use by physicians and field health personnel in the delivery of health services and by health planners and managers in relation to program management, planning, and budgeting requirements. The ability to identify health problems is incorporated in the system to provide support for allocation decision making. The improvement of direct health care will result from MIS providing medical and paramedical personnel with pertinent medical, social, and environmental data. The system will also provide a mechanism for quality control of medical care.

Data required to implement the prototype MIS for the Sells Service Unit are presently being consolidated for entry into a central computer storage bank. Social and demographic data and environmental data are being correlated with each person's medical record number(s). Medical data will be mechanically updated after the patient visits IHS facilities or encounters various personnel in the field. The preliminary system is scheduled to be operational on an experimental basis in the fall of 1969.

The data will be stored and can be accessible in two basic modes, online and offline, and will fulfill the two primary objectives of the system—health services support and management support. Information stored in the online mode will be on a diskfile and is accessible through remote teletype terminals at each of the medical facilities in the service unit. This system will give the physician, at the time of a patient's visit, two types of information: (a) in emergency cases, "Medalert" will deliver data in a matter of seconds on vital information such as the patient's blood type, previous critical illnesses, medication, and drug allergies and (b) before each outpatient examination a

"patient profile" will be generated; it will accompany the patient into the examining room. This profile will include summary-type data such as previous visits by date, type, and place; premise and environmental record; immunization summary by type, date, and results; and, if appropriate, a prenatal summary.

Data stored offline will be on tape files and will support both medical and management functions. It will generate statistical reports to meet area office and headquarters requirements, provide data for epidemiologic surveys, cost-benefit analysis, studies for resource allocation, and, in contrast to summary records that are standard for all visits, provide detailed patient records for physicians upon demand.

Other projects in applied health services research have been initiated by the center. Socio-cultural information concerning the consumers of health services has been studied to identify those behavioral factors which enhance or preclude full use of services. A systems design for IHS service-wide collection, analysis, and reporting of Indian vital statistics has been developed. Evaluation of the tribal community health representative program continues. Demand generators for inpatient and outpatient facilities are being studied in order to develop a model that can be used to regulate demand for services and to provide more effective and efficient services.

The center is developing tools for measuring and evaluating the impact of family planning programs on population distribution, IHS facility use, and infant and maternal morbidity and mortality. A practical index of health program priorities, developed by the Indian Health Service, continues to be refined. The maternal-infant continuum was studied to identify high-risk mothers and children more readily and to improve obstetric and pediatric practices.

#### Comments

Although considerable progress has been made by the Indian Health Service in improving the health of the American Indians and Alaskan Natives in a relatively short time (4), the health status of these descendants of our first Americans lags significantly behind other population groups in the United States. Tradition, emotion, bias, hunches, public health prac-

tice not based on theory or principle, and subjective justification for fiscal and program support can no longer substitute for quantified descriptions of specific difficulties and priorities, for analyses of alternate courses of action, and for measures of accomplishment which highlight positive impacts on health status.

We have come to a time when effective management of health services can be achieved only through decision making and allocation of resources based upon valid and meaningful information. The Indian Health Service is confident that the following improvements can be made:

- The planning and providing of preventive, restorative, and rehabilitative health services can be systematized.
- Many factors and facets can be identified and measured which contribute to the total yield of such health services.
- There are, and can be developed, accurate and practical methods and procedures for diagnosing a community's health status.
- Evaluation systems can be devised which truly reflect the results of any specific program, combination of programs, or discipline mix.
- Simulation models of health delivery systems and subsystems can be developed and used to predict changes which may occur in the health status of a discrete population when a specified package is systematically administered or altered, or both.

The Health Program Systems Center represents the service's active commitment to developing, testing, and demonstrating the efficacy and efficiency of such concepts. If its efforts in applied research can be translated into effective medical and public health practice throughout the nation's communities, the service's work will have added meaning.

#### Summary

Since 1955 the Indian Health Service has been responsible for the management of a comprehensive program for individual and community health to elevate the health status of 400,000 geographically and culturally isolated American Indians and Alaskan Natives to the highest possible level.

The service is committed to carrying out its responsibilities through judicious allocation of scarce human and physical resources, in con-

cert with the wishes and requirements of the Indian people themselves. The service has established the Health Program Systems Center at Tucson, Ariz., to develop, test, refine, and demonstrate optimal and alternative ways of planning, implementing, and monitoring comprehensive health services for a discrete population group—namely 8,000 Papago and other Indians residing on, and adjacent to the Papago Reservation.

A multidisciplinary staff is using diversified methods in operations research and systems analysis to develop objective descriptions of health services delivery problems and priorities, to design concepts of alternative improvements, to test and refine such improvements, and to demonstrate their efficacy and service-wide feasibility.

After documenting demographic, environmental, and sociocultural baseline data concerning the sample population, the center is developing and analyzing quantitative models of selected components of the delivery system to predict changes in the community's health

status when a specified program is systematically administered or altered. In addition, the center is designing a computerized management information system to serve the operational and research needs of the comprehensive health delivery system under study. This system, in prototype form, is scheduled to be in use by the fall of 1969.

#### REFERENCES

- (1) U.S. Public Health Service: The Indian health program of the U.S. Public Health Service. PHS Publication No. 1026. U.S. Government Printing Office, Washington, D.C., 1966.
- (2) Operation SAM—applied research in health services management. Health Program Systems Center Monograph, Tucson, Ariz., June 1967. Mimeographed.
- (3) HPSC current project summaries and published monograph abstracts. Health Program Systems Center Monograph. U.S. Government Printing Office, Washington, D.C., September 1968.
- (4) U.S. Public Health Service: To the first Americans—a report on the Indian health program of the U.S. Public Health Service. PHS Publication No. 1580. U.S. Government Printing Office, Washington, D.C., 1968.

## Community Health Aspects of Physical Therapy Education

A report, "Community Health Aspects of Physical Therapy Education," has been published by the University of North Carolina School of Public Health, as a result of a 5-day institute conducted in Durham, N.C., in October 1968 with 52 participants.

The institute was the climax of a 2-year project designed to strengthen the preparation of physical therapists for expanded participation in community health. The project was supported by contract No. PH 110-72 with the Public Health Service and co-sponsored by the Council of Physical Therapy School Directors and the University of North Carolina.

Discussions were led by nationally recognized community health leaders, with group problem-solving sessions assisted by physical therapists experienced in community health practice. In addition to the edited proceedings of the institute, the report includes a statement

of the potential role and function of physical therapists in community health.

A rationale for change in physical therapy curriculums is outlined in a working statement prepared by the staff and task force which planned the institute. Summary findings of 46 schools of physical therapy (83 percent responding) give an indication of the current status of community health aspects in physical therapy curriculums.

The report, with emphasis on the need for change and alternate methods for curriculum development, should be useful to other health disciplines seeking to enlarge their scope of practice and education.

Requests for a copy of the report should be addressed to Miss Lydia Holley, associate professor, School of Public Health, University of North Carolina, Chapel Hill, N.C. 27514.

# Health Defects and Need for Treatment of Adolescents in Low Income Families

ARTHUR J. SALISBURY, M.D., M.P.H., and ROBERT B. BERG, M.D., M.P.H.

**P**LANNING for new services to improve the health of children in low income families has been made difficult by the scarcity of published information regarding the number and type of the health defects which can be expected to be observed in these children. The results of examinations in schools are diluted to an undetermined degree, because they combine data on poor children and those from more affluent families (1). The reports of the causes of rejection in Selective Service examinations, although probably representative of health problems in the lower income groups, do not include information on girls (2). The Head Start program has produced considerable data for both boys and girls of preschool age (3), but this information may not be applicable to older children.

If some of the variables which seem to affect health status could be defined and considered in the planning process, planning could be facilitated. Planning could also become more specific by applying the improved knowledge of the factors that act to determine the need for services and treatment.

This analysis is intended as a possible aid to more exact planning.

## Methods

The results of physical examinations on 618 children, 14 to 16 years old and descriptive data regarding these children, including five others

who did not complete the examination, are discussed. These children were examined in July 1966 as part of the summer work program conducted by Action for Boston Community Development, Inc., the antipoverty agency for the city of Boston, Mass. All the children in this program were from low income families and lived within the boundaries of municipal Boston. All had attended school during the year before their enrollment in this program.

Selective factors determined to a degree the composition of the group. First, the enrollees were motivated either by their families or by themselves to take advantage of the offer of summer employment. Second, recruitment for the program was by referral from churches, schools, welfare workers, boys' and girls' clubs, and other sources. Thus, these children did not come from the hidden poor, and the recruitment procedure probably tended to select those children who were believed to be most likely to continue with and to profit most from an 8-week program of summer employment.

The children were directed to appear at the

---

*Dr. Salisbury is a pediatrician and consultant in maternal and child health to the Massachusetts Committee on Children and Youth, Boston. Dr. Berg is chief of pediatrics, Beth Israel Hospital, Boston, and assistant professor of pediatrics at Harvard Medical School.*

outpatient department of a Boston hospital according to a schedule. Parental permission for the examination was obtained, and the parents completed a brief questionnaire regarding the child's health history. Only portions of the data from this questionnaire are included in this report. Only a few parents accompanied their child to the examination.

A record was started for each child at the time of the examination. This record included and amplified some of the identifying and descriptive information supplied by the parents. Nonmedical employees of the sponsoring agency obtained and recorded additional information.

Height, weight, blood pressure, and visual acuity (using Snellen's literate chart only) were determined by a nurse.

Seven physicians, six of whom were pediatricians, served as examiners. One pediatrician examined the head and neck, including dentition, of every child, and the child was then sent to one of the other physicians to complete the examination. The children removed all clothing except underwear in the privacy of curtained cubicles. Approximately 10 minutes were spent examining each child. The external genitalia of the girls were not examined, and the presence or absence of inguinal hernia was determined only for the boys.

After recording his observations and reviewing those recorded by the nurse and by the physician who examined the head and neck, each examiner recorded his recommendations regarding the need for further investigation and followup care of the abnormalities discovered. In making this recommendation, the physician considered the child's history obtained from parents, the response to questions asked the child, and his subjective conclusions regarding the past and current management of the disorder.

Laboratory studies, X-rays, and tests for tuberculosis were not included in this examination. Aural acuity was estimated only grossly. No attempt was made to assess the emotional health or mental capabilities of the children.

#### **Basis for Analysis**

The results and recommendations appearing on all the records were reviewed, summarized, and coded for tabulation by one of the authors, Dr. Salisbury, with clerical assistance. In not

more than five instances was further information regarding the status of care of an abnormality sought and obtained from parents by telephone in order to make a decision regarding the necessity for further care and followup. For all other abnormalities, recommendations of the examining physician were followed in tabulating these results.

The classification of abnormalities as major or minor was, with certain exceptions, largely done in terms of the authors' objective experience and subjective interpretation. The degree and type of the existing functional handicap, the likelihood of progressive disability, and the estimated extent to which medical and other resources would be required to alleviate or eliminate the abnormality were considered.

The criteria employed in the classification of the observations as either normal or no abnormality, minor abnormality, or major abnormality are not reproduced here but are available from the authors.

#### **Descriptive Data**

A total of 623 children were examined. Of these, 343 were boys and 280 girls. Results were incomplete for five children because they did not finish the examination or some of the results were not recorded. Descriptive data, however, were recorded for all 623 of them.

*Sex.* The participation of more boys (55.1 percent of the group) probably reflects the increased personal desire of boys to become wage earners at this age and possibly also the desire of parents to have boys contribute to their own support as soon as possible. Appropriate job opportunities were available equally to boys and girls.

*Reciprocity of public assistance.* Two hundred sixty-four or 42 percent of the children were members of families receiving public assistance through Aid to Families with Dependent Children (AFDC) or other categorical programs. It was not determined if or when any of the other 359 (58 percent) had received assistance from AFDC in the past or if any of the children lived in families who received non-categorical assistance. All the children, however, were members of families whose income was low enough to qualify for programs of the Office of Economic Opportunity.

The usual sources of medical and dental care were as follows:

<i>Usual source</i>	<i>Number</i>	<i>Percent</i>
<b>Medical care:</b>		
Physician in private practice....	86	13. 8
Voluntary hospital.....	133	21. 3
Public hospital.....	334	53. 6
Government and other hospitals..	14	2. 2
None.....	40	6. 4
Two or more of these sources....	16	2. 6
<b>Dental care:</b>		
Dentist in private practice.....	160	25. 7
Dental school clinic.....	75	12. 0
Public hospital clinic.....	134	21. 5
Voluntary hospital clinic and government hospital clinic....	26	4. 2
Health department clinic.....	101	16. 2
Other and none.....	40	6. 4
No response.....	87	14. 0

*Dental observations.* The single examining physician, using only a tongue blade and light for examination, discovered severe, untreated dental disease in 29 percent or 181 of the children. In the remaining 442, or 71 percent, dental disease was absent or not major, or the child was under care which was judged to be or had been adequate.

Thus, the discovery that 29 percent of the children required extensive dental treatment must be regarded as conservative, because the examination was not made by a dentist or dental hygienist, and it is emphasized that a large, but undetermined, number of the other 71 percent were not free of dental disease.

*Medical observations.* The following results, classified as described previously, were noted. Results of dental examinations are excluded in the following text table and subsequent tables.

<i>Classification</i>	<i>Number</i>	<i>Percent</i>
No medical abnormality.....	324	52. 0
One or more minor abnormality, no major abnormality.....	202	32. 4
One or more major abnormality, no minor abnormality.....	92	14. 8
Not classified, incomplete examination.....	5	. 8
Total.....	623	100. 0

Of the 373 abnormalities noted, 99 were classified as major, and 274 as minor (table 1). These 373 abnormalities were observed in 294 or 47.5 percent of the children.

In the overall, 144 (40 percent) of the 373 abnormalities were judged to have received inadequate care. The treatment of 34 percent of the minor abnormalities and of 52 percent of

the major abnormalities was judged to be inadequate.

The numbers of major and minor abnormalities are listed in table 2.

### Predictive Factors in Planning Services

The results of the dental and medical examinations have been analyzed for variables of sex, source of care, and existence of a financial barrier to obtaining services. These analyses were made to test the possibility that any of these variables might prove to be of value in predicting the type and extent of care and treatment which will be required in treating physical defects of adolescents in low income families.

*Sex and dental disease.* Of the 623 children, 181 had severe untreated dental disease, and 442 had no major problems. Only 49 (17.5 percent) of the girls, but 132 (38.5 percent) of the boys had severe, untreated dental disease. A total of 231 girls (82.5 percent) had no major dental difficulty as compared with 211 (61.5 percent) of the boys.

There is a significant difference ( $P < 0.0005$ ) in the prevalence of severe, untreated dental disease among the boys and the girls. The lower rate of untreated dental disease among girls may possibly be explained by the increased importance attached to appearance by girls and their families, but there are other possible variables including diet, hygiene, and smoking habits which might produce a decreased incidence of caries and other disorders, as well as better care of such conditions, among girls.

This discovery indicates that planning for treatment of dental disease in these children should be based on the likelihood that the resources (funds and personnel) needed for boys

**Table 1. Adequacy of care and treatment of major and minor abnormalities**

Abnormality	Adequate		Inadequate		Total
	Number	Percent	Number	Percent	
Major.....	45	48	54	52	99
Minor.....	184	66	90	34	274
Total....	229	60	144	40	373



will be approximately double those needed for girls.

*Sex and medical abnormalities.* The examination of the boys was more complete than that of the girls in that the external genitalia of the girls were not examined, and the presence or

absence of inguinal hernia was not determined. Table 3 shows the distribution of major and minor abnormalities and comparative evaluation and treatment, or both, in the 618 children with complete observations after exclusion of the results of the two procedures in the boys.

**Table 2. Major and minor abnormalities, rate of prevalence, and percent of abnormalities inadequately treated of 618 Boston children**

Description	Number	Percent of abnormalities	Percent receiving inadequate care
Major abnormalities.....	99	100.0	52
Vision—acuity less than 20/70 in one or both eyes.....	38	38.3	37
Lungs—arrested tuberculosis, chronic cough, incapacitating asthma, repeated "pneumonia".....	14	14.1	57
Bones, joints, muscles—any abnormality of spine and large joints.....	12	12.1	67
Hypertension—systolic over 140 mm. Hg., diastolic over 100 mm. Hg., or both.....	8	8.8	100
Heart—diastolic murmur, systolic murmur with history and observations suggesting heart disease.....	5	5.5	40
Hearing—gross deafness on examination and known history of hearing difficulty.....	4	4.4	25
All other <sup>1</sup> .....	18	16.8	83
Minor abnormalities.....	274	100.0	34
Vision—acuity less than 20/40 but better than 20/70 in one or both eyes.....	78	28.4	17
Skin—nondisfiguring lesions resolving without scars.....	36	13.0	22
Development, nutrition—moderate obesity.....	35	12.8	29
Bones, joints, muscles—asymptomatic abnormalities of feet or hands.....	32	11.7	11
External genitalia (boys only)—hypospadias without history or findings of renal disease, hydrocele, varicocele, phimosis.....	24	8.7	50
Heart—systolic murmur without other findings of heart disease.....	12	4.4	58
Hearing—record of abnormal audiogram with no discernible gross deafness.....	12	4.4	100
Other <sup>2</sup> .....	45	16.9	53

<sup>1</sup> Includes inguinal hernia, seizures, aural discharge, keratitis, and marked obesity.

<sup>2</sup> Includes umbilical hernia, conjunctivitis, nasal obstruction, enlarged tonsils, and infrequent and mild asthma.

**Table 3. Distribution and the need for evaluation and treatment of major and minor abnormalities among 338 boys and 280 girls**

Category	Male		Female		Total	
	Number	Percent	Number	Percent	Number	Percent
Major and minor abnormalities.....	338	100.0	280	100.0	618	100.0
One or more major abnormality, no minor abnormality.....	59	17.8	31	11.1	90	14.6
One or more minor abnormality, no major abnormality.....	74	21.9	104	37.1	178	28.8
No abnormality.....	205	60.3	145	51.8	350	56.6
Evaluation and treatment.....	338	100.0	280	100.0	618	100.0
Inadequate evaluation and treatment.....	76	22.5	38	13.6	114	18.4
Adequate evaluation and treatment or no abnormality.....	262	77.5	242	86.4	504	71.6

**Table 4. Dental health status of Boston children according to usual source of dental care**

Source of care	Severe, untreated disease		No major problems		Total
	Num-ber	Per-cent	Num-ber	Per-cent	
Dentist in private practice.....	24	15.0	136	85.0	160
Dental school clinic.....	19	25.3	56	74.7	75
Public hospital clinic.....	60	44.8	74	55.2	134
Voluntary or government hospital clinic..	8	30.8	18	69.2	26
Health department clinic.....	28	27.7	73	72.3	101
Other and none.....	11	27.5	29	72.5	40
No response.....	31	35.6	56	64.4	87
Total.....	181	29.0	442	71.0	623

The differences in major abnormalities by sex in table 3 are significant ( $P<0.0005$ ) indicating that boys are more likely than girls to have major abnormalities, although girls are more likely to have minor abnormalities.

Table 3 also shows the comparative need for further evaluation and treatment of abnormalities, or both (major and minor combined), among boys and girls. Again, the differences in evaluation and treatment are significant ( $P<0.0005$ ) indicating the need for more treatment resources for boys.

*Source of care for dental disease.* The distribution of severe, untreated dental disease according to the usual source of dental care is

shown in table 4. The difference noted in the rates of severe disease in the seven groups are significant ( $P<0.0005$ ). These rates vary from a low of 15 percent for children receiving care from practitioners in private practice to 45 percent for children who receive their dental care at public hospital clinics. Thus, variations in needs for treatment resources can be predicted, if such information is available in advance for program planning.

*Source of care for medical abnormalities.* Table 5 shows the distribution of inadequately evaluated or treated abnormalities according to the usual source of medical care. The differences ( $P>0.700$  and  $P<0.849$ ) are not significant and, therefore, knowing the source of care does not aid in predicting the need for further evaluation and treatment of abnormalities.

*Financial barriers to treatment.* This group of children was composed of those in families receiving public assistance and those whose families, although having very low incomes, were not receiving such assistance. At the time these studies were made there was no program of medical assistance in Massachusetts for the medically indigent except for those receiving public assistance.

The medical assistance program for welfare recipients was broad and comprehensive, and any needed service was obtainable without cost to the family. This situation provided an opportunity to compare the need for dental and medical care in the recipient group, for whom there was no financial barrier, with the need in the nonrecipient group, who at that time were

**Table 5. Distribution according to usual source of medical care of inadequately evaluated or treated abnormalities**

Source of care	Evaluation and treatment inadequate		Evaluation and treatment adequate or no abnormality		Total	
	Number	Percent	Number	Percent	Number	Percent
Physician in private practice.....	20	15.6	65	13.3	85	13.8
Voluntary hospital.....	27	21.1	105	21.4	132	21.3
Public hospital.....	68	53.1	264	53.7	332	53.6
Other.....	3	2.3	11	2.2	14	2.2
None.....	9	7.0	30	6.3	39	6.4
Two or more of above.....	1	.8	15	3.1	16	2.6
Total.....	128	100.0	490	100.0	618	100.0

not eligible for financial assistance in meeting medical and dental costs.

Table 6 shows the prevalence of severe, untreated dental disease and comparative need for care of medical abnormalities among recipients and nonrecipients of public assistance.

The difference between the recipient and non-recipient groups in the care of severe untreated dental disease is not significant ( $P>0.317$ ). This difference indicates that the absence of a preexisting financial barrier to obtaining dental care does not diminish the estimate of needs for treatment in these children.

The difference in comparative need for care of medical abnormalities is not statistically significant ( $P>0.157$ ). This fact indicates that the need to provide for further and additional care of medical abnormalities cannot be predicted by the presence or absence of a financial barrier.

## Discussion

These results, like those of other studies, show the great prevalence of medical and dental abnormalities in children in low income families. These results alone are not sufficient to describe the health status of these children. The needed additional dimension has been supplied by the numbers of abnormalities judged to require further evaluation and treatment. The magnitude of the requirements for followup and treatment resources can be estimated with considerable accuracy if these results are confirmed by other studies.

Among the three factors—sex, source of care, and presence of a financial barrier—analyzed for their effect on health status, the sex of the child seems to be most useful in predicting

health service needs. The source of dental care also seemed to be of significance in this group of children. Although the absence of a financial barrier might be expected to affect health status favorably, no such correlation was demonstrated.

Many other factors undoubtedly influence the health status of adolescent children in low income families and in all other families. Among these factors are availability and accessibility of care, health attitudes in varying cultural settings, and the effect of other medical and social difficulties in the family which compete for attention. The determination of the effect of these and other factors would further facilitate planning efforts.

The intention of this report was not to discuss the implications regarding the ineffectiveness of existing systems and programs of medical and dental care which these observations reveal. Apparently existing systems and services must be changed and improved if we are to eliminate the unnecessary and unjust association of poverty and ill health.

## Summary

Adolescents in a summer work program in Boston, Mass., were given physical examinations in July 1966. Examinations of 618 of the 623 children, 14–16 years old, were completed. Families of 264 children received public assistance through Aid to Families with Dependent Children; the families of all children, however, had incomes low enough to qualify for programs of the Office of Economic Opportunity.

The prevalence of major and minor physical abnormalities and of severe dental disease was

**Table 6. Prevalence of severe, untreated dental disease, and need for care of medical abnormalities among recipients and nonrecipients of public assistance**

Classification	Recipient		Nonrecipient		Total	
	Number	Percent	Number	Percent	Number	Percent
Dental disease.....	264	100.0	359	100.0	623	100.0
Severe, untreated disease.....	72	27.3	109	30.4	181	29.0
No major problem or adequately treated.....	192	73.7	250	69.6	442	71.0
Care, evaluation, and treatment of medical abnormalities.....	262	100.0	356	100.0	618	100.0
Inadequate.....	49	18.7	79	22.2	128	20.7
Adequate or no abnormality.....	213	81.3	277	77.8	490	79.3

determined. In addition, physical abnormalities were classified according to the adequacy or inadequacy of their treatment. The prevalence of severe dental disease and of physical abnormalities was analyzed in relation to sex, usual source of care, presence of a financial barrier, and adequacy of treatment.

A total of 373 physical abnormalities was observed in 294 or 47.5 percent of the children. Of these, 99 were classified as major, such as poor vision, diastolic heart murmur, and hypertension, and 274 as minor, for example, some hearing deficiency, moderate obesity, and systolic murmur without other observations of heart disease. Fifty-two percent of the major and 34 percent of the minor abnormalities were judged to have been treated inadequately.

Twenty-nine percent of the children required extensive dental treatment, and a large but undetermined number of the other 71 percent were not free of dental disease.

Major abnormalities were observed with significantly greater frequency among boys than among girls, but the reverse was true of minor

abnormalities. Inadequacy of treatment of all abnormalities was significantly greater among boys as was the prevalence of severe dental disease.

Severe dental disease was observed less frequently in those children whose usual source of care was a dentist in private practice. The adequacy of treatment of medical abnormalities is not predictable by the source of care.

The absence of a preexisting financial barrier does not favorably affect the health of these children.

#### REFERENCES

- (1) Rogers, K. D., and Reese, G.: Health studies—presumably normal high school students, I. Physical appraisal. *Amer J Dis Child* 108: 572-600 (1964).
- (2) U.S. President's Task Force on Manpower Conservation: One third of a nation; a report on young men found unqualified for military service. Washington, D.C., 1964.
- (3) Mico, P. R.: Health services in project Head Start, Boston, 1965. Action for Boston Community Development, Boston, 1966. Mimeographed.

## National Library of Medicine Bibliographies

Bibliographies on specific biomedical subjects are published periodically by the Public Health Service's National Library of Medicine. Prepared by MEDLARS in response to requests from physicians, researchers, and educators, these bibliographies are available to interested health professionals on request. They may be obtained (request by number) from the National Library of Medicine, 8600 Rockville Pike, Bethesda, Md. 20014.

1-69. Psychotherapy in alcoholism. January 1964-August 1968. 160 citations.

2-69. Psychotherapy in drug addiction or abuse. January 1964-

August 1968. 50 citations.

3-69. Psychotropic drug addiction or withdrawal symptoms in man. January 1964-August 1968. 207 citations.

4-69. Cannabis toxicology. January 1964-August 1968. 55 citations.

5-69. Heart transplantation in man. January 1964-August 1968. 180 citations.

6-69. Kidney transplantation in man. January 1964-June 1968. 651 citations.

7-69. Progestational or estrogenic hormones and human lipid metabolism. January 1964-August 1968. 51 citations.

8-69. Programs for rehabilitation of the aged. January 1964-August 1968. 115 citations.

9-69. Sarcoidosis. January 1966-December 1968. 546 citations.

# Salmonellosis in Man in Poland, 1957-66

K. PIETKIEWICZ, M.D., and Z. BUCZOWSKI, M.D.

**E**PIDEMIOLOGIC data concerning salmonellosis in human beings in Poland during 1946-56 were published in 1961 (1). During this period 30 different serotypes of *Salmonella* were isolated in specimens from 13,500 persons. Nineteen of the 30 were recovered from clinically ill patients.

The activities of the National Salmonella Center, Gdansk, Poland, which included cooperation with field laboratories during the subsequent 10 years from 1957 through 1966, are presented in this report. The methods of cooperation and data collection were described in the previous paper (1). Most of the bacteriological investigations were carried out in field laboratories. These studies primarily concerned healthy persons who were employed or applying for employment in institutions which prohibited persons who excreted enteric pathogens from working for them.

During the 10-year period, about 28 million specimens from more than 8 million persons were examined. Samples were obtained from many of these persons several times each year. The National Salmonella Center received 16,412

cultures suspected of containing *Salmonella* from field laboratories for serotyping, 15,715 of which were confirmed as containing these organisms. Nearly half the cultures contained *Salmonella typhi*, *Salmonella paratyphi* A, *Salmonella paratyphi* B, or *Salmonella paratyphi* C, but data on these cultures are not included in this report.

A total of 56 *Salmonella* serotypes were isolated from 52,461 persons during the 10 years (table 1). Thirty-one of the 56 came from 33,640 persons with clinical illnesses and 55 from 18,821 healthy persons and persons whose medical histories were not known. The serotypes occurring most frequently in the persons who were ill were not the same as those occurring most frequently in the asymptomatic. The percentage of persons who were ill is based on the total number of persons culturally diagnosed (those ill plus those not ill). Perhaps these percentages may also serve as an index of pathogenicity for individual *Salmonella* serotypes. The given serotypes could be ranked according to their incidence, beginning with *Salmonella enteritidis* as the most pathogenic (89.4 percent) and *Salmonella give* as the least (6.7 percent). Of course, the proof of this hypothesis requires a more exact epidemiologic analysis with consideration of age groups, outbreaks (foci), and sporadic cases.

The serotypes that were infrequently encountered are summarized in the footnotes to table 1. Seventeen of the less common types were isolated from patients and 41 from other persons.

---

*The authors are with the National Salmonella Center, Gdansk, Poland. The investigation described was supported in part by grant BSS-NCDC-P-4 from the National Communicable Disease Center, Public Health Service. The late Mildred M. Galton, chief, Veterinary Public Health Laboratory, National Communicable Disease Center, assisted the authors with the preparation of this paper.*

More than one serotype was isolated from 18 persons with sporadic cases of *Salmonella* infection in the period 1957-66, only two of whom had been ill.

Salmonella organisms isolated	Persons infected
<i>S. typhimurium</i> and <i>S. enteritidis</i> .....	1
<i>S. typhimurium</i> and <i>S. heidelberg</i> .....	1
<i>S. typhimurium</i> and <i>S. paratyphi</i> B and <i>S. brandenburg</i> .....	1
<i>S. typhimurium</i> and <i>S. anatum</i> .....	2
<i>S. typhimurium</i> and <i>S. give</i> .....	2
<i>S. brandenburg</i> and <i>S. bovis-morbificans</i> .....	1
<i>S. brandenburg</i> and <i>S. give</i> .....	1
<i>S. heidelberg</i> and <i>S. newington</i> .....	1
<i>S. derby</i> and <i>S. stanleyville</i> .....	1
<i>S. derby</i> and <i>S. anatum</i> .....	1
<i>S. derby</i> and <i>S. meleagridis</i> .....	1
<i>S. saint-paul</i> and <i>S. give</i> .....	2
<i>S. anatum</i> and <i>S. give</i> .....	1
<i>S. newington</i> and <i>S. new-brunswick</i> .....	1
<i>S. haifa</i> and <i>S. gallinarum-pullorum</i> .....	1
Total.....	18

<sup>1</sup> Clinically ill.

The number and percent of ill and normal persons in the period 1957-66 are shown by infecting *Salmonella* serotypes in table 2. Isola-

tions from persons whose medical histories were unknown and from persons with miscellaneous types of infections are excluded. A drastic change in the prevalence of two serotypes occurred during the 10 years. The proportion of persons with infections caused by *S. enteritidis* increased from 7.4 percent of the total persons ill with *Salmonella* infections in 1957 to 80.5 percent in 1966; the proportion of those infected by *Salmonella typhimurium* decreased from 76.3 percent of the total to 15.6 percent. The prevalence of these two serotypes in otherwise healthy persons increased considerably. A slight decrease occurred in the percentage of ill persons infected with *Salmonella heidelberg*.

*Salmonella kottbus* was not reported in ill persons until 1961 although it had been found in normal persons in 1958. A considerable increase was noted from year to year in the number of isolations from normal persons of serotypes *Salmonella bovis-morbificans*, *Salmonella brandenburg*, *Salmonella anatum*, *S. give*, *S. heidelberg*, and *Salmonella derby*, but no similar increase was observed in symptomatic cases.

Table 1. *Salmonella* serotypes isolated from ill and normal persons, Poland, 1957-66

Serotype	Number of persons infected				Total
	Ill	Percent	Not ill	Unknown	
<i>S. enteritidis</i> .....	20, 777	89. 4	2, 468	205	23, 450
<i>S. typhimurium</i> .....	10, 241	66. 1	5, 253	136	15, 630
<i>S. bovis-morbificans</i> .....	571	42. 0	789	11	1, 371
<i>S. dublin</i> .....	433	79. 2	114	8	555
<i>S. cholerae-suis</i> <sup>1</sup> .....	269	85. 1	47	11	327
<i>S. newington</i> .....	251	10. 1	2, 233	30	2, 514
<i>S. heidelberg</i> .....	238	34. 6	450	10	698
<i>S. anatum</i> .....	231	8. 3	2, 541	11	2, 783
<i>S. brandenburg</i> .....	181	18. 9	778	9	968
<i>S. give</i> .....	156	6. 7	2, 182	22	2, 360
<i>S. kottbus</i> .....	55	13. 4	356	9	420
<i>S. derby</i> .....	53	10. 4	457	4	514
<i>S. new-hav</i> .....	38	26. 6	105	2	145
<i>S. saint-paul</i> .....	24	23. 1	80	2	106
Others.....	<sup>2</sup> 122	20. 1	<sup>3</sup> 486	12	620
Total.....	33, 640	64. 7	18, 339	482	52, 461

<sup>1</sup> *S. cholerae-suis* (diphaseic) was isolated from 51 patients and 24 other persons; *S. cholerae-suis* var. *kunzensdorf* was isolated from 218 patients and 34 other persons.

<sup>2</sup> The following 17 types were isolated from patients: *S. abortus-equi*, *S. stanleyville*, *S. haifa*, *S. mission*, *S. bareilly*, *S. tennessee*, *S. muenchen*, *S. manhattan*, *S. rostock*, *S. gallinarum-pullorum*, *S. meleagridis*, *S. london*, *S. lexington*, *S. rosenthal*, *S. new-brunswick*, and *S. senftenberg*.

<sup>3</sup> The following 41 types were isolated from persons

who were not ill: *S. bispebjerg*, *S. abortus-equi*, *S. abortus-bovis*, *S. stanley*, *S. reading*, *S. chester*, *S. kingston* var. *copenhagen*, *S. bredeney*, *S. stanleyville*, *S. haifa*, *S. mission*, *S. montevideo*, *S. potsdam*, *S. virchow*, *S. bareilly*, *S. hartford*, *S. tennessee*, *S. muenchen*, *S. manhattan*, *S. newport*, *S. blockley*, *S. chailey*, *S. hadar*, *S. rostock*, *S. panama*, *S. gallinarum-pullorum*, *S. butantan*, *S. meleagridis*, *S. nchanga*, *S. london*, *S. welleveden*, *S. orion*, *S. lexington*, *S. cambridge*, *S. drypool*, *S. new-brunswick*, *S. binza*, *S. senftenberg*, *S. alachua*, *S. heves*, and *S. thiaroye*.

Table 2. Infecting *Salmonella* serotypes from ill

Infected persons and serotypes	1957		1958		1959		1960		1961	
	Num-ber	Per-cent	Num-ber	Per-cent	Num-ber	Per-cent	Num-ber	Per-cent	Num-ber	Per-cent
<i>Ill persons</i>										
<i>S. enteritidis</i> .....	78	7.4	196	17.4	37	4.2	162	12.5	153	10.3
<i>S. typhimurium</i> .....	800	76.3	724	64.2	694	78.5	956	73.9	921	62.2
<i>S. bovis-morbificans</i> .....	9	.9	5	.4	28	3.2	16	1.2	80	5.4
<i>S. dublin</i> .....	27	2.6	6	.5	24	2.7	80	6.2	7	.5
<i>S. cholerae-suis</i> .....	48	4.6	47	4.2	12	1.4	41	3.2	28	1.9
<i>S. newington</i> .....	11	1.0	48	4.3	20	2.3	11	.8	54	3.6
<i>S. brandenburg</i> .....	2	.2	0	0	15	1.7	10	.8	80	5.4
<i>S. anatum</i> .....	33	3.1	9	.8	2	.2	4	.4	10	.7
<i>S. give</i> .....	0	0	46	4.1	10	1.1	0	0	49	3.3
<i>S. heidelberg</i> .....	26	2.5	28	2.5	34	3.8	5	.4	17	1.1
<i>S. kottbus</i> .....	0	0	0	0	0	0	0	0	25	1.7
<i>S. derby</i> .....	0	0	0	0	2	.2	0	0	13	.9
<i>S. new-haw</i> .....	5	.5	4	.3	5	.6	2	.1	9	.6
<i>S. saint-paul</i> .....	8	.8	13	1.1	1	.1	0	0	0	0
Other <i>Salmonella</i> .....	1	.1	2	.2	0	0	6	.5	35	2.4
All types.....	1,048	100.0	1,128	100.0	884	100.0	1,293	100.0	1,481	100.0
<i>Normal persons</i>										
<i>S. enteritidis</i> .....	24	3.1	48	2.6	79	6.8	63	6.7	103	3.0
<i>S. typhimurium</i> .....	491	62.9	524	28.6	422	36.5	492	52.7	1,005	29.2
<i>S. bovis-morbificans</i> .....	15	1.9	22	1.2	78	6.7	32	3.4	211	6.1
<i>S. dublin</i> .....	10	1.3	16	.9	15	1.3	13	1.4	10	.3
<i>S. cholerae-suis</i> .....	5	.6	4	.2	3	.3	0	0	5	.2
<i>S. newington</i> .....	79	10.1	316	17.2	207	17.9	114	12.2	415	12.1
<i>S. brandenburg</i> .....	9	1.2	9	.5	40	3.5	68	7.3	213	6.2
<i>S. anatum</i> .....	99	12.7	75	4.1	44	3.8	54	5.8	145	4.2
<i>S. give</i> .....	1	.1	669	36.4	149	12.9	21	2.2	784	22.8
<i>S. heidelberg</i> .....	12	1.5	20	1.1	71	6.1	25	2.8	37	1.1
<i>S. kottbus</i> .....	0	0	1	.1	4	.3	15	1.6	204	5.9
<i>S. derby</i> .....	2	.3	3	.2	7	.6	4	.4	180	5.2
<i>S. new-haw</i> .....	6	.8	11	.6	15	1.3	5	.5	14	.4
<i>S. saint-paul</i> .....	13	1.7	39	2.1	0	0	4	.4	5	.2
Other <i>Salmonella</i> .....	14	1.8	77	4.2	23	2.0	24	2.6	106	3.1
All types.....	780	100.0	1,834	100.0	1,157	100.0	934	100.0	3,437	100.0

NOTE: Percentages may not add to 100.0 because of rounding.

This result seems to confirm the hypothesis that these six serotypes show a lesser degree of pathogenicity.

A total of 336 foodborne *Salmonella* infections were recognized clinically, by laboratory studies, or by both means, during this 10-year period (table 3). The percent of foodborne outbreaks attributed to salmonellae varied from about 14 to 34 percent of the total number of incidents, although no consistent trends in their occurrence were observed.

The majority of the *Salmonella* outbreaks involved less than 10 ill persons, although in 50 outbreaks 26 to 100 persons reportedly were involved and in 13 outbreaks, 101 to more than

500 persons (table 4). The six largest outbreaks affected 210, 222, 296, 380, 522, and 556 persons.

The population of Poland increased from 28,310,000 persons in 1957 to 31,551,000 in 1965. In 1957, the proportion that was rural was 54.7 percent and in 1965, 50.3 percent. The outbreaks and patients involved, by environment of residence and year, are shown in table 5. The predominance of incidents oscillated considerably between rural and urban populations with no definite trends, although 193, or 57.4 percent, of the outbreaks occurred in rural areas and 143, or 42.6 percent, in urban.

The average number of patients per outbreak was 20.3 in rural areas and 24.3 in the cities.



# and normal persons, by year, Poland, 1957-66

1962		1963		1964		1965		1966		Total 1957-66
Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	
921	31.8	2,006	59.9	4,163	78.6	6,968	80.2	6,093	80.5	20,777
1,710	58.9	1,057	31.6	885	16.7	1,315	15.1	1,179	15.6	10,241
51	1.8	32	.9	18	.3	310	3.6	22	.3	571
68	2.3	57	1.7	113	2.1	8	.1	43	.5	433
22	.8	35	1.0	20	.4	11	.1	5	.1	269
32	1.1	20	.6	32	.6	8	.1	15	.2	251
31	1.1	24	.7	7	.1	1	.01	11	.1	181
4	.1	54	1.6	7	.1	31	.3	77	1.0	231
25	.9	13	.4	3	.1	6	.1	4	.1	156
14	.5	12	.4	0	0	3	.03	99	1.3	238
7	.2	2	.1	1	.01	16	.2	4	.1	55
10	.3	21	.6	3	.1	2	.02	2	.02	53
1	.03	0	0	7	.1	1	.01	4	.1	38
1	.03	0	0	0	0	1	.01	0	0	24
4	.1	17	.5	36	.7	10	.1	11	.1	122
2,901	99.9	3,350	100.0	5,295	99.9	8,691	99.9	7,569	100.2	33,640
115	7.4	193	8.1	376	26.2	602	33.0	865	28.7	2,468
550	35.5	427	18.0	415	28.9	496	27.2	431	14.3	5,253
133	8.6	78	3.3	57	4.0	53	2.9	110	3.6	789
14	.9	13	.5	13	.9	4	.2	6	.2	114
4	.3	4	.2	4	.3	15	.8	3	.1	47
261	16.8	315	13.3	228	15.9	94	5.2	204	6.7	2,233
118	7.6	256	10.8	18	1.2	12	.6	35	1.2	778
83	5.4	558	23.6	116	8.1	353	19.3	1,014	33.6	2,541
148	9.5	241	10.2	100	7.0	46	2.5	23	.8	2,182
18	1.2	34	1.4	7	.5	16	.9	210	6.9	450
20	1.3	19	.8	26	1.8	49	2.7	18	.6	356
47	3.0	120	5.1	12	.8	27	1.5	55	1.8	457
6	.4	7	.3	16	1.1	15	.8	10	.3	105
9	.6	6	.3	3	.2	0	0	1	.03	80
23	1.5	98	4.1	45	3.1	43	2.4	33	1.1	486
1,549	100.0	2,369	100.0	1,436	100.0	1,825	100.0	3,018	99.9	18,339

The average number of persons involved in single-family outbreaks in both rural and urban areas was four to five. In other outbreaks not associated with specific environments but only with certain areas of towns, villages, or districts, an average of 56 persons per focus were involved in towns and 40 persons per focus in villages.

The lower number of patients in rural outbreaks may be explained partly by incomplete registration of patients in those areas. Nevertheless, the restaurants, canteens, shops, and ready-to-eat foods available to the urban population must be taken into account. Two of the six largest outbreaks (one involving 556 persons and the other 380) occurred in towns, and the other

four (with 522, 296, 222, and 210 persons affected) occurred in the country; however, the environments of the persons affected varied.

Reported outbreaks of *Salmonella* infections with infecting serotype, number of patients involved, and source of infection are shown in table 6. *S. typhimurium* accounted for 258 (76.8 percent) of all outbreaks. Only four other serotypes were involved in more than two outbreaks.

These types, with number and percent affected were as follows: *S. enteritidis*—44 (13.1 percent), *Salmonella dublin*—19 (5.6 percent), *Salmonella cholerae-suis* var. *kunzendorf*—5 (1.5 percent), and *S. heidelberg*—4 (1.2 percent). Of the six largest outbreaks, four were

caused by *S. typhimurium*, one by *S. bovis-morbificans*, and one by *S. enteritidis*. Outbreaks caused by *S. typhimurium* were evenly distributed between the urban and rural populations. Foci of *S. enteritidis* were slightly more predominant in the country. However, all five outbreaks of *S. cholerae-suis* var. *kunzen-dorf* occurred in the urban population.

It should be emphasized that the parts played by *S. typhimurium* and *S. enteritidis* in *Salmonella* food poisoning in Poland have remained constant for 20 years. The previous report (1) showed that in the years 1946-56, *S. typhimurium* was the cause of 74.5 percent and *S. enteritidis* of 15.0 percent of all *Salmonella* food poisoning outbreaks. These proportions are in accordance with the data in table 6. (*S. typhimurium*—76.8 percent and *S. enteritidis*—13.1 percent). The ratio of *S. typhimurium* to *S. enteritidis* in the food poisoning of

groups remained unchanged even though in the years 1962-66 the proportion of *S. enteritidis* infections increased about seven to eight times in relation to the total number of *Salmonella* infections (table 2). This observation seems to indicate that food poisoning outbreaks caused by *Salmonella* and sporadic cases involve separate mechanisms.

Meat and meat products were the predominant sources of infection in outbreaks in which a food source was known to be the cause (130, or 84.4 percent). Eggs were the source of infection in only one reported outbreak. Unfortunately, the source was not known in 54.2 percent of the outbreaks. The small proportion of patients per outbreak indicates that most of the occurrences were single-family outbreaks, in which the search for the source of infection is frequently inadequate.

During the same 10-year period, 752 *Salmo-*

**Table 3. Outbreaks of food infections or intoxications according to bacterial etiology, by year, Poland, 1957-66**

Year	Total food infections and intoxications	Incidents of bacterial etiology	Incidents caused by <i>Salmonella</i>		
			Number	Percent of bacterial outbreaks	Percent of total food infections and intoxications
<i>1957</i>					
Outbreaks.....	91	87	24	27. 8	26. 3
Patients.....	2, 783	2, 736	352	12. 8	12. 6
<i>1958</i>					
Outbreaks.....	82	77	18	23. 3	21. 9
Patients.....	3, 105	3, 050	484	15. 8	15. 5
<i>1959</i>					
Outbreaks.....	124	107	20	18. 7	18. 1
Patients.....	3, 166	2, 860	412	14. 4	13. 0
<i>1960</i>					
Outbreaks.....	136	130	46	35. 4	33. 8
Patients.....	3, 435	3, 397	684	20. 1	19. 9
<i>1961</i>					
Outbreaks.....	122	109	29	26. 6	23. 7
Patients.....	3, 332	3, 245	401	12. 3	12. 0
<i>1962</i>					
Outbreaks.....	195	174	38	21. 8	19. 5
Patients.....	4, 519	4, 387	1, 238	28. 2	27. 3
<i>1963</i>					
Outbreaks.....	210	195	29	14. 8	13. 8
Patients.....	4, 519	4, 385	716	16. 3	15. 8
<i>1964</i>					
Outbreaks.....	184	171	38	22. 2	20. 6
Patients.....	3, 920	3, 819	669	17. 5	17. 0
<i>1965</i>					
Outbreaks.....	269	196	54	27. 5	23. 5
Patients.....	4, 932	4, 766	1, 695	35. 5	34. 5
<i>1966</i>					
Outbreaks.....	236	145	40	27. 6	16. 9
Patients.....	5, 196	4, 225	739	17. 5	14. 2

NOTE: 3 or more patients constitute an outbreak.

**Table 4. *Salmonella* food intoxication incidents by number of persons involved and type of organism, Poland, 1957-66**

Number of persons involved	Number of outbreaks caused by—				
	<i>S. typhi-</i> <i>murium</i>	<i>S. enteri-</i> <i>tidis</i>	<i>S. dublin</i>	<i>S. cholerae-</i> <i>suis</i> var. <i>kunzendorf</i>	<i>S. bovis</i> <i>morbificans</i>
3.....	56	13	3	1	0
4-5.....	71	11	0	0	0
6-10.....	47	8	4	0	0
11-25.....	35	6	6	3	0
26-50.....	27	4	5	1	0
51-100.....	12	0	1	0	0
101-200.....	6	1	0	0	0
More than 200.....	4	1	0	0	1

**Table 5. *Salmonella* food intoxication outbreaks and number of patients involved in towns and rural districts, by year, Poland, 1957-66**

Year	Outbreaks in urban environment					Outbreaks in rural environment					Yearly total
	Single family	Boarding schools, sanitoriums	Other	Total	Percent of yearly total	Single family	State farms and children's summer camp	Other	Total	Percent of yearly total	
<i>1957</i>											
Outbreaks.....	6	3	0	9	37.5	4	6	5	15	62.5	24
Patients.....	39	72	0	111	31.5	22	142	77	241	68.5	352
<i>1958</i>											
Outbreaks.....	7	1	4	12	66.7	2	0	4	6	33.3	18
Patients.....	24	161	255	440	90.9	13	0	31	44	9.1	484
<i>1959</i>											
Outbreaks.....	7	0	4	11	55.0	3	1	5	9	45.0	20
Patients.....	27	0	284	311	75.5	21	14	66	101	24.5	412
<i>1960</i>											
Outbreaks.....	8	2	6	16	34.8	17	3	10	30	65.2	46
Patients.....	34	104	172	310	45.3	73	81	220	374	54.7	684
<i>1961</i>											
Outbreaks.....	9	2	2	13	44.8	7	0	9	16	55.2	29
Patients.....	33	36	69	138	34.4	36	0	227	263	65.6	401
<i>1962</i>											
Outbreaks.....	7	1	6	14	36.8	10	3	11	24	63.2	38
Patients.....	25	151	630	806	65.1	64	38	330	432	34.9	1,238
<i>1963</i>											
Outbreaks.....	6	2	6	14	48.3	8	1	6	15	51.7	29
Patients.....	20	51	410	481	67.2	40	37	158	235	32.8	716
<i>1964</i>											
Outbreaks.....	13	4	3	20	52.6	9	4	5	18	47.4	38
Patients.....	51	100	195	346	51.7	46	69	208	323	48.3	669
<i>1965</i>											
Outbreaks.....	10	3	3	16	29.6	21	4	13	38	70.4	54
Patients.....	43	152	108	303	17.9	122	145	1,125	1,392	82.1	1,695
<i>1966</i>											
Outbreaks.....	11	0	7	18	45.0	16	3	3	22	55.0	40
Patients.....	42	0	184	226	30.6	71	54	388	513	69.4	739
<i>1957-66</i>											
Outbreaks.....	84	18	41	143	42.6	97	25	71	193	57.4	336
Patients.....	338	827	2,307	3,472	47.0	508	580	2,830	3,918	53.0	7,390

NOTE: 3 or more patients constitute an outbreak.

*nella* isolations were obtained in the bacteriological laboratories of the National Veterinary Service and the National Health Service from foods of animal origin, other foods, animals, water, and sewage and were identified in the National Salmonella Center (table 7). Of these 752 isolations, 73 (9.7 percent) were associated with foodborne outbreaks of salmonellosis. Eighteen serotypes were involved, six of which were responsible for the majority of the reported infections from food (table 6).

A similar relationship appeared in the source

of the isolations from foods of animal origin, other foods, animals, water, and sewage (table 8) and the source of isolations in human outbreaks (table 6). The greatest number of isolations were obtained from cattle and pigs and the meat of these animals. Although *Salmonella gallinarum* and *Salmonella pullorum* accounted for most of the isolations from poultry, eggs, and egg products, no infections in human beings from these serotypes have been reported. *S. give*, found in animals and meat, has not been associated with outbreaks in man, but it has been

**Table 6. *Salmonella* outbreaks by serotype and source of infection, Poland, 1957-66**

<i>Salmonella</i> serotype	Source of infection				Total	
	Meat and meat products	Eggs	Other products	Unknown	Number	Percent
<i>S. typhimurium</i> :						
Outbreaks.....	<sup>1</sup> 98	1	<sup>2</sup> 18	141	258	76. 8
Patients.....	3, 572	65	1, 104	789	5, 530	74. 8
<i>S. enteritidis</i> :						
Outbreaks.....	14	0	<sup>3</sup> 3	27	44	13. 1
Patients.....	885	0	27	126	1, 038	14. 0
<i>S. dublin</i> :						
Outbreaks.....	12	0	<sup>4</sup> 1	6	19	5. 6
Patients.....	317	0	14	40	371	5. 0
<i>S. cholerae-suis</i> var. <i>kunzensdorf</i> :						
Outbreaks.....	3	0	0	2	5	1. 5
Patients.....	65	0	0	18	83	1. 1
<i>S. bovis-morbificans</i> :						
Outbreaks.....	1	0	0	0	1	. 3
Patients.....	296	0	0	0	296	4. 1
<i>S. heidelberg</i> :						
Outbreaks.....	1	0	0	3	4	1. 2
Patients.....	15	0	0	10	25	. 3
<i>S. haifa</i> :						
Outbreaks.....	0	0	<sup>5</sup> 1	1	2	. 6
Patients.....	0	0	23	4	27	. 4
<i>S. anatum</i> :						
Outbreaks.....	0	0	0	1	1	. 3
Patients.....	0	0	0	9	9	. 1
<i>S. newington</i> :						
Outbreaks.....	0	0	0	1	1	. 3
Patients.....	0	0	0	6	6	. 1
<i>S. group B</i> (unidentified):						
Outbreaks.....	1	0	0	0	1	. 3
Patients.....	5	0	0	0	5	. 1
Total:						
Outbreaks.....	130	1	23	182	336	100. 0
Patients.....	5, 155	65	1, 168	1, 002	7, 390	100. 0
Percent of total outbreaks.....	38. 7	. 3	6. 8	54. 2		100. 0
Percent of all patients.....	69. 8	. 9	15. 8	13. 5		100. 0

<sup>1</sup> Includes outbreaks caused by duck meat.

<sup>2</sup> 7 outbreaks caused by cakes, 2 by ice cream, 7 by processed dishes, 1 by smoked fish, and 1 by sweet vanilla milk soup.

<sup>3</sup> 1 outbreak caused by fish, 2 by processed dishes.

<sup>4</sup> Caused by grease of animal origin.

<sup>5</sup> Caused by a canteen meal.

NOTE: 3 or more patients constituted an outbreak.

**Table 7. Isolations of *Salmonella* serotypes from foods of animal origin, other foods, animals, water, and sewage, by year, Poland, 1957-66**

Salmonella serotype	Number of isolations <sup>1</sup>												Total iso- lations									
	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966												
<i>S. cholerae-suis</i> -----	8	3	1	4	6	16	121	39	15	11	12	235	1									
<i>S. typhimurium</i> -----	6	5	4	3	6	3	7	5	24	7	21	11	68	6	18	1	15	10	46	4	215	55
<i>S. dublin</i> -----	2	1	4		11	4	7		12		8	2	14	2	6		3		6	1	70	6
<i>S. enteritidis</i> -----	1	1	0		2	2	2		4		6	2	3	1	7		7	3	22		54	9
<i>S. bovis-morbificans</i> ..	1		0		0	0	1		0		1	0	1	0	3	1			1		7	1
<i>S. give</i> -----	0		19		0	0	1		0		0	0	0	0	0		0		0		20	
<i>S. saint-paul</i> -----	0		3		0	0	0		0		0	0	0	0	0		0		0		3	
<i>S. kottbus</i> -----	0		1		0	0	1		0		0	0	0	0	0		0		0		2	
<i>S. anatum</i> -----	0		0		1	0	0		0		0		1	0	0		0		5		7	
<i>S. gallinarum- pullorum</i> -----	0		0		0	22	7		27		18		11		3				20		108	
<i>S. brandenburg</i> -----	0		0		0	0	2		1		0		2		2				1		8	
<i>S. derby</i> -----	0		0		0	0	1		0		0		0		0				0		1	
<i>S. newport</i> -----	0		0		0	0	1		0		0		0		0				3		4	
<i>S. newington</i> -----	0		0		0	0	0		2		3		1		1				4		11	
<i>S. muenchen</i> -----	0		0		0	0	0		0		1		0		0				0		1	
<i>S. senftenberg</i> -----	0		0		0	0	0		0		1		0		2				0		3	
<i>S. new-haw</i> -----	0		0		0	0	0		0		0		0		2				0		2	
<i>S. heidelberg</i> -----	0		0		0	0	0		0		0		0		0				1	1	1	1
Total-----	18	7	34	4	24	3	41	7	70	7	186	15	149	9	60	1	49	14	121	6	752	73

<sup>1</sup> Italics show the number, among the yearly isolations to the left, that were associated with foodborne outbreaks of salmonellosis.

recovered sporadically from specimens from ill persons.

### Summary

Detailed data were assembled and studied on the *Salmonella* infections diagnosed in 33,640 ill and 18,821 symptomless persons in Poland over the 10-year period 1957-66. The percent of isolations of individual serotypes from persons who became ill in relation to total isolations of the serotype from both the sick and well revealed the role of each serotype in causing symptomatic infections during this period.

The proportion of *Salmonella* food poisoning outbreaks in Poland caused by *Salmonella typhimurium* remained fairly constant over the years 1957-66, as well as over the preceding 10 years, as did the proportion of outbreaks caused by *Salmonella enteritidis*. *S. typhimurium* caused 74.5 percent of the outbreaks in the years 1946-56 and 76.8 percent in the years 1957-66. *S. enteritidis* caused 15.0 percent of the outbreaks in the earlier period and 13.1 percent in the period under study. However, in the years

1962-66, the proportion of *S. enteritidis* infections increased several times in relation to the total number of *Salmonella* infections. These results suggest that a different mechanism is involved in the spread of *S. enteritidis* infections from that operating in the spread of infections caused by other *Salmonella*.

The percentage of symptomatic infections caused by a given serotype in relation to the total infections, both symptomatic and asymptomatic, that the serotype has caused might serve as a basis for rating the degree of pathogenicity of individual serotypes. By this hypothesis, *S. enteritidis*, which caused illness in 89.4 percent of the persons in Poland it infected in the period 1957-66, would be ranked as most pathogenic of the serotypes studied; *Salmonella give*, which caused illness in 6.7 percent of those infected, would be ranked as least pathogenic.

### REFERENCE

- (1) Bucowski; Z.: Salmonellosis of man diagnosed in the years 1946-56 in Poland. Bull Inst Mar Med Gdansk 12: 51-71 (1961).

**Table 8. *Salmonella* isolations from foods of animal origin, other foods, animals, water, and sewage, by serotype and source, Poland, 1957-66**

Source of isolation	Salmonella types										Total			
	S. cholerae-suis	S. typhimurium	S. gallinarum-pullorum	S. dublin	S. enteritidis	S. give	Others <sup>1</sup>							
Foods of animal origin:														
Cattle, beef, veal.....	5	16	6	1	44	3	8	7	19	14	107	16		
Swine, pork, bacon.....	182	25	5	0	1		3		0	4	215	5		
Sheep, mutton.....	1	0		0	0		1		0	0	2			
Rabbit.....	0	1		0	0		0		0	0	1			
Hare.....	0	1		0	0		1		0	0	2			
Wild hog.....	1	0		0	0		0		0	0	1			
Meat (meat dishes).....	24	10	9	0	5	2	0		0	1	40	12		
Processed meat (jellied meats, pâtés).....	0	20	19	0	0		0		0	3	23	20		
Smoked meat (sausages, ham).....	1	1	9	7	0	2	1	1	0	0	13	9		
Animal fat.....	0	0		0	1	1	0		0	0	1	1		
Duck.....	2	26		2	0		11		0	5	46			
Goose.....	0	4		1	0		0		0	0	5			
Chicken.....	0	21		36	2		9		0	0	68			
Smoked herring.....	0	1	1	0	0		0		0	0	1	1		
Other foods:														
Salad.....	0	0		0	0		1	1	0	0	1	1		
Eggs, frozen eggs, egg powder.....	0	9		68	1		1		0	1	80			
Ice cream.....	0	2	2	0	0		0		0	0	2	2		
Artificial baby food.....	0	0		0	0		2		0	0	2			
Bone meal.....	0	0		0	0		0		0	3	3			
Fish meal.....	0	0		0	0		0		0	2	2			
Roll, macaroni.....	0	1		0	1		0		0	1	3			
Cake.....	0	6	6	0	0		0		0	0	6	6		
Food not further specified.....	0	4		0	0		0		0	1	5			
Other sources:														
Horse.....	0	3		0	1		0		0	0	4			
Rat, mouse.....	0	15		0	6		3		0	4	28			
Dog.....	1	0		0	1		1		0	0	3			
Fur animals (silver fox, nutria).....	16	32		0	4		2		0	2	56			
Guinea hen.....	0	1		0	0		0		0	0	1			
Guinea pig.....	0	1		0	0		8		0	0	9			
Monkey.....	0	0		0	0		0		0	2	2			
Snake.....	0	0		0	0		1		0	0	1			
Canary.....	0	1		0	0		0		0	0	1			
Water.....	0	2		0	0		0		1	1	4			
Sewage.....	1	0		0	1		1		0	5	8			
Pigeon.....	0	2		0	0		0		0	0	2			
Deer.....	1	0		0	0		0		0	0	1			
Puma.....	0	1		0	0		0		0	0	1			
Fox.....	0	0		0	0		0		0	1	1			
Nutria.....	0	1		0	0		0		0	0	1			
Total.....	235	1	215	55	108	70	6	54	9	20	50	2	752	73

<sup>1</sup> *S. saint-paul*, *S. derby*, *S. brandenburg*, *S. heidelberg*, *S. muenchen*, *S. newport*, *S. kottbus*, *S. bovis-morbificans*, *S. anatum*, *S. new-haw*, *S. newington*, and *S. senftenberg*.

NOTE: Italics show the number, among the isolations to the left, that were associated with foodborne outbreaks of salmonellosis.

# Racial Similarities and Differences in Family Dental Care Patterns

JANE MOOSBRUKER, Ph.D., and ANTHONY JONG, D.D.S., M.P.H.

**T**HE UNDER-UTILIZATION of health care services by blue-collar workers has been attributed to a variety of factors, including lack of sophistication in dealing with bureaucratic agencies and organizations, economics, lack of orientation toward the future, and prejudice on the part of health personnel (1). There is evidence that not only social class but also cultural factors have an effect on illness behavior (2). This paper focuses on a specific type of illness behavior, the utilization of dental care services.

Reports of a disparity in the use of dental services among various ethnic, racial, and socioeconomic groups have appeared in the literature. In general, low-income groups receive less dental care than upper-income groups (3-5). The U.S. National Health Survey (6) reported three times the average annual number of dental visits per person among whites (1.6 visits) than nonwhites (0.5 visits). Suchman and Rothman (7) in a 1965 New York City study reported that 49 percent of the whites had been to a dentist during the previous year, as com-

pared to 39 percent of the Puerto Ricans and 31 percent of the Negroes. They further stated that these differences continued to hold even when controlled on socioeconomic status, although they did not describe the methods used for this control. Wisan and co-workers (8), in a study of preschool children in Philadelphia, reported a significantly higher percentage of nonwhite children in need of dental treatment than white children.

Our study of dental care patterns in low-income families contradicts some of the previous findings and attempts to delineate some of the factors related to their low level of dental care, with particular emphasis on differences between Negro and white families.

## Subjects and Methods

The subjects of this study consisted of a respondent from each of 646 families enrolled in Boston's Summer Head Start Program of 1967. This constituted an 83 percent sample of the 778-family total enrollment. Head Start is a child development program for disadvantaged preschool children which offers services to families who meet the financial eligibility requirements set by the Office of Economic Opportunity. The requirement is an annual income of \$1,500 or less for the first member of the family and an additional \$500 for each other family member. The local antipoverty agency and the school system apprised low-income families of the services offered by Head

---

*Dr. Moosbrucker is an assistant professor of social psychology at Boston College and a research associate at the Harvard School of Dental Medicine. Dr. Jong, formerly the dental consultant to Boston's Head Start Program, is currently an assistant professor at the Harvard School of Dental Medicine. This study was supported in part by Public Health Service Traineeship Grant RT-25A-68.*

Start. Parents voluntarily enrolled their children in the 8-week program, which was held in 46 Head Start centers.

The participating families resided in low-income areas of the city. Their racial distribution (in rounded figures) was 59 percent white, 38 percent Negro, and 2 percent "other" (mainly Puerto Rican and Chinese). The "other" category is not included in our analysis of the data; thus the total sample size was 621. We were mainly interested in exploring differences between the two major groups (whites and Negroes).

The families consisted mostly of young parents, with the modal range of mothers' ages between 26-30 years and fathers' ages between 31-35 years; 232 respondents, or 35.9 percent, reported no father present in the home. The mean number of children per family was 4.5.

Fifty-five percent of the families were receiving financial assistance from a public agency, primarily in the category of Aid to Families with Dependent Children, and 44 percent were self-supporting.

The heads of the households were primarily blue-collar workers (54 percent), and the remainder were sales or white-collar workers (7 percent) and housewives or unemployed (39 percent). The median range of educational attainment of the head of the house was 10-11 years of schooling. Median income for the Negro population was in the range of \$3,000-\$3,999; for the white population, it was in the \$4,000-\$4,999 category. Demographic characteristics of the Negro and white subsamples are shown in table 1.

The research instrument used was a 5-page structured interview schedule consisting of 46 questions on dental service utilization by the respondent and all members of the family, dental health knowledge and attitudes of the respondent, and social and demographic variables.

Parts of the schedule had been pretested with the previous year's Head Start population and found to be answerable by the survey population. The results of the pretest also correlated well with national survey data for a similar income group.

The following are some of the questions asked. Do you have a dentist or dental clinic that you

usually go to for dental care? When was the last time you had any dental treatment of any kind? Do you remember what kind of work was done then? Did you go for one visit at that time or was it one of a series of visits? Were you having any trouble with your teeth at the time you decided to go to the dentist?

The interviewers, eight dental hygienists and three senior dental students, were given a 3-day orientation which included training in interviewing and familiarization with the interview schedule.

The interviews were obtained in the Head Start centers if the mother accompanied the child to class or in the home of the family if the mother was not available at the center. If an adult was not at home at the first visit, a return visit was made on a subsequent day. If no interview was obtained after these three attempts, the family was classified as "nonrespondent." The interviews were completed during a 6-week period from July to August 1967.

The responses to the questions were coded on data transfer sheets, and the material was subsequently punched on IBM cards for computer processing. Statistical significance was determined by chi-square with acceptance at the 0.05 level.

## Results

*Differences.* There were a number of significant racial differences in patterns of dental care, as tables 2-4 indicate. For example, whites were more likely to have a regular source of dental care than Negroes. Of the respondents who had a regular source of care, Negroes were more

**Table 1. Demographic characteristics of study population's 621 families, by race**

Characteristics	Negro		White	
	Num- ber	Per- cent	Num- ber	Per- cent
Children per household	4. 62	-----	4. 51	-----
Without male head of house	130	46. 7	184	28. 4
Receiving financial assistance	142	59. 4	200	53. 6
Type of occupation of head of house:				
Blue-collar worker	117	50. 2	211	56. 7
White-collar worker	11	4. 7	32	8. 6
Unemployed or housewife	105	45. 1	129	34. 7



**Table 2. Differences<sup>1</sup> in patterns of dental care, by race**

Variable	Negro		White	
	Num- ber	Per- cent	Num- ber	Per- cent
Have regular source of dental care.....	146	60.3	275	72.6
Type of facility used:				
Dental clinic.....	95	62.5	90	32.1
Private practitioner....	57	37.5	190	67.9
Visited dentist before age 6.....	65	30.7	142	43.4
Last visit was one of a series of visits.....	115	50.0	230	63.0
Have a bridge or plate to replace missing teeth.....	60	26.9	187	53.0

<sup>1</sup> All differences significant at level of 0.01.

likely to go to a public clinic for their care and whites to a private dentist. White parents reported having had dental care at a younger age as children than Negro parents.

There were also significant differences between types of treatment received (table 2). Categories of treatment included prevention (examinations, X-rays, cleanings, and topical fluoride treatments), restorations (fillings or single crowns), extractions, and dentures. While prevention was similar in the two groups (approximately 8 percent) Negroes were more likely to have extractions and whites more likely to have restorations and dentures. The same pattern existed for the mother and father of the family and for the respondent, who was usually but not always the mother. Even when the dentures category is eliminated, the differences re-

main significant between the racial groups for "father" and "respondent" but not for "mother."

When differences in treatment were examined for children, the denture category was routinely eliminated, since only two children in the entire sample had dentures. No treatment differences existed for any of the three older children in the family or for the Head Start child. For the second-born child, differences approached significance at the 0.10 level, with the white child having more restorations, fewer extractions, and somewhat less preventive care.

Another difference relating to treatment was that Negro respondents were more likely to have had only one visit while white respondents were more likely to have had a series of visits the last time they went to the dentist.

When recency of last visit to the dentist was divided into the categories 0-12 months, 1-3 years, more than 3 years, and "never," there were no significant differences between the two racial groups for mother, father, respondent, or the Head Start child. However, regarding recency of last visit for the other children in the family, the results are inconsistent. The eldest white child had visited the dentist more recently than the eldest Negro child ( $\chi^2=10.66$ ,  $df=2$ ,  $P<0.01$ ). There were no racial differences in recency of last visit for the second-born child, however, nor for the Head Start child, whose numerical position in the family was not known.

Based on the responses to the following six questions on dental health information, the dental health knowledge of the white group was found to be significantly higher than that of the Negro (table 4):

**Table 3. Differences<sup>1</sup> in type of treatment received at last dental visit of the mother, father, and respondent, by race**

Treatment	Mother				Father				Respondent			
	Negro		White		Negro		White		Negro		White	
	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent
Preventive.....	17	8.3	28	8.7	6	7.2	31	15.4	17	8.2	25	7.6
Restorative.....	38	18.4	73	22.7	15	18.1	43	21.4	38	18.4	78	23.7
Extraction.....	128	62.1	146	45.3	55	66.3	89	44.3	130	62.8	151	45.9
Dentures.....	23	11.2	75	23.3	7	8.4	38	18.9	22	10.6	75	22.8

<sup>1</sup> Significant differences: mother— $\chi^2=17.45$ ,  $df=3$ ,  $P<0.001$ ; father— $\chi^2=11.27$ ,  $df=3$ ,  $P<0.02$ ; respondent— $\chi^2=14.69$ ,  $df=3$ ,  $P<0.01$ .

1. No matter how well you take care of your teeth eventually you will lose them. (agree-disagree)

2. If you have a toothache which goes away by itself after a while, there is no need to see a dentist. (agree-disagree)

3. A child's first set of teeth are important and should be treated so as to keep them until they come out naturally. (agree-disagree)

4. The back teeth which a child gets at age 6 are baby teeth. (agree-disagree)

5. A person can always tell if there is something wrong with his teeth and gums (agree-disagree)

6. At what age do you think a child should be taken to the dentist for the first dental examination?

"High" knowledge means five or six questions were answered correctly, "medium" three or four answered correctly, and "low" zero to two correct.

The relationship between knowledge and behavior was also different for the two groups. The white person (respondent) who knows more about dental health is more likely to have a regular dentist ( $\chi^2=6.46$ ,  $df=1$ ,  $P<0.02$ ), to go to a private dentist rather than a public clinic ( $\chi^2=4.30$ ,  $df=1$ ,  $P<0.05$ ), and to have restorative dental treatment and dentures rather than extractions ( $\chi^2=8.52$ ,  $df=3$ ,  $P<0.05$ ). There is no relationship between knowledge and having a regular dentist, private dentist, or type of treatment received for the Negro person.

*Similarities.* Approximately 81 percent of the respondents from each group said they were having trouble with their teeth the last time they went to the dentist. About 67 percent in each group (68.3 percent Negro and 66.5 percent white) visit a dentist only when they have a toothache. When asked if they ever go for a checkup when they have no toothache only 22 percent of the Negroes and 28 percent of the whites said "yes." These findings reveal a 9 percent discrepancy for the Negro respondents and a 5 percent discrepancy for the white respondents.

In both groups approximately 20 percent of the respondents had all their natural teeth. Significantly more whites (50 percent) than Negroes (25 percent) however, had a plate or bridge to replace missing teeth.

No differences were seen between Negroes and whites in the percentage of respondents who felt a current need for dental treatment (about 60 percent). Nor was there a difference in the percentage who had made a dental appointment

**Table 4. Racial differences in dental health knowledge**

Level of dental knowledge	Respondents <sup>1</sup>			
	Negro		White	
	Num-ber	Per-cent	Num-ber	Per-cent
Low.....	28	11.6	37	9.8
Medium.....	113	46.7	144	38.0
High.....	101	41.7	198	52.2
Total.....	242	100.0	379	100.0

<sup>1</sup> One Negro respondent did not answer the total set of 6 questions on dental knowledge.

NOTE:  $X^2=6.95$ ,  $df=2$ ,  $P<0.05$ .

within this group (about 25 percent, which constitutes about 12 percent of the total sample). When asked why they did not have an appointment, whites were more likely to say they could not afford treatment, while Negroes blamed their own negligence. A similar percentage of each group listed fear and lack of time as reasons for lack of treatment.

Current and childhood attitudes toward going to the dentist were also similar in the two racial groups (table 5). Respondents were categorized according to their first response to these questions: How did you feel about going to the dentist as a child? How do you feel now about going to the dentist? A slightly higher percentage of Negroes remembered liking to go to the dentist as children, but the overall differences are not significant.

*Multivariate analysis.* The effects of income, education, and public assistance (welfare) on Negro-white differences in the following areas were analyzed: (a) use of public versus private dental facilities, (b) having a regular source of dental care, (c) being treated in one visit versus a series of visits, (d) type of treatment received, (e) recency of last visit, and (f) degree of dental knowledge.

Income was divided into three categories: under \$3,000 a year, \$3,000-\$4,999, and more than \$5,000. An example of the kind of question for which we sought an answer in the data was: "Does the finding that Negro subjects are more likely to attend a public clinic for dental care, while white subjects are more likely to go to a private dentist, hold true at different income

levels within the population?" A partial coefficient for Goodman and Kruskal's gamma, described by Davis (9), was used to ask the questions statistically. The results previously reported in each of the six areas mentioned did not differ when income level was held constant.

Educational level was also divided into three categories for the analysis; 9 years or under, 10 to 11 years, and 12 years and over. The particular groupings were chosen to allow for an approximately equal number of subjects in each category or cell. The previously reported results in the six areas analyzed remained the same at different education levels.

When the dichotomous variable "receiving public assistance" (or not) was held constant, the Negro-white differences or similarities in the six areas remained as previously reported.

Thus the major findings reported in this study remain when controls are built in for income and educational differences and receipt of welfare.

## Discussion

Unlike the findings of most previously published reports, the two racial groups in our study did not generally differ as to recency of their last dental visits. Suchman and Rothman (7) found that in New York, Negro and white adults did differ in the percentage who had visited a dentist during the previous year. Factors

responsible for these contrasting results may include differences in dental facilities in New York and Boston and differences in the populations with regard to income and education.

Our findings, however, are not necessarily in contradiction with the National Health Survey, which reported an average of three times as many annual visits to the dentist for whites as nonwhites. First, we are dealing with dentally aware persons to the extent that they volunteered their children for a dental Head Start program. Within this population it is not surprising that no racial difference was seen in recency of last visit for the adults in the study. Given these two similarities (volunteering for Head Start and recency of last visit) the differences which do appear in the overall pattern of dental care become particularly significant. Further, there are some indications that the racial differences reported are related to availability as well as to utilization of dental care.

*Treatment.* One difference in the pattern of care which emerged was that Negroes are more likely to go to a public clinic for treatment while whites go to a private dentist. The dentist-to-population ratio is as high in communities where residents are primarily Negro as it is in the lower income white communities of the Head Start program. The Negro's use of a public clinic may reflect his economic concerns, or it may be that he feels more comfortable in the anonymity of the clinic situation and more at ease with care which is specifically provided for "poor people."

Supporting the noneconomic explanations are the many studies which describe the Negro's problems of identification and his negative self-image. For example, Clark and Clark (10) have shown that by the age of 3 racial consciousness exists. Most Negro children choose white dolls in preference to black dolls, and some evidence shame that they themselves are black. Pettigrew (11) documents many instances of mental illness in Negro people centering around desires for and delusions of being white. Silberman (12) speaks of the Negro's feelings of inferiority and crushing sense of "nobodiness" which remain as a heritage of their slavery.

When an adult patient enters a dental care situation, the kind of treatment he receives differs with his race. Negroes are less likely

**Table 5. Racial similarities in attitudes toward going to the dentist**

Attitudes	Negro		White	
	Number	Percent	Number	Percent
<i>Attitude as a Child</i>				
Liked.....	16	10.7	16	5.3
Neutral or "duty"....	41	27.3	78	25.8
Disliked.....	42	28.0	111	36.8
Pain or fear.....	51	34.0	97	32.1
Total.....	150	100.0	302	100.0
<i>Present Attitude</i>				
Like.....	10	4.3	14	3.8
Neutral or "duty"....	103	51.1	177	53.7
Dislike.....	50	21.3	73	19.9
Pain or fear.....	55	23.4	83	22.6
Total.....	218	100.0	347	100.0

to have restorations, more likely to have extractions, and less likely to have dentures.

*The dental clinic as a communication channel.* To understand why these differences exist, it is important to explore the question of who determines what the dental treatment will be. One example is that of an institution making the decision. The dental clinic in the Boston City Hospital, surrounded by a large Negro population, offers only extraction services; no other treatment is provided. This is the clinic attended by the majority of our respondents who receive care at a public facility. In most instances, the patient who goes there knows that an extraction is the only treatment he can receive. The interaction is two way, however. The hospital is communicating to the surrounding community of potential patients when it offers this and only this service. The message which it sends out might be interpreted as "We think extractions are the only treatment you need" or "We provide you only with relief from suffering, not positive health care."

The clinic also sends out communications to other groups. Dental students from New England's dental schools rotate through the city hospital clinic as a part of their educational experience. The impressions which they receive at the clinic are that the patients there, who are poor and primarily Negro, do not care about their teeth. In small group meetings held by Moosbrucker, fourth-year dental students repeatedly stated that the patients at the city hospital wanted only to have their teeth "pulled" and were not interested in preserving them. (Unpublished manuscript by Moosbrucker, "Personality Patterns of Dental Students and the Dental School Experience," 1968).

We are not suggesting that the dental students are unaware of the hospital's policy of offering only extractions, but rather that they are unaware of the clinic's function as a communication channel. That is, the students do not consider that the clinic is sending out messages to the patients to the effect that extractions are the only care they need. The student perceives the patients as being solely responsible for their treatment decisions; he does not perceive that they may be influenced by the hospital.

Further implications of the hospital clinic's

policy have to do with the perpetuation of poor dental habits within the patient population. For example, Kriesberg and Treiman found that parents' preventive care is positively related to their children's preventive dental care (13). Metz and Richards (14) support these results and say that the relationship holds for all income and education groups. In our study, racial differences in types of treatment received by the parents were not present to a significant extent for the children. Our results do not contradict the studies cited, however, since we consider several types of treatment and present data for the population as a whole rather than individual parent-child relationships. It is possible that by offering only emergency or "crisis" care to the adult population, a pattern of dental care which is contradictory to good dental health may be passed on to the next generation.

There is a danger that future improvements in the dental care for low-income groups are being undermined as a result of students' exposure to a clinic which only extracts teeth. The danger is particularly acute since the attitudes of health workers are considered a serious barrier to health care for the poor (15).

Perhaps middle-class health professionals, based on their experiences in clinics and hospitals during their training period, unwittingly stereotype and categorize working-class people. The patient is not insensitive to the health workers' attitudes, and he may respond with the fatalistic uncooperative behavior appropriate to the role he is assigned (16).

*Dental knowledge.* The amount of our respondents' dental knowledge was related to having a regular dentist, going to a private dentist, and type of treatment received for whites but not for Negroes. This suggests that the barriers, other than lack of knowledge, which prevent the potential patient from obtaining good dental care are stronger for Negroes than for whites. Since attitudes toward going to the dentist and aspects of motivation, such as reasons for going and actually getting oneself there, are similar between racial groups, the knowledge finding further suggests that at least some of the barriers standing between the Negro potential patient and good dental care are external to the patient himself. The barriers may exist in the attitudes of health workers and health institu-

tions, as we have suggested, or they may exist in the economic differences cited.

Social patterns related to housing and employment may also affect patterns of dental care differentially. Negroes reported a shorter period of residence in their present home than whites ( $\chi^2=26.1$ ,  $df=4$ ,  $P<0.001$ ), and while these more frequent moves may be based in part on personal preferences, economic pressures or urban redevelopment, or both, probably play a part as well.

### Summary

The dental health behavior of low-income Negro and white families who had a preschool child enrolled in Boston's Head Start Program of 1967 was investigated by means of a structured interview with a respondent from the family.

Differences were found between the Negro and white families with respect to the variables of regular source of dental care, type of treatment received at last visit, one or a series of visits, replacement of missing teeth, and dental health knowledge. The white families were found to represent the positive aspects of dental health behavior for these variables; for example, they were more likely to have a regular dentist, to go for a series of visits, to have restorations or dentures rather than extractions, and to have replacements for missing teeth. If the Negro families had a regular source of dental care, it was more likely to be a public clinic rather than a private dentist.

There were also a number of similarities between racial groups for variables such as recency of last visit, current felt need for dental treatment, making an appointment when in need of care, and attitudes toward visiting a dentist.

### REFERENCES

- (1) Rosenblatt, D., and Suchman, E.: Blue-collar attitudes and information toward death and illness. *In* Blue-collar world, edited by A. Shostak and W. Gomberg. Prentice-Hall, Inc., Englewood Cliffs, N.J., 1964, pp. 324-333.
- (2) Zola, I.: Illness behavior of the working class: implications and recommendations. *In* Blue-collar world, edited by A. Shostak and W. Gomberg. Prentice-Hall, Inc., Englewood Cliffs, N.J., 1964, pp. 350-361.
- (3) Kriesberg, L., and Treiman, B.: Socioeconomic status and the utilization of dentists' services. *J Amer Coll Dent* 27: 147-165, September 1960.
- (4) Kegeles, S.: Why people seek dental care: a review of present knowledge. *Amer J Public Health* 51: 1306, September 1961.
- (5) Freidson, E., and Feldman, J.: The public looks at dental care. *J Amer Dent Assoc* 57: 325, September 1958.
- (6) U.S. National Health Survey: Dental care: Interval and frequency of visits, July 1957-June 1959. PHS Publication No. 584-B14. U.S. Government Printing Office, Washington, D.C., 1960.
- (7) Suchman, E., and Rothman, A.: The utilization of dental services. *New York Dent J* 31: 151, April 1965.
- (8) Wisan, J., Lavell, M., and Colwell, F.: Dental survey of Philadelphia pre-school children by income, age, and treatment status. *J Amer Dent Assoc* 55: 1, July 1957.
- (9) Davis, J. A.: A partial coefficient for Goodman and Kruskal's gamma. *Amer Stat Assoc J* 189: 189-193, March 1967.
- (10) Clark, K. B., and Clark, M.: Racial identification and preference in Negro children. *In* Readings in social psychology, edited by T. M. Newcomb and E. L. Hartley. Ed. 1. Holt, Rinehart, and Winston, New York, 1947.
- (11) Pettigrew, T.: A profile of the Negro American. D. Van Nostrand Co., Princeton, N.J., 1967.
- (12) Silberman, C. E.: Crises in black and white. Random House, New York, 1964.
- (13) Kriesberg, L., and Treiman, B. R.: Preventive utilization of dentists' services among teenagers. *J Amer Coll Dent* 29: 28, March 1962.
- (14) Metz, A., and Richards, L.: Children's preventive dental visits: influencing factors. *J Amer Coll Dent* 34: 204, October 1967.
- (15) Hoff, W.: Why health programs are not reaching the unresponsive in our communities. *Public Health Rep* 81: 654-658, July 1966.
- (16) Bergner, L., and Yerby, A.: Low income and barriers to use of health services. *New Eng J Med* 278: 541, Mar. 7, 1968.

## PUBLICATION ANNOUNCEMENTS

*Address inquiries to publisher or sponsoring agency.*

*Home Care Programs in Arthritis. A manual for patients.* 1969; 23 pages. The Arthritis Foundation, 1212 Avenue of the Americas, New York, N.Y. 10036.

*Diagnostic Standards and Classification of Tuberculosis.* 1969; 94 pages. National Tuberculosis and Respiratory Disease Association, 1740 Broadway, New York, N.Y. 10019.

*Air Pollution Primer.* 1969; 104 pages. National Tuberculosis and Respiratory Disease Association, 1740 Broadway, New York, N.Y. 10019.

*On Psychotherapy and Casework. A position statement formulated by the Committee on Psychiatry and Social Work.* Vol. VII, No. 71. 1969; 32 pages; \$1. Publications Office, Group for the Advancement of Psychiatry, Inc., 419 Park Ave. South, New York, N.Y. 10016.

*Crisis in Psychiatric Hospitalization. Formulated by the Committee on Therapeutic Care.* Vol. VII, No. 72. March 1969; 44 pages; \$1. Publications Office, Group for the Advancement of Psychiatry, Inc., 419 Park Ave. South, New York, N.Y. 10016.

*Prelude to Action. The next twenty years in maternity care. Report of the Maternity Center Association's 50th Seminar on Childbearing and Family Life.* 1969; 170 pages; Maternity Center Association, 48 East 92nd St., New York, N.Y. 10028.

*Studies in Public Welfare: Reactions of welfare clients to case-worker contact.* By Richard Pomeroy in collaboration with Harold Yahr and Lawrence Podell. The Center for the Study of Urban Problems, Graduate Division, Bernard M. Baruch College, City University of New York, 257 Park Ave. South, New York, N.Y. 10010.

*Fluoridation of Public Waters in New York State. A report.* August 1968. 63 pages. New York State Department of Health, Division of Pure Waters, Bureau of Water and Wastewater Utilities Management, 84 Holland Ave., Albany, N.Y. 12208.

*Facts About Venereal Disease.* Order No. 5-884. By Victor H. Vogel, M.D., and Virginia E. Vogel. 1969; 47 pages; \$1 (discounts for multiple copies). Guidance Department, Science Research Associates, Inc., 259 East Erie St., Chicago, Ill. 60611.

*Outpatient Health Care. Report and recommendations of a conference on hospital outpatient care conducted March 11-13, 1968, and of a followup meeting of a working party on June 13-15, 1968.* 1969; 58 pages; \$2.25. American Hospital Association, 840 North Lake Shore Dr., Chicago, Ill., 60611.

*Length of Stay in PAS Hospitals. United States, Pre- and Post-Medicare.* 1969; 553 pages; \$4. Commission on Professional and Hospital Activities, First National Building, Ann Arbor, Mich. 48108.

*The Role of Medical Inspection of Labour.* International Labour Office. 1968; 111 pages; \$2; Geneva. International Labor Office, Washington Office, 917 15th St., NW., Washington, D.C. 20005.

*Carcinogenicity Testing. A report of the Panel on Carcinogenicity of the Cancer Research Commission of the UICC.* UICC Technical Report Series, vol. 2. Edited by I. Berenblum. 1969; 56 pages; \$2 (discounts for bulk quantities). International Union Against Cancer, P.O. Box 400, 1211 Geneva 2, Switzerland.

*Radiation Protection in the Mining and Milling of Radioactive Ores.* Code of practice and technical addendum. International Labour Office Manual of Industrial Radiation Protection, Part VI, International Atomic Energy Agency Safety Series

No. 26. International Labour Office. 1969; 108 pages; \$2; Geneva. International Labor Office, Washington Branch, 917 15th St. NW., Washington, D.C. 20005.

### World Health Organization

*WHO publications may be obtained from the Columbia University Press, International Documents Service, 2960 Broadway, New York, N.Y. 10027.*

*Applications of Mental Health Statistics. Uses in mental health programmes of statistics derived from psychiatric services and selected vital and morbidity records.* By Morton Kramer. 1969; 112 pages; \$3; Geneva.

*Measure of Air Pollutants. Guide to the selection of methods.* By M. Katz, M.Sc., Ph.D. 1969; 123 pages; \$5; Geneva.

*The Work of WHO, 1968. Annual report of the Director-General to the World Health Assembly and to the United Nations.* Official Records of the World Health Organization, No. 172. April 1969; 254 pages; \$2.25; Geneva.

*Executive Board, Forty-Third Session, Geneva, 18-28 February 1969. Part I. Resolutions and Annexes.* Official Records of the World Health Organization, No. 173. May 1969; 70 pages; \$1; Geneva.

*Proposed Regular Programme and Budget Estimates for the Financial Year, 1 January-31 December 1970 with Proposed Programmes and Estimated Obligations Under Other Available Sources of Funds.* Official Records of the World Health Organization No. 171. December 1968; 600 pages; \$6; Geneva.

*Executive Board, Forty-Third Session, Geneva, 18-28 February 1969. Part II. Report on the proposed programme and budget estimates for 1970.* Official Records of the World Health Organization No. 174. May 1969; 124 pages; \$1.75; Geneva.

## **Better Use of Health Professionals in New York City Schools**

**LESTER J. ROSNER, M.A., J.D., OLIVE E. PITKIN, M.D., GRACE M. McFADDEN, R.N., M.P.H.,  
LUCILLE ROSENBLUTH, M.P.A., and MARGARET J. O'BRIEN, R.N., M.S., M.P.H.**

**P**HASE 1 of the school health personnel utilization project covered a large factfinding study in more than 300 public and parochial schools in New York City (1, 2). This report on phase 2 describes the action that followed: the introduction and evaluation of a new health team in the school health program (3).

The intended third stage, beyond the project itself, is the extension of the new team concept to all public and parochial schools in New York City. We believe the team concept should be extended, and we are confident it will be done. In fact, funds were allotted in the New York

City budget for 1968-69 to permit extending the team concept to two of the city's five boroughs, and some progress has been made in this direction.

The basic motivation for undertaking the project was a desire to give the best possible health supervision to the children despite a worsening shortage of nurses. Although many varied actions were taken to recruit more nurses, employ part-time personnel, and create new classifications of personnel, the overall problem of staffing was becoming more acute. Clearly, while obtaining more personnel would be a solution, if it could be done, making better use of the personnel we had would be another.

The report on phase 2 begins, as it should, with a brief statement of the major findings of phase 1 (1), since it was on these findings that further action was based.

### **Findings and Recommendations in Phase 1**

1. *Professional nurses spent about one-third of their time on nonprofessional activities.*

RECOMMENDATION: Use more ancillary personnel in the school health program to do the nonprofessional work done by nurses.

2. *Public health assistants only partly relieved nurses of nonprofessional duties.*

RECOMMENDATION: Revise duties of the public health assistants to relieve nurses of nonprofessional activities, particularly in technical areas.

3. *Public health nurses and staff nurses had essentially the same duties and responsibilities.*

---

*The authors are or were with the City of New York Department of Health. Dr. Rosner, the department's former administrative assistant commissioner, was director of the school health personnel utilization project, and he is currently dean of administration at Bernard M. Baruch College, City University of New York. Dr. Pitkin is director of New York City's bureau of school health. Miss McFadden is the former director and Miss O'Brien is now acting director of its bureau of public health nursing. Mrs. Rosenbluth, chief researcher for the project, is now coordinator of a school health records system project that was developed from the utilization study.*

*The personnel utilization project was sponsored by the Medical and Health Research Association of New York City, Inc., and supported by grant CH 34-41 from the Community Health Service, Public Health Service.*

**RECOMMENDATION:** Reevaluate work assignments of public health nurses so that their services would be commensurate with their professional skills and training.

4. *Only 36 percent of all time of staff (including physicians, nurses, and public health assistants) was spent in direct services to children, 63 percent was spent on supportive activities, and 1 percent of reported activities could not be coded.*

**RECOMMENDATION:** Critically examine distribution of personnel time by program area giving primary consideration to changing priorities and perspectives in health services administration.

5. *More time was spent by health personnel on clerical operations than on any other single work classification.*

**RECOMMENDATION:** Examine clerical work generated by the school health program to determine whether the volume could be reduced by simplified systems, forms, and procedures.

#### **Team Experiment and Evaluation Techniques**

Phase 2 of the school health personnel utilization project consisted of demonstrating and evaluating a new team concept developed during phase 1. The concept was designed to respond to the first three recommendations. The demonstration began in January 1966 and continued through December 1966. The team concept was tested in three health districts selected on the basis of socioeconomic, ethnic, and population factors. The demonstration districts were fairly representative of the population served by the school health program. In the three districts are 95 elementary schools, public and parochial, and 12 junior high schools with a total pupil registration of 128,000—about 10 percent of the student population in New York City.

The team was designed to enable each member to devote the largest possible percentage of time on duties appropriate to his training and experience. In the demonstration a group of schools was served by a health team consisting of a physician, a public health nurse functioning as combined team leader and community nurse, a staff nurse to give the usual school nursing services, and a public health assistant to perform nonprofessional duties for the team.

The role of each team member and the techniques for improved intrateam communications were carefully delineated. The allocation of duties to each team member was based on the analysis made in phase 1 of the project. Functions and responsibilities of each team member are described in detail in the full report published on the project by the Medical and Health Research Association (3).

Although the demonstration changed the types of activities assigned to and performed by specific health workers, it did not alter the total school health program. Physical examinations, teacher-nurse conferences, immunizations, and other health services were carried out in the three demonstration districts as in the city's other health districts during the study year. Basic school health forms, procedures, and reports remained the same.

Since one goal was to test the team concept for possible extension to the entire school system, the demonstration was carried out under regular field conditions, including usual staff turnover, absences due to illness, and work problems such as crash immunization programs and special reports. By carefully defining the role of each team member, providing adequate public health assistant's time for each team, fixing responsibilities at the appropriate level, and retaining the same persons on each team, we expected to increase the proportion of time all professional employees spent working at their highest level of skills.

A control group of schools was selected as a source of data for comparison with similar data from the experimental schools. The control group was selected to match the experimental schools on the basis of type, size, socioeconomic level of pupils, and amount of public health assistants' time allotted.

There were 107 schools in the experimental group—95 elementary and 12 junior high schools. The control group contained 150 schools—133 elementary and 17 junior high schools. The control schools were selected from different health districts than the experimental schools districts. They were so chosen to avoid or at least minimize the problem of district supervisory staff carrying over into the control schools some of the team concepts and practices used in the experimental schools. A fuller dis-



cussion of sample selection and selection factors will be found in the report on phase 2 (3).

The effects of the restructured team approach were evaluated by comparative studies of the following types of data from the experimental and control schools.

1. Activity log data to determine differences in personnel utilization practices.
2. Daily work tally sheets to document differences in the rate of work completion.
3. Students' school medical records to evaluate case management.
4. Employees' attitudes to determine satisfaction with work assignments and adequacy of performance.

It may be noted at this point that the findings on the activities of physicians and nurses in the control group in phase 2, even though the data were collected during different time periods and in a different sample of schools, were remarkably similar to the findings in phase 1. For example, school physicians in phase 1 spent 89.9 percent of their time on professional activities; in phase 2 physicians in the control schools spent 90.1 percent on such activities. Nurses spent 59 percent on professional level duties in phase 1 and 57.8 percent of their time on such duties in the control schools in phase 2.

A discussion of the statistical techniques used in the study may be found in the phase 1 report, appendix G (2).

### Major Findings of Phase 2

1. The experimental school health team reduced time spent by nurses on nonprofessional activities. Nurses serving experimental schools spent 68 percent of their time on professional activities, while nurses in the control schools spent 58 percent of their time on professional activities. If observations in the experimental schools are compared with those in all schools in phase 1 of the project in 1964, the difference is even greater: 68 percent of nursing time devoted to professional activities in the experimental schools as compared with 55 percent for nurses in schools studied in phase 1.

2. School health personnel in both experimental and control schools still spent more time on supportive activities than on direct services to children. Members of the school health team, particularly professional nurses, spent slightly

more time on direct services in experimental schools than health personnel in control schools.

In the experimental schools, 33 percent of all the health staff's time was spent on direct services to children as compared with 31 percent of the health staff's time in the control schools. The greatest improvement in increased time spent in direct services to children was among professional nurses. In the experimental schools, nurses spent 46.3 percent of their time on direct services as compared with 40.6 percent in the control schools.

The largest amount of staff time used in supportive services was spent on clerical work. Professional nurses in control schools spent 21 percent of their time on clerical activities. Nurses in the experimental schools had reduced their clerical work to 14 percent of their time. A comprehensive study of clerical operations, including school health systems, forms, and records is now in progress and is supported by a Public Health Service grant.

3. The phase 2 experiment succeeded in developing a unique function for the public health nurse-team leaders, more suited to the level of their training than their former tasks. Public health nurses showed the most dramatic improvement in personnel utilization patterns. In the experimental schools they spent 72 percent of their time on professional activities as compared with the 58.3 percent they spent on such activities in the control schools (table 1). Public health nurses in the phase 1 study spent 56 percent of their time on professional activities (table 2).

**Table 1. Percentage expenditure of time of nurses at different levels of professional work in New York City's experimental and control schools, 1966**

Functional level	Experimental schools		Control schools	
	Public health nurses	Staff nurses	Public health nurses	Staff nurses
All professional.....	72.1	66.6	58.3	59.1
Public health nurse only.....	1.9	.7	.6	.7
Staff nurse only.....	5.1	12.9	11.0	11.5
Public health nurse or staff nurse.....	65.1	53.0	46.7	46.9

Public health nurse-team leaders in the experimental schools showed a major shift from the staff nurse type of work they had been found doing in phase 1. In phase 1 we observed little difference between the duties of staff nurses and public health nurses. In the experimental schools team leaders, all public health nurses, spent markedly more time than staff nurses in the control schools in guidance counseling, health education, community agency contacts, and administration and less time on health appraisal and casefinding, immunization, first aid, clerical procedures, maintenance, and housekeeping (table 3).

4. Public health assistants were more effective in reducing the subprofessional activities of nurses in experimental schools than in control schools. Although the time assignments for public health assistants were inadequate for their new and expanded duties, these assistants were notably more effective in releasing nurses from subprofessional activities, clerical and technical, in the experimental than in the control schools. Nurses in the experimental schools spent only 21 percent of their time on subprofessional activities, compared with 31 percent for those in the control schools (table 4). Subprofessional technical work took only 8.7 percent of nursing time in the experimental schools as against 12.2 percent in the control schools.

The function of the public health assistant was substantially changed in the experimental schools. In addition to her traditional clerical duties, increased emphasis was placed on technical responsibilities. Public health assistants aided physicians at medical sessions without a nurse. The public health assistants also carried special caseloads, without changing the subprofessional nature of their position, by extending this aspect to the issuance of forms for followup on children.

5. Despite the limited duration of the experiment, a review of the rates of successful case management showed some improvement in the experimental schools when compared with the control schools. We did not expect a 1-year trial to reveal such qualitative change in a program of the scope and complexity of the New York City school health services. Successes and

failures in case management will have to be observed over a longer period before a definite evaluation can be made.

However, the team approach resulted in placing a significantly higher percentage of new patients under satisfactory medical care than the procedures in the control schools. In the control schools, 56 percent of children listed as new patients were placed under satisfactory care, while in the experimental schools, 68.9 percent of the new patients were so placed. The experimental schools were significantly more effective in getting new patients under care (0.05 level of significance).

6. There was a reduction in the work units performed per staffing hour in the experimental schools compared with the control schools. The difference was small among the nurses and public health assistants, but for school physicians the difference in number of work units performed per staffing hour between physicians in experimental and control schools appeared significant. There is evidence, however, that toward the end of the study this difference was being overcome. We believe the difference was due chiefly to the need for personnel in the experimental schools to learn new procedures and approaches. The work unit study should be repeated after team members have been completely trained.

**Table 2. Percentage expenditure of time of nurses in New York City's experimental and control schools, 1966, and in schools in phase 1, 1964, by level of activity**

Categories of nurses and schools	Professional	Subprofessional	Incidental	Other
<b>All nurses:</b>				
Experimental schools.....	67. 6	21. 0	11. 4	0
Control schools.....	57. 8	30. 8	11. 3	. 1
Schools in phase 1....	54. 7	33. 5	10. 3	1. 5
<b>Public health nurses:</b>				
Experimental schools.....	72. 1	14. 4	13. 5	0
Control schools.....	58. 3	30. 4	11. 2	. 1
Schools in phase 1....	56. 0	32. 0	10. 4	1. 5
<b>Staff nurses:</b>				
Experimental schools.....	66. 2	23. 3	10. 5	. 1
Control schools.....	54. 8	33. 5	11. 7	0
Schools in phase 1....	51. 6	37. 4	9. 8	1. 2

**Table 3. Percentage expenditure of time of nurses, by activity, New York City's experimental and control schools, 1966**

Activity	Experimental schools		Control schools	
	Public health nurses	Staff nurses	Public health nurses	Staff nurses
Health appraisal and casefinding-----	7. 6	21. 4	18. 3	18. 2
Administration of immunizations and tests-----	. 9	. 7	1. 9	2. 3
First aid and emergency care-----	. 3	1. 6	1. 7	1. 7
Guidance, counseling, health or safety education, and accident prevention---	31. 6	21. 5	18. 5	17. 8
Referrals to community agencies-----	3. 3	2. 1	1. 4	1. 7
Administration of school health program-----	25. 7	13. 9	12. 2	13. 8
Maintenance, house-keeping, and facilitating services--	7. 6	12. 2	14. 2	12. 8
Clerical procedures-----	9. 2	15. 2	20. 1	19. 8
Incidental activities---	13. 5	11. 0	11. 1	11. 3
Other-----	. 3	. 4	. 6	. 6

7. Restructured school health teams should be extended to other health districts, but this extension will require more public health assistants. An adequate number of public health assistants is crucial to extending the team concept. Phase 1 of the project showed that nurses serving schools without public health assistants spent 40 percent of their time on subprofessional activities that could be performed by public health assistants. Nurses in the experimental schools, working with public health assistants and following the team concept, spent only 21 percent of their time on such activities. This percentage can be reduced even further if sufficient public health assistants are available to carry relatively uncomplicated caseload responsibilities in addition to their regular subprofessional assignments.

#### Physicians' Response to the Experiment

The new arrangements were not primarily aimed at effecting changes in the work of school physicians, since it had been found in the phase 1 study that, on the whole, their professional skills were being appropriately used. Neverthe-

less, physicians were affected in the following ways.

1. Since physicians were now members of teams, each team covering a specific group of schools, physicians' assignments were stabilized to a much greater degree than before. Outside the study districts, an effort is made to keep each physician in certain schools. There is, however, considerable variation from this ideal, whereas within the study districts almost no variation was permitted.

2. Under the experimental system, school physicians had many work sessions at which only the public health assistant was present. These sessions were for routine work with the children who had no health problems. The nurse was present only at sessions where children with known health problems requiring her services were under consideration; previously, she had been present at practically every physician session.

3. The physicians, as team members, participated in the regular team conferences at which the total workload was reviewed and organized, and individual cases were discussed. This kind of conference is not held regularly in other districts.

The physicians' reactions to all of these changes were favorable. Physicians felt that stability of assignment made them significantly more familiar with school staff as well as permitting them to followup individual children more efficiently. Physicians responded well to

**Table 4. Percentage expenditure of nurses' and public health assistants' time for subprofessional activities, New York City's experimental and control schools, 1966**

Categories of personnel and schools	All sub-professional activities	Clerical activities	Technical activities
All nurses:			
Experimental schools--	21. 0	12. 3	8. 7
Control schools-----	30. 8	18. 6	12. 2
Staff nurses:			
Experimental schools--	23. 3	13. 8	9. 5
Control schools-----	33. 5	21. 4	12. 1
Public health assistants:			
Experimental schools--	86. 0	63. 5	22. 5
Control schools-----	85. 2	60. 1	25. 1

working with the public health assistants, finding them capable of handling the workload, setting up sessions, and assisting in the examinations. Finally, physicians liked the team conferences, reporting that a better picture of the work of all team members and the academic personnel evolved from the conferences. Physicians developed a better perspective on the kind of public health work they themselves were doing, and they felt that, by participating in the conferences, they were using their medical skills at a higher level and in a broader scope.

There were, of course, wide variations in the response of individual physicians, and a minority at the completion of the study still felt that the old system was preferable. But most physicians considered the experiment an advance which they welcomed. Informal followup nearly 2 years later indicates that all the physicians have accepted the new plan as routine and are, on the whole, satisfied with their part on the team, preferring it to the former arrangement.

### **The Nurses' Attitudes**

The new team approach to school health required a major orientation and staff training effort. The two groups who required the more intensive work were the public health nurses and the public health assistants. This need was understandable since under the team concept their functions changed more markedly than those of the regular staff nurses.

Previously, the public health assistant's duties in the school health program were largely clerical—recording, filing, checking transfers in and out, and other routines. Now she was being asked to carry a caseload of her own, an uncomplicated caseload to be sure, but still a great deal of supervisory assistance was needed to help her to move from recordkeeping to personal involvement with the child.

The broadened scope of the public health nurse's services as the community nurse with responsibility for the overall health program in several schools and for a specific caseload requiring her skills created mixed reactions—from marked enthusiasm in some nurses to frank, outright resistance in others. Interestingly enough, the marked enthusiasm was equally divided between the young nurses and those who had been with the agency for some

time. The resistance encountered was not due to opposition to the team concept but to uncertainties brought on by a change from limited functions to markedly increased community responsibilities.

Although it is too early to speak with total assurance about nurses' attitudes regarding the team approach in school health, we can say with some confidence that after a preliminary period of adjustment most nurses in the experimental schools were pleased and satisfied with their new functions. The public health nurses liked the flexibility in arranging their own work schedules. These nurses enjoyed being relieved of some of the clerical and subprofessional work, thus permitting them to spend more time with the families of school children and with community organizations. Public health nurses also felt that they were able to make a more significant contribution to the total school health program than before the advent of team practice.

For the staff nurse the sharper definition of duties and responsibilities helped to clarify her status and duties. She was freed from many routine duties and chores, and she was no longer chiefly responsible for children with complex medical or social problems or both. The staff nurse was asked to perform nursing duties at a professional level but within the limitations of her academic preparation and training.

It has not been easy to determine the views and attitudes of the majority of public health assistants. They seem to enjoy working closely with physicians and also appear to welcome more direct involvement with children. Assistants' responsibilities and workloads have increased, and they have expressed concern that they may not have sufficient time to do all that is being asked of them. Program administrators will need to work out appropriate work schedules for the health assistants and to staff the program adequately so the concerns expressed will be met by effective action. With proper work schedules, public health assistants, like the other major participating groups, will strongly favor the team concept.

### **Conclusion**

The school health personnel utilization project is one of the largest of its kind. In phase 1 we studied 335 public and parochial elementary and

junior high schools, covering 31.9 percent of the total elementary and junior high school population in New York City. In its implications, this study goes beyond solving immediate problems.

Some advances in modern medicine are now so costly—not just in dollars but in the use of professionals who require years of training—that there are doubts as to how universally these advances may be applied. Of course, a partial answer is to shift the emphasis of medical practice to the prevention of disease or to early detection, since preventing or treating disease in its early stages is almost always less costly than treating a condition after it has become acute or chronic.

Whatever course is followed, we shall inevitably have to make better use of the health professionals we have. We simply cannot afford to have physicians and nurses waste time on chores that can easily be performed by technicians or aides. This study has demonstrated beyond question that meaningful change in professional practices can be effected if the proper foundation for change has been constructed.

This study deals with a school health service, but the findings should throw some light on the use, or misuse, of professionals in other programs. While studies of this type are not common in the health professions, industry often uses such studies with great effectiveness.

The study is of interest because of the wide applicability of its techniques and because of its success in demonstrating how judicious use of nonprofessional workers can free scarce professionals for the more skilled tasks which only they can handle.

### Summary

In phase 2 of New York City's school health personnel utilization project, activities of school health teams in 107 experimental schools in three health districts were compared with those of conventionally organized personnel in 150 control schools in different districts. The demonstration ran from January through December 1966.

Findings on the activities of professionals in the control group in phase 2 were remarkably similar to the findings in phase 1. In phase 2, 68 percent of nursing time in the experimental

schools was devoted to professional activities as compared with 55 percent for nurses in the schools studied in phase 1.

The phase 2 experiment succeeded in developing a unique function for the public health nurse-team leaders which was more suited to their level of training than their former tasks. Public health nurses showed a dramatic improvement in personnel utilization patterns. In the experimental schools they spent 72 percent of their time on professional activities as compared with 56 percent of professional work in phase 1.

In the experimental schools, 33 percent of all health staff's time was spent on direct services to children as compared with 31 percent in the control schools. Staff nurses, freed from routine duties, were asked to perform nursing duties at a professional level but within the limitations of their academic preparation. Public health assistants' traditional clerical duties were expanded to include technical duties, special case-loads, and aid to physicians at medical sessions without a nurse.

In the experimental schools, nurses spent 46.3 percent of their time on direct services to children as compared with 40.6 percent in the control schools. Nurses in the experimental schools spent only 21 percent of their time on subprofessional activities compared with 31 percent for those in the control schools.

There was a reduction in the work units completed per staffing hour in the experimental schools compared with the control schools. In the control schools 56 percent of the children listed as new patients were placed under satisfactory care, while in the experimental schools, 68.9 percent of the new patients were so placed.

### REFERENCES

- (1) Rosner, L. J., et al.: Better use of health professionals in New York City schools. *Public Health Rep* 82: 862-866, October 1967.
- (2) Rosner, L. J., et al.: School Health Personnel Utilization Project. Report on phase 1. A study of utilization patterns: Methodology and findings. Medical and Health Research Association of New York City, Inc., 1966.
- (3) Rosner, L. J., et al.: School health personnel utilization project. Report on phase 2. An experiment with a restructured school health team. Medical and Health Research Association of New York City, Inc., 1968.

# U.S. and Mexican Medical Students *Draft and Pretest Questionnaires* for Border Health Resources Survey

RICHARD E. KETTLER, M.D., NORMAN C. AHL, M.D., and CARL N. MUCHNICK, M.D.

THE CONCEPT of resource and need surveys to identify and quantify deficiencies in the delivery of health care is widely accepted as the intelligent response of society in attempting to improve the health of its population. This report is an account of a summer experience (July through August 1968) in which Mexican and American medical students jointly drafted and pretested questionnaires in English and Spanish for a survey of existing hospitals, nursing homes, and public health department facilities in the El Paso-Juarez sector of the Mexico-United States border. The students' work was the first step in a complex borderwide health survey being conducted by the U.S.-Mexico Border Public Health Association. It also introduced the students in a practical way to many aspects of preventive medicine.

## Need for a Border Health Resources Survey

The United States and especially Mexico are nations of substantial population growth. This is particularly true along the border where in El Paso, for example, the 1967 birth and death rates were 21.9 and 5.5 per 1,000 respectively as compared to equivalent U.S. national figures of 17.8 and 9.4 (1, 2). El Paso's 1965 population was 312,200; that of Juarez, just across the border from El Paso, 330,000 (3). These figures have been projected to reach 501,500 and 570,-

500 by 1985 (4a). Where such rapid expansion is taking place, health resources are bound to lag behind needs unless both are monitored, potential disparities anticipated, and corrective action initiated.

The border population is mixed: in El Paso County, Mexican-Americans make up 42.6 percent, "Anglo-Americans" 54.2 percent, and non-whites 3.1 percent (4b). The population is young; the median age is 22.6 years, and 27.8 percent are under age 10 (4c). Also, a significant proportion are indigent or economically depressed. The 1962 per capita income in El Paso was \$1,755, only 85 percent of the equivalent national average (4b). Manifest cultural differences, emphasized by language barriers, have resulted in inadequate communication concerning the availability of health care services

---

*When this paper was written the authors were senior medical students at the University of California School of Medicine, Los Angeles. Serving their internships at present, Dr. Kettler is at the Cedars-Sinai Medical Center, Los Angeles, Dr. Ahl is at the Wadsworth Veterans' Administration Hospital, Los Angeles, and Dr. Muchnick is at the Rochester General Hospital, Rochester, N.Y. The research was supported in part by an apprenticeship training grant from the Public Health Service to the School of Medicine's department of preventive medicine.*

on the one hand and inadequate recognition of the extent of health care needs on the other. The data suggest that a large number of persons along the border cannot make use of private resources.

The geographic fact of an international border separating peoples of differing cultural modes and economic means—particularly one where many crossings occur (30 million at El Paso-Juárez in 1964, according to a border public health official) leads to a number of unique health problems. It is well known that infectious diseases, especially tuberculosis and venereal disease, are widespread and require close communication and cooperation between Mexican and American health officials to be satisfactorily controlled. A high incidence of rabies among stray dogs presents a similar challenge for intensified U.S.-Mexico teamwork.

Abortions, relatively easy to obtain in Mexico, are easily obtained by Americans as well. Drugs, available over the counter in Mexico but requiring prescription in the United States, present a control problem which is not yet being met. Many of the border health problems could be eased considerably by the augmentation and upgrading of health resources, particularly those available to the poor, in both Mexico and the United States.

Although previous attempts had been made to undertake a survey in El Paso, these efforts did not include the joint U.S.-Mexico features of the current work. In assessing the reports of past surveys and their impact on the community, we found that many of the present key persons in medicine and public health were barely aware of the existence of such documents, let alone of their contents. Furthermore, quantified data were seldom supplied in the surveys, and from one survey to the next the approach to and conception of the problem varied considerably. None of the surveys was comprehensive, and today most of the studies are out of date because no provision had been made for periodic updating.

### **The Border Survey**

Recognizing the rapid population expansion and the consequent need for more and improved health resources along the border, the U.S.-

Mexico Border Public Health Association recommended at its 14th annual meeting in April 1967 that a survey of health resources and needs be undertaken. The association contacted members of the departments of preventive medicine at the medical schools of the University of California, Los Angeles, and the University of Chihuahua for consultation. It was decided that the survey be done in three stages, one in each of the next 3 years. The first stage of the survey was devoted to cataloging existing medical facilities (hospitals, nursing homes, public health departments); the second stage will focus on medical practitioners (physicians, nurses, curanderos) available along the border; the third stage will document health needs in border populations. To provide regular updating of the survey data after the first 3 years, the border will be re-surveyed cyclically in subsequent years with one part of the survey to be updated yearly. In this way, information relating to any portion of the survey will never be more than 2 years old.

American medical students supported by Public Health Service apprenticeships and Mexican medical students supported by their school were to undertake, with supervision, the initial development and pretesting of the survey instruments during three summers. The actual surveying will be carried out later in each year under the direction of the heads of the various local public health departments along both sides of the border who will distribute and collect the questionnaires in their respective areas.

To help the local health departments with the initial survey, regional meetings with health department heads will be held under the auspices of the Pan American Health Organization to answer specific questions and provide general consultation in relation to completion of the questionnaires. The regional meetings will be organized and chaired by Dr. Jorge Jiménez-Gandica, Secretary, U.S.-Mexico Border Public Health Association. With the completion of each stage of the survey, the results will be tabulated and published. Project directors are Dr. Arnold I. Kisch at the University of California, Los Angeles, and Josué Martínez-Berumén at the University of Chihuahua.

Rather than hurriedly scan large portions of the border in preparation for constructing their

questionnaires, the medical students were to study in depth a representative but small area—the El Paso-Juarez sector.

### Method and Progress in the Field

During the 2 months in the field, the project progressed through five stages, roughly according to a preset timetable: (a) orientation, (b) research and interviews, (c) writing of the working draft, (d) pretesting, and (e) final draft and presentation.

Orientation began when the students arrived in El Paso early in July 1968. The four Mexican and three American medical students and their faculty advisers met, and they were welcomed by representatives of the U.S.-Mexico Border Public Health Association, the Pan American Health Organization, and the El Paso City-County Health Department. A short while later, when the Mexican students returned to school for several weeks to complete final exams, the American students started to interview and acquaint themselves with El Paso as well as to draft tentative versions of the questionnaire. The Mexican students, having grown up near Juarez and already having a hospital questionnaire drafted earlier by the department of preventive medicine at their school, were somewhat more advanced at the start of the summer's work.

With the assistance of personnel at the El Paso City-County Health Department, the students met hospital and nursing home administrators as well as other prominent persons in community medicine on the northern side of the border. In subsequent lengthy interviews these people contributed greatly to the students' knowledge of the operation of the various facilities. Thus it was possible for the students to become acquainted with the general spectrum of health resources in El Paso, gain detailed knowledge about the facilities which would specifically concern the survey, and obtain valuable insights into the border's special health needs—all in a brief period of time.

The following are five of the preliminary findings in El Paso. (Problems similar to these had been observed also in Juarez.)

*Nursing and skilled paramedical personnel.* Administrators in almost all the facilities con-

tacted complained of crippling shortages of nursing and paramedical personnel. Lacking were not only persons with sufficient education and interest to be trained for these positions but also appropriate education facilities to train them. A further problem was presented by the meager salaries provided for these positions.

*Physicians.* Shortages were noted in most of the medical specialties, particularly psychiatry.

*Facilities for the care of the aged and chronically ill.* A general hospital with 42 extended care beds, seven nursing homes with 310 beds, and the Visiting Nurse Association working at a capacity of 200 individual home care visits per month fall far short of what is needed to care for El Paso County's estimated 20,954 citizens over the age of 65 and thousands more afflicted with chronic, debilitating disease (4d).

*Facilities and staff for low-cost prenatal and well-baby care.* The city-county health department, according to its director, Dr. M. D. Hornedo, provides most of the prenatal and well-baby care, but it is severely handicapped by the self-reinforcing problems of low budget allotment for staff nurses and physicians as well as the nursing shortages mentioned earlier.

*Low-cost obstetric services.* The limited facilities available cannot begin to meet the rising need. The shortage is further accentuated by a high birth rate among low-income families.

Around mid-July the American and Mexican students were benefited by a visit from a PAHO official from the Washington, D.C., headquarters. His suggestions and practical experience stimulated the group's thinking considerably and further aided progress on the questionnaires.

Toward the end of July the two student teams began long, arduous work sessions to hammer out similar questionnaires in English and Spanish. Questionnaires in the two languages were prepared for hospitals and for health departments. It was extremely gratifying at the conclusion of this set of meetings to realize that it was actually possible to make the questionnaires uniform, thanks to the students on both teams who had a working knowledge of the other's language. At this time, with the approval of the faculty advisers, the questionnaires were declared ready for pretesting. This was scheduled for the first 3 weeks in August.



For the pretest, the questionnaires were distributed to several dozen hospitals, nursing homes, and the El Paso City-County Health Department. A similar pretest south of the border was undertaken by the Mexican students. Facilities chosen were partly those with which the students had previous contact and partly those which were new to the students.

After a specified period of time the questionnaires were collected by appointment. At this time the students met with the persons who had filled out the questionnaires and worked through them, question by question, checking to see if each had been correctly understood and the desired information supplied. When problems arose, discussion clarified the difficulty and frequently resulted in some alteration. Numerous minor points of clarification were validly raised by respondents, and there were also occasional insightful additions and suggestions for large-scale improvement. Without exception the questionnaires were well received as materially relevant and comprehensive without being overly long.

Constant communication between the student groups was the key feature of the summer's experience. Each team profited enormously from the others' knowledge and perspectives.

### The Survey Questionnaires

The questionnaires developed by the students cover the following range of topics relative to health facilities along the border: (a) identification of facility, (b) services offered, and (c) personnel employed.

For hospitals, identification headings include such items as sponsorship and accreditation, sources of revenue, operating budget allotment for nonreimbursable care, the percentage contribution to total patient load by various geographic areas, and the condition of the physical plant. Similar questions in less detail were asked of the public health departments. Because of their more limited range of services provided and patients served, nursing homes were also questioned in less detail.

The core material of the questionnaires covers the services provided by the various facilities. For hospitals, "medical services" were sub-

divided into (a) inpatient services and (b) other departments, including outpatient clinics, emergency service, and auxiliary diagnostic and treatment services (pathology, radiology, blood banks, anesthesia, physical therapy, inhalation therapy, pharmacy, clinical laboratory, and preventive medicine services). Public health department services were grouped into (a) preventive medicine services, including environmental sanitation, disaster control, vital statistics, education programs, communicable disease control, and rabies, (b) clinic programs, and (c) laboratory services. Nursing home services were categorized into (a) extended care, (b) long-term skilled nursing care, and (c) custodial care.

Questions about personnel and staffing were incorporated into each of the services' sections in the public health department questionnaires, whereas for hospitals a separate section was devoted exclusively to staffing—physicians, nurses, paramedical personnel, and volunteers. A similar but less detailed format was used for the nursing home questionnaires.

Each of the questionnaires concluded with the following questions to be answered by the facility administrator: "As a person knowledgeable in health care, what in your opinion are the major unmet health needs in your community? Are any of these problems related to your border location?"

The English and Spanish versions of the public health department questionnaires were virtually identical and the hospital questionnaires also were similar except for a series of questions, not included in the English questionnaire, detailing certain features of the physical plant (elevators, electricity, energy powerplant, heating facilities, sewage system). Since there are no nursing homes on the Mexican side of the border, a nursing home questionnaire was not prepared in Spanish.

The pretest indicated that the questionnaires could be accurately and consistently completed by administrators without the benefit of an interviewer and at minimum inconvenience. The questionnaires did not attempt to investigate quality of services except within broad limits. Rather, the attempt was to compile basic information cataloging a facility's ability to deliver various components of medical care.

## Conclusions

Because the summer's effort was unique in several respects—the short period of time allotted, the use of medical students, the international features of the work—the following rather obvious conclusions take on an increased significance.

- The students' experience clearly demonstrated that it is feasible for medical students, participating in a short-term summer project, to come to a geographic area previously unfamiliar to them and learn a sufficient amount about its health resources to draft and pretest comprehensive questionnaires for cataloging existing medical facilities.

- If the border is an example, such projects are currently receiving enthusiastic response by professionals concerned with the upgrading of community health resources.

- The presence of such ongoing survey activity seems in itself to catalyze greater communication and cooperation among physicians, administrators, public health officials, and others directly or indirectly involved in the delivery of medical care.

A less-evident conclusion, based on our reflections and consultations with a number of health professionals, is that in all likelihood the questionnaires, or easily derived modifications, might well prove serviceable as survey instruments in other U.S. communities.

Federal funds are more and more being made available to supplement local health needs only so long as disparities between resources and needs can be clearly demonstrated. We found

that to begin the job of gathering accurate data is not as awesome as one might suppose.

## Future Directions

Now that the facility questionnaires are in final form, it will be possible for the project to move ahead in two regards: first, by starting the actual survey of hospitals, nursing homes, and health departments along the entire 1,000 mile stretch of border; and second, by developing, in the summers of 1969 and 1970, questionnaires covering medical practitioners and health needs along the border. Presumably, the second part of the work can be managed by students in much the same manner as it was accomplished earlier.

With the completion of all questionnaires and the surveying of all three areas of interest, it is our opinion that it will be possible for planners on either side of the border to intelligently assess present health conditions and future needs and to set priorities for improved resource allocation. Tentative completion date is June 1971.

## REFERENCES

- (1) Department of Planning, City of El Paso: Population and housing trends, 1960-68. El Paso, Tex., 1968, p. 16.
- (2) U.S. Bureau of the Census: Statistical abstract of the United States, 1968. Ed. 89. U.S. Government Printing Office, Washington, D.C., 1968.
- (3) Real Estate Research Corporation: Community and economic analysis, Chamizal planning program, El Paso, Texas. Los Angeles, 1966, sec. 2, p. 8.
- (4) El Paso Center for Mental Health and Mental Retardation Services: A proposed master plan. El Paso, 1967, (a) sec. 3, introduction; (b) sec. 3, pt. a; (c) appendix 7; (d) appendix 5.

# 12-State Survey of Needs and Interests in Continuing Education in Public Health

LAURENCE B. CALLAN, Ph.D., NICHOLAS PARLETTE, M.P.H.,  
and ALVIN R. LEONARD, M.D., M.P.H.

**T**HE Program of Continuing Education in Public Health provides university-led post-graduate education on topics of concern to professional health workers in 12 western States. The program is a partnership of professional schools (the Schools of Public Health of the University of California at Berkeley, University of California at Los Angeles, University of Hawaii, and Loma Linda University) and professional associations (the Western Regional Office of the American Public Health Association and the Western Branch of the American Public Health Association).

---

*Dr. Callan is lecturer in public health, University of California School of Public Health, Berkeley. Mr. Parlette is chief of the Program of Continuing Education in Public Health, Western Regional Office, American Public Health Association. Dr. Leonard is clinical professor of public health, University of California, Berkeley, and chairman of the faculty executive committee for the program.*

*The study described in this paper was supported in part by Hill-Rhodes Formula funds to the schools of public health and by grant No. MH-07661-06 from the National Institute of Mental Health, Health Services and Mental Health Administration, Public Health Service. The full report of the survey, "Public Health Professionals and Continuing Education," published in June 1968 by the program, contains detailed tables on the course offerings in each of the eight curriculum areas.*

The program's part-time field faculty of more than 500 persons is drawn from faculties of sponsoring graduate schools, parent universities, and other major universities as well as from private practice, industry, and operating health and social agencies. The program brings continuing professional education near to the participants' home areas.

The tempo and variety of course offerings have greatly increased since the program fielded its first of four presentations in 1960. From 1960 through 1966, a total of 4,772 participants have attended. At the end of December 1968, 8,364 persons had participated in program offerings. Over the past 3 years an average of 39 courses per year have been presented.

To find out whether the Program of Continuing Education in Public Health was, in fact, meeting the needs of public health professionals, a survey was carried out during 1966-67.

The purpose of the survey was to determine preferences of different groups of public health professionals by soliciting expressions of interest in and needs for continuing education courses from a representative consumer sample. Indications of preferences for newly proposed techniques and methods of instruction were also sought, as well as data on the characteristics of

professional health workers in the West (age, sex, preprofessional education, professional training, length of time in the health field, position in agency, and type of employing agency).

### Study Design

The survey was conducted in four phases: field interviews, pretest self-administered questionnaires, mailed self-administered questionnaires, and data analysis.

Interviews were undertaken with persons in 10 western States by requesting the chairman of each State's continuing education committee (committees are composed of public health professionals who belong to the State's public health association) to select persons representing a cross section of health disciplines in his State. Persons in Alaska and Hawaii were excluded from the field interviews because of travel expense, but they were a part of the mailed questionnaire sample. Colorado, which is not a part of the confederation, was excluded except for staff of the Public Health Service in Region VIII.

One hundred interviews were conducted by the program staff and three graduate students from the School of Public Health, University of California at Berkeley. The interviews were open-ended and exploratory. Their purpose was to secure data to assist in developing a self-administered questionnaire.

Before going into the field, interviewers and program staff discussed the history and operation of the program, the purpose of the study, questions to be asked, areas to be probed, and other pertinent details. At post-interview meetings, staff and interviewers reviewed written findings and the synopsis of impressions formed by each interviewer.

Data were summarized and categorized. From this compilation, a pretest self-administered questionnaire was developed and mailed to the 100 persons originally interviewed, 100 additional professionals from the same States named by the original interviewees, and 100 persons randomly selected from the professional staff rosters of health departments located in the western region.

The pretest had two purposes: (a) to test the questions for accuracy and clarity and (b) to predict the response rate of the final survey.

The pretest response rate was 62 percent.

The final questionnaire consisted of four sections: (a) participation in continuing education, (b) variations in course presentation, (c) course offerings, and (d) background of respondents.

### Nature of the Sample

Due to the budgetary considerations, the study population was limited to health professionals in departments of public health and selected voluntary health agencies in 12 western States (Alaska, Hawaii, California, Washington, Oregon, Nevada, Idaho, Montana, Wyoming, Arizona, New Mexico, and Utah). Data contained in this report are limited to information collected from health professionals in official health agencies. A separate report has been prepared containing information collected from professionals in voluntary health agencies.

A professional was defined as one whose position or title or both was included in "Compensation of Full Time Professional and Technical Personnel," an annual report of the California State Department of Public Health.

Rosters of professional personnel were obtained from 12 State health departments; the then existent seven city health departments; Regional Offices VII, VIII, and IX of the Public Health Service; all county health departments serving a population of more than 250,000; and a stratified random sample of county health departments serving populations of less than 250,000.

It is estimated that approximately 10,000 professionals are employed by departments of public health in the 12 western States, about half of them in California. Returns were weighted in order to provide equivalent bases for comparison between California and non-California respondents. The study was also designed so that responses from participants in courses of the program could be compared with nonparticipants. This additional factor entered into the final determination of the sample size.

Sampling was done in the following manner: in California, every fifth name was selected from the rosters of the Federal (Region IX, Public Health Service), State, city, and county health departments serving a population of more than 250,000. In the 11 other States, every

third name was taken from the rosters of the Federal (Regions VII and VIII, Public Health Service), State, city, and county health departments according to the same population criteria.

Next, using a stratified random sample of county health departments serving populations of less than 250,000, every fifth department in California and every third department in other western States was selected. Every name was taken from the rosters of these departments. In this manner—since one-fifth of the small county departments in California and one-third of the small county departments in other western States were included—the sampling ratio of one-fifth in California and one-third in other western States was preserved.

Rosters of professional personnel were cross-checked to eliminate duplication of names and to exclude clerks, laboratory assistants, and other nonprofessionals who were included on lists received from cooperating agencies.

#### Data Collection Techniques

The self-administered questionnaire was mailed on March 31, 1967, to the 2,534 persons in the sample. A second mailing on April 30, 1967, was addressed to those whose questionnaires had not been returned. The cutoff date for data collection was June 6, 1967.

Upon return of the completed questionnaire to the University of California Survey Research Center at Berkeley, each instrument was coded and processed for direct keypunching. Tabulations were prepared employing an IBM 1620 computer. A total of 1,355 persons responded; 43 percent of these were from California, 57 percent were from the other 11 States (table 1).

#### Background of Respondents

Twenty-nine percent of the respondents (table 2) had participated in the Program of Continuing Education in Public Health (C.E.P.H.). Sixty-six percent had no formal public health training (table 3). This lack reinforces the need for increased efforts in continuing education in public health. Table 3 also shows that among persons who have no formal public health training, fewer attended continu-

ing education courses than those who have such training, suggesting that ways must be found to motivate those who may need the continuing education most.

When comparing participants with nonparticipants, the participant group had a much higher percentage of those holding a master's degree or doctorate (table 3). In terms of academic attainment, there was little difference between California and non-California respondents.

The distribution of disciplines responding appears nearly equivalent for California and the other States, as it does for C.E.P.H. participants and nonparticipants. However, physicians and nonmedical administrators have participated in the program proportionately more than other disciplines. Laboratory personnel, statisticians, and health investigators are underrepresented in the participant population (table 4).

Places of employment of respondents (Federal, State, county, city, or city-county agency) correspond on a percentage basis to places of employment for public health professionals

**Table 1. Sample drawn and return by region**

Region	Actual number in sample	Number returned	Percent returned
California.....	1, 035	583	56
Non-California.....	1, 402	772	55
Total.....	2, 437	1, 355	55

NOTE: 97 questionnaires were rejected as incomplete or returned by the post office.

**Table 2. Participation in the Program of Continuing Education in Public Health (C.E.P.H.) as reported by respondents**

Region	Totals	Percent participating in C.E.P.H.	Number participating in C.E.P.H.	Number not participating in C.E.P.H.
California.....	583	19	116	463
Non-California.....	772	36	279	483
Total.....	1, 355	29	395	946

throughout the West. The type of employing agency does not appear to be a significant factor in determining participation in the Program of Continuing Education in Public Health.

A considerably higher percentage of C.E.P.H. participants than nonparticipants are in top management positions. Those in staff posi-

tions are underrepresented as C.E.P.H. participants. This underrepresentation may be explained, in part, by the types of courses offered, since many are concerned with management and aimed at persons with administrative responsibilities. Another possible explanation may be that those in the upper echelon have more free-

**Table 3. Educational attainment and possession of a degree in public health of respondents, by region and participation in the Program of Continuing Education in Public Health, in percentages**

Level and degrees	All respondents (N=5,231) <sup>1</sup>	By region		By participation <sup>3</sup>	
		California (N=583) <sup>2</sup>	Non- California (N=772) <sup>2</sup>	C.E.P.H. (N=1,417) <sup>1</sup>	Non- C.E.P.H. (N=3,764) <sup>1</sup>
<i>Educational level attained <sup>4</sup></i>					
High school.....	1	<0. 05	2	1	1
College (no degree).....	6	5	6	5	6
Associate in arts.....	<. 05	<. 05	1	<. 05	1
Registered nurse.....	9	7	12	8	9
Registered sanitarian.....	1	2	1	1	2
Bachelor of law.....	<. 05	<. 05	1	1	<. 05
Bachelor.....	49	52	45	39	53
Master.....	19	18	21	28	16
Doctorate.....	13	14	11	17	11
<i>Degrees in public health <sup>4</sup></i>					
None.....	66	62	70	56	69
Public health nurse.....	22	24	18	21	22
Master of science in public health.....	1	1	1	2	1
Master of public health or diploma in public health.....	11	12	10	21	7
Doctor of public health.....	<. 05	<. 05	1	1	. 05
Doctor of philosophy <sup>5</sup> .....	<. 05	. 000	. 05	. 05	. 000

<sup>1</sup> Weighted—California respondents times 5, non-California times 3.

<sup>2</sup> Not weighted—actual number of respondents.

<sup>3</sup> 14 persons did not answer the question on participation.

<sup>4</sup> Percentages were carried to 3 decimal points and have been rounded to the nearest whole number; therefore totals may be 99 or 101.

<sup>5</sup> Earned or awarded by an accredited school of public health.

**Table 4. Primary professional role of respondents by region and participation, in percentages**

Profession	All respondents (N=5,321) <sup>1</sup>	By region		By participation <sup>3</sup>	
		California (N=583) <sup>2</sup>	Non-California (N=772) <sup>2</sup>	C.E.P.H. (N=1,417) <sup>1</sup>	Non-C.E.P.H. (N=3,764) <sup>1</sup>
Dentists.....	41	41	41	41	41
Physicians.....	9	11	7	15	7
Nurses.....	37	36	39	37	38
Environmentalists.....	23	23	22	23	23
Health investigators.....	3	4	3	1	4
Statisticians.....	2	3	2	1	3
Educators.....	2	3	2	3	2
Social workers.....	9	8	10	8	9
Nutritionists.....	1	1	1	1	1
Nonmedical administrators.....	5	3	8	7	4
Laboratory personnel.....	7	8	6	3	8

NOTE: See footnotes 1-4 to table 3.

**Table 5. Age, position in agency, and length of time in present post and in public health of respondents, in percentages**

Item	All respondents (N=5,231) <sup>1</sup>	By region		By participation <sup>3</sup>	
		California (N=583) <sup>2</sup>	Non-California (N=772) <sup>2</sup>	C.E.P.H. (N=1,417) <sup>1</sup>	Non-C.E.P.H. (N=3,764) <sup>1</sup>
Age, in years: <sup>4</sup>					
Under 30.....	19	22	15	7	23
30-39.....	25	24	26	21	26
40-49.....	28	27	30	32	27
50-59.....	21	20	23	32	18
60 or more.....	6	7	5	8	5
No answer.....	.05	.05	1	.05	.05
Position in agency: <sup>4</sup>					
Head of agency.....	4	3	5	8	2
Head of subunit in agency.....	13	13	14	24	9
Supervisor.....	25	22	28	32	23
Staff.....	58	62	53	36	66
Length of time in present post: <sup>4</sup>					
Less than 2 years.....	34	33	36	26	37
2 to 4 years.....	25	26	24	29	24
5 to 9 years.....	20	21	18	23	19
10 to 14 years.....	10	10	10	10	9
15 or more years.....	11	10	12	12	10
Length of time in public health: <sup>4</sup>					
Less than 2 years.....	13	12	14	5	16
2 to 4 years.....	15	16	14	12	16
5 to 9 years.....	24	26	20	18	25
10 to 14 years.....	15	15	16	19	14
15 to 19 years.....	12	11	14	13	12
20 or more years.....	21	19	22	33	16

NOTE: See footnotes 1-4 to table 3.

dom to attend courses of their choice (table 5).

C.E.P.H. participants tend to have been in their present positions longer than nonparticipants; 45 percent of them have held their jobs 5 years or longer, as compared with 38 percent of nonparticipants. This same trend is evidenced with regard to the length of time in public health; 65 percent of C.E.P.H. participants have been in public health 10 or more years, as compared with 42 percent of nonparticipants (table 5). These two factors may be a concomitant of the overrepresentation of top managers among C.E.P.H. participants.

C.E.P.H. participants as a group were somewhat older than nonparticipants, which correlates with data on length of time in public health (table 5). In comparing California with non-California respondents, there was an overall balance in age groupings. Fifty-two percent of all respondents were female; 48 percent were male. There was a 50-50 distribution of the sexes of responding C.E.P.H. participants.

More than half of the respondents (56 per-

cent) were not members of any professional public health association. Seventy percent of C.E.P.H. participants, however, were members of the American Public Health Association, their State health association, or both, but only 32 percent of the nonparticipants belonged to one or both associations. A major reason cited for not attending C.E.P.H. course offerings was that the respondent had not been notified of the availability of courses. The program staff sends those on the membership rosters of State public health associations notices of future courses. The disparity may also reflect a tendency of those who have high professional motivation both to join their professional association and to take continuing education courses.

A separate report has been prepared on membership in the APHA and its affiliates. Three factors seem to be of prime importance in determining whether a person will join his professional association—possession of a public health degree encourages membership; the longer one has been in the field, the more likely

he is to be a member; and the higher the person's position in his organization, the more likely he is to join a professional association.

### Course Offerings

In the section of the questionnaire devoted to course offerings, titles of specific courses which were already developed and ready for presentation, in development stages, or ones considered feasible for development from those suggested in the initial pretest interview stage were listed.

A total of 78 course titles were grouped into these eight general content areas: administration, chronic disease, communication and coordination, environmental health, general public health, maternal and child health, medical care organization, and mental health.

Each area had nine or 10 course topics, but because of punchcard limitations, 10 was the maximum number possible in any broad area. Each respondent was first asked if he had an interest in the area or the course listed. If not, he was instructed to proceed to the next area. If he did, he was asked to indicate his first and second choice of courses.

The respondent was also asked to suggest additional courses he would like to see offered. These suggestions are considered in developing courses.

#### *Administration*

In the subject area of administration 33 percent of the respondents selected Introduction to Administration and Decision Making as the course they would be most or second-most interested in taking. Urbanization: Its Effects on Public Health; and Research Methods: Including Use of Computers and Program Evaluation were both selected by 31 percent of participants.

Of least interest to respondents in this area were Occupational Medicine and the Law (9 percent) and Medical-Health Economics (11 percent).

In comparing C.E.P.H. participants with nonparticipants, frequency of selection was similar, except for the course Introduction to Administration and Decision Making. The course was selected less frequently by those who had attended C.E.P.H. presentations. For the course

Political Science, Public Administration, and Health Programs, the reverse was true. Many participants may have taken the Introduction to Administration course which was offered throughout the region. This fact would, of course, affect the percentage selecting the course in political science.

Respondents who were either heads of agencies or of major subunits within agencies selected Research Methods: Including Use of Computers and Program Evaluation most frequently. The choice of supervisors was Introduction to Administration and Decision Making, while for staff personnel the top choice was Urbanization: Its Effects on Public Health.

By professional category, Research Methods was the first choice of physicians, health investigators, statisticians, nutritionists, social workers, and laboratory personnel. Educators and nonmedical administrators selected Political Science as their first choice. Environmentalists chose Urbanization, while nurses and social workers picked Introduction to Administration and Decision Making.

A person's position within an agency determined to a great extent his selection of courses within this curriculum. Ninety-four percent of heads of agencies, 91 percent of deputy heads, 82 percent of supervisors, and only 57 percent of staff personnel selected specific courses in the area of administration.

Other courses listed under administration were Budget Development and Personnel Management, Executive Development, and Federal Legislation and Health Programs.

#### *Chronic Disease*

The course most frequently selected by all respondents was Epidemiology (40 percent), followed by Dangerous and Addictive Drugs (27 percent), and Multiphasic Screening for Chronic Diseases (25 percent). There was little difference between California and non-California respondents in course preference.

C.E.P.H. participants differed from nonparticipants in several course topics. Participants in the program selected as their top preferences, after Epidemiology, the following courses: Multiphasic Screening, Geriatrics: Problems of Aging, and Dangerous and Addictive Drugs. After Epidemiology, nonparticipants chose



Drugs, Alcoholism, and Multiphasic Screening, in that order.

Chronic disease was the most popular curriculum area for nurses, with only 2 percent indicating no interest in it. Multiphasic Screening was their primary course selection. The top course priority for health educators was Dangerous Drugs; for social workers, Alcoholism; for nutritionists, Quackery, Consumer Education. Epidemiology was the top course choice for physicians, environmentalists, health investigators, statisticians, nonmedical administrators, and laboratory personnel. Other courses grouped under chronic disease were Cardiovascular Disease, Chronic Respiratory Diseases, Dental Research Applied to Public Health, and Stroke-Rehabilitation.

#### *Communication and Coordination*

The curriculum area of communication and coordination grew out of the field interviews. Most courses in this category were suggested by respondents during the interviews. Eighty-three percent of all respondents selected courses in communication and coordination. Of the eight general curriculum areas, it received the second highest frequency of selection. Of the nine courses listed, Motivation and Persuasion Techniques was the first choice, with 46 percent of all respondents selecting it as their first or second preference. Next was Communications: Individual and Organizational, the choice of 33 percent. Third was Community Organization: Development and Use of Resources, a choice of 29 percent.

Californians chose Communications as their second highest priority course, and Community Organization as their third choice. Non-Californians reversed these preferences. There was little difference in selection between C.E.P.H. participants and nonparticipants.

Some interesting variations occurred when hierarchical position was the variable. For example, 18 percent of the heads of agencies selected Coping with the Legislature and Management Decisions, while only 9 percent of staff personnel chose this topic. Interdisciplinary Coordination was selected by 40 percent of the agency heads and 17 percent of staff personnel. For the course Interpersonal Relationships the reverse was true—27 percent of the staff per-

sonnel chose this topic, while only 10 percent of the agency heads expressed an interest in it.

Of those with public health degrees, 21 percent selected Coping with the Legislature and Management Decisions. This course was picked by only 11 percent of those not having public health degrees. Those with an M.P.H. followed the same trend as heads of agencies; those without public health degrees followed the trend of staff personnel.

By discipline, Motivation and Persuasion Techniques was the first choice of dentists, physicians, nurses, environmentalists, educators, and nonmedical administrators. Statisticians and laboratory personnel picked Technical and Scientific Report Writing as their first choice; social workers, Community Organization; and nutritionists, Interdisciplinary Coordination.

Other courses listed under this area were Audio-Visual Methods and Terminology for Medicine and Nursing in Public Health.

#### *Environmental Health*

Seventy-seven percent of the respondents selected course titles in the curriculum area of environmental health. Environmentalists, as might be expected, selected environmental health as their top curriculum area, with 98 percent expressing interest.

Of the four course titles most frequently selected by respondents, Air and Water Pollution: Prevention and Control was the first choice of dentists, environmentalists, health investigators, and laboratory personnel; Environmental Sociology and Anthropology was the first choice of nurses, statisticians, social workers, and nonmedical administrators; Accident and Injury Prevention and Control was the first choice of educators; and Food and Drugs was the overwhelming selection of nutritionists.

There was little difference in the choices of California and non-California respondents, the only minor exception being Housing. More Californians expressed an interest in this topic than did persons outside of California.

#### *General Public Health*

The category of general public health received the highest percentage of respondent interest. Eighty-eight percent selected courses

in this area. Like communications and coordination, the general public health curriculum grew out of the pretest field interviews and pretest self-administered questionnaires. Titles listed were a synthesis of courses suggested by most of the pretest group as needed in their daily affairs and not currently available, to their knowledge, from any other source of continuing education.

The most popular courses were Consultation: How to Use It; How to Give It and Comprehensive Health Planning. Comprehensive Health Planning ranked highest with C.E.P.H. participants. Non-Californians gave Comprehensive Health Planning a higher priority than did California respondents. It might be noted that, at the time the questionnaire was mailed out, national and regional conferences on comprehensive health planning had been convened.

A higher percentage of non-Californians chose Techniques of Health Education and Teaching than Californians. Californians, to a greater degree, chose Public Health Law and Principles, Practices and Philosophies of Public Health.

The course, Applied Behavioral Sciences and Public Health, had a high degree of selection. It was about equally popular among California and non-California respondents and C.E.P.H. participants and nonparticipants.

Comprehensive Health Planning was the top course selection for physicians and nonmedical administrators. The course in consultation received the highest priority among nurses, social workers, and nutritionists. Health investigators and educators picked Applied Behavioral Sciences and Public Health as their first choice. Statisticians chose Biostatistics for the Public Health Worker; environmentalists, Public Health Law; laboratory personnel, Current Trends in Biochemistry and Microbiology; and dentists, Techniques of Health Education and Teaching.

Comprehensive Health Planning was chosen more often by those possessing a public health degree than by those not having the degree. Hierarchically, the heads of agencies chose Comprehensive Health Planning more frequently than did those in staff positions—45 percent as

opposed to 18 percent. The reverse was true of Consultation, in which 36 percent of the staff personnel expressed an interest, as opposed to only 17 percent of heads of agencies. Techniques of Health Education and Teaching was a choice of staff—34 percent versus only 12 percent for heads of agencies. On the other hand, Principles, Practices, and Philosophies of Public Health was a choice of agency heads—32 percent versus only 19 percent of staff personnel.

### *Maternal and Child Health*

Maternal and child health did not attract as much interest among respondents as did the other general categories discussed thus far. Non-Californians chose courses from this category more frequently than did Californians, and C.E.P.H. participants had a higher response rate than did nonparticipants.

Courses receiving the most responses were Family Planning and Community Services (31 percent), Neurological Disorders in Children (24 percent), Health of the School-Age Child (24 percent), and Child Development (23 percent).

In comparing respondents by region, the course, Health of the School-Age Child, was considered more popular with non-California than with California respondents. Thirty-one percent of non-Californians chose this course title, versus only 18 percent of the Californians. More Californians than non-Californians, on the other hand, chose Child Development and Neurological Disorders in Children.

When we noted differences in priorities between C.E.P.H. participants and nonparticipants, two courses stand out. Twenty-five percent of the participants expressed an interest in Genetic Counseling, while only 16 percent of nonparticipants did. The reverse is true of Child Development, a course picked by 25 percent of the nonparticipants, as contrasted with only 16 percent of C.E.P.H. participants.

Family Planning and Community Services was the top course selection of physicians, nurses, educators, and nonmedical administrators. Migrant Health Programs was the overwhelming first choice of environmentalists and health investigators. Dentists chose Health of the School-Age Child: School Health Pro-

grams; laboratory personnel chose Genetic Counseling; social workers chose Neurological Disorders in Children; nutritionists chose Problem Areas in Nutrition; and statisticians chose Reducing Infant Morbidity and Mortality.

There seemed to be little differentiation on the basis of possession of a public health degree. Some variation did show up, in that more persons without such a degree than with one expressed interest in the course Child Development. The reverse was true for the courses Migrant Health Programs and Reducing Infant Morbidity and Mortality.

### *Medical Care Organization*

Despite exciting new developments in medical care organization, this curriculum area received a low response rate; 31 percent of the persons surveyed indicated no interest in it. Within the curriculum, preferences centered on courses dealing with regional planning of services and facilities, quality control and evaluation, public medical care, organized health care, and medical care law. Interest then dropped off sharply for the other course topics listed. There was little difference between California and non-California respondents except that non-Californians tended to select regional planning as their central concern, while Californians chose both regional planning and quality control.

In comparing responses by C.E.P.H. participants and nonparticipants, we found some minor variations; the most notable concerned the course Regional Planning of Services and Facilities. Forty-five percent of the participants selected this topic, as contrasted with only 31 percent of nonparticipants. The courses Health Manpower and Organized Health Care received higher priorities from C.E.P.H. participants than nonparticipants, while Medical Care Law received a higher frequency of selection by nonparticipants than participants.

Among heads of agencies, 92 percent selected courses in this curriculum area; among agency subunit heads, 72 percent selected courses; among supervisory personnel, 62 percent selected courses; and among staff personnel, 57 percent selected courses. Heads of agencies, deputy heads, and supervisors tended to center their selections on the two courses, Quality Con-

trol and Evaluation and Regional Planning of Services and Facilities. Staff personnel tended to spread their selection more evenly throughout all courses listed.

Neither possession of a public health degree nor length of time in public health seemed to be a deciding factor in selection of courses in this curriculum.

By discipline, Regional Planning of Health Facilities and Services was the top course selection for physicians, nurses, environmentalists, educators, social workers, and nonmedical administrators. Quality Control and Evaluation was the first preference for health investigators, statisticians (overwhelmingly), and laboratory personnel. Nutritionists chose Health Manpower, while dentists perhaps understandably, chose Dental Care. Other courses listed were Drug Control, Health Insurance, Hospital Administration, and Public Medical Care.

### *Mental Health*

There was little difference between California and non-California respondents and C.E.P.H. participants and nonparticipants in their course choices within the area of mental health. The only notable variation was that more participants (24 percent) gave priority to Comprehensive Mental Health Planning than did nonparticipants (14 percent). Courses with the highest priority from all respondents were, in order, The Multiproblem Family, Mental Health of Children and Teenagers, and Mental Health Problems of Race Relations and Poverty Populations.

With only minor variations, possession of a public health degree, length of time in the health field, and age appeared to have little influence on course selection.

When choices were examined hierarchically, four courses showed some differentiation. Persons high in their organizations tended to choose Community Psychiatry and Comprehensive Mental Health Planning more frequently than staff level persons. The reverse was true when the courses Mental Disorders of Concern to Public Health Personnel and Mental Health of Children and Teenagers were compared with position held within the agency. The course on The Multiproblem Family received the high-

est percentage of choices throughout all hierarchical levels.

The area of mental health, as determined by the percentage of course title selections, was the highest among physicians (81 percent choosing courses in this area), nurses (95 percent), and social workers (90 percent). Course selection by discipline showed that dentists picked Comprehensive Mental Health Planning as their first choice, as did nonmedical administrators. Environmentalists, educators, and laboratory personnel chose Mental Disorders of Concern to Public Health Personnel. Nurses, social workers, and nutritionists chose The Multiproblem Family; physicians, Mental Health of Children and Teenagers; statisticians, The Mental Patient in the Community; and environmentalists and health investigators, Mental Health Problems of Race Relations and Poverty Populations.

#### Interest in Areas By Discipline

Marked differences in interest in curriculum areas were shown by respondents according to the various disciplines they represented. The differences can be measured by the percent of persons selecting courses in a given curriculum area. Table 6 summarizes this information.

Physicians tended to select uniformly from all curriculum areas. Environmental health was

their lowest priority, with 70 percent selecting such courses, while mental health was their highest, with 81 percent selecting courses.

Nurses showed a relative lack of interest in only one area—administration. Only 61 percent selected courses dealing with the subject. Mental health, chronic disease, general public health, communication and coordination, and maternal and child health were all of high priority to nurses. More than 90 percent selected courses in these areas.

Environmentalists centered their interest in environmental health, with 98 percent picking course titles under this category. Their next area of priority was general public health, with an 85 percent selection factor. Less than half of them selected courses in the categories of maternal and child health, medical care organization, and mental health.

Social workers clustered their choices in mental health (90 percent), communication and coordination (85 percent), and maternal and child health (80 percent).

Nonmedical administrators chose courses with greatest frequency in these four areas: administration (96 percent), general public health (96 percent), communication and coordination (94 percent), and medical care organization (83 percent). Laboratory personnel as a group tended to select courses with less frequency than

**Table 6. Percentage of respondents selecting courses in 8 curriculum areas, by discipline**

Discipline	Number of respondents	Curriculum area							
		Admin- istra- tion	Com- muni- cation and coordi- nation	Chronic disease	Envi- ron- mental health	Gen- eral public health	Mat- ernal and child health	Medi- cal care organi- zation	Mental Health
Dentists.....	52	94	88	94	73	88	85	100	79
Physicians.....	489	71	75	78	70	79	80	76	81
Nurses.....	1,953	61	91	93	75	92	91	70	95
Environmentalists.....	1,185	79	79	61	98	85	31	42	39
Health investigators.....	165	75	76	85	82	87	48	44	63
Statisticians.....	122	92	72	84	56	88	56	69	57
Educators.....	119	89	96	76	79	96	81	77	84
Social workers.....	462	64	85	73	52	77	80	55	90
Nutritionists.....	52	73	90	100	90	100	81	67	44
Nonmedical administrators.....	265	96	94	58	52	96	37	83	49
Laboratory personnel.....	367	50	62	69	79	91	36	47	45
All respondents.....	5,231	72	83	78	77	88	66	61	72

NOTE: Percentages were figured to 3 decimal points and have been rounded to the nearest whole number; therefore totals may be 99 or 101.

other disciplines. The only area receiving a substantial number of their selections was general public health (91 percent). The area of next greatest concern was environmental health, with 79 percent expressing interest.

Educators, while tending to select courses in all general curriculum areas, picked courses in communication and coordination and general public health with the greatest frequency.

Administration, general public health, and chronic disease were the most popular with statisticians. Health investigators most often selected courses under the headings of general public health, environmental health, and chronic disease. Dentists and nutritionists were represented in small numbers within the sample, and they tended to select courses in all curriculum areas. The exceptions were that nutritionists less often chose courses in mental health (only 44 percent) and medical care organization (only 67 percent).

### New Courses

Respondents were asked to indicate any courses not mentioned in the questionnaire which they would like added to the curriculum. Suggestions obtained from that open-ended question have been excerpted and compiled and are used in course planning enterprises.

Respondents were also asked to indicate their interest in either or both of two topical areas: current national trends as they affect the health field and basic preparatory areas, such as new mathematics, symbolic logic, systems theory, and calculus. Thirty-seven percent of the respondents said that they would be interested in both areas, and 13 percent indicated no interest in either. When asked to select only one of the two areas, 40 percent chose current national trends, while only 6 percent chose new mathematics, symbolic logic, systems theory, and calculus. Four percent did not answer this question. There was no apparent difference between C.E.P.H. participants and nonparticipants or between Californians and non-Californians. Neither did there seem to be any major difference when discipline was the factor for comparison.

Respondents were then asked to suggest the maximum number of courses they would be interested in attending during a year. The ma-

jority suggested two courses per year. Again, there was little difference when participation in the program, residence, and discipline were comparison factors.

Respondents were asked to designate those curriculum areas which they believed would be the most useful for them and for other professionals in their own discipline. Table 7 summarizes this information.

There was a reasonably uniform distribution of choice among administration, communication and coordination, environmental health, general public health, and maternal and child health as selections for self. However, when asked to select courses needed by others in their disciplines, respondents were unanimous in choosing communication and coordination as the most needed area, followed by general public health.

### Variations in Course Presentations

In one section of the questionnaire we tried to find out what respondents thought about new methods of teaching—that is, innovative techniques integrated into programs as supplementary learning experiences, augmenting current offerings in the field. A short paragraph summarizing possible alternative uses of each technique preceded the questions. Respondents were queried about the use of TV-telephone tieups, use of circuit-riding faculty, use of teaching machines, and use of programmed texts. Opinions on the desirability and usefulness of these techniques were cross-tabulated according to position, professional discipline, age, and sex of respondents.

Approximately the same response pattern was found for C.E.P.H. participants and non-participants and for Californians and non-Californians regarding use of TV-telephone tieups. There were also no significant differences in regard to position, discipline, age, or sex of respondents. Following are the opinions of all respondents about use of TV-telephone tieups:

<i>Opinion</i>	<i>Percent</i>
Definitely useful.....	35
Might be useful.....	53
Would not be useful.....	9
No reply.....	4

The responses of those who worked in rural areas and in suburban areas were checked, since

they would be the groups who might benefit most from this technique. However, their responses did not differ noticeably from the overall response.

On the use of the circuit-riding faculty, there was little variation from the total pattern among any major category. The total response indicated overwhelmingly that respondents would like to see circuit-riding faculty used, but they did not want to lose the advantage of attending meetings at central sites. The opinions and percentage of respondents on this matter follow.

<i>Opinion</i>	<i>Percent</i>
Would like meetings only at central sites----	13
Would like to see circuit-riding faculty only--	4
Introduce circuit-riding faculty, but keep central meeting sites-----	78
No reply-----	5

In cross-tabulations no major change emerged from the overall pattern.

Programed learning techniques have been suggested as supplemental aids to courses offered in the field. The Program of Continuing Education in Public Health has invested time and effort in research, development, and the introduction into its presentations of teaching machine units and programed texts. This survey afforded an opportunity for potential consumers to indi-

cate receptivity to these techniques and express opinions on how they might best be used.

Answers indicated that there is resistance to both these methods. Thirty-one percent of respondents indicated that teaching machines were not useful or did not reply. Nineteen percent saw programed texts as not useful or did not reply.

Preferences for when to use techniques were evenly distributed over before, during, or after a seminar. There was, however, a slight difference expressed in the sequence in which the two techniques might ideally be used. Respondents felt that teaching machines can best be employed in post-seminar reviews and that a programed text can be employed more appropriately in pre-seminar preparation.

In cross-tabulating disciplines, it was found that the range of resistance to teaching machines varied from a low of 12 percent for nutritionists to a high of 46 percent for social workers. The median was 29 percent, represented by environmentalists. Physicians, nurses, health investigators, and laboratory personnel were more resistant to the technique than were statisticians, educators, and nonmedical administrators.

Respondents were less resistant to programed

**Table 7. Curriculum areas selected as most useful for self and for others in same discipline, in percentages**

Curriculum area	All respon- dents (N=5,231) <sup>1</sup>	By region		By participation <sup>3</sup>	
		California (N=583) <sup>2</sup>	Non- California (N=772) <sup>2</sup>	C.E.P.H. (N=1,417) <sup>1</sup>	Non- C.E.P.H. (N=3,764) <sup>1</sup>
Most useful for self: <sup>4</sup>					
Administration.....	18	15	21	25	15
Chronic disease.....	6	7	6	5	7
Communication and coordination.....	17	16	18	21	15
Environmental health.....	18	19	16	15	19
General public health.....	14	15	13	10	16
Maternal and child health.....	12	13	11	9	13
Medical care organization.....	3	4	3	5	3
Mental health.....	9	10	9	8	10
No answer.....	2	2	3	1	3
Most useful for others: <sup>4</sup>					
Administration.....	9	8	9	11	8
Chronic disease.....	5	6	5	5	5
Communication and coordination.....	28	26	30	33	26
Environmental health.....	14	14	12	11	15
General public health.....	19	19	19	18	20
Maternal and child health.....	6	6	6	6	6
Medical care organization.....	4	4	4	4	4
Mental health.....	8	9	7	7	9
No answer.....	7	7	7	5	7

NOTE: See footnotes 1-4 to table 3.

texts. Those indicating they regarded the technique as not useful ranged from 6 percent of nutritionists to 31 percent of social workers. The median was 18 percent, as represented by nurses and statisticians. Educators were the only group to maintain a consistent percentage of resistance to both techniques—25 percent to each.

Age did not appear to be a factor in determining responses to either technique, except that 35 percent of those 65 and over were resistant to programed texts, as compared with 20 percent of those in other age groups. There was no difference with regard to teaching machines.

Persons with a high school education indicated the greatest resistance to both techniques, although there is a distinct possibility that they may not have understood the techniques; 43 percent did not answer the question on teaching machines and 33 percent did not answer the question on programed texts. Respondents with more education had a response rate of 85 percent or more to both questions.

Cross tabulation for other factors showed no unusual variances with the possible exception that staff personnel were more accepting than heads of agencies. Eighty-two percent of staff compared to 64 percent of agency heads accepted teaching machines, and 80 percent of staff, compared to 76 percent of agency heads, accepted programed texts.

### **Single or Multidiscipline Seminars**

Respondents were asked to indicate their preference for seminars geared to single or multidisciplinary groups. Forty-three percent favored the multidiscipline groups, 37 percent, single discipline seminars, and 18 percent showed no preference. C.E.P.H. participants preferred multidisciplinary to single discipline seminars by a margin of 55 percent to 27 percent, whereas nonparticipants in the program reversed the preference—41 percent to 38 percent in favor of single discipline groups.

Among the various professions, laboratory personnel favored single over multidisciplinary seminars, 59 percent to 21 percent; sanitarians, 44 percent to 38 percent; and dentists, 54 percent to 46 percent. These were the only groups that preferred courses restricted to their own field. All other professions showed a preference for multidisciplinary seminars, although ap-

proximately 30 percent of the respondents in each discipline preferred seminars designed for their own discipline.

In comparing educational attainment with this response, we found that those who had a high school education showed a preference for single discipline seminars, 50 percent to 21 percent. Those who had registered sanitarian certification, but no degree, showed a similar preference—52 percent to 31 percent.

### **Participation in C.E.P.H.**

Persons in the survey had an opportunity to indicate how much contact, if any, they had had with the Program of Continuing Education in Public Health and what contact they had had with other sources of continuing education.

Twenty-nine percent of the respondents stated that they had participated in C.E.P.H. courses. The percentage of those attending was higher (36 percent) for those outside of California than for Californians (19 percent). By discipline, participation was highest among physicians (44 percent) and lowest among statisticians (7 percent). For other disciplines, participation was 38 percent of the nonmedical administrators, 37 percent of educators, 27 percent of dentists, 24 percent of environmentalists, nurses, and social workers, 17 percent of nutritionists, 13 percent of laboratory personnel, and 10 percent of health investigators.

Some factors which seem to influence participation in the program, or at least the opportunity to participate, were length of time in public health, position within their agency, and possession of a degree in public health. Forty-four percent of respondents had participated during 1966; 31 percent in 1967 and 12 percent in 1965.

Those in the sample were asked to indicate the number of C.E.P.H. courses they had attended during the period 1961–66. The responses indicated that the program is reaching a reasonably broad range of persons rather than a narrow group of seminar attendees.

Respondents who had not attended C.E.P.H. courses were asked to check the chief reason or reasons which prevented their attendance. Lack of notification of courses was the principal one given. This reason is undoubtedly valid, since courses are announced primarily

in mailings by the State public health associations to their membership, and a majority of respondents did not belong to their State association.

Finally, all respondents were asked to indicate the most important and next most important reasons other people did not attend courses presented by the program. The reason checked most frequently was that employers felt they could not afford to give time off from work. Other reasons mentioned in order of declining frequency were lack of notification of courses, heavy workloads, and lack of recognition of employee participation by the employing agency.

### **Implications for Planning and Study**

One outcome of the survey has been approval by the faculty advisory committee and development by the program of the following courses:

1. Community Organization
2. Advanced Series in Comprehensive Health Planning
3. Advanced Series in Environmental Health
4. Consultation : How to Use It : How to Give it
5. Mental Health in Rural Areas
6. Dangerous and Addictive Drugs
7. Mental Health of Teenagers
8. Advanced Course on Planning for Comprehensive Health Planning
9. Program Evaluation
10. Courses Dealing with Problems of Infants and Children

The first seven courses on the list have already been given and were positively received. Appropriate content subcommittees of the faculty advisory committee are undertaking further course development. Because of the need and demand expressed selected courses, such as the administration series, communication, and family planning, are being repeated in the States or offered on a regional basis or both. Also, State continuing education committees have planned their annual course scheduling in light of the study findings.

Based on the widespread acceptance of TV and video tapes to supplement continuing education courses, the program has intensified efforts to use these methods. A 14-video tape series on Drug Use and Abuse and tapes on Comprehensive Health Planning have been developed and used.

Methods to recruit participants are being

reevaluated by the continuing education committee of each State. Reliance on mailings to association members is not effective since the majority of professionals do not belong to their State associations. A more basic reason for the ineffectiveness of the mailings is that the scope of public health is broadening to those in social planning, welfare, and mental health agencies, who are involved both in course planning and as participants.

In selecting courses to develop and in recruiting participants, greater attention must be paid to the job levels of potential participant-students. Parallel curriculums have been developed, one for staff level and another for management level persons.

Follow-on studies are being planned. These will attempt to identify both the individual and organizational motivational factors which determine whether a person participates in continuing education. One in-depth study in California was recently concluded (1). And at least one school of public health in the West is reviewing these studies and others to assist its faculty in planning curriculum modifications.

### **Summary**

The Program of Continuing Education in Public Health surveyed public health professionals in 13 western States in 1967. A mailed questionnaire was used to determine needs and interests in continuing education. The 1,355 respondents (53 percent of the 2,534 persons in the sample) made two choices from a list of 78 courses grouped into eight broad categories.

Twenty percent or more of all respondents chose the following course topics: Motivation and Persuasion Techniques for Use With the Legislature, the Professional, the Public—38 percent; Epidemiology—31 percent; Air and Water Pollution: Prevention and Control—30 percent; Environmental Sociology and Anthropology—30 percent; Consultation: How To Use It: How To Give It—30 percent; Communications: Individual and Organizational—27 percent; The Multiproblem Family—27 percent; Community Organization: Development and Use of Resources—24 percent; Comprehensive Health Planning—24 percent; Introduction to Administration and Decision Making—23 per-



cent; Applied Behavioral Sciences and Public Health—23 percent; Techniques of Health Education and Teaching—23 percent; Mental Health of Children and Teenagers—23 percent; Urbanization: Its Effects on Public Health—22 percent; Research Methods: Including Use of Computers, Program Evaluation—22 percent; Dangerous and Addictive Drugs—21 percent; Multiphasic Screening for Chronic Diseases—20 percent; Accident and Injury: Prevention and Control—20 percent; Family Planning and Community Services—20 percent.

Survey data indicated that public health professionals are concerned with general problems, not specific diseases or narrow subjects, and with acquiring skills to increase their capacity for solving organizational and community problems. The majority preferred courses designed for multidisciplinary audiences, but 30 percent of those in all disciplines and at all organizational levels preferred single discipline courses.

Respondents overwhelmingly favored use of TV video tapes and telephone tieups as a supplement to continuing education. They were resistant to the use of teaching machines; how-

ever, a high percentage did not answer this question and may therefore be unfamiliar with the machines.

Primary reasons for not taking courses were not receiving notification of the courses, lack of recognition by their agency, and heavy workloads. The choice of courses depended greatly on the respondents' administrative level within their agencies.

Those who had taken previous courses of the Program of Continuing Education in Public Health have been in public health longer, hold higher positions in their agencies, are older, have more advanced degrees, and are more likely to be members of the American Public Health Association or their State public health association than nonparticipants in courses. Sixty-six percent of those in full-time professional positions did not possess a degree in public health.

#### REFERENCE

- (1) Carlaw, R. W., Hellman, S., and Paillette, G. N.: The organization and continuing education. American Public Health Association Western Regional Office, San Francisco, 1969.

---

## Dr. Egeberg, Assistant Secretary for Health and Scientific Affairs

DR. ROGER OLAF EGERBERG, former dean of medicine at the University of Southern California School of Medicine, is the new Assistant Secretary for Health and Scientific Affairs, Department of Health, Education, and Welfare.

Dr. Egeberg was clinical professor of medicine at the University of California at Los Angeles from 1948 to 1964 and professor of medicine at the University of Southern California from 1956 until he was named dean of the School of Medicine in 1964.

After graduating from Cornell University in 1925, he received his M.D. in 1929 from the Northwestern University School of Medicine. He interned at Wesley Hospital in Chicago and completed his residency in internal medicine at the University of Michigan Hospital in Ann Arbor in 1932.

Dr. Egeberg practiced internal medicine in Cleveland for 10 years. He served in the U.S. Army Medical Corps from 1942 to 1946, spending the period from 1944 to 1945 as personal physician and aide-camp to Gen. Douglas MacArthur.

From 1946 to 1956, Dr. Egeberg was chief of Medical Services at the Veterans Administration Hospital in Los Angeles. He was medical director of the Los Angeles County Hospital from 1956 to 1958.

The new Assistant Secretary for Health and Scientific Affairs has served on numerous State and Federal medical advisory boards and commissions, including the President's Panel on Narcotic Addiction (1962) and the President's Advisory Commission on Narcotic and Drug Abuse (1963). From 1964 to 1967, he was a member of the National Advisory Cancer Council. He was chairman of the Governor's Committee for the Study of Medical Care and Health in California from 1959 to 1960.

Dr. Egeberg is a diplomate of the American Board of Internal Medicine, a fellow of the American College of Physicians, and a member of the American Clinical and Climatological Association, California Society of Internal Medicine, American Medical Association, California-Los Angeles Medical Association, and Alpha Omega Alpha.

# Education Notes

**Applied Epidemiology for Physicians.** A course in applied epidemiology for physicians will be offered at the National Communicable Disease Center, Public Health Service, Atlanta, Ga., November 17-21, 1969.

The course, part of the Center's continuing education program, is directed to physicians who investigate disease outbreaks or who have administrative responsibility for such investigations. A refresher for experienced health administrators and an introductory medium for physicians new to public health, the course is designed to show how epidemiologic techniques can be used in disease prevention.

Although the course will include lecture-discussion sessions, emphasis will be placed on group participation obtained through the use of group solution of epidemiologic problems, seminar-type presentations, and panel discussions. Audiovisual aids are used in the presentations.

Registrants will be expected to attend all sessions. Additional information and application forms may be obtained from the National Communicable Disease Center, Atlanta, Ga. 30333. Attention: Medical Training Officer, Health Services Branch, Training Program.

**Public Health and Medical Aspects of Chemical and Biological Defense.** A 5-day course in public health and medical aspects of chemical and biological defense will be offered by the Public Health Service and the Army Chemical Center and School, Fort McClellan, Ala. Classes are scheduled at the Army Center October 13-17, 1969, and February 9-13, and May 11-15, 1970.

The course includes detailed instruction in current capabilities in chemical and biological agents and munitions systems; defensive techniques, including planning, organization, materiel, and defensive operations; public health aspects of chemical and biological operations; detection and identification of chemical and biological agents; survey and deline-

ation of contaminated chemical areas; decontamination materials and techniques; first aid for chemical casualties; treatment for biological casualties; care and use of defensive equipment; and psychological aspects of chemical and biological weapons systems.

Representatives of State or local health departments, the Veterans' Administration, or the Public Health Service; faculty members of affiliated schools in the Medical Education for the National Defense Program; and persons holding positions in which knowledge of chemical and biological defense would be useful are eligible. Security clearance of students is not required.

Additional information is available from the Deputy Chief, Training Branch, Division of Emergency Health Services, Public Health Service, 6935 Wisconsin Avenue, Chevy Chase, Md. 20015.

**Health Planning.** The University of Michigan's first broad-scale professional training program in health planning will be offered to about 10 graduate students the fall of 1969.

The 2-year curriculum will include social sciences, operations research, statistics, public health, and planning techniques. Problems of poverty, housing, race relations, manpower, and economic development will also be considered.

Stipends are available upon arrangement with the School of Public Health. A bachelor's degree from an accredited college is required.

Additional information is available from Dr. Myron E. Wegman, Dean, School of Public Health, University of Michigan, Ann Arbor, Mich. 48104.

**Graduate Program in Public Health Nutrition.** Tulane University School of Public Health and Tropical Medicine will begin a graduate program in public health nutrition at both the master's and doctoral levels in September 1969. Degrees will be tailored to the individual candidate's background and interests.

The master of public health, master of science in hygiene, doctor of public health, and doctor of science in hygiene degrees in nutrition are available. Master of science and doctor of philosophy degrees are available through the graduate school in basic science disciplines related to nutrition.

A limited number of stipends are available in accordance with standard fellowship allowances of the National Institutes of Health, Public Health Service. The program is approved for Veterans' Administration educational benefits.

Additional information is available from Dr. Patrick M. Morgan, Tulane University School of Public Health and Tropical Medicine, 1430 Tulane Ave., New Orleans, La. 70112.

**Residency in General Preventive Medicine.** A new residency training program in general preventive medicine is being started by the University of Michigan School of Public Health.

The 3-year program, approved as meeting the requirements of the American Board of Preventive Medicine, will prepare physicians for administrative, research, and teaching careers.

Most first-year residents probably will enroll in the master of public health program. Physicians already holding an M.P.H. degree or its equivalent may be admitted directly into the second year of residency training.

The program will permit specialization in epidemiology, maternal and child health, medical care administration, industrial health, population planning, or public health administration and may include completion of requirements for the doctor of public health degree.

Additional information is available from Dr. Myron E. Wegman, Dean, School of Public Health, University of Michigan, Ann Arbor, Mich. 48104.

**Principles of Epidemiology.** The Training Program of the National Communicable Disease Center, Public Health Service, will conduct a multidisciplinary course in epidemiology, January 19-23, 1970, as part of the continuing education program.

The course is designed to provide public health workers with a basic understanding of the use of epidemiologic techniques in disease prevention. It is offered for physicians, dentists, veterinarians, nurses, laboratory workers, environmental health personnel, and other members of the public health team.

Participants will be admitted on the basis of pro-

fessional education and experience and current responsibility in public health programs. Preference will be given to applicants whose professional tasks involve application of epidemiologic procedures.

Further information and application forms may be obtained from the National Communicable Disease Center, Atlanta, Ga. 30333, Attention: Medical Training Officer, Training Program.

**Courses for Physicians in Maternal and Child Health.** The University of California School of Public Health at Berkeley offers six postgraduate programs of study for physicians, primarily pediatricians and obstetricians. Each curriculum leads to the master of public health degree.

*Maternal and child health* is a 9-month program in planning, organizing, operating, and evaluating community health programs for mothers and children.

*School health* is a 9-month program in providing health services for children and adolescents of school age.

*Handicapped children, including mental retardation and learning disorders* is a 21-month program combining clinical and community training in the diagnosis, treatment, rehabilitation, and management of handicapped children and youth.

*Career development program in community pediatrics* requires 36 months and includes 2 years of pediatric residency training and 1 year of training in maternal and child health. This program meets the training requirements for certification by the American Board of Pediatrics.

*Maternal and child health—family planning* is a 9-month program on planning, organizing, operating, and evaluating health services for mothers and children, with emphasis on family planning. The course is designed primarily for obstetricians.

*Career development program in maternal health* combines a clinical residency in obstetrics and gynecology at the University of California Medical School with training in maternal and child health and family planning at the School of Public Health.

Tax-exempt fellowships are available from the Public Health Service and the Children's Bureau. Applications are being received for admissions beginning July or September 1970.

Further information is available from Helen M. Wallace, M.D., Professor and Chairman, Division of Maternal and Child Health, University of California School of Public Health, Berkeley, Calif., 94720.



**Guidelines to Radiological Health.** *PHS Publication No. 999-RH-33; September 1968; 174 pages.* Presents a report of the International Conference on Guidelines to Radiological Health, held at McGill University, Montreal, Quebec, Canada, August 1967, and sponsored by the Public Health Service's Bureau of Radiological Health and the Department of National Health and Welfare, Radiation Protection Division, Ottawa, Canada. Contains the texts of the discussions on radiological health problems as presented by a group of experts. Speakers from the United States, Canada, Great Britain, and Japan presented papers on radiation injury, preventive measures, and sources of radiation and epidemiology. These included the fields of diagnostic and therapeutic radiation, industrial exposure to radiation, changes induced by irradiation of nutritional elements, and radioecological concentration processes.

**Mental and Emotional Illnesses in the Young Child.** *PHS Publication No. 1877; by Bertram S. Brown; 1969; 12 pages; 25 cents.* Presents an illustrated guide for parents to antisocial behavior in children. Discusses, in a general way, some of the mental and emotional illnesses which may beset children from infancy through adolescence. Also discusses the essentials—including affection, security, a feeling of personal significance—a child needs to mature in a healthy way.

**Georgia Radium Management Project.** *PHS Publication No. 999-RH-34; January 1969; 70 pages.* The Georgia Radium Management Project, a joint effort of the Radiological Health Service, Georgia Health Department, and the Radioactive Materials Section, Division of Radiological Health (presently Radioactive Materials and Nuclear Medicine

Branch, Division of Medical Radiation Exposure, Bureau of Radiological Health), determined the extent of the use of radium in medicine and the radiological health problems existing as a result of this use. Basically, the investigation concerned an assessment of (a) the extent and types of radium usage in the practice of medicine, (b) adequacy of radiation safety procedures and equipment employed in handling, storing, and using radium sources, (c) leakage of radium sources, and (d) contamination resulting from use of radium in medicine. Phase I of the project surveyed the hospitals of Georgia, and Phase II surveyed medical offices and clinics. Radiological health practices related to the use of radium in most of the hospitals were below acceptable standards. General and specific findings for radiological health practices in medical offices and clinics are presented. Hospitals, medical offices, and clinics were generally unaware of radium contamination insurance. A study of radium contamination insurance is included.

#### **Statistics From the National Health Survey**

**COMPARISON OF CLASSIFICATION OF PLACE OF RESIDENCE ON DEATH CERTIFICATES AND MATCHING CENSUS RECORDS, United States, May–August 1960.** *PHS Publication No. 1000, Series 2, No. 30; January 1969; 60 pages; 60 cents.*

**PSEUDOREPLICATION.** Further evaluation and application of the balanced half-sample technique. *PHS Publication No. 1000, Series 2, No. 31; January 1969; 24 pages; 35 cents.*

**METHODS FOR MEASURING POPULATION CHANGE.** A systems analysis summary. *PHS Publication No. 1000, Series 2, No. 32; March 1969; 18 pages; 30 cents.*

**INFANT LOSS IN THE NETHERLANDS.** *PHS Publication No. 1000, Series 3, No. 11; August 1968; 63 pages; 50 cents.*

**THE 1970 CENSUS AND VITAL AND HEALTH STATISTICS.** A study group of the Public Health Conference on Records and Statistics. *PHS Publication No. 1000, Series 4, No. 10; 14 pages; 30 cents.*

**PERSONS HOSPITALIZED, by number of hospital episodes and days in a year, United States, July 1965–June 1966.** *PHS Publication No. 1000, Series 10, No. 50; February 1969; 51 pages; 55 cents.*

**CHRONIC CONDITIONS CAUSING ACTIVITY LIMITATION, United States, July 1963–June 1965.** *PHS Publication No. 1000, Series 10, No. 51; February 1969; 48 pages; 50 cents.*

**HEARING STATUS AND EAR EXAMINATION.** Findings among adults, United States, 1960–1962. *PHS Publication No. 1000, Series 11, No. 32; November 1968; 28 pages; 35 cents.*

**USE OF SPECIAL AIDS IN HOMES FOR THE AGED AND CHRONICALLY ILL, United States, May–June 1964.** *PHS Publication No. 1000, Series 12, No. 11; December 1968; 27 pages; 40 cents.*

**PATIENTS DISCHARGED FROM SHORT-STAY HOSPITALS, by size and type of ownership, United States, 1965.** *PHS Publication No. 1000, Series 13, No. 4; December 1968; 29 pages; 40 cents.*

---

This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared with Federal support.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington, D.C. 20201.

The Public Health Service does not supply publications other than its own.

---

**AXNICK, NORMAN W.** (National Communicable Disease Center), **SHAVELL, STEVEN M.**, and **WITTE, JOHN J.**: *Benefits due to immunization against measles. Public Health Reports, Vol. 84, August 1969, pp. 673-680.*

The immunization effort against measles in the United States was initiated in 1963. It has resulted in a sharp decrease in incidence of the disease—from 4 million cases in 1963 to one quarter of a million cases in 1968—and in associated costs.

A study by researchers of the National Communicable Disease Center shows that during the years 1963 through 1968 the immunization effort is estimated to have averted 9.7 million acute cases of measles and 3,244 cases of mental retardation. It also

is estimated to have saved 973 lives, 555,000 hospital days, 291,000 years of normal life, more than 1.6 million workdays, 32 million schooldays, and \$423 million.

About nine-tenths of the savings in each of these categories has been realized in the last 3 years—the period of intensive national effort to eradicate measles.

**SCHLAFMAN, IRVING H.** (Public Health Service): *Health systems research to deliver comprehensive services to Indians. Public Health Reports, Vol. 84, August 1969, pp. 697-704.*

Since 1955 the Indian Health Service has been responsible for the management of a comprehensive program for individual and community health to elevate the health status of 400,000 geographically and culturally isolated American Indians and Alaskan Natives to the highest possible level.

The service is committed to carrying out its responsibilities through judicious allocation of scarce human and physical resources, in concert with the wishes and requirements of the Indian people themselves. The service has established the Health Program Systems Center at Tucson,

Ariz., to develop, test, refine, and demonstrate optimal and alternative ways of planning, implementing, and monitoring comprehensive health services for a discrete population group—namely 8,000 Papago and other Indians residing on, and adjacent to the Papago Reservation.

A multidisciplinary staff is using diversified methods in operations research and systems analysis to develop objective descriptions of health services delivery problems and priorities, to design concepts of alternative improvements, to test and refine such improvements, and to demon-

strate their efficacy and service-wide feasibility.

After documenting demographic, environmental, and sociocultural baseline data concerning the sample population, the center is developing and analyzing quantitative models of selected components of the delivery system to predict changes in the community's health status when a specified program is systematically administered or altered. In addition, the center is designing a computerized management information system to serve the operational and research needs of the comprehensive health delivery system under study. This system, in prototype form, is scheduled to be in use by the fall of 1969.

**SALISBURY, ARTHUR J.** (Massachusetts Committee on Children and Youth), and **BERG, ROBERT B.**: *Health defects and need for treatment of adolescents in low income families. Public Health Reports, Vol. 84, August 1969, pp. 705-711.*

Adolescents in a summer work program in Boston, Mass., were given physical examinations in July 1966. Examinations of 618 of the 623 children, 14-16 years old, were completed. Families of 264 children received public assistance through Aid to Families with Dependent Children; the families of all children, however, had incomes low enough to qualify for programs of the Office of Economic Opportunity.

The prevalence of major and minor physical abnormalities and of severe dental disease was determined. In addition, physical abnormalities were classified according to the adequacy or inadequacy of their treat-

ment. The prevalence of severe dental disease and of physical abnormalities was analyzed by sex, usual source of care, presence of a financial barrier, and adequacy of treatment.

A total of 373 physical abnormalities were observed in 294 or 47.5 percent of the children. Of these, 99 were classified as major, such as poor vision, diastolic heart murmur, and hypertension, and 274 as minor, for example, some hearing deficiency, moderate obesity, and systolic murmur without other observations of heart disease. Fifty-two percent of the major and 34 percent of the minor abnormalities were judged to have been treated inadequately.

Twenty-nine percent of the children required extensive dental treatment, and a large but undetermined number of the other 71 percent were not free of dental disease.

Major abnormalities were observed with significantly greater frequency among boys than among girls, but the reverse was true of minor abnormalities. Inadequacy of treatment of all abnormalities was significantly greater among boys as was the prevalence of severe dental disease.

Severe dental disease was observed less frequently in those children whose usual source of care was a dentist in private practice. The adequacy of treatment of medical abnormalities is not predictable by the source of care.

The absence of a preexisting financial barrier does not favorably affect the health of these children.

**PIETKIEWICZ, K.** (Polish National Salmonella Center), and **BUCZOWSKI, Z.**: *Salmonellosis in man in Poland, 1957-66. Public Health Reports, Vol 84, August 1969, pp. 712-720.*

Detailed data were assembled and studied on the *Salmonella* infections diagnosed in 33,640 ill and 18,821 symptomless persons in Poland over the 10-year period 1957-66. The percent of isolations of individual serotypes from persons who became ill in relation to total isolations of the serotype from both the sick and well revealed the role of each serotype in causing symptomatic infections during this period.

The proportion of *Salmonella* food poisoning outbreaks in Poland caused by *Salmonella typhimurium*

remained fairly constant over the years 1957-66, as well as over the preceding 10 years, as did the proportion of outbreaks caused by *Salmonella enteritidis*. *S. typhimurium* caused 15.0 percent of the outbreaks in the earlier period and 13.1 percent in the period under study. However, in the years 1962-66, the proportion of *S. enteritidis* infections increased several times in relation to the total number of *Salmonella* infections. These results suggest that a different mechanism is involved in the spread of *S. enteritidis* infec-

tions from that operating in the spread of infections caused by other *Salmonella*.

The percentage of symptomatic infections caused by a given serotype in relation to the total infections, both symptomatic and asymptomatic, that the serotype has caused might serve as a basis for rating the degree of pathogenicity of individual serotypes. By this hypothesis, *S. enteritidis*, which caused illness in 89.4 percent of the persons in Poland it infected in the period 1957-66, would be ranked as most pathogenic of the serotypes studied; *Salmonella give*, which caused illness in 6.7 percent of those infected, would be ranked as least pathogenic.

**ROSNER, LESTER J.** (Bernard M. Baruch College, City University of New York), **PITKIN, OLIVE E.**, **McFADDEN, GRACE M.**, **ROSENBLUTH, LUCILLE**, and **O'BRIEN, MARGARET J.**: *Better use of health professionals in New York City schools: summary of the final report on the school health personnel utilization project. Public Health Reports, Vol. 84, August 1969, pp. 729-735.*

In phase 2 of New York City's school health personnel utilization project, activities of school health teams in 107 experimental schools in three health districts were compared with those of conventionally organized personnel in 150 control schools in different districts. The demonstration ran from January through December 1966.

Findings on the activities of professionals in the control group in phase 2 were remarkably similar to findings in phase 1. In phase 2, 68 percent of nursing time in the experimental schools was devoted to professional activities as compared with 55 percent for nurses in the schools studied in phase 1.

The phase 2 experiment succeeded in developing a unique function for the public health nurse-team leaders which was more suited to their level of training than their former tasks. Public health nurses showed a dramatic improvement in personnel utilization patterns. In the experimental schools they spent 72 percent of their time on professional activities as compared with 56 percent on professional work in phase 1.

In the experimental schools, 33 percent of all health staff's time was spent on direct services to children as compared with 31 percent in the control schools. Staff nurses, freed from routine duties, were asked to perform nursing duties at a profes-

sional level but within the limitations of their academic preparation. Public health assistants' traditional clerical duties were expanded to include technical duties, special case-loads, and aid to physicians at medical sessions without a nurse.

In the experimental schools, nurses spent 46.3 percent of their time on direct services to children as compared with 40.6 percent in the control schools. Nurses in the experimental schools spent only 21 percent of their time on subprofessional activities compared with 31 percent for those in the control schools.

There was a reduction in the work units completed per staffing hour in the experimental schools compared with the control schools. In the control schools 56 percent of the children listed as new patients were placed under satisfactory care, while in the experimental schools, 68.9 percent of the new patients were so placed.

*Public Health Reports*, published since 1878 under authority of an act of Congress of April 29 of that year, is issued monthly by the Public Health Service pursuant to the following authority of law: United States Code, title 42, sections 241, 245, 247; title 44, section 220. Use of funds for printing this publication has been approved by the Director of the Bureau of the Budget, August 26, 1963.

**ORDER BLANK FOR PHR**

**To: Superintendent of Documents  
Government Printing Office  
Washington, D.C. 20402**

Please enter my Subscription for Public Health Reports. I am enclosing Money Order ☐ Check ☐ for this subscription. (\$6.50 a year; \$1.75 additional for foreign mailing. A discount of 25 percent is allowed for orders of 100 or more subscriptions. Subscriptions are accepted also for 3-year periods, for the convenience of subscribers, at the established annual rate.)

Please address the PHR as follows: \_\_\_\_\_



UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON, D.C. 20402. 1969

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.  
Subscription price \$6.50 a year, \$1.75 additional for foreign mailing.  
Price for a single copy of this issue is 55 cents.



U. S. DEPARTMENT OF  
HEALTH, EDUCATION AND WELFARE  
PUBLIC HEALTH SERVICE  
BETHESDA, MD. 20014

OFFICIAL BUSINESS



POSTAGE AND FEES PAID  
U. S. DEPARTMENT OF H. E. W.

If you do not desire to continue receiving this publication, please **CHECK HERE** ☐;  
cut off this label and return it to the above address. Your name will then be  
promptly removed from the appropriate mailing list.

Public Health Reports  
ph  
r



SEPTEMBER 1969 Volume 84 Number 9

# PUBLIC HEALTH REPORTS

## *In this issue*

**Survey of Bone Density in Two Towns**

**Publicizing Medicaid Benefits**

**Lawyers in Ghetto Health Centers**

**Human Rabies-Immune Globulin**

**State Laws Requiring Immunization**



U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Public Health Service

Digitized by Google



**PLEASE CHECK CAREFULLY YOUR JULY 1969  
ISSUE OF PUBLIC HEALTH REPORTS**

**Some Pages May Be Missing**

Because of an error in the binding process, *pages 639-666* may be missing, and *pages 603-638* may appear twice in your copy.

If you have a faulty copy, please fill out and mail the postal card at the bottom of this page (no postage required), and the Government Printing Office will send you a copy of the July 1969 issue with the correct pages.

Please destroy the faulty issue. It is not necessary to return it to receive a copy with the correct pagination.

We regret this inconvenience and we thank you for your cooperation.

**Keith Kost, M.P.H.,  
Executive Editor,  
*Public Health Reports.***

Please send me a copy of July 1969 issue of *Public Health Reports* to replace my faulty copy.

---

Name

---

Address

---

**U.S. GOVERNMENT PRINTING OFFICE**  
OFFICE OF THE PUBLIC PRINTER  
WASHINGTON, D.C. 20401  

---

OFFICIAL BUSINESS



**Planning Service Division  
Room C-830  
Government Printing Office  
Washington, D.C. 20401**





CONTENTS	PAGE
Health advocates..... <i>Penny Urvant</i>	761
Educating New York City residents to benefits of Medicaid. <i>Raymond S. Alexander and Simon Podair</i>	767
Personal versus telephone interviews: Effect on responses.. <i>John Colombotos</i>	773
Leak tests by high-velocity impact of infectious specimen containers..... <i>Charles A. Glick and Arnold G. Wedum</i>	783
State laws on compulsory immunization in the United States. A review..... <i>Charles L. Jackson</i>	787
Human rabies immune globulin. Progress report..... <i>R. Keith Sikes</i>	797
Survey of State-level programs in mental health statistics.. <i>Kurt Gorwitz</i>	803

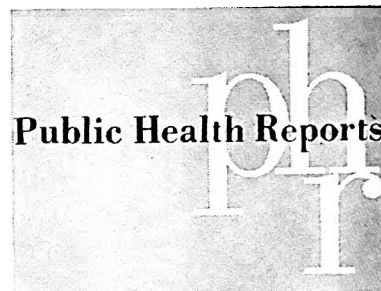
continued

### frontispiece

Health advocate on the staff of Montefiore Hospital's neighborhood health center discusses housing code violations with a tenant. Report on these lawyers who work with physicians and citizen groups appears on pp. 761-766.

CONTENTS—continued

	PAGE
Bacteriological safety of hot tapwater in developing countries . . . . .	812
<i>H. H. Neumann</i>	
Relationship of water fluoridation to bone density in two N.Y. towns . . . . .	815
<i>Robert F. Korn</i>	
Decline in mortality from carcinoma of the cervix in Beverly, Mass . . . . .	826
<i>Leslie Lipworth, Humphrey E. D. Lloyd, and Robert Fienberg</i>	
Functions of independent variables in research and program planning . . . . .	831
<i>Charles O. Crawford</i>	
Short reports and announcements:	
\$71 million in grants for educational facilities . . . . .	766
Films . . . . .	795
Program notes . . . . .	796
Education notes . . . . .	801
Miniature pigs bred for research . . . . .	802
Mental health care in rural areas . . . . .	811
Federal publications . . . . .	835
Synopses . . . . .	836



**MANAGING DIRECTOR**  
**EDWARD J. McVEIGH**  
*Assistant Administrator for Information,  
 Office of Information, Health Services  
 and Mental Health Administration.*



**STAFF**  
**Keith Kost, M.P.H.** *Editor*  
**Marian K. Priest** *Managing Editor*  
**Esther C. Gould** *Asst. Managing Editor*  
**Eugene Fite** *Art Editor*

*Address correspondence to Editor, Public Health Reports, Public Health Service, Department of Health, Education, and Welfare, Lee Building, 6935 Wisconsin Avenue, Chevy Chase, Md. 20015*

*Opinions expressed are the authors' and do not necessarily reflect the views of Public Health Reports or the Public Health Service. Trade names are used for identification only and do not represent an endorsement by the Public Health Service.*

**For subscriptions to Public Health Reports, please use the order form on the inside back cover.**

**U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE**

**ROBERT H. FINCH, Secretary**

**ROGER O. EGEBERG, Assistant Secretary for Health and Scientific Affairs**

**PUBLIC HEALTH SERVICE**

**HEALTH SERVICES AND MENTAL HEALTH ADMINISTRATION**

**JOSEPH T. ENGLISH, Administrator**

# Health Advocates

PENNY URVANT

THAT health is a social problem involving housing, unemployment, and education has long been recognized by health professionals and community leaders. Treating people for illnesses caused by their environment and sending them back to the same environment is both futile and costly. Yet few institutions have the facilities and staff to do more. Some 30 neighborhood health centers, established on the impetus of local communities and funded by the Office of Economic Opportunity, have been organized in U.S. cities specifically to reach into the community and to treat health as the broad social problem that it is.

The Martin Luther King, Jr., Health Center, sponsored by Montefiore Hospital, a large teaching hospital, serves 45,000 people, nearly all low income, who live in the Morrisania area of the Bronx, New York City. The hospital is in an affluent area; the health center is in the middle of dilapidated, boarded-up buildings, close to the people it serves.

Services are prepaid by OEO, private foundations, Medicare, Medicaid, and health insurance plans. All regular public health services are channeled through the center. They include medical and dental checkups, presymptom

---

*Mrs. Urvant is a staff writer for VISTA (Volunteers in Service to America), part of the Office of Economic Opportunity.*

*Nearly 6,000 VISTA volunteers are living and working with the poor in 49 States, Puerto Rico, and the U.S. Virgin Islands. Many, like the VISTA health advocates in New York City, are specializing in health projects.*

screenings, immunizations, health education, family planning, and diagnostic services.

The center also conducts extensive job training in health-allied skills. More than 240 persons have been trained and employed as assistants to physicians or dentists and as laboratory technicians, nurses' aides, secretaries, and receptionists and in other jobs at the center. Some have been placed with other health institutions or as aides to physicians.

The Montefiore Center has the distinction of being the first neighborhood health center to have a health advocacy department. Five lawyers who are health advocates work to obtain health-related rights or to remedy grievances. They represent neighborhood groups that are taking legal actions, and they lecture to community groups on law as it affects consumers, tenants, the mentally ill, and other groups. The lawyers also give the center staff a legal perspective on health matters.

Two of the lawyers are VISTA volunteers in an 18-month program sponsored by VISTA and the New York University Law School. The program leads to a degree in the field of poverty law. These law school graduates spend part of their time taking courses in poverty law and urban affairs, using texts newly written by their professors to deal specifically with these topics. Most of the time they work in the community.

## Lead Paint Poisoning

Unsafe housing with its many health hazards for the poor is a major concern of the health advocacy department. Underlying layers of old lead-based paint in dilapidated buildings were

believed to be responsible for 700 cases of lead poisoning treated in New York City in 1968. Six cases were fatal. A survey taken in the south-eastern Bronx in the summer of 1968 indicated that from 5 to 7 percent of the children had enough lead in their bodies to make them ill.

The Montefiore center is campaigning against lead poisoning on several fronts: testing house paint for lead content, community education, legal action to see that the source of the poisoning is removed, and screening children with suspected cases.

Homes where the danger of lead poisoning exists are identified by family health workers from the center who make followup visits. These health workers carry vials containing a solution of sodium hydroxide with which to test the paint in homes they visit. During one 3-week period they found 20 homes where the hazard existed. In some homes children have been observed eating paint flakes.

The lawyers can use several procedures to try to get landlords to repair hazardous housing. Some old buildings are so dilapidated that forcing complete repair would cause the owner to abandon the building. A remedy for buildings that are rent-controlled is conciliation. Tenants can apply for a decrease in rents. Then tenants and landlord might agree to attend a conciliation meeting whereby the landlord would agree to make needed improvements if the tenants would agree to pay the former rents.

A 1959 New York State statute stipulates that the health department *may* order removal of old, lead-based paint from apartment walls. However, whether to do so or not is left to the discretion of that agency. To date, the department has ordered no paint removed. One reason is that the removal processes—burning or sanding—are dangerous and costly; many building owners would be unable to bear the cost. However, in January 1969, in a case represented by one of the health advocates, a judge ordered the landlord to repair all walls in an apartment where it had been determined there was an underlayer of lead-based paint. But the building is so old, with so many layers of paint on the walls, that it will almost-certainly deteriorate further.

The alternative of covering the old paint with plasterboard or fiberglass has been suggested. Such repairs also would be expensive, but they

could have long-range benefits to the apartment owners. These materials are easy to decorate and maintain, and they are rat resistant and long lasting.

Health center physicians and lawyers are convinced that a change in the law is necessary to protect children. A VISTA lawyer has drawn up legislation, in the form of an amendment to the old statute, which would make it mandatory for the health department to order correction of the condition under certain circumstances. It states in part:

When the department finds that there is a paint containing more than 1 percent of metallic lead based on the non-volatile content of the paint on the interior walls, ceiling, window sills or fixtures of any dwelling, which paint is in a condition dangerous to life or health, and that there are one or more persons below the age of 12 years residing in said dwelling, it shall order whatever corrective measures it deems necessary for the protection of the above specified class of persons from the dangerous condition, under such safety conditions as it may specify and the refinishing of the apartment room or part of a room with suitable finish which is not in violation of subsection (c). Such corrective measures must be sufficient to either eliminate lead-based paint from the environment, or to eliminate the danger that children will ingest such paint. For the purposes of this section, the paint shall be in a condition dangerous to life or health if any portion of the paint is flaking or chipping and/or any portion of the underlying plaster is chipping or crumbling.

The amendment also has provisions for enforcements of the measures, assuring a fair hearing for both landlords and tenants. The amendment will be presented to a city councilman for further action by the council.

Criminal proceedings for violation of housing codes are laborious, and landlords traditionally get one adjournment after another. In 1967 the average fine given in New York City for such violations was \$14 per building, less than 50 cents per violation.

A remedy more tenant groups are beginning to use is withholding rent. Under New York State law, if one-third of the tenants in a building agree, they can give the money they would ordinarily pay for rent to an administrator who will use the money to make repairs. When repairs are completed, the tenants will resume paying rent.

A direct injunction against the landlord can be effective. The tenants testify in court as to





the health and safety hazards of the building, and the judge can order immediate repair on the theory of common law nuisance.

Traditionally, common law nuisance litigation has been brought against landlords for conditions on the premises which affect neighbors. The health advocates want to apply this nuisance concept to conditions on the premises which affect tenants. The first attempt at this litigation will involve lead poisoning incidents. The health advocates are employing an independent laboratory to ascertain that the lead paint conditions caused lead poisoning. When sufficient evidence is gathered, the health advocates will take their case to court.

The health advocacy department tries to attack the roots of the health problems, not just the symptoms.

### Other Functions

One function of the lawyers is to orient the staff of the neighborhood center to possible legal rights of the persons the staff serves. The lawyers help with the training of the family health workers and other paramedical personnel who are frequently in contact with people in the community, and they counsel physicians on legalities and bureaucratic procedures. For example, physicians, nurses, or family health workers should know that a patient with a cardiac condition who lives in a fifth-floor walk-up apartment is entitled to priority in applying for public housing in an elevator building. Health center staff need to recognize when a legal right or legal relationship is involved, to judge whether the situation requires professional assistance of any kind, and to know what resources are available. The lawyers explain and advise how to take action before an agency or court.

In legal actions, the lawyers work primarily with groups. They help gather data for lawsuits concerning sanitation, advise tenant groups on rent strikes, and locate physicians to testify in court proceedings.

The lawyers also help people develop new methods or resources for dealing with health-related problems such as child care, old age, and credit. One lawyer is handling the incorporation of a group which is starting a day-care center for working mothers. Another is develop-

ing a housing plan for a group of elderly people, poor and alone. Their goal is public housing units run by and for old people. A third lawyer is helping neighborhood people develop a credit union. The lawyers do individual casework only when the outcome will set a precedent that might affect many other people.

The lawyers often learn of legal or bureaucratic problems when they sit in on conferences during which medical team-members—a physician, dentist, public health nurse, psychiatrist, and family health worker—discuss the ill health or unhealthy environment of a particular family.

One such problem involved the right of a welfare client with serious illness or injury to have a telephone. The patient had to walk several blocks while ill to call a physician. Generally, welfare clients are not allowed telephones. But a regulation known by few welfare clients or caseworkers permits a telephone when circumstances make it a necessity. Investigation revealed that many health center patients on welfare could qualify for a telephone.

The health advocacy department has prepared a pamphlet on the eligibility requirements for a telephone and the steps involved in asking for one. Family health workers distribute copies to neighborhood people when they make their routine visits.

Another case an advocate is handling is that of a man on welfare whose wife has terminal cancer. He drives his wife to the hospital for treatment in his own car. But welfare officials decreed that if the man had a car, he was not poor enough to receive money for operating it.

The VISTA lawyer planned to contest this decision at a fair hearing—a procedure by which a welfare recipient can contest a negative decision by welfare officials. Before the fair hearing occurred, however, the department of welfare relented, and the man now receives money to operate the car.

Health advocates are also handling the case of a 22-year-old girl who cares for her dead sister's seven children. The lawyers argue that she should be permitted the full amount allowed foster mothers for child care, rather than the lesser amount allowed welfare mothers.

Many welfare clients do not know that they have a right to a fair hearing or how to ask for



Health advocates help residents decide on legal alternatives to force needed repairs of deteriorated housing

one. The lawyers are teaching family health workers to recognize cases where a fair hearing should be requested, so that they can inform patients of the procedures. Patients need not be represented by a lawyer at a hearing. Lay groups in the city can represent them.

Health may depend greatly upon a person's ability to change or improve an unhealthy environment, but making changes or improve-

ments may require knowledge of legal rights, of laws regarding health and safety, of community resources that exist, or resources that can be developed. The health advocates believe that the rights of the poor and the rights of the sick or mentally ill are essentially the rights of the citizen of the United States. A person's poverty or ignorance or incapacitation should in no way negate those rights.

## **\$71 Million in Grants for Educational Facilities**

The Bureau of Health Professions Education and Manpower Training, National Institutes of Health, has awarded five grants totaling \$71,457,813 for the construction of health professions educational facilities, which will make possible an additional 197 first-year student places. Two other awards totaling \$152,128 were granted to fund health research facilities construction programs.

The awards to expand health professions educational facilities are as follows:

1. Harvard School of Public Health, Boston—\$7,083,502 for construction of a new educational facility to replace structures that are obsolete and inadequate. The 12-story building will provide for new developments in teaching technologies and expanding needs, and makes possible an enrollment increase of 108 first-year students for an entering class total of 360.

2. New Jersey College of Medicine and Dentistry, Newark—\$35,300,921 to assist in the construction of a basic science building, a teaching hospital, and a dental education building. This project will enable the school to replace largely obsolete, inadequate, and scattered facilities with a modern, centralized resource, and to increase its first-year enrollment by 32 medical students and 25 dental students. This will bring the entering class to 112 medical students and 80 dental students.

3. Harper Hospital, Detroit, an affiliated teaching hospital of Wayne State University School of Medicine—\$14,795,642 to construct a new nine-story, 348-bed teaching hospital, and to renovate an existing hospital. This project will provide a total of 557 beds for clinical

instruction and will support the Wayne State Medical School enrollment increase of 83 students, bringing the entering class to 208.

4. The University of Pennsylvania School of Veterinary Medicine, Philadelphia—\$316,609 to construct multidisciplinary teaching laboratories in the existing Research and Instruction Building. The new laboratories will enable the school to add 24 first-year places, bringing the entering enrollment to 90 students, and will provide space to bring together the teaching of basic and clinical sciences.

5. The University of Rochester School of Medicine, Rochester, N.Y.—\$13,979,139 for the construction of a new 700-bed teaching hospital and outpatient clinic. The new 10-story facility will provide essential space for the clinical education programs for medical students. The project represents the second and third phases of the construction program which will help the school increase by 20 the number of first-year medical student places, bringing the first-year enrollment to a total of 96 students. Under phase one, now under construction, \$3,626,842 was awarded in August 1967 to aid in constructing teaching facilities in the new education wing.

The five awards for the construction of educational facilities bring Federal grants under the Health Professions Educational Assistance Program to approximately \$528 million. The program, administered by the Division of Educational facilities bring Federal grants under about 140 educational institutions to increase their first-year student enrollment by 4,799 students.

# Educating New York City Residents to Benefits of Medicaid

RAYMOND S. ALEXANDER, M.B.A., M.S., and SIMON PODAIR, M.A.

A COMPLEX health-related law such as Medicaid often creates apathy and incomprehension in the community. The public does not understand the meaning and significance of the law and is confused by conflicting interpretations. Although the need to disseminate information is imperative, often there is no program to inform the public following enactment of health legislation affecting millions of people.

What has distinguished New York City from the rest of New York State, and, in fact, from the rest of the United States, has been the deliberate policy of publicizing and encouraging all eligible persons to enroll in the Medicaid program. The staffs of the city's departments of health and social services were faced with a difficult challenge in interpreting the law to the public and in enrolling eligible persons. Medicaid had been enacted into law on April 1, 1966, with the passage of title 11 of the State Social Welfare Law.

In analyzing the enrollment totals in the spring of 1967, an interdepartmental management group consisting of assistant commissioners from the departments of health and social services discovered that the response to

the Medicaid program from people in the general community, who were not actively seeking medical care, was less than enthusiastic. A study was made of reports from the city's health and social service centers to determine why the public was not responding. It revealed a general lack of knowledge as to Medicaid and its benefits, confusion with Medicare, and a belief that one had to be on the welfare rolls to be eligible.

A concerted public information campaign obviously needed to be launched. The results of the study and subsequent recommendations were given to the Commissioner of Health and the Commissioner of Social Services. If the preventive health benefits of Medicaid were to be realized, it was felt that New Yorkers should enroll in advance of serious illness.

Early in May 1967, the Commissioner of Health decided that the full weight of the health department should be put behind a massive enrollment drive to assist the New York City Department of Social Services in carrying out the mandate of the Medicaid legislation.

The campaign was kicked off by the mayor of New York City who designated June as Medicaid Month at a press conference on June 6, 1967. Our entire efforts centered around his proclamation. The program, however, was extended 8 weeks beyond June 30 because of its success and the need for followup.

Who were we trying to reach in our mass enrollment drive? More than 3 million persons in New York City were estimated to be eligible under the original New York State Medicaid

---

*Mr. Alexander, formerly assistant commissioner, Health and Medical Insurance Programs, New York City Health Department, is deputy administrator, Montefiore Hospital and Medical Center, Bronx, N.Y. Mr. Podair is director, Medicaid Health Education, New York City Health Department.*

law, 2 million of whom had not enrolled. Medicaid's eligibility ceiling of a \$6,000 annual income for a family of four was higher than the income limit for those receiving public assistance. Within this group were families who had been conditioned to believe that government-supported health care was only for the poor. We felt that these working families above the public assistance level were the ones who most needed Medicaid's preventive and diagnostic services to remain productive wage earners.

Another target group was the aged—one of the country's prime poverty groups in need of expanded community health services. Medicare does not include such high cost services as prescription drugs, dentistry, extensive podiatry, and optical services, but these services are available under Medicaid. The elderly were generally unaware that they could receive medical care through both Medicare and Medicaid.

Once we had selected our target groups, we discovered that there were many obstacles to the success of the enrollment drive. Health educators working with various community groups and neighborhood leaders reported that people who were potentially eligible shied away from registering because of lack of understanding, misconceptions as to the meaning of the program, and reluctance to give data on their financial status. Perhaps the most formidable obstacle was public apathy. Health care connotes problems, pain, and payment of bills. Most people do not become concerned about health care until illness strikes.

Our task was to overcome this apathy and to arouse public interest. But even after the apathy receded, other roadblocks hampered our progress. Enrollment was the responsibility of the department of social services which, in most minds, linked the program with welfare. This link, to many aged persons, was a stigma that interfered with effective communication. "If it's welfare I don't want it," was the typical reaction of New York's aged.

### **Content of Campaign**

Early in our campaign it became necessary to dispel widespread misinformation. The feeling persisted among aged residents that eligibility for Medicare precluded eligibility for

Medicaid. A great deal of confusion also existed regarding income and saving requirements and the extent of services offered. Because this was the first time that such extensive health services were offered, it was difficult to convince an incredulous public of the scope of the program.

To overcome general misunderstanding, apprehension, and apathy, we stressed these basic points:

1. Medicaid was not welfare, but a tax-supported health benefits program available to all residents of New York who met eligibility requirements.

2. An aged person could be eligible for both Medicare and Medicaid and benefit from Medicaid's more extensive services.

3. In order to be eligible for checkups and preventive examinations, New Yorkers had to enroll before onset of illness.

4. It was as much the health department's responsibility as the department of social services to encourage enrollment.

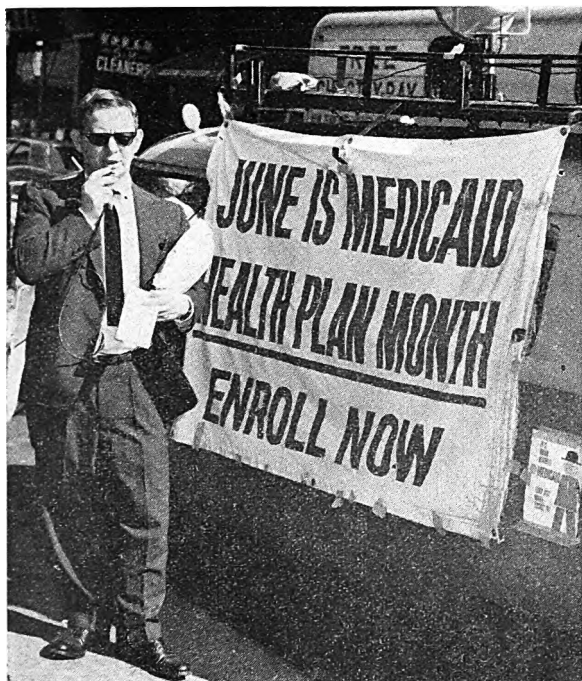
5. A family of four netting \$6,000 after tax deductions was eligible for Medicaid.

6. The health services offered included physician's services, dentistry, optometry, podiatry, drugs, home health and ambulance services, sickroom supplies, eyeglasses, and hearing aids. By limiting our message to these points, we were able to simplify a program that seemed formidable, even to the informed.

### **The Health Aspects**

Throughout our campaign great stress was placed on the health aspects of Medicaid. It has already been pointed out that although Medicaid was a health services program, enrollment was administered by the department of social services. This arrangement meant that important health concepts could be overshadowed by red tape in enrolling, determining eligibility, and issuing identification cards.

The campaign to publicize Medicaid gave us an opportunity to reach the public with these important health concepts: (a) the preventive medicine features of Medicaid—coverage for regular checkups, immunizations, and dental checkups; (b) the importance of choosing a source of health care, whether a physician in private or group practice or with a clinic; (c) the significance of early detection of dis-



**Medicare information is broadcast on a busy street**

ease; (d) the importance of proper treatment of disease; and (e) the contributions of podiatrists, optometrists, and other members of the health team who were formerly overlooked by public health agencies.

These health benefits were brought to the attention of the public as incentives for enrolling in Medicaid. By conducting a health-oriented campaign, we were able to emphasize the practical goals of public health through the means of a publicly funded health care program.

### **Community Involvement**

As in most health programs, dissemination of information was insufficient. To reach the public effectively, we had to focus on community involvement. The organization of the New York City Health Department lent itself to this task.

The department is divided into 30 health districts, with a health officer as its administrative head. A key community health worker on the health officer's staff is the health educator. The health educators were mobilized by the bureau of public health education to obtain community support for the enrollment drive. They contacted the major community-oriented groups

in their neighborhood and discussed the part they could play in our campaign. Special emphasis was placed on reaching the following community leaders.

Professional leaders—ministers, community organizers, social workers, and health workers  
Active lay leaders—PTA presidents, church workers, and leaders of older citizens' resident groups

Informal leaders—the owner of the corner grocery where neighbors congregate or an active block worker in the community.

Volunteers assisting the local health educator included active community workers from anti-poverty agencies and members of the auxiliary police. The auxiliary police are citizen volunteers who assist the police department in emergencies. Their help was obtained through the cooperation of the mayor's New York City Volunteer Council and the Civil Defense Division of the New York City Police Department.

Orientation sessions on Medicaid for the auxiliary police and other volunteers were organized on a borough basis and were led by staff from the departments of health and social services. The purpose of the orientation sessions was to equip volunteers with sufficient knowledge to answer simple questions about Medicaid at the locations.

Essentially the role of the community's leaders in the Medicaid drive, both as individual citizens and as a group, was twofold: (a) to reach their contacts with the overall Medicaid message and (b) to direct persons who might be eligible for Medicaid to the registration centers maintained by the departments of health and social services.

### **Techniques Used**

The techniques used to implement the program were varied. Health workers have questioned the contributions of printed materials and meetings in motivating people for better health. The role of TV and other segments of the mass media has been denigrated, yet the commercial advertisers are quite effective in motivating the public to purchase cigarettes and other products detrimental to health. We did not have the time to engage in community



organization in the textbook sense, but we were able to use a variation of this technique—community mobilization.

*Neighborhood Medicaid Days.* These were held 5 days a week for 12 weeks. Sound trucks with Medicaid banners, manned by the district health educators and volunteers, were stationed at busy street locations to broadcast the points we were trying to make. These locations had been selected by the staffs of the health centers and local community groups to enable the district health educators and volunteers to answer questions of passers-by on Medicaid.

Applicants were not registered at the street locations because of the lack of privacy and the detailed form that had to be completed. Passers-by with complex questions were referred to the special Medicaid registration centers. Persons interested in enrolling were given an application and asked to bring the completed application to a registration center.

Because of people's interest, health educators and volunteers were kept busy answering questions and making referrals to the Medicaid registration centers. At some crowded street locations, persons expressed surprise at the availability of the Medicaid program. Further surprise was evidenced when we described the range of health services. Mingled with this surprise were expressions of approval at the interest of the government in their welfare. Aged residents especially voiced these feelings. One elderly man approached a health educator and said, "Who would think the government would be so good to me."

Most persons were impressed with the availability of complete health care. Dental care, for example, seemed to be of great concern to those who spoke approvingly of the program. The following criticisms were voiced, however.

1. Applicants were unable to obtain a physician who would treat Medicaid patients.
2. There were delays in processing applications.
3. There were delays in receiving a Medicaid card, even after the application had been approved.
4. Persons were unable to reach the Medicaid office because of constantly busy telephones.
5. There were also a few complaints about the type of care given by health practitioners.

Most complaints were administrative and were caused by the lack of leadtime to gear up for the program.

The Neighborhood Medicaid Days removed some of the barriers that had been erected between the residents of New York and the Medicaid program. We were, in a sense, decentralizing the enrollment drive to the streets of the city—the most effective level.

*Medicaid Shoppers Days.* Some department stores cater to a clientele whose income falls within the Medicaid requirements. We decided to set up Medicaid Shoppers Days at which time we could once again present pertinent information on Medicaid. Our concentration point was the Borough of Brooklyn, and our initial step was to meet with the borough president, a man highly respected by the business community. A meeting was called in the borough president's office which was attended by officials of New York City's Health Services Administration and representatives from the leading department stores in the borough.

After considerable discussion, representatives from three stores agreed to cooperate. At these stores, we were allowed to place an information table, manned by the local health educator, on a selling floor for 1 week. The table was identified with a large sign and contained Medicaid literature. The health educator was kept busy answering questions and directing people to the nearest Medicaid registration center. In essence, we had moved our Neighborhood Medicaid Days indoors.

*Distribution of literature.* In addition to distributing literature in the streets and in department stores, we arranged for the distribution of material through banks, post offices, and supermarkets. With the cooperation of the New York City Board of Education, principals distributed a flyer to the children to take home. The flyer stressed that a family of four earning \$6,000 after tax deductions was eligible and urged parents to check with registration centers to determine their eligibility. Thus, we reached thousands of parents who were eligible for Medicaid.

We strived for literature distribution within a meaningful context. Picking up a piece of literature in a bank or a supermarket can have more meaning to the person than a flyer thrust





**Health educator briefs young volunteers before they distribute literature on New York's Lower East Side**

into the same person's hands as he is hurrying from a subway station or a bus stop.

*Use of mass media.* For some time, newspapers, radio, and TV had been critical of the Medicaid program of New York City and had publicized its negative aspects. They reported delays in paying practitioners and sluggish processing of Medicaid applications.

Although these criticisms were valid, they were caused by the administrative scope of the program. The department of social services had been diligently trying to solve these difficulties, and they in no way detracted from the fact that persons were receiving health care who had previously suffered from health neglect.

We were able, however, to obtain publicity for our enrollment drive by persuading the press that the city was anxious to meet its responsibilities under the legislation by launching an intensive, well-organized campaign. We asked the press to assist the city in a constructive effort to improve the Medicaid program. We took an aggressive attitude rather than a defensive one. This approach helped negate pre-

vious adverse press stories. Major daily and weekly newspapers published stories about our campaign and listed the daily locations for Neighborhood Medicaid Days.

Radio stations in the city broadcast announcements daily, and a leading radio station reached thousands of listeners by broadcasting spot announcements throughout their day's programming. The same station produced a documentary on Medicaid. One TV station broadcast a program in Spanish about Medicaid. Health department officials appeared on TV and radio urging viewers to register for Medicaid if they thought they were eligible. The leading administrators of Medicaid made 25 separate TV and radio broadcasts. Car cards were placed in the city subway system, and posters were distributed to hospital outpatient clinics, health centers, and antipoverty offices.

### Evaluation

Our aim was to enroll as many eligible persons as possible, and approximately 450,000 persons applied for Medicaid during and immediately following our campaign. Efforts to enroll eligible persons will continue on an on-going basis.

Justification for publicizing the services offered by Medicaid is contained in the preamble to the State act which states that "in carrying out this program every effort shall be made to promote maximum public awareness of the availability of and procedure for obtaining such assistance and to facilitate the application for and the provision of such medical assistance."

When cutbacks in Medicaid were being discussed at hearings in Albany some 6 months later, the Commissioner of Health was asked why New York City had such an extensive and expensive publicity campaign. He had to remind the legislators of the intent of the law and of the public health impact of enrollment. He added that the management of newspapers and radio had donated thousands of dollars of free time and space. Compared with the benefits derived by the residents, the cost of reaching more than 450,000 New Yorkers was minimal.

Publicizing the benefits of Medicaid required no special expenditures with the exception of the sound truck which cost \$50 a day. Persons

assigned to the campaign were regular employees of the department.

New York City was one of the few jurisdictions in the country to organize a massive Medicaid enrollment campaign. The campaign cannot be judged on a purely statistical basis. Its significance lies far beyond the numbers of persons who applied for Medicaid and even beyond increased public understanding. During the drive the departments of health and social services cooperated closely. It was demonstrated that two large public agencies in a metropolis could work together to heighten public interest in health care. The public was introduced to a concept of total health care—not only care by a physician but also to the services provided by dentists, podiatrists, and optometrists. The public could visualize the wide spectrum of health care that should comprise a complete program.

The program also demonstrated that the public will respond to a health program that has a "gut" basis—meeting the people face to face in the streets. Such an approach tends to remove the barriers between professional health workers and residents. We were conducting a public health education campaign that concentrated on a direct approach to people. In such an approach, newspapers, radio, and TV were effective adjuncts.

### Summary

On June 6, 1967, officials of New York City's departments of health and social services started a campaign to enroll all persons eligible for Medicaid. Of the more than 3 million persons who were eligible under the original New York State Medicaid law, 2 million had not enrolled.

Keeping eligible persons from enrolling were a general lack of knowledge of Medicaid and its benefits, confusing the program with Medicare, and a belief that one had to be on relief to be eligible.

Target groups for the campaign were families whose income was above the public assistance level and the aged who could obtain additional

services not covered by Medicare, such as prescription drugs, dentistry, podiatry, and optical services.

To overcome apathy and arouse public interest, health educators in 30 health districts were mobilized by the bureau of public health education to obtain community support. Many types of volunteers were used—professional leaders, active lay leaders, informal leaders (such as active block workers), volunteers from the police auxiliary, and persons from antipoverty programs.

Techniques used to inform the public about Medicaid were (a) Neighborhood Medicaid Days—sound trucks at busy locations manned by district health educators and volunteers, who answered questions of passers-by, (b) Medicaid Shoppers Days—an information table placed in three department stores in Brooklyn to reach shoppers who might be eligible for Medicaid, and (c) literature distributed in the streets and through department stores, banks, post offices, supermarkets, and schools.

Newspaper, radio, and television publicity, although previously difficult to obtain, were part of the campaign, and health department officials made personal appearances on TV. Car cards were placed in the city subway systems, and posters were distributed to hospital outpatient clinics, health centers, and antipoverty offices to assure widespread publicity.

Approximately 450,000 persons applied for Medicaid during and immediately following the campaign. Among other benefits realized from the effort was the demonstration that two large public agencies in a metropolis could work together to heighten public interest in health care.

The public was introduced to the components of wide spectrum health care—preventive medicine, the importance and significance of choosing a source of health care before illness, the significance of early and proper treatment of disease, and the contributions of dentists, podiatrists, optometrists, and other members of the health team.

# Personal Versus Telephone Interviews: Effect on Responses

JOHN COLOMBOTOS, Ph.D.

TELEPHONE INTERVIEWS have practical and administrative advantages over face-to-face interviews, particularly when the respondents are scattered over a wide area. The telephone charges are likely to be more than offset by the savings in time and money spent by interviewers in traveling from one respondent to another, especially if the respondents are busy, not at home, or otherwise unavailable.

Several years ago Stouffer, commenting on the high cost of personal interviews, emphasized the need for determining how cheaper methods, such as telephone interviews or mailed questionnaires, could be substituted and under what conditions and with what results. "Some of this experience," he said, "has been quite encouraging, particularly with respect to telephone samples" (1).

There are, of course, limitations to the telephone interview as compared with the personal interview. Respondents who do not own telephones or cannot be reached by telephone are excluded. Moreover, some authors have argued that lengthy interviews in which the respondent

is asked about his attitudes on complex topics are not feasible by telephone. Parten, for example, states:

The [telephone] interview must be quite short, so only a few brief items can usually be investigated. . . . Studies in which the attitude of the informant is to be ascertained on the basis of his reaction to numerous questions should not be conducted by means of the telephone interview (2).

Selltiz and co-authors note that:

The telephone interview is particularly useful in obtaining information about what an individual or a family is doing (e.g., what television program he is watching) at the time of the call. Usually, telephone interviewing has to be brief and superficial to obtain the cooperation of the respondent (3).

Implicit in these statements is the argument that responses in lengthy telephone interviews about attitudes—even if they can be obtained—are not as good or as "valid" as responses collected in face-to-face interviews. My purpose in this paper is to compare the responses in these two types of interviews to questions to which the respondents—in this instance, physicians—may give answers that are consciously or unconsciously distorted or biased in the direction of social desirability or prestige enhancement (4).

That differences in the attitudes, expectations, and other characteristics of particular interviewers may result in systematic bias in the answers they obtain from respondents has been well documented (5). But differences in the interviewing situation—apart from differences

---

*Dr. Colombotos is assistant professor, division of sociomedical sciences, Columbia University School of Public Health and Administrative Medicine, New York. This paper is based on one he presented at the annual meeting of the American Association for Public Opinion Research, Groton, Conn., May 14, 1965. The investigation was supported in part by Public Health Service Grant 5 R01 CH 00045.*

among interviewers—may also produce bias (5a).

One way in which interviewing situations differ is in the degree of social involvement they permit between the interviewer and respondent. Hyman puts it this way:

To the extent that a respondent's reaction derives from social or interpersonal involvement [between himself and the interviewer], we may expect it to result in bias, since, under such conditions, the response will be primarily a function of the relation between the respondent and the interviewer, instead of a response to the task (5b).

Hyman continues:

Under what conditions is the social component of involvement increased? First of all, it is obvious that if we remove the "interviewer" from the physical environment, we decrease the possibility of respondent involvement with him as a personality. The case for self-administered questionnaires rests in part on this argument. It is frequently held that there can be no "interviewer effect" if there is no interviewer (5c).

If interviewing situations are classified in terms of the degree of "interviewer presence," and hence, the potential for interviewer-respondent involvement, the telephone interview falls between the face-to-face interview and the self-administered questionnaire. The telephone interview removes the interviewer from the view of the respondent, but it does not remove his voice; the self-administered questionnaire removes both; the personal interview removes neither.

In Hyman's review of studies comparing the personal interview and the self-administered questionnaire, he cites equally plausible arguments for the superiority of each approach in reducing bias. On the one hand, he says: "The social component of involvement [between interviewer and respondent] will be increased as the interviewer looms larger in the psychological field of the respondent. Obviously, we may expect that the respondent will be more sensitized to the 'interviewer' when the latter is physically present" (5d). Hyman adds that the respondent will also be more likely to give answers that are socially desirable and that will enhance his prestige in the eyes of the interviewer. On the other hand, "the very absence of an interviewer [in questionnaire studies] may act as a biasing factor. For in some respects the

interviewer might act as a check on tendencies among respondents to distort data in some way that will serve ego-needs" (5d).

### Previous Studies

Although the results of comparing the interview and self-administered questionnaire methods are not consistent, most of the evidence supports the first of the two plausible but apparently contradictory arguments reviewed by Hyman, namely, that respondents are more likely to give socially desirable answers in a personal interview than in a self-administered questionnaire (5e).

A number of studies using the telephone interview have been reported in recent years (6-11). In some, the interviews were lengthy and questions were asked about sensitive topics. Studies in which personal and telephone interviews are compared, however, are scarcer, and their results are not consistent.

One study by Larsen (12) presumably supports the argument that the personal interview reduces prestige-motivated exaggeration by the respondent as compared with the telephone interview. But his conclusions are questionable. Larsen's data come from a study of message diffusion. On leaflets dropped by air, the reader was asked to check when, where, and how he got the leaflet and to mail it in. Respondents from the two test areas, however, were not randomly assigned to one or the other of the two methods of data collection. Instead, all of the respondents interviewed in person came from one neighborhood while all those interviewed by telephone came from another. Moreover, there is strong evidence that the two neighborhoods were different to begin with in the behavior against which the responses were validated, that is, in mailing in the leaflet.

A recent and more rigorously controlled study by Hochstim (13) does not support the results obtained by Larsen. Hochstim makes extensive comparisons of data collected by mail questionnaire, telephone interview, and personal interview from randomly selected subsamples in the population. Generally, the three strategies produced similar results. There were a few differences, however. To three questions on drinking behavior, women were a little more likely to say that they never drank wine, beer,

or whiskey in the personal interview than in the telephone interview or in the mail questionnaire. The telephone interview and the mail questionnaire gave almost identical results.

Hochstim attributes the difference in results between the personal interview and the questionnaire to an "impulsive type of face saving that is more likely to operate when confronting an interviewer who may possibly be critical than when filling in a mail questionnaire, where the situation is both more impersonal and more conducive to considered response." Since the telephone interview did not elicit any more denials of drinking than the mail questionnaire, however, it is possible that differences in the opportunity for considered response contribute less to differences in responses than does the degree of involvement between the interviewer and the respondent.

On two other questions dealing with discussions between husband and wife about women's medical problems, however, responses in the telephone interview were more like those in the personal interview than those in the mail questionnaire. "Positive" answers to both questions were reported most frequently in the mail questionnaire. Parenthetically, comparisons between personal and telephone interviews provide a more rigorous test of the effects of interviewer-respondent involvement than do comparisons between personal interviews and questionnaires. The interviewer "looms larger" of course in the personal interview than in the mail questionnaire where, in fact, he does not exist. But the personal interview and the mail questionnaire differ in other important ways which may influence responses, for example, in the length of time required and the order in which questions are answered. Personal and telephone interviews are more similar with respect to these factors.

Finally, for screening a population for self-reported visual impairment, Josephson found that telephone and personal interviews yielded equivalent results (14).

## Methods

*Study samples.* The data for this paper came from two interview studies of physicians. The first, called here the "physicians' opinion

study," was a panel study of New York State physicians to determine changes in the ideology of the medical profession in response to Medicare (15-18). The second, called here the "medical conditions study," was a survey of the attitudes of physicians in five States toward reporting certain medical conditions to authorities. Physicians' responses in one of these five States, New Jersey, were compared according to whether the physicians were interviewed in person or by telephone. The National Opinion Research Center of the University of Chicago did the fieldwork for both studies.

In the physicians' opinion study, more than 1,600 physicians were interviewed between 1964 and 1967—1,007 of them twice, both before and after Medicare. Because of the expense of administering personal interviews to the large sample of physicians in widely scattered rural areas called for by the study design, interviews were done by telephone, except for a small, specially selected sample interviewed in person for comparative purposes (which is described later in this section) and a handful of other physicians who preferred to be interviewed in person. Interviews were completed with about 80 percent of the physicians selected.

The data in this paper from the physicians' opinion study came from the first wave of interviews conducted between January and April 1964. These interviews, which averaged about an hour in length, included questions on such topics as attitudes toward the participation of Government in medical care (including Medicare), and other political and health care issues, as well as standard background questions on the respondent's age, country of birth, religion, family background, and present income.

To permit comparisons between data from telephone interviews and personal interviews in the physicians' opinion study, subsamples of physicians in Manhattan and in one upstate county were randomly assigned to be interviewed in person or by telephone to a special group of 10 interviewers. Because this study was one of the first studies of physicians using the telephone method, I wanted to assess both the advantages and disadvantages of sending respondents the questionnaire before the interview. Accordingly, in the last of several pretests, a random half of the physicians in the

pretest sample were sent a questionnaire with a letter just before the interview, and the other half were sent only a letter. It was easier to ask the physician who had the questionnaire questions with long checklists of categories. These interviews also took 5-10 minutes less. These advantages, however, did not compensate for the risks—(a) a loss of control by the interviewer over the interview situation, such as control over the sequence in which questions are answered, and (b) the greater risk of “contamination,” namely, the likelihood of respondents’ showing the questionnaire to one another and discussing it before they were interviewed.

Each of the 10 interviewers was assigned roughly 10 interviews to be completed in person and 10 by telephone. Of the 188 physicians in this special sample, 140 were interviewed; 128 of the 140 interviews were completed by the interviewer to whom they had been randomly assigned and by the method randomly selected. It is the responses of these 128 physicians, 60 interviewed by telephone and 68 in person, that are compared in this paper.

In the medical conditions study, the total sample of 1,200 physicians (including 75 osteopaths) in New Jersey was divided into random halves. Half of the physicians assigned to each of the 42 interviewers in the study were to be interviewed in person and half by telephone. The interviews, which averaged about 45 minutes each, were completed between May and September 1965 with 83 percent of the physicians in the originally selected sample. As in the physicians’ opinion study, only the physicians interviewed by the originally assigned interviewer and according to the originally assigned method, or about 80 percent of the physicians with whom interviews were completed, are included in my analysis.

In both studies, each physician in the sample received a letter from his State medical (or osteopathic) society explaining the purpose of the study and that an interviewer would be calling for an appointment to interview him.

In both studies, physicians in the personal interview sample and the telephone sample were essentially similar in age, type of specialty, sex, marital status, and country of birth. Also, the proportions of the telephone and personal interview samples successfully inter-

viewed were roughly the same in both studies. The personal interviews, however, lasted a little longer than the telephone interviews, in part because there were more interruptions by patients and the physician’s office staff during the personal interviews.

*The questions.* From the physicians’ opinion study, 12 sets of questions to which answers were likely to be distorted in a greater or lesser degree in the direction of social desirability were selected for comparison. In most of these questions, the direction of social desirability was clear. For example, in questions on whether the physicians had taken any postgraduate courses in the past 3 years, on the number of medical journals they read regularly, and on the number of articles that they had published, it was assumed that respondents would tend to exaggerate their participation in such activities. Nevertheless, all 12 sets of questions were submitted to seven judges, of whom two were physicians and five were social scientists, all on the staff of a school of public health. The judges were asked to “indicate which of the available responses is more (or most) likely to . . . conform to what is considered ‘socially desirable’ (by the physician respondents).” There was almost unanimous agreement among those judges.

Judgments of social desirability should of course ideally be made by the interview respondents themselves. It is possible that the ratings of social desirability by the judges and by the physician respondents would not agree (19). In the medical conditions study, the respondents themselves did provide judgments of the social desirability of answers to some questions.

In the medical conditions study, five items were selected for comparison. Two items, in which the physician was asked which medical journals he read regularly and what his religious preference was, were similar to those in the physicians’ opinion study. In the other three items, the physician was asked whether he was willing to report 10 specified conditions to the authorities.

On the questions dealing with the physician’s willingness to report certain conditions, the responses considered socially acceptable were provided by the respondents themselves in a prior question, which read as follows: “In your opin-

ion, which of these conditions should always be reported to the public health authorities or police, which should be reported under certain circumstances, and which should not be reported?"

With the exception of two diseases, alcoholism and epilepsy, the majority of the physicians interviewed thought that each of the named conditions should "always be reported." Almost half thought alcoholism should be reported "under certain circumstances," about 10 percent thought that it should always be reported, and about 40 percent thought that it should not be reported. With respect to epilepsy, roughly one-third gave each of the response alternatives.

The physicians interviewed personally were more likely than the physicians interviewed by telephone to say in respect to eight of the 10 conditions that they should always be reported. The difference averaged about 3 percent. Although this difference is not a strong one, it raises the question as to whether the very expression of the social desirability of answers depends on the method of interview.

## Results

In the physicians' opinion study, a higher proportion of the personal interview sample gave socially acceptable answers than the telephone interview sample in eight of the 12 items compared, a higher proportion of the telephone interview sample gave socially acceptable answers in three of the items, and the two samples tied in one item (table 1). These results are not statistically significant at the 0.05 level according to the sign test. (It is recognized that the observations are not independent, as required by the sign test.)

For the six measures with differences of more than 10 percent in any one category or combination of categories, the personal interview sample gave more socially acceptable answers in four items. Two of these four questions dealt with motivations for going into medicine (Q. 16a and Q. 17), the third with the number of journals read regularly (Q. 82), and the fourth with the number of articles the physician had published (Q. 83). In the other two questions with differences of more than 10 percent, one dealing with the legitimacy of charging higher fees to patients with insurance (Q. 77d) and one with the importance of religion in the phy-

sician's life (Q. 95b), the telephone sample gave more acceptable answers.

No readily apparent interpretation of this particular pattern of differences comes to mind. The largest differences, however, are in the two questions in which the respondents were asked to estimate, without the help of checklists, the number of scientific journals that they read regularly and the number of articles that they had published in such journals. The personal interview sample gave more socially desirable answers to both questions.

In the medical conditions study, as in the physicians' opinion study, the physicians interviewed personally reported reading more medical journals regularly than those interviewed by telephone (table 2). The number of journals reported in the medical conditions study, however, and the difference between the personal interview and the telephone samples were both considerably smaller than in the physicians' opinion study. In the physicians' opinion study, the respondents were asked only to estimate the number of journals read regularly, whereas in the medical conditions study they were asked to name them, a fact which may have acted as a brake on overestimation.

The respondents in the medical conditions study, unlike those in the physicians' opinion study, were a little more likely to state that they had no religious preference when interviewed personally than by telephone.

In the willingness of physicians to report the listed medical conditions to the authorities, there was essentially no difference in the responses of those interviewed personally and those interviewed by telephone. Those interviewed personally gave the more socially acceptable answers for nine items—only one of these differences, however, was statistically significant—and those interviewed by telephone gave the more socially accepted answers for 15 items—five of these differences were statistically significant (table 3).

This part of the analysis is restricted to the eight conditions which the majority had indicated, in answer to a previous question, should "always be reported." The physicians were asked about their willingness to report these conditions in three different situations. Would they report a child or a regular patient with

Table 1. Responses in personal and telephone

Question	Percent of sample	
	Personal (N=68) <sup>1</sup>	Telephone (N=60) <sup>2</sup>
10. In the past three years, have you taken any special courses or any other kind of post-graduate training, apart from occasional scientific lectures or meetings? (If "Yes") About how many hours altogether did you spend in these activities in the past three years—Was it less than 50 hours, or 50 hours or more?-----	+	
None-----	66	70
Less than 50 hours-----	6	7
More than 50 hours-----	25	23
Don't know, no answer-----	3	0
16a. IF "FATHER WANTED ME TO BE A DOCTOR" (Q. 16): What was the main reason your father wanted you to be a doctor—Was it because of the social prestige of a medical career, the chance to help people, the chance to do work of special interest to you, or the economic opportunity?-----	+	
Social prestige-----	24	24
Chance to help people or work of special interest-----	40	29
Economic opportunity-----	12	19
Don't know, no answer-----	24	29
17. a. Which of the following things was the most important to you then in your decision to go into medicine—Was it the social prestige of a medical career, the chance to help people, the chance to do work of special interest to you, or the economic opportunity? b. Which of these things was second most important to you then in your decision to go into medicine?		
MOST IMPORTANT SECOND MOST IMPORTANT	+	
Social prestige or economic opportunity----- Economic opportunity or social prestige----	3	2
Social prestige or economic opportunity----- Chance to help people or work of special interest-----	2	3
Chance to help people or work of special interest----- Social prestige or economic opportunity-----	19	37
Chance to help people or work of special interest----- Work of special interest or chance to help people-----	56	43
Don't know, no answer to Q. 17a and/or Q. 17b-----	21	15
18. a. What about the present—Which of these things is most important to you now—Is it the social prestige of a medical career, the chance to help people, the chance to do work of special interest to you, or the economic opportunity? b. Which of these things is second most important to you now?		
MOST IMPORTANT SECOND MOST IMPORTANT		+
Social prestige or economic opportunity----- Economic opportunity or social prestige----	0	2
Social prestige or economic opportunity----- Chance to help people or work of special interest-----	3	3
Chance to help people or work of special interest----- Social prestige or economic opportunity-----	22	20
Chance to help people or work of special interest----- Work of special interest or chance to help people-----	66	70
Don't know, no answer to Q. 18a and/or Q. 18b-----	9	5
19. Suppose physicians earned only half what they actually earned, would you have gone into medicine, or would you have gone into some other kind of work?-----	(No difference)	
Medicine-----	90	90
Other kind of work-----	4	5
Don't know, no answer-----	6	5
77d. It is justifiable for doctors to charge higher fees to patients who carry medical insurance than to patients without insurance.-----		+
Agree-----	15	8
Disagree-----	78	90
Don't know, no answer-----	7	2
77e. Everyone in our society has the right to the best available medical care, whether he can afford it or not.-----	+	
Agree-----	94	90
Disagree-----	4	8
Don't know, no answer-----	2	2



# interviews, physicians' opinion study

Question	Percent of sample	
	Personal (N=68) <sup>1</sup>	Telephone (N=60) <sup>2</sup>
82. About how many scientific medical journals do you read regularly?-----	+	
None-----	3	2
1-----	2	7
2-----	6	7
3-----	15	15
4-----	23	25
5-----	10	23
6 or more-----	39	19
Don't know, no answer-----	2	2
Mean number of journals read regularly-----	4. 9	4. 3
83. Have you ever had an article published in a scientific medical journal? (If "Yes")		
How many?-----	+	
None-----	46	58
1-----	15	13
2-----	2	5
3 or more-----	37	22
Don't know, no answer-----	2	2
Mean number of articles published in journals-----	2. 4	1. 8
94. What is your present religious preference?-----	+	
Protestant-----	24	25
Roman Catholic-----	16	5
Jewish-----	50	53
Other-----	0	3
None (least socially desirable)-----	9	12
Don't know, no answer-----	2	2
95. SKIPPED IF "none" TO Q. 94:		
a. How often do you attend religious services, would you say?-----	+	
Never-----	24	19
A few times a year or less-----	39	51
Once or twice a month-----	19	9
Once a week or more-----	14	17
Don't know, no answer-----	3	4
b. Quite apart from your attending religious services, how important would you say religion is to you—very important, fairly important, or not at all important?-----		+
Very important-----	23	34
Fairly important-----	47	34
Not at all important-----	26	24
Don't know, no answer-----	5	8

<sup>1</sup> Except in Q. 16a—where N=25, Q. 95a, where N=62, and Q. 95b, where N=53.

<sup>2</sup> Except in Q. 16a—where N=21, Q. 95a, where N=53, and Q. 95b, where N=62.

## Procedures and Symbols Used in Tables

The most socially desirable response to each question in the tables is set in *italics*, with the exception of Q. 94 of table 1, Q. 31 of table 2, and the questions related to alcoholism and epilepsy in table 3. The symbol + indicates the interview sample more likely to give the socially desirable response, except in Q. 94 of table 1 and Q. 31 of table 2, where it indicates the interview sample less likely to give the least socially desirable answer.

The direction of these differences is determined as follows:

1. In Q. 82 and 83 of table 1 and Q. 28 of table 2, the mean averages are compared.

2. In Q. 16a, 19, 77d, and 77e of table 1, the single proportions representing the socially desirable response are compared. In Q. 94 of table 1 and Q. 31 of table 2, the proportions representing the least socially desirable response are compared.

3. In questions with more than two ordinal categories—Q. 17, 18, 95a, and 95b of table 1 and in Q. 5, 6a, and 6b in table 3, the direction is determined by *S*, used in computing Kendall's tau, a rank order correlation in which the cases in a category are counted as ties (20).

The symbol \* in table 3 indicates a statistically significant difference at the 0.05 level. Significance is determined by the difference-between-means test, the difference-between-proportions test, or by an adaptation of Kendall's tau described by Smith (21), whichever is appropriate.

Although the "no answer" and "don't know" responses are presented in tables 1 and 2, they are excluded in determining the direction and the statistical significance of the differences between the personal and telephone interview samples.

one of these conditions to a public health agency, or would they report a regular patient with one of these conditions to the police? These questions provided 24 comparisons. The willingness to report alcoholism and epilepsy, which only a minority of the respondents thought should "always be reported," also did not differ according to whether the physicians were interviewed in person or by telephone.

Possibly a real difference between the telephone interview and personal interview samples in their willingness to report is obscured because the respondents' judgments as to what constituted a socially acceptable answer were not controlled. Among physicians who believe that measles should always be reported, those interviewed in person might be more likely than those interviewed by telephone to say that they "certainly" would report a case. Conversely, among physicians who believe that measles should not be reported, those interviewed in person might be more likely than those interviewed by telephone to say that they would "probably not" report it.

This interpretation was tested for the five conditions on which there was the most variation as to whether or not they should be reported—alcoholism, attempted suicide, drug addiction, epilepsy, and measles. When the physicians' responses as to whether each of these conditions should or should not be reported were controlled, there was no difference in the proportion of physicians who said they actually would or would not report that condition according to whether they were interviewed in person or by telephone.

The results obtained by the personal and telephone methods in the two studies were also compared by counting for each respondent the number of socially acceptable answers he gave. The differences between the means of the distributions according to the interview method used were negligible and in opposite directions in the two studies.

Finally, answers to questions in which social acceptability was less apparent were also compared in both studies. In the physicians' opinion study, there was little or no difference between the answers of respondents in the personal interview sample and the telephone interview sample to questions about their political ideol-

ogy, including their political party preference; about their attitudes toward governmental participation in medical care; or about their age and ethnic background and their father's occupation and education. In both the physicians' opinion study and the medical conditions study, there was little or no difference in physicians' answers to a question on their annual income.

## Conclusion

There are essentially no differences between the responses of physicians interviewed in person and those interviewed by telephone. The degree to which the results reported here can be generalized is of course limited in obvious ways. The respondents in the studies examined were physicians—high prestige professionals to whom the telephone is a familiar instrument and who rely heavily on it in their daily work. Moreover, the questions asked were mainly about political and professional issues—government participation in medical care, the reporting of certain medical conditions to the authorities; a few questions were on such per-

**Table 2. Physicians' responses in personal and telephone interviews as to number of medical journals read regularly and religious preference, medical conditions study**

Question	Percent of sample	
	Personal (N=408)	Telephone (N=340)
28. Which medical journals do you read regularly? (Number listed)		
None.....	2	2
1.....	4	5
2.....	11	12
3.....	26	26
4.....	20	20
5.....	16	16
6 or more.....	16	15
Don't know, no answer.....	6	4
Mean number of journals read..	3. 9	3. 8
31. What is your religious preference?		+
Protestant.....	31	31
Roman Catholic.....	28	29
Jewish.....	33	32
Other.....	2	3
None (least socially desirable)...	5	3
Don't know, no answer.....	1	2

sonal matters as religion, birthplace, and annual income.

The results justify the use of telephone interviews on both practical grounds—economy, time saved, and flexibility in scheduling interviews—and on methodological grounds—com-

parability of data with those from personal interviews. Additional controlled studies, however, are needed in which the telephone approach is compared with other methods of collecting data, the samples studied come from different socioeconomic backgrounds, the ques-

**Table 3. Percentages of physicians in personal and telephone interviews who would report conditions, medical conditions study**

Condition	Question 5 <sup>1</sup>		Question 6a <sup>2</sup>		Question 6b <sup>3</sup>	
	Personal (N=408)	Telephone (N=340)	Personal (N=408)	Telephone (N=340)	Personal (N=408)	Telephone (N=340)
Alcoholism: <sup>4</sup>						
Certainly.....	15	18	6	7	5	2
Probably.....	11	13	11	10	9	12
Probably not.....	74	69	83	82	86	86
Attempted suicide.....						
Certainly.....	30	35	19	21	51	51
Probably.....	14	11	13	13	23	20
Probably not.....	55	54	69	67	25	28
Diphtheria.....	+		<sup>5</sup> +			* +
Certainly.....	90	89	90	90	1	3
Probably.....	4	3	3	3	( <sup>6</sup> )	1
Probably not.....	6	8	7	7	99	96
Drug addiction.....	+		+			+
Certainly.....	52	52	37	36	37	37
Probably.....	17	13	18	20	22	26
Probably not.....	31	34	45	44	41	38
Epilepsy: <sup>4</sup>						
Certainly.....	28	30	29	29	8	6
Probably.....	14	14	16	14	6	5
Probably not.....	58	56	55	57	86	88
Gonorrhea.....		+		* +		+
Certainly.....	78	82	68	77	1	3
Probably.....	12	9	16	10	1	1
Probably not.....	11	9	15	12	98	96
Gunshot wound.....		+		+	* +	
Certainly.....	46	46	28	27	94	87
Probably.....	4	7	4	6	5	9
Probably not.....	50	47	68	67	1	4
Measles.....	+		+			* +
Certainly.....	56	54	54	56	0	2
Probably.....	9	11	9	10	( <sup>6</sup> )	1
Probably not.....	35	35	37	33	100	98
Syphilis.....	+		+			+
Certainly.....	90	88	84	86	1	3
Probably.....	5	6	10	7	1	1
Probably not.....	5	6	6	7	98	96
Tuberculosis.....	+			* +		* +
Certainly.....	87	86	82	89	( <sup>6</sup> )	2
Probably.....	7	7	10	7	( <sup>6</sup> )	1
Probably not.....	7	7	8	4	100	97

<sup>1</sup> "Q. 5.—Suppose a child or adolescent (under 18 years old) came to your office with one of these conditions. Which would you certainly, which probably, and which would you probably not report to a public health agency?"

<sup>2</sup> "Q. 6a.—If one of your regular patients, an adult, came to your office with one of these conditions, which would you certainly report to public health, which would you probably report, and which would you probably not report to public health?"

<sup>3</sup> "Q. 6b.—Which would you certainly, probably, or probably not report to the police if one of your regular patients came to you with one of these conditions?"

<sup>4</sup> Alcoholism and epilepsy are included in this table but excluded from the main analysis because only a minority of the respondents thought that the conditions should "always be reported."

<sup>5</sup> Slight difference is obscured by rounding of percentages.

<sup>6</sup> Less than 0.5 percent.

tions asked relate to a number of topics and issues, and a variety of questionnaire designs are used.

## Summary

Telephone interviews have practical and administrative advantages over face-to-face interviews, particularly if the respondents are scattered over a wide area. But it has been argued that lengthy telephone interviews in which the respondent is asked about complex topics are not feasible and that responses in attitude surveys conducted by telephone, even if they are obtained, are not as "valid" as those collected in face-to-face interviews.

Previous research has indicated that personal interviews are more likely to elicit socially acceptable responses than self-administered questionnaires because of the "social component of involvement" between interviewer and respondent. The telephone interview falls between the personal interview and the self-administered questionnaire in the opportunity for such involvement.

Data from two surveys of physicians show that there are essentially no differences in the proportions who give socially acceptable responses according to whether they are interviewed in person or by telephone.

## REFERENCES

- (1) Stouffer, S. A.: Methods of research used by American social scientists. In *The behavioral sciences today*, edited by B. Berelson. Basic Books, Inc., New York, 1963, p. 72.
- (2) Parten, M.: Surveys, polls, and samples: Practical procedures. Harper & Brothers, New York, 1950, p. 87.
- (3) Selltitz, C., Jahoda, M., Deutsch, M., and Cook, S.: Research methods in social relations. Holt, Rinehart and Winston, Inc., New York, revised 1961, p. 239.
- (4) Edwards, A. L.: The social desirability variable in personality assessment and research. Dryden Press, New York, 1957.
- (5) Hyman, H. H.: Interviewing in social research. University of Chicago Press, 1954, ch. 1-4; (a) ch. 5; (b) p. 138; (c) pp. 138-139; (d) p. 139; (e) pp. 139-145.
- (6) Fry, H. G., and McNair, S.: Data gathering by long distance telephone. *Public Health Rep* 73: 831-835, September 1958.
- (7) Goldberg, D., Sharp, H., and Freedman, R.: The stability and reliability of expected family size data. *Milbank Mem Fund Quart* 37: 369-385, October 1959.
- (8) Bennett, C. T.: A telephone interview: A method for conducting a follow-up study. *Ment Hyg* 45: 216-220, April 1961.
- (9) Coombs, L., and Freedman, R.: Use of telephone interviews in a longitudinal fertility study. *Public Opin Quart* 28: 112-117, spring 1964.
- (10) Kriesberg, L.: Mental health and public health personnel and programs: Their relations in the fifty States. National Opinion Research Center Report No. 83. Chicago, 1962. Mimeographed.
- (11) Mooney, H. W., Pollack, B. R., and Corsa, L., Jr.: Use of telephone interviewing to study human reproduction. *Public Health Rep* 83: 1049-1060, December 1968.
- (12) Larsen, O.: The comparative validity of telephone and face-to-face interviews in the measurement of message diffusion leaflets. *Amer Sociol Rev* 17: 471-476, August 1952.
- (13) Hochstim, J.: Alternatives to personal interviewing. Paper presented at annual meeting of American Association of Public Opinion Research, Lake George, N.Y., 1963.
- (14) Josephson, E.: Screening for visual impairment. *Public Health Rep* 80: 47-54, January 1965.
- (15) Colombotos, J.: Physicians and Medicare: A before-after study of the effects of legislation on attitudes. *Amer Sociol Rev* 34: 318-334, June 1969.
- (16) Colombotos, J.: Social origins and ideology of physicians: A study of the effects of early socialization. *J Health Soc Behav* 10: 16-29, March 1969.
- (17) Colombotos, J.: Physicians' attitudes toward a county health department: Ideology and self-interest. *Amer J Public Health* 59: 53-59, January 1969.
- (18) Colombotos, J.: Physicians' attitudes toward Medicare. *Med Care* 6: 320-331, July-August 1968.
- (19) Scott, W. A.: Social desirability and individual conceptions of the desirable. *J Abnorm Soc Psychol* 67: 574-585, December 1963.
- (20) Kendall, M. G.: Rank correlation methods. Ed. 3. Hafner Publishing Co., New York, 1962, pp. 34-36.
- (21) Smith, J. E. K.: On the analysis of contingency tables with ordered classifications. Lincoln Laboratory, Massachusetts Institute of Technology, Cambridge. Mimeographed.

# Leak Tests by High-Velocity Impact of Infectious Specimen Containers

CHARLES A. GLICK, B.S., and ARNOLD G. WEDUM, Ph.D., M.D.

**S**PECIFIC REQUIREMENTS for packaging containers of infectious diagnostic specimens for international mail are stated in U.S. Postal Manual section 221.325 c.(2) as follows: "Perishable biological material of a pathogenic nature must be packed in a tightly closed bottle or tube of heavy glass wrapped in thick absorbent material rolled several times around the bottle or tube and tied at the ends, sufficient in quantity to absorb all the liquid; the wrapped container must be placed in a strong well-closed metal box constructed to prevent any contamination outside of it. This metal box must be wrapped in cushioning material and placed in an outer protective box where it should fit tightly to avoid shifting. The outer container must consist of a hollow block of strong wood, metal, or other equally strong material with a tight lid so fitted that it cannot open during transportation." The requirements for domestic mail, parts 124 and 125, are less detailed.

Shipment of infectious material in the amount defined for a diagnostic specimen is exempt, however, from requirements in the Code of Federal Regulations (CFR) 42:72.25. These requirements specify placement of the specimen in a watertight, airtight container, with sufficient surrounding absorbent material

to absorb the entire contents, a second durable watertight, airtight container, and a third individual shipping container of corrugated cardboard fiber or material of equivalent strength. One gallon of contents in the container is the limit for shipment.

An interesting aspect of these specifications is that none includes a test standard for determining how much rough handling the containers will withstand. In a 1960 report, Kokko and associates (1) described the results of drop-testing various specimen containers 20 feet to concrete and 1,000 to 1,500 feet to hard sun-baked ground. Containers also were subjected to 3,000 pounds vertical pressure, 800 to 1,200 pounds horizontal pressure, and explosive decompression to 1.69 pounds per square inch in 0.1 second. The investigators used glass serum bottles, glass test tubes, and glass milk dilution bottles, surrounded by absorbent material, in a crimp-sealed or friction-sealed tin can that was packed in an outer cardboard container. During the tests a few glass tubes or bottles broke, but there was no leakage through the outermost (third) container.

Other types of packages used for transmitting containers of diagnostic infectious specimens through postal mail are described in table 1. Packages I and P complied with the postal regulation requiring absorbent cotton around the test tubes, but the tin (second) container could not be wrapped in cotton because of the lack of space between it and the outer

---

*Mr. Glick is chief of the process development section, Industrial Health and Safety, Fort Detrick, Md. Dr. Wedum is director of Industrial Health and Safety.*

fiber cylinder. Package F, containing a 10-milliliter glass test tube had enough cotton packing to absorb the contents, but neither the tube nor the tin container could be wrapped in cotton because of the small spaces between the test tube and the tin and outer fiber containers. All tubes were wrapped in such a way as to avoid glass-to-glass contact.

The purpose of our experiment was to leak-test containers of diagnostic specimens at impact velocities approaching those they might experience as a result of accidental jettison from an aircraft or on impact within the aircraft during a crash takeoff or landing. Such testing required the establishment of an impact velocity that might be sustained by a package during a crash. The velocity selected as a test standard was 145 to 165 feet per second (106 miles per hour  $\pm$  6.5 percent).

The test figure was obtained by studying the net effect on the aluminum honeycomb shock absorber in the forward end of a large package placed in a cargo aircraft that was experimentally crashed at 138 miles per hour, under controlled and mechanically recorded conditions, into a reinforced concrete wall. This experiment was part of an Air Force project during which calculation of the net velocity impact of the package was of special value to Public

Health Service personnel interested in introducing a container performance test standard into CFR 42:72.25.

Naturally, there is a tremendous range of variable impact speeds and conditions to which packages of different weights and shapes would be subject during the crash of an aircraft, so we used the standard velocity of 145 to 165 feet per second, knowing that it represented only an order of magnitude. Although the maximum velocity achieved in our tests was 139 feet per second, it was enough to show the extent of damage that could occur at an impact of 145 to 165 feet per second.

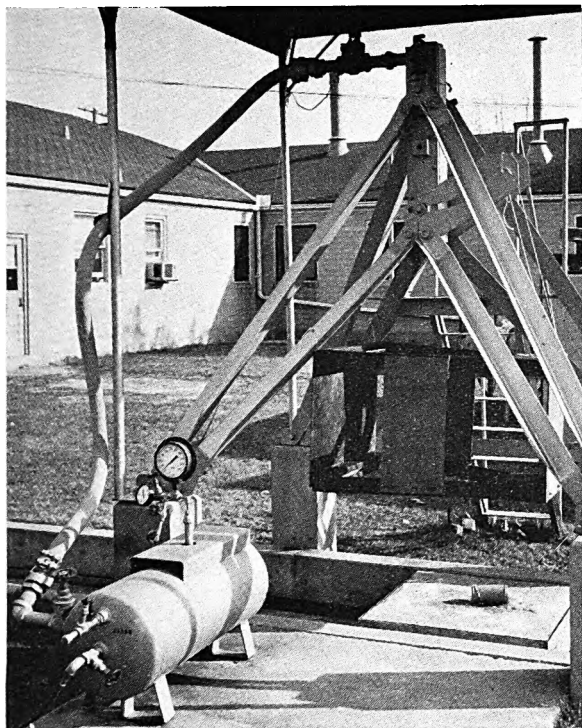
### Materials and Methods

*Impact conditions.* Three weights and sizes of packaged containers of diagnostic infectious fluid specimens were impacted on reinforced concrete by the device shown in figure 1. The speed of impact was measured by a model 5233L Hewlett-Packard electronic counter (table 2). The packages were fired a distance of 72 $\frac{3}{8}$  inches from the end of the barrel to the concrete pad.

The average impact velocity was 130 to 133 feet per second, but attainment of this velocity in 6 feet means that the initial acceleration was almost as violent as the impact. Therefore, the

**Table 1. Description of tested packaged containers**

Package identification	Primary container	Packing	Secondary container	Packing	Outer (3d) container	Average weight of package (oz.)
F14-F23-----	1 pyrex glass test tube, plastic screw cap with liner, 6 inches long by $\frac{3}{4}$ inch outside diameter.	Absorbent cotton, top and bottom.	Metal can, screw top, 7 inches long by 1 inch outside diameter.	Small amount of absorbent cotton, tight fit.	Fiber body, metal screw cap, metal top and bottom, 7 $\frac{1}{16}$ inches long by 1 $\frac{1}{2}$ inches outside diameter.	4. 22
I15-I24-----	4 test tubes, as described in F.	Absorbent cotton all around tubes.	Metal can, screw top, 6 $\frac{1}{16}$ inches long by 2 $\frac{3}{4}$ inches outside diameter.	-----do-----	Fiber body, metal screw cap, metal top and bottom, 7 $\frac{1}{16}$ inches long by 3 $\frac{1}{2}$ inches outside diameter.	16. 15
P1-P10-----	2 test tubes, as described in F.	-----do-----	-----do-----	-----do-----	-----do-----	14. 15



**Figure 1. Firing device used for high-velocity impact tests of packaged containers onto concrete**

test was more severe than if a drop-test or gradual acceleration had been used. All the packages were alternately oriented so that five impacted on the bottom and five on the top. Sabots were made for the packages to adapt them to the diameter of the firing tube.

*Description of packages.* The three basic types of packages are described in table 1; 10 replicates of each type were prepared for testing. Each test tube in the packages contained 10 milliliters of 0.2 percent safranin dye.

## Results

The results of our tests are summarized in table 2.

*F packages.* Figure 2 shows the condition of the F packages, containing one test tube each, after impact at an average velocity of 130.2 feet per second (88.77 miles per hour). Figure 3 shows a typical package disassembled after impact. In all except one F package, the small amount of cotton at the top and bottom of the secondary metal container absorbed the 10 milliliters of liquid dye; in one package, the cotton

was saturated and a spot of dye appeared on the outer fiber container. None of the liquid leaked through the outer container.

*I packages.* The condition of the I packages, containing four test tubes each, after impact at 132.8 feet per second (90.54 miles per hour) is shown in figure 4. All the tubes were broken. In several tests the screw caps on one or two tubes were cracked (table 2), but little or none of the contents leaked onto the absorbent cotton. Figure 5 shows a typical package disassembled after impact. None of the dye leaked through the outer fiber container.

*P packages.* The external and the internal

**Table 2. Impact velocities and resulting condition of test tubes**

Tube No.	Velocity <sup>1</sup> (fps) <sup>2</sup>	Air (psig) <sup>2</sup>	Tubes intact
F14-----	128	104	0
F15-----	132	102	0
F16-----	134	105	0
F17-----	<sup>3</sup> 130	102	0
F18-----	136	98	0
F19-----	120	98	0
F20-----	134	98	0
F21-----	125	100	0
F22-----	137	100	0
F23-----	126	102	0
I15-----	136	100	0
I16-----	<sup>4</sup> 337	102	<sup>5</sup> 1
I17-----	127	105	0
I18-----	136	105	0
I19-----	127	105	0
I20-----	136	89	<sup>5</sup> 1 and 3
I21-----	139	102	0
I22-----	128	105	<sup>5</sup> 2
I23-----	130	102	0
I24-----	136	104	<sup>5</sup> 1
P1-----	133	105	0
P2-----	128	104	0
P3-----	134	104	0
P4-----	127	105	0
P5-----	128	102	0
P6-----	133	104	0
P7-----	133	104	0
P8-----	131	104	0
P9-----	131	102	0
P10-----	130	102	0

<sup>1</sup> F average, 130.2 fps (88.77 mph); I average, 132.8 fps (90.54 mph); and P average, 130.8 fps (89.18 mph).

<sup>2</sup> fps=feet per second; psig=pounds per square inch gauge.

<sup>3</sup> Estimate.

<sup>4</sup> The electronic counter used to count the time lapse between two photoelectric light sources either malfunctioned in counting or the numbers were not canceled before the next test. A conversion factor was introduced to calculate the feet per second (velocity).

<sup>5</sup> Tube intact but cap broken.

condition of the P packages after impact at 130.8 feet per second (89.18 miles per hour) was the same as for the I packages (figs. 4 and 5). All the dye was absorbed by the cotton; none leaked through the outer fiber container.

### Summary

The Department of the Army performed leak tests on three weights and sizes of commonly used packages, consisting of containers of diagnostic infectious specimens, by impacting the packages on reinforced concrete. The three types of packages complied with the requirements for domestic mail set forth in the U.S. Postal Manual, parts 124 and 125. They complied only in part, however, with the specifications in section 221.325 c. (2) pertaining to international mail although they met the intent of the regulation, which is to insure the absence of leakage during transport.

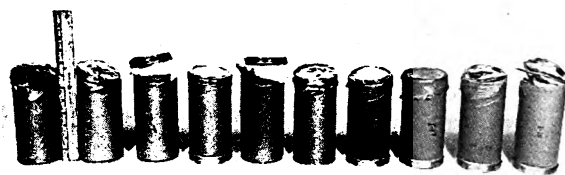
One test package consisted of a single glass test tube holding 10 milliliters of 0.2 percent safranin placed inside a metal container, with cotton packing at the top and bottom, and an outer fiber cylinder,  $7\frac{5}{16}$  inches in length and  $1\frac{1}{2}$



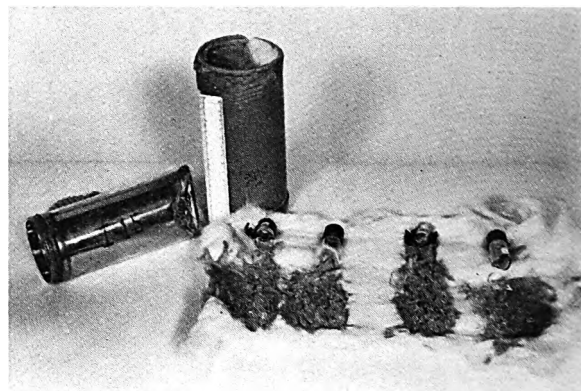
**Figure 2. Condition of F packages, containing a single tube each, after impact**



**Figure 3. Condition of single tube in F package after impact**



**Figure 4. Condition of I packages, containing four tubes each, after impact**



**Figure 5. Condition of four tubes in I package after impact**

inches in diameter, with a small amount of cotton packing inside at its top and bottom.

The second package contained two glass test tubes and the third contained four glass test tubes. A single length of cotton was wrapped around the tubes in such a way as to avoid glass-to-glass contact before they were inserted into the metal container and the outer fiber cylinder. The outer cylinders in the second and third packages were  $7\frac{5}{8}$  inches in length by  $3\frac{1}{2}$  inches in diameter.

None of the three packages leaked when impacted on concrete at average velocities of 130 to 133 feet per second (89 to 90 miles per hour). The mailing tubes more than met the requirements for no leakage under conditions ordinarily incident to handling during transportation.

### REFERENCE

- (1) Kokko, U. P., Stuart, J., and Taylor, G.: Mailing of infectious specimens for diagnostic purposes. Public Health Rep. 75: 979-984, November 1960.



# State Laws on Compulsory Immunization in the United States

CHARLES L. JACKSON, M.A.

**C**OMPULSORY immunization, specifically smallpox vaccination, was required in some States not long after this country became a nation. Almost all the States now have some type of regulation regarding smallpox vaccination for the general population. Some statutes make specific reference to smallpox vaccination for children before they can enter school but, for the most part, such legislation encompasses all susceptible persons within the State's jurisdiction.

Legislation specifically designed to require immunization before entry to school has a direct correlation with the development of poliomyelitis and measles vaccines. Therefore, many States have amended old vaccination laws and enacted immunization laws that increase their scope, requiring immunization not only against smallpox but against diphtheria, pertussis, tetanus, poliomyelitis, and measles as well.

## The Legal Base

The power inherent in the State to enact and enforce laws and to protect and promote the health, safety, morals, order, peace, comfort, and general welfare of the people is known as police power. It means that the State has the power to advance the public welfare by restraining the use of liberty and property. Health

laws, which usually specify what a person may or may not do, fall into this category. In general, they prohibit acts that might endanger the health of others in the community.

Compulsory immunization is a health law with a different twist. It differs because it requires a person to submit himself to a specific personal procedure that he may not desire. The first legislation of this type was adopted in 1809 by the Commonwealth of Massachusetts (1). The law required smallpox vaccination for the general population. Similar legislation soon appeared in other States.

Opposition to such laws, based on the premise of a person's inalienable right to "life, liberty, and the pursuit of happiness," quickly followed. As a result, there were repeated court decisions on the legality of compulsory vaccination laws. Although conflicting legal opinions were given on certain aspects of vaccination requirements, it became an established principle of law that State legislatures may, under certain conditions, require vaccination. Further, it was determined that this power may be delegated by statute to other political subdivisions of the State. The matter was not really settled, however, until the U.S. Supreme Court upheld the constitutionality of the Massachusetts compulsory vaccination law in 1905. The Court ruled that a State had the power, through the legislative process, to pass and enforce compulsory smallpox vaccinations (2).

The question of compulsory vaccination came before the Supreme Court again in 1922. This case involved the constitutionality of a city or-

---

*Mr. Jackson, who is employed by the National Communicable Disease Center, Atlanta, Ga., is assigned as a public health adviser to the Immunization Program, Oklahoma State Department of Health, Oklahoma City.*

dinance requiring smallpox vaccination as a prerequisite for attendance at school. The Court upheld the ordinance as constitutional, basing its decision on the precedent set by the Supreme Court in 1905 (3).

The word "vaccination" as used in compulsory laws was interpreted by the courts to refer to vaccination against smallpox and not against other diseases. However, it is apparent that the legal premise for compulsory laws on other diseases is based on the precedent established by these decisions of the Supreme Court.

### Historical Aspects

Hanlon reported that 15 States and the District of Columbia had laws by 1915 requiring smallpox vaccination as a prerequisite to school attendance. Twenty-one other States had laws or regulations that enabled local jurisdictions to enact compulsory vaccination regulations under certain conditions (4).

Fowler, in his comprehensive study of smallpox vaccination laws, indicated that only six States—Arkansas, Florida, Missouri, Nebraska, Nevada, and Oklahoma—did not have some statute which made express or specific reference to smallpox vaccination (5).

It was not until the late 1930's that compulsory immunization laws pertaining to other diseases were enacted. A study conducted in 1942 indicated that nine States and what was then the Territory of Alaska had provisions requiring immunization against diphtheria. Six provisions were statutory; the others were part of general regulations of the State health codes (6).

Enactment of amendments to compulsory immunization laws in the United States was relatively static during the 1940's and early 1950's. Development of the inactivated poliomyelitis virus vaccine in the late 1950's, followed by the live virus oral poliomyelitis vaccine in 1962 and the advent of live virus measles vaccine in 1963, renewed an interest in compulsory immunization laws as a method of preventing the introduction and spread of preventable diseases.

### A Contemporary Appraisal

Twenty-six States and the District of Columbia now have legislation requiring immunization against a specific disease or diseases as a

prerequisite to school entry (table 1). The statutes and regulations can be divided into two general categories: the older laws requiring vaccination against smallpox only and the laws that have been recently amended or enacted, which require immunization against other diseases in addition to smallpox vaccination.

Five States—Maryland, New Hampshire, Pennsylvania, South Carolina, and Virginia—and the District of Columbia require smallpox vaccinations only. Three of the 26 States—Arkansas, California, and Minnesota—exclude smallpox vaccination from their statutes. Two of these States, California and Minnesota, have laws specifically prohibiting compulsory smallpox vaccination.

Seventeen States require that children be immunized against measles before entry to school (table 1). Twenty States require that a child be protected against poliomyelitis, 18 require immunization against diphtheria, and 16 require immunization against pertussis and tetanus.

Twelve States—Georgia, Hawaii, Illinois, Kansas, Kentucky, Louisiana, Massachusetts, Michigan, Mississippi, Rhode Island, Tennessee, and West Virginia—require immunizations against all six diseases for which immunization materials are routinely used: smallpox, measles, poliomyelitis, diphtheria, pertussis, and tetanus.

In analyzing the immunizations required, the only visible pattern is that laws written within the past 5 years tend to be all-encompassing; that is, they cover all diseases for which immunizations are recommended.

In contrast to compulsory immunization laws, seven States—Arizona, California, Minnesota, North Dakota, South Dakota, Utah, and Washington—have laws making it unlawful to compel a person to receive a smallpox vaccination. Yet two of these States, California and Minnesota, now have legislation requiring children to be immunized against other diseases before entry to school. California requires protection against poliomyelitis and measles, and Minnesota requires protection against measles only.

*Geographic factors.* The majority of States with compulsory immunization laws are east of the Mississippi River—for several reasons. These States were the first of the Union and they faced more immediate danger from the introduction of smallpox from a foreign source,

**Table 1. Compulsory immunization law requirements before entry to school**

State	State law requiring immunization for a specific disease or diseases	Year of last amendment or enactment of new law	Immunizations required					
			Smallpox	Measles	Polio-myelitis	Diphtheria	Pertussis	Tetanus
Alabama <sup>1</sup>	No							
Alaska <sup>2</sup>	No							
Arizona	No							
Arkansas	Yes	1967	No	Yes	Yes	Yes	Yes	Yes
California	Yes	1967	No	Yes	Yes	No	No	No
Colorado	No							
Connecticut <sup>3</sup>	No							
Delaware	No							
District of Columbia	Yes	1906	Yes	No	No	No	No	No
Florida	No							
Georgia	Yes	1968	Yes	Yes	Yes	Yes	Yes	Yes
Hawaii	Yes	1967	Yes	Yes	Yes	Yes	Yes	Yes
Idaho	No							
Illinois	Yes	1968	Yes	Yes	Yes	Yes	Yes	Yes
Indiana <sup>4</sup>	No							
Iowa	No							
Kansas	Yes	1965	Yes	Yes	Yes	Yes	Yes	Yes
Kentucky	Yes	1968	Yes	Yes	Yes	Yes	Yes	Yes
Louisiana	Yes	1968	Yes	Yes	Yes	Yes	Yes	Yes
Maine	No							
Maryland	Yes	1951	Yes	No	No	No	No	No
Massachusetts	Yes	1967	Yes	Yes	Yes	Yes	Yes	Yes
Michigan	Yes	1966	Yes	Yes	Yes	Yes	Yes	Yes
Minnesota	Yes	1967	No	Yes	No	No	No	No
Mississippi	Yes	1966	Yes	Yes	Yes	Yes	Yes	Yes
Missouri	Yes	1961	Yes	No	Yes	Yes	No	No
Montana	No							
Nebraska <sup>5</sup>	No							
Nevada	No							
New Hampshire	Yes	1951	Yes	No	No	No	No	No
New Jersey	Yes	1967	Yes	Yes	Yes	Yes	No	No
New Mexico	Yes	1962	Yes	No	Yes	Yes	Yes	Yes
New York	Yes	1968	Yes	Yes	Yes	No	No	No
North Carolina	Yes	1957	Yes	No	Yes	Yes	Yes	Yes
North Dakota	No							
Ohio	Yes	1959	Yes	No	Yes	Yes	Yes	Yes
Oklahoma	No							
Oregon	No							
Pennsylvania	Yes	1959	Yes	No	No	No	No	No
Rhode Island	Yes	1968	Yes	Yes	Yes	Yes	Yes	Yes
South Carolina	Yes	1952	Yes	No	No	No	No	No
South Dakota	No							
Tennessee	Yes	1967	Yes	Yes	Yes	Yes	Yes	Yes
Texas <sup>6</sup>	No							
Utah	No							
Vermont	No							
Virginia	Yes	1942	Yes	No	No	No	No	No
Washington	No							
West Virginia	Yes	1967	Yes	Yes	Yes	Yes	Yes	Yes
Wisconsin	No							
Wyoming	No							

<sup>1</sup> Montgomery County, Ala., requires diphtheria, tetanus, pertussis, smallpox, and poliomyelitis immunizations; not tested in court.

<sup>2</sup> Under special conditions, school children can be required to get immunizations.

<sup>3</sup> Compliance is a local option; majority of counties require compliance.

<sup>4</sup> Kindergarten ordinance requires immunizations in Marion County, Ind.

<sup>5</sup> Schoolboard resolutions require various immunizations, but they are not considered binding.

<sup>6</sup> Local schoolboards may require immunizations.

especially States along the eastern seaboard. Also, as time passed and other immunizing materials became available, it was easier for a State with a smallpox vaccination law to add other immunization requirements to it. Writing a completely new law on compulsory immunization proved to be difficult in some States. Concentration of population is also a factor. States with large populations, especially large urban populations, are more likely to have compulsory immunization. In addition, some of the Southern States with large numbers of people in the lower socioeconomic class apparently have need for this type of legislation. The majority of States without compulsory immunization laws are in the north and northwest sections of the United States.

*Structure of compulsory immunization laws.* The terminology of current immunization laws indicates that major emphasis is on the requirement that all children be adequately immunized before being allowed to enter school on a permanent basis. There are exceptions. North Carolina's law, for example, requires that all children be immunized against diphtheria, tetanus,

pertussis, and poliomyelitis by the age of 1 year (7). Hawaii's requirement is the same for these diseases. In addition, the law requires that children be vaccinated against smallpox within 1 month after their first birthday and be immunized against measles during the second year of life (8). Kentucky's legislation has similar provisions (9).

The salient point is this: although legislation in some States requires immunizations early in life, enforcement usually does not come until entry to school. The States follow this procedure simply because they find it too difficult to identify susceptible preschool children in the population.

*Administrative responsibility for implementation.* The administrative body having responsibility for implementation of compulsory immunization laws varies considerably from State to State. In 15 States responsibility rests with the State health department. In six States individual school districts must implement the law. In two States local departments of health are responsible. One State law requires the State board of education to set up the necessary

**Table 2. Agencies responsible for implementation of immunization laws and penalties for noncompliance, by State**

State	Responsible agency	Penalty for noncompliance
Arkansas.....	State department of education.....	Misdemeanor.
California.....	Local departments of health.....	Penalty not mentioned.
District of Columbia.....	District department of education.....	Do.
Georgia.....	State department of health.....	Misdemeanor.
Hawaii.....	do.....	Fine, not to exceed \$500.
Illinois.....	State department of education.....	Penalty not mentioned.
Kansas.....	State department of health.....	Do.
Kentucky.....	do.....	Fine or imprisonment or both.
Louisiana.....	Individual school districts.....	Penalty not mentioned.
Maryland.....	State department of health.....	Fine or imprisonment or both.
Massachusetts.....	State department of education.....	Penalty not mentioned.
Michigan.....	State department of health.....	Do.
Minnesota.....	Individual school districts.....	Do.
Mississippi.....	do.....	Do.
Missouri.....	State department of health.....	Do.
New Hampshire.....	do.....	Fine, not to exceed \$10.
New Jersey.....	Individual school districts.....	Penalty not mentioned.
New Mexico.....	State department of health.....	Misdemeanor.
New York.....	do.....	Penalty not mentioned.
North Carolina.....	do.....	Fine or imprisonment or both.
Ohio.....	Individual school districts.....	Penalty not mentioned.
Pennsylvania.....	State department of health.....	Fine or imprisonment or both.
Rhode Island.....	do.....	Penalty not mentioned.
South Carolina.....	do.....	Fine or imprisonment or both.
Tennessee.....	do.....	Penalty not mentioned.
Virginia.....	Individual school districts.....	Misdemeanor.
West Virginia.....	Local departments of health.....	Fine, not to exceed \$100.

mechanism. (See table 2 for information on each State.)

Although most immunization laws specify that the State health department is the responsible agency, in reality almost all authority for issuing regulations has been delegated to some branch of local government. Unfortunately, in many instances this delegation has led to misinterpretation of the law, with stringent regulations being applied in some parts of the State and almost complete noncompliance in other areas.

*Compliance.* As mentioned before, current immunization laws are directed primarily toward unimmunized children entering public, private, or parochial schools. Analysis of the statutes indicates that such laws usually encompass all children regardless of the type of school they are attending. Exceptions are the District of Columbia, Georgia, Louisiana, Maryland, New Jersey, and West Virginia, which require compliance from children attending public schools only.

In general, it can be said that compliance is uniform, with two major exceptions: (a) if a physician certifies that administration of an immunizing preparation required under the provisions of the act is detrimental to a child's health, the child is exempted or (b) if the parents or guardians are bona fide members of a recognized religious organization whose teachings are contrary to the practices of immunization, the child need not be immunized. These two major escape clauses are in almost all statutes on compulsory immunization, especially laws enacted within the last decade.

Five States—Missouri, Rhode Island, Illinois, Michigan, and Ohio—have immunization laws that must be considered "voluntary" compulsory immunization. Each State has provisions in the statute for exempting children if a parent objects in writing to such requirements for any reason.

For example, Missouri's immunization law, enacted in 1961, states in the ninth through 12th sentences of section 2: "It is unlawful for any parent or guardian to refuse or neglect to have his child immunized, as required by this section, unless the child is properly exempted." Immediately after this statement, in the first paragraph of section 3, is the following stipulation: "This

act shall not apply to any child if one parent or guardian objects in writing to his school administrator against the immunization of the child" (10).

*Penalty for noncompliance.* State compulsory immunization laws, in reality, are compulsory in the spirit of the law only. Fifteen laws do not include a penalty of any type for noncompliance. A few state that violation of the act is considered a misdemeanor (table 2).

Eight States—Hawaii, Kentucky, North Carolina, Pennsylvania, South Carolina, New Hampshire, West Virginia, and Maryland—specifically impose a fine or jail sentence for violation of the statute. In practice, the penalty has been withholding the privilege of attending school. However, this stipulation often conflicts with compulsory school attendance laws in many States. To avoid this conflict, most newly enacted compulsory immunization laws simply state that the child must be adequately immunized before entry to school or within a specified time thereafter, usually 30 to 60 days.

The principal regulations in compulsory immunization laws vary considerably from State to State, but a few similarities can be gleaned from them. The following is a synoptic view of the general provisions in most modern compulsory immunization laws.

1. They require compliance from parents of children entering public, parochial, or private schools for the first time.

2. Persons objecting because of medical or religious reasons are exempted from compliance.

3. The State health agency is the administrative body responsible for establishing policy. Implementation is delegated to a local branch of government.

4. Laws enacted within the past decade cover almost all diseases for which immunizing materials are available and recommended for the school age population.

5. Penalty for noncompliance is not stated in the content of the law. Compliance is based on the premise that people comply with the law of the land without coercion.

As I mentioned earlier, a direct correlation apparently exists between the development of poliomyelitis vaccine in 1953 and the enactment of new compulsory immunization laws. Since

1953, 20 States have made poliomyelitis immunization mandatory before entry to school. Fourteen States have either amended or enacted new legislation on compulsory immunization within the past 2 years. A definite increase has occurred in the scope and number of immunization laws passed in the last decade.

So far, I have been concerned with the structure of compulsory immunization laws. I have said nothing about the function (that is, the value) of compulsory legislation in preventing disease. Any discussion of its value among public health officials usually results in a maelstrom of controversy. The following composite of arguments has been heard for and against compulsory immunization.

### Arguments for Compulsory Laws

Support for compulsory immunization is based almost entirely upon what would probably be considered humanitarianism. This philosophy centers around the idea that no child should have to suffer from a disease that can be prevented. If the parent will not or cannot assume the responsibility for having the child properly immunized, then it is the responsibility of society to see that the child is protected. This idea is congruent with the belief that in any society a small minority of people must be forced to do things that are, in the long run, for their own benefit.

Although this argument is the main one for compulsory immunization, there are some underlying assumptions. For instance, it is often argued that if a child suffers permanent disability from a preventable disease, his disability represents an economic loss both in potential earning power and actual cost of hospitalization, and possibly long-term therapy. It is also pointed out that such cost often falls on every citizen either through contributions to charitable organizations or through funds earmarked for State welfare. Support also comes from the theory that preventable diseases will never be eradicated in the United States unless very high immunity levels are maintained in the population for a long period; therefore, the only way to insure such levels is through compulsory immunization laws.

Arguments for compulsory immunization are

based on broad generalizations, but they have one major factor in their favor: the altruistic attitude of the American people, especially regarding the health and welfare of children. This attitude probably has been the determining factor in the passage of new laws on the subject in the last few years. Since the development of measles vaccines, associations for retarded children have also supported legislation requiring measles immunization.

### Basic Objections to Compulsory Laws

Objections to compulsory immunization laws are of two general types: (a) those based on a person's philosophy about governmental control and individual freedom and (b) disagreements based on the thinking that such legislation does not serve the purpose for which it was intended. The following objections are the major ones raised against the concept of compulsory immunization laws.

*Religion.* Several religious groups in the United States object to compulsory immunization on the principle that they are members of a religious organization whose teaching prohibits this type of medical care. They feel that any attempt by the State to force a bona fide member of their organization to be immunized against his will is a violation of their constitutional right to freedom of religion. Almost all compulsory immunization laws exempt these groups from compliance.

*General distrust of medical science.* Many people in the United States, although a diminishing group, distrust the practices of modern medicine. They do so out of ignorance, fear of pain, cultural characteristics, or membership in one of the many health cults that abound in certain geographic areas of the United States.

*Infringement of personal liberty.* To the rallying call of "Give me liberty or give me death" often come the diverse elements of our society. They are heard not because of the rationality of their arguments but because of the intensity of interest and the emotionalism that often accompany such arguments. Anyone doubting this needs only to recall the turmoil that resulted when many urban areas were considering fluoridation of the public water supply.

In the broadest sense, compulsory immunization laws are an infringement of personal lib-

erty. However, the rationale of such laws is inherent with the philosophy that man not only has the responsibility for himself but also for the community in which he resides.

*Difficulty of enforcement.* Analysis of the statutes reveals the considerable merit of this objection. Only a few of 26 State immunization laws specifically mention a penalty for non-compliance. Apparently the philosophy applied is that the threat of specific punishment is unnecessary for people to comply with the spirit of the law. The standard procedure of the agencies enforcing such laws is to require a record of immunizations given, signed by a private physician or the local health agency. There is little evidence that parents object en masse to such requirements. However, the children of parents who persistently refuse to cooperate are usually simply forgotten.

*Emphasis on compulsion rather than education.* A long-range comprehensive educational program on the need for good immunization practices undoubtedly is more desirable than forced compliance through an immunization law. Until educational programs can be directed toward the hard-to-reach group, immunization laws are at least an alternative.

*Compulsory laws encourage delayed primary immunization.* One of the most damaging arguments is that compulsory laws encourage parents to delay primary immunization for their children until entry to school. Many public health officials believe that such laws encourage parents to delay immunizations because they know that immunizations are not mandatory until their children are ready to enter school.

Unfortunately, research apparently has not been done on this argument. There are no published data that prove or disprove the postulation that preschool children residing in States with compulsory immunization laws are not as well immunized as preschool children living in States without such laws. However, unpublished data on the immunization programs in Kansas and North Carolina reveal that at least in these two States the immunization laws do not cause parents to delay immunizations for their children.

Unpublished data from a survey conducted

by the Immunization Program of the Kansas State Health Department, Topeka, indicate that the majority of 1-year-old children had started the primary immunization series. The study included 17,369 children reaching 12 months of age during fiscal year 1967. Eighty-eight percent of these children had received three or more doses of diphtheria-tetanus-pertussis (DTP) vaccine. Seventy-nine percent had received two or more doses of oral poliomyelitis vaccine, 59 percent had been immunized against measles, and 40 percent had received a primary smallpox vaccination.

The Immunization Program of the North Carolina State Health Department, Raleigh, conducted a similar study, which included followup of 6,717 children reaching 2 years of age between December 1965 and December 1966. Unpublished data of the department show that 94 percent had started the DTP and poliomyelitis immunization series before age 2, and 84 percent had finished the series before their second birthday. Fifty-seven percent had received measles immunization, and 38 percent had received primary smallpox vaccination.

Kansas' compulsory immunization law has required immunization against smallpox, poliomyelitis, diphtheria, pertussis, and tetanus since 1961. An amendment in 1965 included measles (11). North Carolina's law, effective since 1957, covers smallpox, poliomyelitis, diphtheria, pertussis, and tetanus (?).

Evidence supporting the theory that immunization laws encourage the delay of needed immunizations is based on the field experiences of public health officials. In support of this belief they point to the large number of children immunized at local health departments each year just before entry to school. Although there are several possible explanations for such activity, the following two seem to have particular significance.

1. In regard to smallpox vaccination the officials are probably correct. It has long been a common practice among the private medical profession and public health alike to defer giving smallpox vaccinations until the child is 4 or 5 years old, and only then in the cool weather of autumn. However, this practice is related to smallpox only.

2. Booster immunizations are recommended for diphtheria, pertussis, tetanus, smallpox, and poliomyelitis. The recommended time for such boosters is just before entry to elementary school. Many children receiving immunizations before starting school possibly are getting boosters, not starting a primary immunization series.

If a significant correlation exists between unimmunized preschool children and compulsory immunization laws, it has yet to be proved.

*Compulsory immunization laws are ineffective in preventing disease.* Hanlon points out that in U.S. areas once having a high incidence of smallpox, vaccination laws were a significant factor in reducing incidence and eventually controlling the disease. He cites a 1936-46 study in which it was found that the incidence of smallpox was significantly lower in the States with compulsory vaccination laws and higher in the States where compulsory vaccination was prohibited (4a).

For diphtheria and pertussis, the incidence of cases and deaths occurs overwhelmingly in the preschool population. Tetanus is now a disease of neonates and middle-aged people. However, since children eventually become middle aged and tetanus is a disease that attacks the unimmunized of all ages, there is no logical reason not to immunize susceptible school age children who had been missed during their preschool years.

Poliomyelitis, like diphtheria and pertussis, is primarily a disease of preschool children. But there is little doubt that school age children provided part of the reservoir of subclinical cases that kept the virus circulating in the population until the mass poliomyelitis campaigns of the early 1960's. Presumably, immunization of school age children was a factor in reducing the morbidity of poliomyelitis.

Measles offers the strongest case for compulsory immunization. The epidemiologic link to circulation of the measles virus is children in kindergarten and the first and second grades. Many measles epidemics originate within these groups. The infection is then carried home, where preschool siblings become infected.

Antagonists point to the incidence of all these diseases and say that compulsory immunization laws requiring immunization before entry to school are ineffective in preventing disease. This

assertion is true only if these laws actually cause parents to defer immunizations for their preschool children until entry to school.

## Conclusion

Reviewing the structure of compulsory immunization laws is, for the most part, an academic exercise. The important question is whether we should have such legislation in the United States. Analysis of the arguments for and against such legislation indicates that the choice can be difficult.

I believe that State compulsory immunization laws pose little threat to our cherished belief in individual choice and freedom of action. Therefore, I feel that such laws do little harm and, when applied in a uniform manner, can have a positive impact in raising immunization levels and preventing the spread of communicable diseases.

Compulsory legislation on immunization should not be considered a police tool but a positive expression of public policy that immunization is important to the health of the individual and of the community.

## Summary

A review of State compulsory immunization laws revealed that 26 States and the District of Columbia now have legislation requiring immunization against a disease or diseases as a prerequisite to school entry. The legal base for such laws is the U.S. Supreme Court ruling of 1905 that upheld the constitutionality of the Massachusetts compulsory law on smallpox vaccination. Although initial State legislation on compulsory immunization pertained to smallpox only, by the late 1930's compulsory laws including other diseases were enacted.

Analysis of the structure of State laws on compulsory immunization revealed that most State laws of this type now require compliance from the parents of children in public, private, or parochial schools. Almost all diseases that can be prevented by immunization are included. The children of parents who object because of medical or religious reasons are exempted. The penalty for noncompliance is considered a misdemeanor and usually is not enforced.



The value of State compulsory immunization laws continues to be controversial. Arguments for and against such legislation are analyzed.

# REFERENCES

- (1) Tobey, J. A.: Public health law, New York. The Commonwealth Fund, New York, 1947.
- (2) *Jacobson v. The Commonwealth of Massachusetts*, 197 U.S. 11, 25 S.Ct. 358, 49L. Ed. 643, Ann. Cas. 765 (1905).
- (3) *Zucht v. King*, 260 U.S. 174 43 S.Ct. 24, 67L. (1922).
- (4) Hanlon, J. J.: Principles of public health administration. Ed. 3. C. V. Mosby Co., St. Louis, Mo., 1968; (a) p. 552.
- (5) Fowler, W.: Principal provisions of smallpox vaccination laws and regulations in the United States. Public Health Rep 56: 167-189, Jan. 31, 1941.
- (6) Fowler, W.: State diphtheria immunization requirements. Public Health Rep 57: 325-328, Mar. 6, 1942.
- (7) N.C. Gen. Stat. 1959, art. 9, GS 130-87.
- (8) Rev. Laws of Hawaii (1955), amend. pt. II, ch. 49 § 49-30 (1967).
- (9) Ky. Rev. Stat. § 214.036, February 1968.
- (10) Mo. Rev. Stat., House Bill No. 34 (1961).
- (11) Kansas School Immunization Law, Kans. Stat. Ann., ch. 72 § 5381 (1965).



**Sample mounting techniques—Filtration.** Order No. M-1343. Motion picture, 16 mm., color, sound, 6 minutes, 1966.

**SUMMARY:** Demonstrates filtration technique for mounting precipitated samples using a vacuum pump, suction flask, filter paper, and filter tower. Shows three types of filter towers—glass, teflon, and stainless steel—and procedure for placing filter paper, through which the sample slurry has passed, in a counting dish and drying it under a heat lamp. After drying, the sample may be counted in the dish or it may be mounted more permanently with a ring and disk for counting. This procedure is also demonstrated.

**Gross Radioactivity Analysis of Water.** Order No. M-1344. Motion picture, 16 mm., color, sound, 5½ minutes, 1966.

**SUMMARY:** Shows gross alpha and beta counting of water samples involving the preparation of suspended solids and dissolved solids. The suspended solids are removed with a membrane filter apparatus connected to a vacuum; the filter paper is burned away, and only the suspended

solid sample is prepared for mounting. The dissolved solids from the filtrate are removed by an inverted volumetric flask method. The flask is placed on a hot plate until all liquid is evaporated, and the remaining solid is allowed to cool in the planchet.

These two films were produced by the National Medical Audiovisual Center for the Bureau of Radiological Health, Public Health Service.

**AUDIENCE:** Radiochemists, radiobiologists, engineers, laboratory technicians, health physicists, plant safety engineers, and public health personnel. These films are not cleared for television.

**AVAILABLE:** Free short-term loan from the National Medical Audiovisual Center (Annex), Chamblee, Ga. 30005, Attention: Film Distribution. Purchase from DuArt Film Laboratories, Inc., 245 West 55th St., New York, N.Y. 10019. These films are available also in 8-mm. format (Fairchild cartridge) from Modern Talking Picture Service, Inc., 1212 Avenue of the Americas, New York, N.Y. 10036.

**Silent World, Muffled World.** Order No. OM-1279. Motion picture, 16 mm., color, sound, 28 minutes, 1966, cleared for television. Produced by Churchill Films for the Deafness Research Foundation and the American Academy of Ophthalmology and Otolaryngology.

**AUDIENCE:** Civic, educational, voluntary, and professional health groups, including medical and paramedical professions.

**SUMMARY:** Produced to further the understanding of deafness and hearing loss, to stress the need for medical research, and to encourage people with hearing loss or other ear disorders to participate by bequeathing their inner ear structures to the Temporal Bone Banks Program for Ear Research. Narrated by Gregory Peck, the film relates historically the difficulties of speech, education, and normal living for the deafened. Animation explains the physiology of the ear, the mechanics of the hearing process, and the hearing impairment caused by certain disorders of the outer, middle, and inner ear. The film was awarded a blue ribbon at the American Film Festival competition in May 1966 in New York City and was given a Chris Award by the Film Council of Greater Columbus (Ohio).

**AVAILABLE:** Free short-term loan from National Medical Audiovisual Center (Annex), Chamblee, Ga. 30005, Attention: Film distribution. Captioned version for the deaf from Captioned Films for the Deaf, Office of Education, Department of Health, Education, and Welfare, 400 Maryland Ave. SW., Washington, D.C. 20202. Purchase from DuArt Film Laboratories, Inc., 245 West 55th St., New York, N.Y. 10019.

## Program Notes

### **Safer Glass Doors**

Safety markings are required on transparent glass doors and fixed adjacent glass sidelights in mercantile establishments and in public and commercial buildings and structures throughout Maryland.

The Maryland State Board of Health and Mental Hygiene was authorized by the legislature to establish regulations to prevent injuries to persons unfamiliar with areas where glass doors are located. The regulations, which went into effect in March 1969, are enforced by the Maryland State Health Department.

### **Coronary Care in Colorado**

Seventeen of the 18 general hospitals in Colorado with more than 200 general service beds and 13 of the 23 with between 50 and 200 such beds have specialized coronary care units. There are four coronary care units in the 25 specialized hospitals in the State. Many of the hospitals without specialized coronary care units have defibrillators and monitors. For example, only four general hospitals of 25-50 bed capacity do not have defibrillators and monitors.

Also, by the beginning of 1969, a total of 138 registered nurses had completed 38 weeks of course work in the care of the patient on a coronary care unit. These nurses were from 37 hospitals or agencies in 19 communities in Colorado.—*Colorado's Health*, January-February 1969.

### **New Diagnostic Tool**

An "Atlas of Mental Retardation Syndromes" is designed as a ready reference for the physician who is confronted with a child whose appearance suggests mental retardation. The 372 photographs in the book are accompanied by brief descriptions of major diagnostic features, clinical appearance, labora-

tory and radiological results, patterns of inheritance, and suggested treatment. An exhaustive index of clinical characteristics is listed.

Dr. Sydney S. Gellis and Dr. Murray Feingold, two pediatricians at the Tufts-New England Medical Center, collaborated in the preparation of this new diagnostic aid.—*THIS WEEK in Public Health* (Massachusetts Department of Public Health), June 23, 1969.

### **War on Rats in Washington, D.C.**

A million-dollar war on rats in the District of Columbia was opened officially June 30, 1969, with ceremonies in a city park. The new program, funded by a grant from the Department of Health, Education, and Welfare, represents a multifaceted attack on rats in the Model Cities Area. The program is administered by the District's departments of public health, sanitary engineering, and economic development.

### **Telling It Like It Is**

The staff of the drug abuse program of the Texas State Health Department's division of public health education tries to "tell it like it is." Presentations to junior and senior high school students dispense with philosophizing or preaching and leave students free to decide for themselves whether they should use marihuana.

At every school presentation, Sonny Bono of the singing team "Sonny and Cher" narrates a film entitled "Marihuana" and relates the subject matter to teenagers. Attitudes toward use of marihuana are explored, and arguments and counter-arguments are ventilated.

After the film, "the air is filled with questions." E. C. Nelson of the State's division of public health education tries to answer them, assisted by a pharmacist from the division of food and drugs and often aided also

by a physician. If Nelson or his colleagues don't have the answer, the questioner is told, "We do not know precisely, but we'll find out for you."

Since January 1969, approximately 14,000 teenagers have attended the presentations. In the 34 presentations to date, not once has a school official expressed disappointment.—*Texas Health Bulletin*, May 1969.

### **"Measles Must Go"**

Reported cases of measles in Washington State declined from 5,876 cases in 1967 to only 610 in 1968, according to Governor Dan Evans. This decrease, he said, is evidence of the success of a "Measles Must Go" program conducted in the fall of 1967. In this immunization campaign, approximately 116,100 Washington children were immunized at public health clinics. Vaccine sales reports indicated that an additional 10,500 children were immunized by private physicians during the campaign.

The 1967 legislature appropriated \$180,000 for the State's contribution to the eradication of measles. In this connection, Dr. Wallace Lane, acting director of the State health department, noted that it has been estimated that the direct cost to the people of Washington for just one measles epidemic year would have been about \$2,880,500. And health department epidemiologists had predicted that the winter and spring of 1969 would have been a measles epidemic period.

### **Deaths per 1,000 Live Births**

The provisional U.S. infant mortality rate for 1968, 21.7 deaths per 1,000 live births, is the lowest ever recorded for the United States according to the National Center for Health Statistics, Public Health Service. Fifty years ago the rate was 100.9 deaths per 1,000 live births.

---

*Items for this page: Health departments, health agencies, and others are invited to share their program successes with others by contributing items for brief mention on this page. Flag them for "Program Notes" and address as indicated in masthead.*

# Human Rabies Immune Globulin

R. KEITH SIKES, D.V.M., M.P.H.

**A**PPROXIMATELY 8,000 persons in the United States receive antirabies serum of equine origin (ARS) each year. This passive immunization provides rabies antibody immediately as well as apparent protection from infection for 12 to 14 days. After that, antibody from active immunization is usually present.

Unfortunately, approximately 16 percent of the persons who receive the equine-origin antirabies serum develop serum sickness; for persons over 15 years of age, this incidence increases to 46 percent (1). Most authorities have agreed that to prevent these reactions a human-origin rabies immune globulin (HRIG) was needed. This globulin should be not only safer but also as potent as the ARS now available.

The Rabies Unit at the National Communicable Disease Center, Public Health Service, has coordinated efforts to develop such a globulin for experimental use and to determine whether it is feasible to produce and use such a product in the field. This report summarizes the progress in four areas of this program.

1. Collection and fractionation of plasma
2. Potency and animal protection tests
3. Testing in man
4. Anticipating problems that might arise in subsequent development of the globulin.

## Collection and Fractionation of Plasma

Donors, mostly veterinarians, had previously received rabies vaccine. Before donating either a single or double unit of blood, each person received a booster injection of the duck embryo origin rabies vaccine (DEV). The American National Red Cross collected and stored the

plasma until it was fractionated; the Medical Laboratory Section, National Communicable Disease Center, conducted the fractionation procedures.

A sample of serum from each donor was tested for rabies serum neutralizing (SN) antibody. For the first three lots of experimental globulin, the plasma of donors was accepted if their SN antibody titers were 1:100 or greater. In the fourth—the most recent—lot, the titer of each donor's serum had to be at least 1:400 to be included for fractionation by the cold ethanol technique (2, 3). The final globulin was reconstituted to 16 percent in 0.3 molar glycine. A titer increase of approximately twentyfold has occurred as a result of fractionating each 250 ml. quantity of plasma to its concentrated 5 ml. of gamma globulin (see box).

A total of 400 ml. of human-origin rabies immune globulin was prepared for the first series of studies to determine its potency and protective value as measured in animals. An additional 2,500 ml. lot of HRIG is now available for studies in human beings.

## Potency and Animal Protection Tests

The first lots of human-origin rabies immune globulin used in animal protection tests contained between 33 and 62 international units per ml. The lot prepared during the last 6 months

---

*Dr Sikes is chief, Viral Zoonoses Section, Epidemiology Program, National Communicable Disease Center, Public Health Service, Lawrenceville, Ga. This paper was presented at the 96th annual meeting of the American Public Health Association, Detroit, Mich., November 13, 1968.*

for use in human beings contained 165 international units per ml. The current potency requirement for antirabies serum is that it contain at least 100 units per ml. The potency values of four lots of HRIG prepared at the National Communicable Disease Center and two lots of commercial antirabies serum are presented in table 1.

The ability of the human-origin immune globulin to protect rabies-challenged animals was tested in comparison with antirabies serum

in mice, guinea pigs, and dogs. Although these first lots of HRIG contained 0.2 to 0.5 times as many units as the ARS, there was no significant difference in their capacity to protect the 103 challenged animals (table 2).

These first results therefore indicated that HRIG, which was tested as a heterologous globulin, was as effective in preventing rabies in various species of animals as the antirabies serum. When homologous and heterologous antirabies serums were compared in guinea pigs,

**Table 1. Potency value of human-origin rabies immune globulin, equine-origin antirabies serum, and National Institutes of Health reference serum**

Test material	Plasma or serum pool		Globulin or serum concentrate		Concentration factor
	Titer <sup>1</sup>	Antibody units per ml.	Titer <sup>1</sup>	Antibody units per ml.	
Human-origin rabies immune globulin:					
Lot 1-----	1:625	4.5	1:5,900	42	10
Lot 2-----	1:800	5.7	1:8,700	62	11
Lot 3-----	1:350	2.5	1:4,700	33	16
Lot 4-----	1:1,400	5.8	1:29,000	166	21
Equine-origin antirabies serum:					
Lot 1-----			1:19,000	136	
Lot 2-----			1:23,400	167	
Reference serum:					
Lot 1B-----	1:280	2.0			
Lot 2-----	1:350	2.0			

<sup>1</sup> Dilution of material protecting 50 percent of the mice.

**Table 2. Rabies mortality in three species receiving human or equine antibody treatment after challenge**

Species	Dosage volume (cc.) <sup>1</sup>	Human-origin rabies immune globulin			Antirabies horse serum concentrate			Deaths of controls
		Lot No.	Antibody units per dose	Deaths	Lot No.	Antibody units per dose	Deaths	
Mice.....	0.5	1, 2	25	3 of 50.....	1	67.9	0 of 43.....	24 of 25. <sup>2</sup>
Guinea pigs.....	2.0	1, 2	100	1 of 33.....	1	271.6	1 of 40.....	20 of 20. <sup>3</sup>
Dogs.....	4.5	3	16.3	3 of 20.....	2	83.6	1 of 20.....	10 of 14. <sup>4</sup>
Total.....				7 of 103.....			2 of 103.....	54 of 59.

<sup>1</sup> Inoculated in left rear leg. Mice and guinea pigs, 1 hour or 24 hours after challenge; dogs, 24 hours after challenge.

<sup>2</sup> 630 mouse intracerebral LD<sub>50</sub> (MIC LD<sub>50</sub>) or 10 mouse intramuscular LD<sub>50</sub> (MIM LD<sub>50</sub>) in the right rear leg, 21-day observation. The 50 percent effective dose (ED<sub>50</sub>) = the amount of brain tissue that will protect 50 percent of the mice against a subsequent challenge with rabies virus.

<sup>3</sup> 10,000 MIC LD<sub>50</sub> or 63 guinea pig intramuscular LD<sub>50</sub> (GPIM LD<sub>50</sub>) in the right rear leg, 21-day observation.

<sup>4</sup> Per kg.

<sup>5</sup> 200,000 MIC LD<sub>50</sub> in the right rear leg, 180-day observation.

**Gamma Globulin Yield, Human-Origin Rabies Immune Globulin, Using Cohn Fractionation Technique**

4 units of blood yield 1,000 ml. plasma = 750.0 ml. serum  
 750.0 ml. serum contain 0.6 percent gamma globulin = 4.5 gms. gamma globulin  
 4.5 gms. gamma globulin estimated 75 percent recovery = 3.4 gms. gamma globulin  
 3.4 gms. gamma globulin reconstituted to 16 percent = 21.0 ml. of final product or approximately 5 ml. gamma globulin per unit of blood

there was a strong suggestion that fewer units of homologous than of heterologous antiserum would protect guinea pigs challenged with rabies virus (table 3).

Similarly, homologous antirabies serum protected dogs and mice after challenge at least as effectively as the heterologous serum (4). However, in dogs a major interference problem developed between passive and active immuniza-

tion when the dose of human antiserum was used in conjunction with duck embryo origin rabies vaccine. This problem pointed up the need for more studies in other animals to determine degrees of interference that develop when various doses of antiserum, both homologous and heterologous, were used.

Various regimens were tested to see which might overcome the interference. Results of these studies showed three conditions.

1. Heterologous antibody titers decreased by 50 percent every 1.5 days while homologous antibody titers decreased by 50 percent every 7 days, lasting five times longer.

2. When homologous antiserum was followed by DEV, response to the vaccine was suppressed longer than when heterologous antiserum and vaccine were administered. The response was delayed until the antibody titer decreased to 1:20 or lower.

3. Interference was greatly diminished or overcome when the dose of antiserum was reduced from 100 units to 25 units or when a more potent vaccine was used. When the suckling

**Table 3. Rabies mortality in challenged guinea pigs, by type and dosage of antirabies serum**

Type of serum	Antibody units per dose	Number tested	Number developing rabies
Experiment 1—2.0 ml. dose: <sup>1</sup>			
Controls.....		<sup>2</sup> 9	8
Antirabies guinea pig serum.....	30. 8..... 3. 08..... . 308..... ED <sub>50</sub> ≤ . 308 units.....	9 9 9	0 0 4
Antirabies burro serum.....	322. 0..... 32. 2..... 3. 22..... ED <sub>50</sub> = 5. 8 units.....	9 9 8	1 3 3
Antirabies horse serum concentrate lot 1.....	272. 0..... 27. 2..... 2. 72..... ED <sub>50</sub> = 39. 4 units.....	9 9 9	3 6 5
Experiment 2—0.2 ml. dose: <sup>1</sup>			
Controls.....		<sup>3</sup> 9	7
Antirabies guinea pig serum.....	3. 08..... . 308..... ED <sub>50</sub> = ≤ . 308 units.....	9 9	0 3
Antirabies burro serum.....	32. 2..... 3. 22..... ED <sub>50</sub> = 6. 42 units.....	9 9	5 3

<sup>1</sup> 0.2 ml. or 2.0 ml. of the appropriate dose of serum or serum concentrate in the left rear leg 24 hours after challenge.

<sup>2</sup> 8,300 MIC LD<sub>50</sub> in the right rear leg, 30-day observation.

<sup>3</sup> 8,300 MIC LD<sub>50</sub> in the right rear leg, 40-day observation.

mouse brain vaccine was used, the response to vaccine was apparent in the presence of a passive titer of 1:120.

### Testing in Man

The studies described marked the completion of the previously planned animal protection studies with human-origin rabies immune globulin and homologous or heterologous antiserum. The next step was to test the HRIG in man.

Although no human beings had received HRIG, the Rabies Control Unit had done much of the work leading to the testing in man. The major task was to prepare enough globulin. The 2,500 ml. of HRIG that had been collected, fractionated, and tested in the laboratory was of excellent quality and sufficient quantity to complete the two phases of studies planned in human volunteers in the United States during 1969.

In the meantime, the Rabies Control Unit registered an application for investigation of new drugs with the Division of Biologics Standards, National Institutes of Health, Public Health Service. Further, the NCDC Epidemiology Program assigned two physicians to direct testing of HRIG in human beings.

The first study, initiated in June 1969, was to determine the antibody decay rate of the HRIG. Twenty persons from the Atlanta, Ga., area received the globulin without any unusual reactions, and serum samples from these persons are now being tested for rabies antibody. The protocol for this study was developed and reviewed by several physicians and other rabies experts to allow intelligent progress to the next phase of human testing.

The second phase of testing will encompass a similar group of volunteers who will receive both the HRIG and rabies vaccine to determine whether interference between passive and active immunization is observed. There is every reason to believe that HRIG will provide as high initial antibody levels as that produced by the equine-origin antirabies serum. However, this high antibody titer is expected to last longer, and it might produce interference with active immunization. Only when a regimen has been developed which will satisfactorily overcome interference will work on development of HRIG be considered finished.

### Anticipated Problems

Collecting, fractionating, and testing lots of human-origin rabies immune globulin have thus far required considerable time and effort. However, much has been learned that can be applied in the future, and the feasibility of producing HRIG for practical use has been demonstrated.

HRIG is expected to be available on a limited basis from a few commercial laboratories in the reasonably near future. Two major problems remain to be overcome.

1. A supply of donors whose antibody titer is at least 1:400 must be obtained.

2. The cost of providing such a specialized globulin to people who are exposed is very high.

The following analysis was done to determine the number of donors required to supply sufficient HRIG for the 8,000 people in the United States expected to need antirabies serum each year.

A total of approximately 240,000 ml. of globulin would be required if each ml. contained 100 units and if the average weight of persons treated was 120 pounds. Each person would require 1,000 units per 40 pounds body weight. Since 10 ml. of globulin could be obtained by plasmapheresis from each donor at least every 2 weeks, one donor could provide 260 ml. of globulin per year. Thus 920 donors would be required to provide the amount used in the United States. If the HRIG contained as high a titer as that developed at the National Communicable Disease Center, only 552 donors would be needed.

Approximately 90 percent of the plasma used in the HRIG development program was donated by veterinarians in single or double units of blood and collected without charge by the American National Red Cross. The remaining 10 percent was obtained from various persons in the El Paso, Tex., and Atlanta, Ga., areas. Each person yielded 2 pints of blood per bleeding by the plasmapheresis method; each was paid \$25 per double unit.

If HRIG is to be produced by independent laboratories which use paid donors, the cost of sufficient plasma to be fractionated for treating one man weighing 160 pounds would be \$100. It is possible, however, that plasma can be obtained at a much cheaper rate, but the cost of fractionating and testing to assure its quality

will undoubtedly increase the cost of a human antirabies treatment to at least 10 times the present amount.

### Summary

A total of 2,500 ml. of rabies immune globulin of human origin (HRIG) has been produced by the Rabies Unit of the National Communicable Disease Center, Public Health Service, and is now being tested in human beings. This globulin has passed all safety tests, and it contains 165 international units per ml., which is equal to the potency of antirabies serum of equine origin (ARS) now prescribed in the United States for persons exposed to rabid animals.

Human rabies immune globulin gave animals challenged with rabies virus as much protection as ARS. The next step is to develop for human use a satisfactory regimen of HRIG in conjunction with rabies vaccine. Being a homologous

globulin, this HRIG should preclude serum sickness in exposed persons who are sensitive to equine serum.

### REFERENCES

- (1) Karliner, J. S., and Belaval, G. S.: Incidence of reactions following administration of antirabies serum. *JAMA* 193: 109-112 (1965).
- (2) Cohn, E. J., et al.: A system for the separation into fractions of the protein and lipoprotein components of biological tissues and fluids. *J Amer Chem Soc* 68: 459-475 (1946).
- (3) Oncley, J. L., et al.: The separation of antibodies, isoagglutinins, prothrombin, plasminogen, and B<sub>2</sub>-lipoprotein into subfraction of human plasma. *J Amer Chem Soc* 71: 541-550 (1949).
- (4) Winkler, W. G., Schmidt, R. C., and Sikes, R. K.: Evaluation of human rabies immune globulin and homologous and heterologous antibody. *J Immunol* 102: 1314-1321 (1969).
- (5) Archer, B. G., and Dierks, R. E.: Effects of homologous or heterologous antiserum on neutralizing-antibody response to rabies vaccine. *Bull WHO* 39: 407-417 (1968).

## Education Notes

**Doctoral Study in Social Work and Social Science.** The University of Michigan offers an interdepartmental program which combines social work with economics, political science, psychology, or sociology and leads to a doctor of philosophy degree. Social psychology may be chosen as a field of concentration within psychology or sociology.

The program is designed to prepare students for careers in research, teaching, policy development, and administrative positions in the social welfare field. Candidates for a master's degree in social work in 1969-70, experienced social workers, holders of a master's degree in a social science, or persons with a bachelor's degree only may apply.

Support for this advanced study is available from several sources, including the Children's Bureau and the Public Health Service. Stipends range from \$1,600 to \$3,400 plus tuition and dependency allowances.

Fellowship applications and applications for admission only will be received up to January 13, 1970.

For detailed information and application forms write to Doctoral Program in Social Work and Social Science, University of Michigan School of Social Work, 1065 Frieze Building, Ann Arbor, Mich. 48104.

**Hospital and Health Care Administration.** Saint Louis (Mo.) University has redesigned its graduate program in hospital administration and broadened its name. The new title, hospital and health care administration, effective September 1, reflects the increased scope of the program's academic content.

In addition, the academic-residency sequence has been altered to consist of two academic semesters, followed by an 8-month residency, and concluding with a third academic semester.

Courses in health care economics and community health and medical care have been added. The new curriculum will also give additional emphasis to hospital and health care planning, systems analysis and design in health care, and health care research.

## Miniature Pigs Bred for Research

A strain of miniature pigs for use in research has been bred at the University of Minnesota under the sponsorship of the Hormel Foundation. Compared with an average pig, weighing from 500 to 1,000 pounds, the adult "mini pig" weighs 100 to 200 pounds.

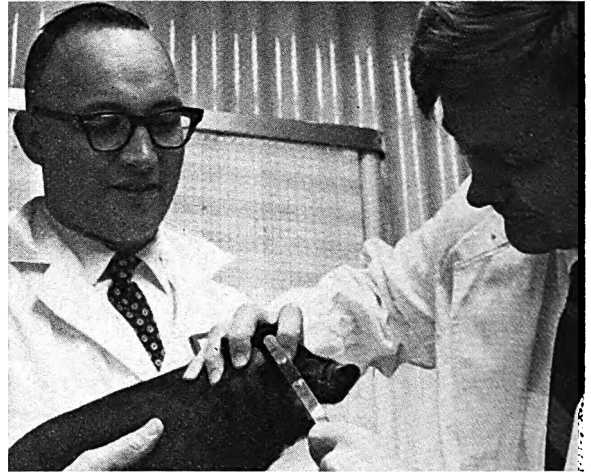
The pig's cardiovascular system, skin, blood vessels of the retina, gastrointestinal tract, and dental structure are similar to man's. Like human beings, pigs suffer from atherosclerosis, gastric ulcers, rheumatoid arthritis, nutritional deficiencies, influenza, and trichinosis. However, the pig has not been an ideal laboratory animal because of his ungainly bulk and piggy habits.

In addition to size, another drawback of pigs has been lack of clinical data. Pigs have been known to live from 15 to 16 years on a farm, but their lifespan in a controlled environment is not known.

The clinical and other data on the pigs is being sought in a research project at the University of Missouri School of Veterinary Medicine. In the project, a study group of 200 pigs has been divided into three groups. Individual animals in one group will be sacrificed periodically and necropsied. A second group will provide blood, fecal, and urine samples throughout their lifespan. The third group will live out their full lives with as little stress as possible. The animals are housed at the university's Sinclair Comparative Research Farm for the Study of Chronic Diseases and Aging in Columbia, Mo.

Records are kept on each animal, and he is ear notched and tattooed for identification. From physiological, anatomical, radiographic, microbiological, and parasitological observations made at regular intervals upon meaningful numbers of animals, biological profiles from birth through old age are being developed.

A team of researchers is working on this project. Dr. Richard B. Wescott, associate professor of veterinary microbiology and of medical mi-



crobiology, is the principal investigator and project coordinator. Wescott, Dr. Myron Tumbleson, and Dr. Charles Middleton have established and will maintain the mini-pig population. Taking care of physiological aspects are Tumbleson, Dr. Margaret Flynn, and Dr. Saul Larks. Electrocardiograms of all the miniature swine, including fetal electrocardiograms of pregnant sows and newborn pigs, are being recorded. All growth changes, blood, fecal, and urine analyses are also being noted.

Two pathologists, Middleton and Dr. Lawrence Morehouse, are determining the normal gross and microscopic anatomy of the pigs. For more detailed study, tissues are being carefully preserved with formaldehyde in plastic bags for future research aims.

The normal skeletal development of the pigs is being determined by Dr. E. Allen Corley through periodic radiographic examinations. Wescott and Dr. A. Roland Dommert are studying the microbiology and parasitology of the animals' gastrointestinal tract.

The project, now in its second year, is aided by a 5-year grant from the Public Health Service. The yearly allotment is \$102,000. To achieve the full research goals of the project will require about 15 years, depending on the actual lifespan of the miniature pig.



# Survey of State-Level Programs in Mental Health Statistics

KURT GORWITZ, Sc.D.

THE FIRST U.S. facility which provided care for the mentally ill was the Pennsylvania Hospital in Philadelphia. When it opened in February 1752 as a general treatment service, the hospital established a program "for the reception and care of lunaticks" as part of its regular operations (1). In fact, one of the first two patients admitted was mentally ill. The first hospital specifically for the care of the mentally ill was the Eastern Lunatick Asylum (Eastern State Hospital) at Williamsburg, Va., which accepted its first patient on October 12, 1773. Unsuccessful earlier efforts to establish such institutions go back at least to 1730, in Massachusetts (2). The first privately operated mental hospital, the Quaker-sponsored Friend's Asylum, opened at Frankford, Pa., in 1817.

In the early period of asylum care of the insane in the United States, little thought was given to the need for statistical records or statistical reports. Names of patients admitted to institutions usually were recorded in a book in chronological order. In some institutions this information was supplemented by the patient's age, nativity, and place of residence. When patients died or were discharged, appropriate notations were made in the admission book, or

separate books were maintained for recording this information. Some of the larger facilities used a census book which showed the daily number of patients in residence and of admissions, discharges, and deaths.

The Association of Medical Superintendents of American Institutions for the Insane, predecessor of the American Psychiatric Association, was established in 1844. At its founding a committee on statistics was established under the chairmanship of Dr. Samuel B. Woodward, superintendent of the Worcester (Mass.) State Hospital and first president of the association (3). In the same year, the American Journal of Insanity was founded by Dr. Amariah Brigham, superintendent of the Utica (N.Y.) Lunatic Asylum and one of the 13 original members of the association. One of the six articles in the first issue was entitled "Number of the Insane and Idiotic, With Brief Notices of the Lunatic Asylums in the United States."

In 1848, Dr. Pliny Earle, another founding member of the association, published a statistical study of admissions to the Westchester Division of the New York Hospital between June 1, 1821, and December 31, 1844. In this study, he analyzed separately 594 cases of delirium tremens and 1,841 cases of what he considered properly to be insanity. In 1849, Dr. Isaac Ray, superintendent of the Butler Asylum at Providence, R.I., presented to the association a paper dealing with the need for accurate and meaningful statistics on mental illness (4).

---

*Dr. Gorwitz is director of mental health statistics for the Maryland Department of Mental Hygiene, Baltimore, and assistant professor of biometrics at the Psychiatric Institute of the University of Maryland.*

Despite these early reports and indications of interest, routine statistical programs were not established until much later, when care of the mentally ill was legally recognized as a State responsibility. Probably the first program was in Massachusetts, where the State Board of Health, Lunacy and Charity began to publish annual reports containing statistical data in 1879. New York established the first permanent statistical bureau in 1911. Illinois, Iowa, and Ohio also have had a fairly extended history in this field. In addition, a few individual facilities, such as the Worcester State Hospital in Massachusetts and the Warren State Hospital in Pennsylvania, have for some time collected and released comprehensive statistical information. In 1949, when the recently organized National Institute of Mental Health conducted a study of local statistical programs, it found only 11 States with an organized and functional statistical service. Of these, none except New York had a program director who by training and experience could be defined as a statistician.

In February 1951, the National Institute of Mental Health invited mental hospital administrators and statisticians from these 11 States to a conference in Washington which led to the establishment of the Model Reporting Area for Mental Hospital Statistics (M.R.A.) It adopted the following statement of purpose (5):

The need for uniform, comparable, and meaningful statistics on the mentally ill of the Nation is recognized by all who are concerned with this problem. In order to embark on the immense task of solving, in a constructive and cooperative manner, the complex problems involved in gathering such statistics, a group of State mental hospital authorities, with the aid and counsel of the National Institute of Mental Health, have joined together in the Model Reporting Area for Mental Hospital Statistics. The objectives set forth by this group are:

1. Development of a strong central statistical bureau in each State mental hospital system.
2. Development and use of standardized definitions of the various categories of mental hospital patients.
3. Production of a standard set of basic tabulations which every State hospital system should have.
4. Use of statistical methods appropriate to the analysis of data on patients followed for long periods of time.

It is the further purpose of this group to aid and encourage other States throughout the country to meet the standards of the Model Reporting Area so that all may contribute to the understanding and elimination of mental disorder as a major national health problem.

Annual meetings of the M.R.A. were held until 1965, when it was dissolved by the Biometry Branch, National Institute of Mental Health, in order to develop a broader program involving both inpatient and outpatient services in all 50 States. By this time, the number of States able to produce the annual patient movement tabulations required for membership had increased from the original 11 to 36.

Despite this apparent progress, figures on past and present State mental hospital statistics programs, such as staff size, cost of operations, and data output, were not available. It was therefore impossible to measure changes which may have occurred in these programs. To bridge this gap, I prepared a questionnaire which I asked directors of these services to complete during the 1965 M.R.A. conference. In those instances in which the forms were not completed at this time, followup efforts by mail and telephone were employed in order to attain maximum completeness. I subsequently analyzed data from this survey in my doctoral dissertation (6). Data summarized here are from this survey, together with other statistics from a second, more comprehensive survey which I conducted in 1968 in a similar manner among the same group of people. Questionnaires were completed by statisticians from 46 States plus the District of Columbia (all except Alaska, Texas,

**Table 1. State directors of mental hospital statistics, by specialty and highest scholastic degree attained, 1968 survey<sup>1</sup>**

Specialty	Total	Doc- torate	Mas- ter's	Bach- elor's
Psychology-----	13	2	5	6
Sociology-----	6	0	6	0
Mathematics-----	6	0	0	6
Statistics (other)-----	4	1	1	2
Economics-----	3	0	1	2
Business administra- tion-----	3	0	0	3
Accounting-----	2	0	0	2
Biostatistics-----	2	0	2	0
Education-----	2	0	1	1
Medicine-----	1	1	0	0
School administration--	1	0	1	0
Social service-----	1	0	0	1
Mental health-----	1	1	0	0
Total-----	45	5	17	23

<sup>1</sup> Of 48 directors who had completed questionnaires, 3 had not graduated from college.

**Table 2. State directors of mental hospital statistics, by number of years employed as a mental health statistician in May 1968 and May 1965**

Number of years	May 1968	May 1965
Less than 1.....	4	5
1.....	8	3
2.....	5	4
3.....	3	5
4.....	2	3
5-9.....	10	14
10 or more.....	14	13
Not reported.....	2	-----
Total.....	48	47
Median (years).....	5.5	6.3

Vermont, and Wyoming) for the 1965 survey and by statisticians from 47 States plus the District of Columbia (all except Minnesota, Mississippi, and Washington) for the 1968 survey. In my opinion, the absence of information from the seven States does not appreciably affect the data. In addition, unpublished data on State salaries were provided me by the Biometry Branch, NIMH, from an informal survey conducted in September 1963 through its regional offices.

#### Current Status

In 1968, 45 of the 48 State directors of mental hospital statistics had graduated from college (table 1); the other three had attended but not

completed college. Of the 45 directors, 23 had only a bachelor's degree, 17 had also received a master's, and five had attained the doctorate. The speciality most frequently listed for the highest degree earned was psychology (13), followed by sociology (six) and mathematics (six). Two directors reported degrees in biostatistics and four had degrees in unspecified areas of statistics. The other 14 cited degrees in eight different specialties. Two directors with bachelor's degrees are now studying for their master's in biostatistics at the University of North Carolina. Comparable figures on level of education from the 1965 survey were: no college degree, eight; bachelor's degree, 17; master's degree, 14; and doctorate, eight. While this distribution differed somewhat from that noted in 1968, the number with graduate degrees remained unchanged.

In 1968 a majority of respondents (24 of 46) had been employed as mental health statisticians for 5 years or more (table 2). A somewhat larger number (27 of 47) had stated this in 1965. The median length of continuous employment declined from 6.3 years in 1965 to 5.5 years in 1968, so that in 1968 one of four had been in this field less than 2 years as compared with one of six in 1965.

According to the NIMH survey in September 1963, the median annual salary of State mental health statistics directors was \$7,850 (table 3). Data on salaries were not collected in 1965. In the 1968 survey, the median salary was \$11,333, representing an increase of 44.4 percent during

**Table 3. State directors of mental hospital statistics, by annual salary in May 1968 and September 1963**

Annual salary	May 1968	Annual salary	September 1963 <sup>1</sup>
Less than \$5,000.....	1	Less than \$5,000.....	2
\$5,000-\$7,499.....	8	\$5,000-\$5,999.....	4
\$7,500-\$9,999.....	7	\$6,000-\$6,999.....	9
\$10,000-\$12,499.....	15	\$7,000-\$7,999.....	12
\$12,500-\$14,999.....	8	\$8,000-\$8,999.....	8
\$15,000-\$17,499.....	2	\$9,000-\$9,999.....	3
\$17,500-\$19,999.....	4	\$10,000-\$14,999.....	12
\$20,000 or more.....	3	\$15,000-\$19,999.....	1
		\$20,000 or more.....	0
Total.....	48	Total.....	51
Median.....	\$11,333	Median.....	\$7,850

<sup>1</sup> Data from National Institute of Mental Health survey (includes District of Columbia).

this period of 4 years and 8 months, or a compound rise of approximately 8 percent per year. In 1968, three directors of mental health statistics reported annual salaries of \$20,000 or more; none were in this category in 1963. In 1968, nine had salaries exceeding \$15,000 per year in contrast to one in 1963. Concurrently, the number earning less than \$10,000 decreased from 38 in 1963 to 16 in 1968.

In 1968, annual salaries of State mental hospital statistics directors were directly related to the highest degree attained (table 4). The median salary was \$18,750 for the five directors with doctorate degrees, \$12,292 for the 17 with master's degrees, and \$10,156 for the 23 with bachelor's degrees. The three statisticians who had not graduated from college received an average of \$6,875. None of the nine directors with salaries of less than \$7,500 had gone beyond the bachelor's level. Conversely, each of the nine earning \$15,000 or more had a master's or doctorate degree.

In addition to the director, State mental hospital statistics programs had a median of 4.4 clerical and 1.4 professional employees (table 5). Both of these figures are slightly higher than in 1965. However, the low figures for both 1965 and 1968 are somewhat inflated since a number of States indicated that their count included some employees either not directly working in statistics (medical records) or primarily involved in some other, nonrelated phase of health statistics.

In 1968 the directors were asked whether during the preceding 3 years they or their staffs had presented papers at professional meetings or had papers published in professional jour-

**Table 5. State mental hospital statistics programs, by size of clerical and professional staff in May 1968 and May 1965**

Number of employees	Clerical		Professional	
	1968	1965	1968	1965
None.....	3	5	19	22
1.....	6	4	12	8
2.....	7	10	4	5
3.....	4	5	2	3
4.....	9	4	3	3
5.....	3	4	1	2
6.....	3	5	1	1
7.....	0	3	1	0
8.....	3	0	1	0
9.....	2	0	0	1
10-14.....	1	2	1	1
15-19.....	2	0	0	1
20 or more.....	5	5	3	0
Total.....	48	47	48	47
Median.....	4.4	3.9	1.4	1.2

nals; 33 reported no papers presented and 32 reported no papers published. Twenty-eight had neither presented nor published any papers during this period (table 6). Fifteen respondents reported a total of 64 papers presented, an average of 4.3. Sixteen respondents reported a total of 45 papers published, an average of 2.8. Only one State's staff (Maryland) had presented and published five or more papers. Similar responses to these questions had been obtained in the 1965 survey.

State directors were asked whether their offices, in addition to statistics from State mental hospitals, also routinely collected patient movement data from facilities for the mentally retarded, private psychiatric hospitals, and outpatient psychiatric centers. The number stating

**Table 4. State directors of mental hospital statistics, by annual salary and highest degree attained, May 1968**

Annual salary	Total	Doctorate	Master's	Bachelor's	None
Less than \$5,000.....	1	0	0	1	0
\$5,000-\$7,499.....	8	0	0	6	2
\$7,500-\$9,999.....	7	0	3	4	0
\$10,000-\$12,499.....	15	0	6	8	1
\$12,500-\$14,999.....	8	1	3	4	0
\$15,000-\$17,499.....	2	1	1	0	0
\$17,500-\$19,999.....	4	1	3	0	0
\$20,000 or more.....	3	2	1	0	0
Total.....	48	5	17	23	3
Median salary.....	\$11,333	\$18,750	\$12,292	\$10,156	\$6,875

that they did was 34, 18, and 37, respectively (table 7). While 13 States reported that they received data from all three types of facilities, five stated that their program was limited to State mental hospital statistics. The remaining 30 had a variety of combinations. The largest number (17) received reports from facilities for the mentally retarded and from outpatient psychiatric centers, but not from private psychiatric hospitals.

The 43 States which supplied financial data had a median annual operating budget of \$38,888 for statistical services (table 8). In general, expenditures for statistics were closely related to total operating costs. States with annual hospital budgets of less than \$10 million spent an average (median) of \$21,875 for statistics. By comparison, States expending between \$10 million and \$29,999,999 had an average statistical budget of \$33,333, while the largest States (maintenance expenditures of \$30 million or more) reported that their statistical operations cost an average of \$125,000. Six States (California, Illinois, Michigan, New York, Ohio, and Texas) indicated that they spent \$200,000 or more for their statistical programs; all had relatively large mental hospital expenditures. Conversely, eight of the 14 States which spent less than \$25,000 per year for statistics had hospital budgets of less than \$10 million and five spent between \$10 million and \$29,999,999. My estimate is that the 50 States plus the District of Columbia annually spent between \$4 million and \$4½ million for mental health statistics pro-

**Table 6. State mental hospital statistics programs, by number of papers presented at professional meetings and published in professional journals in the 3 years preceding 1968 survey**

Number of papers published	Number of papers presented						
	Total	0	1	2	3	4	5 or more
0-----	32	28	2	2	0	0	0
1-----	6	1	0	2	1	0	2
2-----	1	1	0	0	0	0	0
3-----	4	1	1	1	0	0	1
4-----	1	0	0	0	0	0	1
5 or more-----	4	2	0	0	1	0	1
Total-----	48	33	3	5	2	0	5

**Table 7. Number of States receiving centralized reporting of patient data from facilities for the mentally retarded, private psychiatric hospitals, and outpatient psychiatric centers, 1968 survey**

Number of States	Facilities for mentally retarded	Private psychiatric hospitals	Outpatient psychiatric centers
13-----	Yes	Yes	Yes
17-----	Yes	No	Yes
4-----	Yes	No	No
3-----	No	Yes	Yes
4-----	No	No	Yes
2-----	No	Yes	No
5-----	No	No	No
Total yes----	34	18	37
Total no-----	14	30	11

grams, or approximately 0.25–0.30 percent of their total operating budgets. Nearly half of this amount was accounted for by the six States with the largest expenditures.

In fiscal year 1968, there were 2.6 statistical employees per 1,000 total employees in mental hospital programs (table 9). That is, about one of every 400 employees worked in statistics. While this ratio was highest in States with a staff of less than 1,500, a number of the States have only one hospital and they combine statistics and medical records programs. In such instances, figures submitted may not be for statistics alone but for the joint section. Most of the other States, including the six with a statistical staff of 20 or more, had a ratio slightly lower than the national average.

Only five States reported that they currently have research grants related to mental health statistics. While these grants amounted to approximately \$1,750,000 per year, more than three-fourths of this amount was accounted for by a single grant to New York. In addition, the Biometry Branch, NIMH, has also awarded a few small contracts; most have not been with local mental health statistics offices. The Biometry Branch has expended some of its operating funds since 1961 for the joint administration with the Maryland Department of Mental Hygiene of a statewide psychiatric case register. It is thus evident that most local mental health statistics offices are supported solely from State operating funds and do not receive sup-

plementary financial support from other sources. The impact of Federal funds, with few exceptions, has been minimal.

### Estimated Future Personnel Needs

The directors stated that their programs would require an additional 174 professional and 164 clerical employees in the next 5 years (table 10). This requirement would double currently authorized professional staff and increase the clerical force by 50 percent. The six most populous States, which in 1968 employed 65 percent of all professionals and more than 40 percent of all clerks, accounted for 33 percent of the indicated expansion in professional staff and for 40 percent of the indicated expansion in clerical staff. Conversely, the 27 least populous States, which according to the 1968 survey had 17 percent of all professionals and 31 percent of all clerks, estimated a need for 24 percent of all additional professionals and 31 percent of all additional clerks. Should these changes occur, 50 percent of the professionals and 44 percent of the clerks would then be working in the six largest States. In the 27 smallest States, the figures would be 21 percent of professionals and 31 percent of the clerical force.

The statistical staff in the six largest States had a high ratio of professionals to clerks (roughly 3 to 4). In the 14 States with less than 1 million inhabitants, on the other hand, this ratio was less than 1 to 4. While this disparity would be somewhat reduced by 1973, if antic-

**Table 9. Total agency staff for public mental hospitals in the United States, by size of statistical staff, June 30, 1968**

Size of statistical staff	Total agency staff <sup>1</sup>			
	Total	Less than 1,500	1,500-4,099	4,100 or more
0-4-----	14	6	5	3
5-9-----	20	9	6	5
10-14-----	5	0	3	2
15-19-----	3	2	0	1
20 or more-----	6	0	0	6
Unknown—not reported-----	3	0	3	0
Total-----	51	17	17	17
Number of statistical employees per 1,000 total employees-----	2.6	9.1	2.3	2.3

<sup>1</sup> Reference 7.

ipated plans materialize, it would still remain quite substantial. The six most populous States would then have four professionals for every five clerks as opposed to a ratio of less than 2 to 5 in the least populous States.

### Discussion

Data presented here point to wide variations in the levels of State mental hospitals statistics programs. While some programs have directors with graduate education in biostatistics or related fields, substantial professional and clerical

**Table 8. Total maintenance expenditure of States for public mental hospitals, by estimated annual operating budget for statistics, fiscal year ending June 30, 1968**

Estimated annual State operating budget for statistics	Total maintenance expenditure <sup>1</sup>			
	Total	Less than \$10 million	\$10 million-\$29,999,999	\$30 million or more
Less than \$25,000-----	14	8	5	1
\$25,000-\$49,999-----	9	2	6	1
\$50,000-\$74,999-----	5	2	0	3
\$75,000-\$99,999-----	4	1	1	2
\$100,000-\$149,999-----	2	0	1	1
\$150,000-\$199,999-----	3	<sup>2</sup> 1	1	1
\$200,000 or more-----	6	0	0	6
Not reported—unknown-----	8	3	3	2
Total-----	51	17	17	17
Median-----	\$38,888	\$21,875	\$33,333	\$125,000

<sup>1</sup> Reference 7.

<sup>2</sup> Includes cost of statistics services for other pro-

grams. Separate figures for mental health statistics not available.

**Table 10. Estimated additional professional and clerical staff needed by State mental hospital statistics programs in the years 1969-73, by geographic region and State population**

Geographic region and State population	Professional staff				Clerical staff		
	Total States	On duty May 1968 <sup>1</sup>	Additional needed	Total requirement <sup>1</sup>	On duty May 1968	Additional needed	Total requirement
<b>Region:</b>							
Northeast.....	9	38	40	78	71	35	106
North Central.....	11	67	32	99	80	33	113
South.....	16	38	77	115	109	72	181
West.....	12	27	25	52	74	24	98
<b>Estimated State population:</b>							
10 million or more.....	6	111	57	168	149	69	218
3-9 million.....	15	30	75	105	81	44	125
1-2 million.....	13	14	23	37	37	27	64
Less than 1 million.....	14	15	19	34	67	24	91
<b>Total.....</b>	<b>48</b>	<b>170</b>	<b>174</b>	<b>344</b>	<b>334</b>	<b>164</b>	<b>498</b>

<sup>1</sup> Excluding director.

staff, and relatively adequate budgets, many others do not. Although statistical services appear to have progressed in many States since 1951, the following 1968 data suggest that a majority of programs need further improvement: in about half of the States surveyed, directors do not have a graduate degree and earn less than \$12,000 per year; the total size of the statistical staff is less than seven and primarily clerical; the annual operating budget is less than \$50,000, or about 0.25 percent of the total cost of operations; and special papers have not been presented or published in the past 3 years. In fact, figures on personnel and budget may be even lower than indicated here since a number of smaller States appear to have included non-statistical functions in their survey statements. Moreover, examination of individual questionnaires revealed that States with the most limited programs often reported little or no need for additional personnel by 1973.

It seems that the goals spelled out in 1951 by the Model Reporting Area for Mental Hospital Statistics in its statement of purpose have not yet been realized in most States. For example, the M.R.A.'s first objective was "development of a strong central statistical bureau in each State mental hospital system." While the organization did not state what the characteristics of a strong bureau are, a director with graduate education in biostatistics or other appropriate fields, sufficient clerical and professional supportive personnel, and an adequate budget

would surely be required. Based on data presented here related to these criteria, programs in approximately 10 States can be readily rated as strong, about 20 can be rated as weak, and the remaining 20 between these two extremes. My impression is that most of the middle-rated group are more like the weak than the strong States.

While some improvement has been made since 1951, it is not overly encouraging. Further remedial steps are necessary and need to be concentrated in three broad areas: (a) improved education and training of biostatisticians, (b) more effective use of available data, and (c) expanded and better relationships between biostatisticians, administrators, and other professional mental health workers.

In an earlier paper (8), I presented data on the limited value to public health of many phases of presently available graduate programs in biostatistics. I proposed reform measures such as greater emphasis on applied statistics, use of practicing biostatisticians as course instructors, field training in statistics offices, jointly sponsored courses (where possible) between biostatistics and mental health departments, and use of available mental health data for dissertations and class projects.

Brooke (9) discussed some readily available means for improving the effectiveness of mental health statistics. For example, she showed the importance of counting persons treated in addition to counting treatment events. She out-

lined how available patient movement data could be easily unduplicated without expensive equipment and indicated the value of such information for mental health planning and administration if properly presented and analyzed. Such statistics are now generally unavailable.

Although statistics directors were asked in the 1968 survey to state the title of their immediate supervisor, these data were not tabulated because of the large variety of position titles mentioned. The responses indicated that in many States, statistics occupied a low-level position in the administrative structure and had no direct ties to research. Thus, the statistician should concern himself with two distinct issues: (a) to raise his status to a more appropriate administrative level and (b) to develop and promote the research potential of mental health data.

Brooke showed that statistics could play an important role in the management of, and planning for, mental health services, and she indicated how such data would be more meaningful if supplemented by appropriate text, graphs, and other visual material (9). However, the statistician's potential role goes beyond the mere supplying of information. In many situations, his unique knowledge and training can offer an important contribution at the policymaking level. It is the statistician's responsibility to bring this fact to the attention of appropriate program heads. It is the administrator's responsibility to employ these capabilities to the fullest extent possible. In States without experienced statisticians, it would be advantageous to raise salary levels as well as job requirements in order to attract and retain such personnel.

The research potential of mental health data has not been adequately recognized in the majority of States, as indicated by the survey's results on papers presented or published. We can only speculate as to the factors related to this failure. Certainly the fact that many statistics directors are overwhelmed with routine, repetitive work is an important reason. Another might be the limited knowledge that some directors have of research carried out in this field and of research needs and techniques for conducting such studies. Where statisticians do not have time for special projects, time might be

obtained by delegating work (where appropriate) to lower level employees, by reviewing work responsibilities and organizing them in a more suitable manner, and by intensifying efforts to obtain supportive staff particularly at a professional level.

State directors of mental health statistics attend annual national meetings sponsored by the Biometry Branch. It would be valuable if these meetings, as well as comparable regional meetings, provided a setting for reviewing research in this field (by conference participants and others), for discussing techniques for conducting such research, and for fostering the development of cooperative, interstate projects. In many States, statisticians need to develop channels of communication with fellow researchers such as psychiatrists, psychologists, and sociologists. Mutual research interests and objectives need to be explored and steps for carrying out joint studies need to be considered.

The Federal Government, through the Biometry Branch, must play a key role if these objectives are to be attained. It has not, as yet, fully done so. Encouraging the development of basic data banks (9), providing outlines for minimum annual tabulations, suggesting qualifications and salary levels for statistical staff, developing training courses, fostering communication and cooperation with biostatistics and mental health departments in schools of public health, and assisting in the growth of interstate projects are examples which readily come to mind of areas where efforts need to be intensified.

### Summary

Of the 48 State directors of mental health statistics responding in a 1968 survey, 23 had only a bachelor's degree, 17 had also received a master's, and five had attained the doctorate. Three had not graduated from college. These figures were essentially unchanged from comparable survey results in 1965. The average length of continuous employment in mental health statistics was 5.5 years, a slight reduction from a 1965 survey result.

The median salary of the directors was \$11,333, or \$3,483 higher than the median obtained from a survey conducted in September 1963. The 1968 median salary was equal to a com-



pound annual increase of 8 percent. Salaries were related to the highest degree attained. The range was from \$6,875 for three directors with no college degree to \$18,750 for five directors with a doctorate.

State mental hospital statistics programs had an average of 4.4 clerical employees and 1.4 professional employees—a slight increase in both categories since 1965. The directors indicated a need for an additional 174 professional employees and 164 clerical employees in the next 5 years. Should this additional personnel materialize, the currently authorized professional staffs would be doubled and the clerical forces increased by 50 percent.

A majority of the directors indicated that they or their staffs had neither presented papers at professional meetings nor published any papers in professional journals during the preceding 3 years. Comparable figures had been noted in 1965.

The average budget for statistics was \$38,888. The total expenditures for these programs in all States was estimated to be between \$4 million and \$4½ million, or approximately 0.25–0.30 percent of the total cost of operations.

## REFERENCES

- (1) Morton, T. G.: *History of the Pennsylvania Hospital*. Revised. Times Printing House, Philadelphia, 1895, p. 10.
- (2) Boston selectmen's minutes. Boston, Mass., Mar. 2, 1730, vol. 13, sec. 6.194.
- (3) Deutsch, A.: *The mentally ill in America*. Columbia University Press, New York, 1949, p. 195.
- (4) Ray, I.: *The statistics of insane hospitals*. *Amer J Insanity* 6: 23–52, July 1849.
- (5) U.S. Public Health Service: *The model reporting area for mental hospital statistics*. PHS Publication No. 699. Revised. U.S. Government Printing Office, Washington, D.C., 1962, p. 1.
- (6) Gorwitz, K.: *A critique of past and present mental health statistics in the United States and a blueprint for future program development*. Thesis. Johns Hopkins University School of Hygiene and Public Health, Baltimore, October 1966.
- (7) National Institute of Mental Health: *Provisional patient movement and administrative data, State and county hospitals, United States, July 1, 1967–June 30, 1968*. U.S. Government Printing Office, Washington, D.C., 1969.
- (8) Gorwitz, K.: *Programs in biostatistics at the master's and doctoral level*. *Public Health Rep* 84: 299–304, April 1969.
- (9) Brooke, E.: *Do psychiatric administrators need statisticians?* *Canada's Ment Health* 17: 9–13, May–August 1969.

## Mental Health Care in Rural Areas

During the next decade Americans living in the rural areas of the United States will receive a greater share of mental health care than at any time since the rise of the large custodial mental hospitals.

In a recent tabulation of the growing number of community mental health centers, the National Institute of Mental Health reported that centers are now slated for 23 percent of the country's rural county population. These centers will bring mental health services within reach of millions of people who previously had no access to community-based care nor alternatives to hospitalization.

Centers to be created in 11 States, with the aid of Federal construction and staffing grants, will cover more than one-third of their rural county populations.

Among the States with the highest mental health service coverage for rural county residents, based on grants awarded up to early

1969, are Kentucky, 88 percent; North Dakota, 63 percent; and Vermont, 44 percent. Colorado, Massachusetts, Montana, and Michigan range from 39 to 42 percent. Pennsylvania, Florida, New Hampshire, and South Carolina range from 33 to 38 percent coverage.

Among the States which had no funded centers covering rural counties by early 1969 are Connecticut, Rhode Island, Delaware, New Jersey, Utah, Alaska, California, Nevada, and Oregon. Approximately 2,260,000 citizens reside in the rural counties of these States. Of the 500 poorest counties in the country, 486 are rural. Funded centers will serve 122, or 25 percent, of these.

Most of the 134 new rural centers will cover several counties, using mobile treatment teams or satellite clinics. They will provide a comprehensive range of services, as required by the Federal aid program.

## BACTERIOLOGICAL SAFETY OF HOT TAPWATER IN DEVELOPING COUNTRIES

H. H. Neumann, M.D.

OF THE 4,804,635 Americans who went abroad in 1968, many traveled in regions with questionable sanitary standards, particularly for water supplies. The frequency of the various types of enteritides and dysenteries is high enough to make them a public health problem among traveling U.S. citizens. Whether these illnesses are euphemistically called "Montezuma's revenge" or "tourista" in some countries, or by more prosaic names elsewhere, the disability and discomfort from them should not be underestimated. Often an expensive or much-needed vacation is terminated by severe gastrointestinal disturbances, and the ailments frequently hamper the course of business transactions.

There are many possible sources of intestinal infections, often caused by specific, identifiable agents and sometimes with prolonged unpleasant sequelae, such as in amebic dysentery. Such sources include salads, milk products, ice, and often the water that may be used for drinking, diluting drinks, or brushing teeth. The unavailability of safe water can seriously inconvenience the American traveler accustomed to being well shielded from unsafe water at home.

Most hotels in which American travelers are likely to stay (unless they venture into back country) are likely to have hot and cold running tapwater in the guests' rooms or bathrooms. Considering the temperatures of the hot, piped water, these supplies should, theoretically, be pasteurized. However, before assuming this theory is practical, its validity should be tested in the field.

In order to test the theory, I traveled the coast of West Africa from Senegal to Nigeria,

a region with a particularly high incidence of intestinal infections. The various dysenteries are among the more common causes of death among the residents, causing, for example, in Ghana, 6 percent of all deaths (1).

Tapwater was tested in the hotels of Senegal, Ivory Coast, Ghana, Togo, and Dahomey. The hotels themselves varied from excellent to poor. A total of 49 tests were made in 17 establishments. Since West Africa is not frequented by tourists, the number of hotels is relatively small, and some of the more simple resthouses had no hot water.

In getting samples of hot and cold tapwater for comparative testing, I was not limited to the hotels where I roomed. In cities such as Dakar, Abidjan, Accra, Lomé, and Cotonou, water was also drawn in the private residences of Americans and in the washrooms of hotels where I stopped for a drink or a meal.

### Technique

Millipore monitors were used to analyze water under field conditions. These sterile, disposable plastic filter holders require a minimum of equipment.

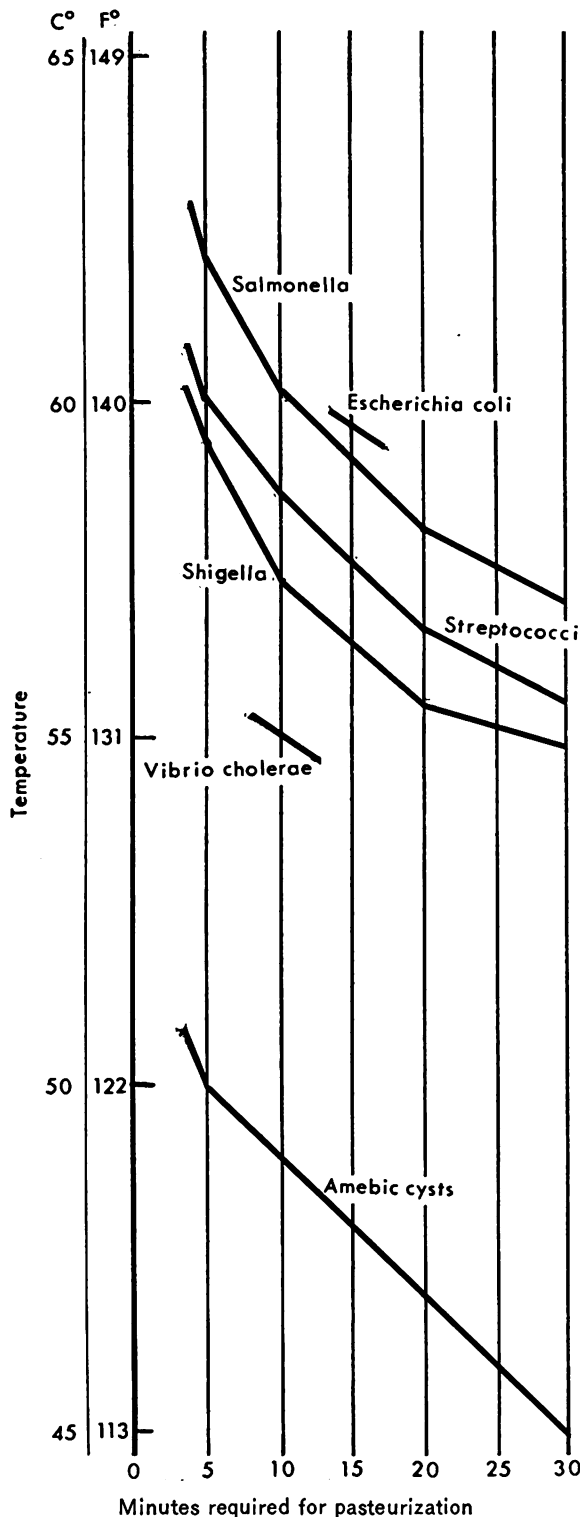
M-Endo broth medium was added to incubate coliform bacteria while suppressing the growth of most noncoliform colonies. This medium is obtainable in small, easily transported ampoules. The presence of coliform bacteria is commonly used as an indication of the extent of pollution of a water supply and its suitability for drinking.

Using a small, plastic syringe, 100 ml. of water were syphoned through the filter of the monitor. After adding the medium, the plastic filter holders were closed and placed in trouser pockets which served as incubators for 1 or 2

---

*Dr. Neumann is director of preventable diseases, Department of Health, New Haven, Conn.*

# **Temperature and time required to rid tap-water of intestinal pathogens by pasteurization**



days. Since outside temperatures ranged from the eighties to the nineties in degrees Fahrenheit, incubation was no problem. After 2 days, the number of coliform colonies on the filter were counted. The colonies exhibited the greenish metallic sheen characteristic of the coliform bacteria.

## **Results of Tests**

The quality ratings of water supplies were in accordance with the 1962 Public Health Service Drinking Water Standards (2). The maximum number of allowable coliform organisms is two per 100 ml. The presence of three or more coliform organisms in 100 ml. samples was considered evidence of unsatisfactory water quality.

In a few hotels the cold tapwater was tested repeatedly and the coliform count was zero. In most of the hotels, however, the number of coliform organisms in cold water was at a level that would confirm the traditional advice: "Don't drink the water." Only two hotels had carafes in their rooms; as expected, the water in the carafes was particularly unsafe (3).

The hot water drawn from faucets was uniformly safe bacteriologically. Water temperatures ranged from 57° C. to 69° C. Fifteen samples had no coliform, one culture had a single colony, and another had two colonies.

Since travelers cannot be expected to carry water thermometers, a rule of thumb is that if the unmixed stream from the tap is too hot to be tolerated by hand, the water is hot enough to be bacteriologically modified. A small thermometer is, of course, preferable. Pasteurization is not a method of sterilization: it is a heat treatment sufficient to kill some, but not all of the micro-organisms and to attenuate other pathogens. The time-temperature relationships required for pasteurization may not always prevail even though the temperature of the water delivered at the tap may be in excess of 140° Fahrenheit. Yet only 5 to 10 minutes are required to affect most pathogens at this temperature (see chart).

On a worldwide basis, the most common pathogens causing enterocolitis are the *Salmonella* and *Shigella* groups, *Vibrio cholerae*, *Entamoeba histolytica*, some viruses, and, infrequently, *Escherichia coli*. Most intestinal pathogens are very sensitive to heat. *E. coli* is

somewhat more heat resistant (see chart). *V. cholerae* is killed in 10 minutes at 55° C. (4). *E. histolytica* is readily destroyed by heat, and the more resistant amebic cysts are killed in 5 minutes at the relatively low temperature of 50° C. or 122° F. (4a). This fact may be of practical interest since amebic dysentery is a most common waterborne disease. The sensitivity of amebic cysts to heat contrasts with their resistance to commonly applied concentrations of chlorine which are unable to destroy the cysts (5).

The heat resistance of bacterial spores is much higher; however, they are not of importance as intestinal pathogens. It is not known whether the heat resistance of the homologous serum hepatitis virus in injectable materials applies also to the infectious hepatitis virus A. Infectious hepatitis virus A can survive a temperature of 56° C. (133° F.) for 30 minutes; its capability of survival at higher temperatures is unknown (6).

In exploring the practical usefulness of pasteurized water, traveling companions and I drank the hot tapwater after cooling it; used it for toothbrushing and mouthwashing; washing glasses, dishes, and fruit; diluting drinks; and other purposes, without acquiring enteritis. The usual precautions in selecting foods were followed; for example, avoidance of salads, ice, ice cream, and fresh fruits that we could not peel or wash in hot water.

Reluctance to use hot tapwater for drinking may be illusory for the following reason. In Accra, Ghana, we confirmed a suspicion that travelers unknowingly drink piped hot water anyway. Hot tea or coffee, assumed to be relatively safe, is commonly prepared by filling a pot from the hot water faucet and adding instant coffee or a teabag. This is an everyday practice, which may explain the unedifying taste of these beverages.

My objective in preparing this report is partly to point to a relatively safe source of water in regions with low sanitary standards. Another purpose is to suggest further bacteriological tests with hot tapwater in other developing countries more frequently visited by travelers. Such tests may provide a broader basis for conclusions about the comparative safety of "pasteurized" water.

### Summary

Samples of hot tapwater from faucets in hotel rooms were cultured for coliform organisms. A total of 49 tests were made in 17 establishments. The hotels were in countries of West Africa, a region with a particularly high incidence of intestinal infections. The bacteriological quality of these hot water samples was satisfactory. With few exceptions, the cold tapwater was unsafe for drinking.

### REFERENCES

- (1) Derban, L. K. A.: Health and manpower data in Ghana. Ministry of Health, Department of Preventive and Social Medicine, Accra, Ghana, 1968. Mimeographed.
- (2) U.S. Public Health Service: Public Health Service drinking water standards, 1962. PHS Publication No. 956. U.S. Government Printing Office, Washington, D.C., 1963.
- (3) Walter, C. W., et al.: Bacteriology of the bedside carafe. *New Eng J Med* 259: 1198-1202, December 1958.
- (4) Burrows, W.: Textbook of microbiology. W. B. Saunders Co., Philadelphia, 1968, p. 531; (a) p. 774.
- (5) Bundesen, H. N., et al.: Epidemic amebic dysentery. The Chicago outbreak. *National Institutes of Health Bull No. 166* (1936).
- (6) Havens, W. P., and Paul, J. R.: Infectious hepatitis and serum hepatitis. In *Viral and rickettsial infections of man*, edited by F. L. Horsfall and I. Tamm. Ed. 4, J. B. Lippincott Co., Philadelphia, 1965, p. 967.

# Relationship of Water Fluoridation to Bone Density in Two N.Y. Towns

ROBERT F. KORNS, M.D., Dr.P.H.

INTEREST in the relationship of water fluoridation to bone density was rekindled by a study of Bernstein and co-workers (1) that described osteoporosis in residents over 45 years of age in two areas of North Dakota. One had natural water fluoride levels of 4.0 to 5.8 parts per million (ppm) and the other, levels of 0.15 to 0.3 ppm. The study showed a significantly greater prevalence of osteoporosis in all age groups studied, especially among women, living in the areas with low fluoride levels. Another measure of osteoporosis (namely, collapsed vertebrae) was demonstrated by a significantly greater prevalence in women in the low-fluoride areas. A peculiarity of the groups under observation was the high prevalence of collapsed vertebrae among men, suggesting the possibility of inadvertent bias in the sample (2). An incidental observation showed significantly greater calcification of the aorta in all age groups and in both sexes in the areas with low levels of fluoride.

Earlier studies by Leone and associates (3) called attention to the bone status in populations of the Bartlett-Cameron area of Texas and in Framingham, Mass., purporting to show

a greater prevalence of osteoporosis and associated disease in the low-fluoride areas. Ansell and Lawrence (4) aimed primarily at an assessment of rheumatic disease in two communities and attempted to relate their study results to the existence of 1 ppm of fluoride in the water supply of one community and its absence in another. The community experience with fluoridation covered only 5 years and the population sample was small, so definitive answers could not be obtained. The authors noted, however, in hand and cervical X-rays, a diminished prevalence of osteoporosis among women in the community with 1 ppm of fluoride.

P. A. Alffram and co-workers, University of Lund, Malmö, Sweden, in an unpublished paper, stated that bone mineral mass is directly associated with high levels of fluoride in the community water. They studied a sample of healthy women, 45 to 72 years old, in two cities. One city had natural water fluoride levels of 0.2 to 0.4 ppm and the other, 4.0 to 6.8 ppm. Bone mineral mass was determined by a combination of X-ray measurement of the relative cortical thickness and attenuation of a photon beam passing through the femur laterally in the epicondylar area.

Many studies have dealt with the relationship of fluoride to bone, primarily concerning heavy exposure to fluorides and the occurrence of osteosclerosis rather than osteoporosis. In recent years, large doses of fluoride have been used therapeutically for patients with Paget's dis-

---

*Dr. Korn's is research epidemiologist in the division of laboratories and research, New York State Department of Health, Albany. Barbara Cipriani, biostatistician, and Joseph Garfinkel, associate biostatistician, of the department, and Dr. Irving Van Woert, Jr., a radiologist in Albany, assisted in various phases of the study.*

ease and extreme osteoporosis. The therapy is reported to be beneficial. It is therefore natural that the value of 1 ppm of fluoride in drinking water—the accepted level for artificial fluoridation—has been suggested as a means of preventing osteoporosis.

The opportunity to study the effect of this amount of fluoride on the prevalence of osteoporosis developed appropriately in Kingston and Newburgh, N.Y. These two cities were the site of the well-known controlled studies of the effect of fluoridation on dental caries, thus furnishing a wealth of information on the nature of the water supply and the health of the population. The level of fluoride in Newburgh's water supply, initiated May 2, 1945, has been maintained continuously since then at 1.0 to 1.2 ppm. Agitation to fluoridate the Kingston water supply caused a flurry of interest about 8 years ago but failed to receive public support, and today Kingston's water supply still is not fluoridated beyond its natural level of 0.05 ppm.

The Kingston-Newburgh studies, centering around dental caries (5-8), showed beyond question the beneficial effect of fluoridation in preventing this disease. Careful appraisal of the health of infants and children over a 10-year period also demonstrated that no observable detrimental effect had developed. During the course of these pediatric studies, bone status was assessed. The primary concerns were normal bone development and osteosclerosis, which was not detected. Osteoporosis was not seen and in any event is rare in young persons.

Several methods were considered for testing the hypothesis that 1 ppm of fluoride in a community water supply will reduce the prevalence and severity of osteoporosis. Initial attention was given to the careful examination of a properly selected sample of persons, over 45 years of age, who had resided in Newburgh or Kingston continuously since 1945. Adequate identification of this sample numbering perhaps 1,000 persons from each city, development of appropriate clinical facilities for interviewing and examining them, and anticipated difficulties in persuading the study subjects to participate all combined to suggest that this approach to evaluation be deferred at least until several intermediate studies were completed. These more

limited studies included determinations of the incidence of hip and wrist fractures as well as prevalence of osteoporosis, vertebral fractures, and calcification of the aorta in comparable populations of the two cities.

Clinicians have presumed for a long time that fractures of the hip and wrist, particularly in older women, are related to osteoporosis; therefore, the incidence of these entities in the two cities was thought to be of interest. The most pertinent descriptions of the epidemiology of hip and wrist fractures appear in Swedish literature. Alffram (9) has discussed the occurrence of cervical and trochanteric fractures of the hip in Malmö, Sweden. He described the distribution of these fractures in a total population and factors underlying the relatively high incidence in women over 50 years of age.

Alffram and Bauer (10) discussed the striking increase of wrist fractures in women after menopause; the peak is reached at 65 years of age, where it remains on a plateau throughout life. In contrast, wrist fractures in men do not increase after the age of 45 years. These findings suggest that the fractures are related in some way to sex-linked metabolic changes rather than to differences in exposure of men and women to risk. One observation of the Swedish investigators was that wrist and hip fractures tended progressively to be more associated with minor injury as age increased, particularly among women. Under 45 years of age, the association with minor injury was not different for the sexes and was rare.

Goggin and associates (11) described the incidence of hip fracture in a city 5 years before and after the initiation of water fluoridation. No change was observed.

Iskrant (12) noted that mortality in the United States from hip fractures was lower in communities with high levels of natural fluoride in the water. No difference was observed for communities known to be using artificial fluoridation.

### Study Design

Kingston and Newburgh were ideal communities for enumerating the total number of hip and wrist fractures since the acute medical needs of each city were met locally. All patients with

fractures of the hip were admitted to local hospitals and thus the injury became a matter of record. As it turned out, in recent years all patients with wrist fractures were referred to the orthopedic physicians in the two cities and, even more pertinent to this study, all X-ray examinations in Newburgh were channeled through one X-ray department at St. Luke's Hospital. (A small group of patients were examined privately in the office of the hospital radiologist.) The same arrangement existed in Kingston although the two hospitals, Benedictine and Kingston, had separate X-ray departments. Thus, complete rosters existed of all X-rays taken in the two cities.

Data processing entailed the identification of patients in the X-ray department logbook who had received X-rays of the wrist or forearm and listing those over 40 years of age who were residents of the two cities. Reports on X-rays of these residents were then examined to determine whether a fracture had occurred. Wrist fractures were classified according to the system followed by the Swedish researchers and included the classic Colles' fracture or other fractures of the distal end of the radius and ulna within 3 centimeters of the joint. Fractures of the wrist bones or more proximal on the shaft of the radius and ulna were not included.

City directories were searched to determine whether the patients had been residents of Kingston or Newburgh since 1945. Nearly 80 percent of the patients living in the cities at the

time of their hip fractures (1964-66) lived there in 1945. To check further on population mobility in the two cities, random samples of residents in the 1946 directories were searched for in the 1968 directories. The proportions found in the 1968 directories for both cities were the same.

Success in identifying persons with wrist fractures was hampered to some extent by less information in the limited clinical records and an appreciably younger age group—the median age was 21 years under the age of the group with hip fractures. This age difference may reflect a greater mobility of the population and hence account for the more recent arrival in the two cities. In Kingston, 60 percent of the group was found in the 1946 directory, and in Newburgh, 57 percent. Three years of experience (1964 through 1966) were included for hip fractures and 1 year (1966) for wrist fractures to obtain adequate numbers for comparing incidence rates.

### Hip Fractures

Hip fractures included in the enumeration were those clearly identified as cervical, intertrochanteric, or subcapital. Fractures labeled subtrochanteric, those of the shaft of the femur, and obvious pathological fractures were excluded. The pathological fracture group included two patients with multiple myeloma, two with metastatic cancer of the hipbones, two with Paget's disease of the hip, one with extensive long-standing poliomyelitis of the fractured leg

**Table 1. Hip fractures in white residents over 40 years old living in Kingston and Newburgh, N.Y., in 1945 and at time of fracture, 1964-66, by sex and age groups**

Age group	Kingston			Newburgh		
	Men	Women	Total	Men	Women	Total
Total.....	9	41	50	11	32	43
40-49.....	0	0	0	1	0	1
50-54.....	0	0	0	0	1	1
55-59.....	0	2	2	1	2	3
60-64.....	3	3	6	0	2	2
65-69.....	1	4	5	1	2	3
70-74.....	1	4	5	2	2	4
75-79.....	3	7	10	1	5	6
80-89.....	1	15	16	5	13	18
90-99.....	0	6	6	0	4	4
100 or over.....	0	0	0	0	1	1

where atrophy from disuse was a critical factor, and one who sustained a second fracture at the site of a previous cervical fracture in the left hip.

Distribution of hip fractures among white residents over 40 years old, living in Kingston and Newburgh since 1945, is presented in table 1 by sex and age groups. Records of hip fractures sustained from 1964 through 1966 were used. The median age of the Kingston group was 78 years, with a range from 57 to 92. In Newburgh, the median age was 79 years, with a range from 43 to 100.

Striking differences are apparent in the distribution of hip fractures by sex. Women had roughly three or four times as many hip fractures as men in these age groups. Because the city directories indicated that a similar percentage of persons living in Kingston and Newburgh in 1966 were residents of the cities in 1945, it seemed appropriate to use the 1960 census population as a denominator to calculate hip fracture rates in the two cities. The groups were limited to white residents because including the relatively small nonwhite population would have added a complicating variable. Only one hip fracture occurred in a Negro over 40 years old in Kingston and three in Newburgh during 1964-66.

Hip fracture rates for 1964 through 1966, by number of cases and census population groups over 55 and over 65 years of age, are presented in table 2. There were no significant differences in hip fracture rates between the two cities although the difference in rates between men and women was strikingly confirmed. Distribution of hip fractures by month of occurrence is presented in table 3 along with similar data

**Table 3. Distribution of hip and wrist fractures in white residents over 40 years old, living in Kingston and Newburgh, N.Y., in 1945 and at time of fracture, 1964-66, by month of occurrence**

Month of occurrence	Hips		Wrists	
	Kings- ton	New- burgh	Kings- ton	New- burgh
Total for year--	50	43	24	29
January-----	12	6	3	4
February-----	3	4	2	3
March-----	3	3	1	4
April-----	5	4	3	3
May-----	3	3	1	2
June-----	5	3	3	1
July-----	6	3	3	1
August-----	3	3	3	2
September-----	3	3	0	2
October-----	2	4	2	1
November-----	3	5	1	4
December-----	2	2	2	2

for wrist fractures, which are discussed next. No striking variation occurred in distribution except for a concentration of hip fractures in January. Most fractures were sustained indoors, and the winter weather apparently played only a relatively minor part.

An attempt was made from data on hospital records to describe the severity of injury that produced the hip fracture. Occasionally the record was unclear concerning the accident, but it was learned that 80 percent of the hip fractures occurred during a minor fall to the floor or ground from a standing position. Other types of injury included three falls from ladders (fourth or fifth rung), five falls down flights of stairs, one injury by a car, three falls from

**Table 2. Hip fractures and rate per 1,000 white residents living in Kingston and Newburgh, N.Y., in 1945 and at time of fracture, 1964-66, by sex and age groups**

Age group	1960 census population		Cases		Rate per 1,000		Rate per 1,000 residents
	Men	Women	Men	Women	Men	Women	
Over 55 years-----	6,032	8,060	19	72	3.2	8.9	6.5
Kingston-----	3,119	4,317	9	41	2.9	9.5	6.7
Newburgh-----	2,913	3,743	10	31	3.4	8.3	6.2
Over 65 years-----	3,173	4,709	15	63	4.8	13.3	9.9
Kingston-----	1,707	2,585	6	36	3.5	13.9	9.8
Newburgh-----	1,466	2,124	9	27	6.1	12.7	10.0



chairs, and two falls out of beds. By any definition, such injuries would be considered modest, except the injury caused by a motor vehicle.

### Wrist Fractures

Data on wrist fractures in 1966 among long-time city residents were obtained in the same way as for hip fractures. The number of X-rays taken in each X-ray facility included in the study is given in table 4. Scanning of the X-ray department logbooks identified all X-rays of the wrist and forearm. Patients were necessarily limited to those over 40 years old, those who were residents of the cities at the time of X-ray, those with wrist fractures, and those who were residents of the same city in 1945. The number of cases appropriate for comparative analysis was slightly less than one per 1,000 X-ray examinations. The private office records

of two radiologists at St. Luke's Hospital also were examined. Their practice differed considerably from hospital practice, but the private records were reviewed to assure that no wrist fractures were overlooked. One wrist fracture case appropriate for inclusion in the study sample was discovered through this procedure.

The distribution of wrist fractures in patients over 40 years old living in Kingston and Newburgh in 1945 and at time of fracture in 1966, is presented in table 5 by sex and age groups. The sex difference is even more striking for wrist fractures than for hip fractures. In Newburgh only two men had wrist fractures as compared with 22 women—an elevenfold difference. Age distribution of cases was roughly comparable in the two cities. The median age of Kingston patients with wrist fractures was 60 years, ranging from 45 to 78. The median age in New-

**Table 4. Distribution of X-rays and wrist fractures in study population in 1966, by X-ray facility, Kingston and Newburgh, N.Y.**

X-ray facility	Total X-rays done in 1966	Total wrist X-rays of city residents over 40 years old	Total wrist fractures found	Total wrist fractures in 1966 in 1945 residents
Total.....	68,347	244	93	55
Kingston Hospital.....	30,000	71	32	18
Benedictine Hospital.....	12,500	40	16	11
St. Luke's Hospital.....	24,000	123	44	25
Private office.....	1,847	10	1	1

**Table 5. Wrist fractures in 1966 in residents over 40 years old, living in Kingston and Newburgh, N.Y., since 1945, by sex and age groups**

Age group (years)	Kingston			Newburgh		
	Men	Women	Total	Men	Women	Total
Total.....	5	24	29	2	22	24
40-44.....					1	1
45-49.....	2	3	5		3	3
50-54.....		3	3	1	2	3
55-59.....	3	3	6		4	4
60-64.....		5	5		1	1
65-69.....		6	6		6	6
70-74.....					2	2
75-79.....		4	4		2	2
80 or older.....				1	1	2

burgh was 58 years, ranging from 43 to 82. These median ages are 21 years under those of patients with hip fractures. Rates for wrist fractures were calculated as for hip fractures, using 1960 census populations of appropriate age and sex groups. Since the information on wrist fractures includes both whites and nonwhites, we used the census data that included both categories. This procedure was necessary because X-ray and clinic records did not identify race. The 1966 rates of wrist fractures per 10,000 population over 45 years old were as follows:

Kingston -----	25.2
Men -----	9.9
Women -----	37.2
Newburgh -----	21.0
Men -----	4.0
Women -----	35.4

There is no statistically significant difference in wrist fracture experience in the two cities. Distribution of wrist fractures, by month of occurrence, are presented in table 3. There was no striking seasonal trend.

#### **Osteoporosis and Other Conditions**

As another step in the study—short of carefully examining an adequate sample of healthy individuals in the two cities—it was considered useful to review existing hospital X-ray files for evidence of differences in bone density. For this purpose, routine lateral X-rays of the chest were selected that allowed visualization of the thoracic vertebrae and assessment of the bone for osteoporosis and compression fractures. A portion of the aorta also could be seen, and calcification could be determined. (Radiologists tended to take routine lateral chest X-rays whenever a standard anterior-posterior film was ordered.) Since all the X-ray work in these cities was performed in the hospital X-ray departments, it was thought that proper selection of cases could identify comparable groups of patients with a minimum of chronic disease affecting the status of the bone.

Actually, it was impractical to segregate a group of healthy persons since most X-rays were requested because of an accident or illness. Excluding patients from this study because of metabolic diseases and chronic debilitating illnesses such as cancer, emphysema, and duodenal ulcer presented the problem of defin-

ing who was "healthy" in a population of men and women over 55 years of age.

In addition, neither chest survey X-rays nor routine examinations of presumably healthy persons included lateral chest films. Clinical records of patients selected for comparative study indicated that they represented similar categories of patients of the same age and sex distribution. Although Newburgh is rapidly becoming a nonwhite city and Kingston is not, restricting the comparison to patients who were city residents in 1945 essentially eliminated any bias.

The procedure followed was similar to that described for the study of wrist fracture. It consisted of the use of the X-ray logbook as the initial source of subjects and limited consideration to persons for whom only a chest X-ray was requested. This method was used to exclude all major accidents or illnesses that by nature might suggest the likelihood of vertebral fractures or extreme osteoporosis. The study group was then limited to persons of both sexes who had been residents of the cities and used the municipal water since 1945. The study sample included 2 years of experience (1966 and 1967) at the Benedictine Hospital in Kingston and most of the 1967 experience at St. Luke's Hospital in Newburgh. Sampling in Kingston was restricted to the Benedictine Hospital because of its recordkeeping procedures. A total of 2 years of experience was needed to produce the number of patients required for comparative analysis. Careful review of the X-ray department procedures and routine X-ray techniques for lateral chest films used in each study hospital showed them to be essentially similar.

After the study subjects were identified, specific lateral chest films were assembled, labels identifying hospitals and patients were masked out, and new code numbers were assigned. These things were done to be certain that the films subsequently could be read on a double-blind basis. One radiologist read the entire set of films twice, using the following criteria to interpret the X-rays:

#### **OSTEOPOROSIS**

Mild: Suspicious osteoporosis without evidence of vertebral deformity.

Moderate: Osteoporosis with evidence of some

kyphosis due to early wedging of one or more of the vertebral bodies.

Severe: More obvious osteoporosis with moderate to severe wedging.

#### FRACTURES

Obvious fractures, most of which were traumatic; a few were from the severe osteoporosis group, where they were quite marked.

#### AORTIC CALCIFICATION

Mild: Calcification less than 3 centimeters in length (adding all the noted segments of calcification).

Moderate: Calcifications totaling 3 to 10 centimeters in length.

Severe: Calcification more than 10 centimeters in length.

#### First Reading of X-rays

Samples totaling 210 persons from Kingston (nonfluoridated water supply) and 219 from Newburgh (fluoridated water supply) were studied. The age and sex distributions of these samples were similar. Since the films that were satisfactory for interpretation differed for each variable examined (that is, osteoporosis, vertebral fractures, and aortic calcification), the numbers of study subjects in each table differ slightly.

*Osteoporosis.* Measurement of bone density by visual inspection of lateral chest films is highly impressionistic but because the examiner did not know the source of each film his com-

parison between the two cities seemed to be valid. For table 6 purposes, the categories of normal and mild have been designated as "normal," and of moderate or severe, as "osteoporotic." Because of the small number of patients in each category, only two age groups (55 through 64 years and 65 years and over) were presented for each sex. No significant differences were observed between the cities. Great or greater differences would have occurred by chance 70 percent of the time. Increased osteoporosis with age and excessive osteoporosis in older women was apparent.

*Vertebral fractures.* The frequency of one or more dorsal vertebral fractures in the study sample is presented in table 7. Such fractures represent obvious bony defects that would be so classified by any capable examiner. No significant differences between cities were observed. Increased prevalence of fractures with age was evident.

The percentages of thoracic vertebrae visualized that were found to be fractured is shown in table 8. A need for this analysis was suggested because the numbers of vertebrae observed varied to some extent with size of the patient and quality and positioning of the film. No significant differences between the cities were seen. The increased number of fractures with age was striking.

*Aortic calcification.* Lateral chest films do not afford the best technique for visualizing aortic calcification; obviously the positive findings included but a fraction of actual preva-

**Table 6. Number and percentage of residents with osteoporosis living in Kingston and Newburgh, N.Y., since 1945, by sex and age groups, 1966-67**

City	55-64 years		65 years and over		Total	
	Number of X-rays read	Percent of total osteoporotic	Number of X-rays read	Percent of total osteoporotic	Number of X-rays read	Percent of total osteoporotic
Kingston (191 X-rays):						
Men, normal.....	18	-----	20	-----	38	-----
Men, osteoporotic.....	13	41.9	33	62.3	46	54.8
Women, normal.....	18	-----	18	-----	36	-----
Women, osteoporotic.....	12	40.0	59	76.6	71	66.4
Newburgh (204 X-rays):						
Men, normal.....	27	-----	30	-----	57	-----
Men, osteoporotic.....	19	41.3	30	50.0	49	46.2
Women, normal.....	19	-----	17	-----	36	-----
Women, osteoporotic.....	14	42.4	48	73.8	62	63.3

lence. Nevertheless, comparison seems valid in view of the double-blind design of the study. Increased calcification with age was evident. There was no consistent or significant difference between the two cities (table 9).

### Second Reading of X-rays

The radiologist interpreted the 429 lateral chest X-rays the second time without knowledge of his first interpretation. He made conscious efforts to utilize the same classification system. Comparison of the two readings is presented in table 10. Disagreement is most striking in the assessment of osteoporosis. Of 167 films that were read as normal the first time, 79 or 47 percent were said to show osteoporotic changes on the second reading. On the other hand, of 228

films read as showing osteoporosis the first time, only 25 or 11 percent were read as negative the second time. In addition to different interpretations, the data seemed to indicate that the system of classification was unconsciously modified between readings. Of 34 films deemed inadequate for interpretation the first reading, 11 were classified as normal and 11 as osteoporotic the second reading. Only 12 films were found to be inadequate for both readings; one classified as osteoporotic on the first reading was deemed inadequate on the second reading.

Less striking changes are seen in table 10 with respect to calcification of the aorta and collapsed vertebrae; however, the data verify the weakness of the method for measuring all three abnormalities. Two statistical questions may be

**Table 7. Number and percentage of residents with one or more dorsal vertebral fractures living in Kingston and Newburgh, N.Y., since 1945, by sex and age groups, 1966-67**

City	55-64 years		65 years and over		Total	
	Number of X-rays read	Percent of total with fractures	Number of X-rays read	Percent of total with fractures	Number of X-rays read	Percent of total with fractures
Kingston (207 X-rays):						
Men, none	34		53		87	
Men, 1 or more	2	5.6	7	11.7	9	9.4
Women, none	27		66		93	
Women, 1 or more	4	12.9	14	17.5	18	16.2
Newburgh (217 X-rays):						
Men, none	47		59		106	
Men, 1 or more	3	6.0	8	11.9	11	9.4
Women, none	32		53		85	
Women, 1 or more	2	5.9	13	19.7	15	15.0

**Table 8. Thoracic vertebrae visualized and those found to be fractured in residents living in Kingston and Newburgh, N.Y., since 1945, by sex and age groups, 1966-67**

City	55-64 years		65 years and over		Total	
	Number of vertebrae	Percent of total fractured	Number of vertebrae	Percent of total fractured	Number of vertebrae	Percent of total fractured
Kingston (1,908 vertebrae):						
Men, vertebrae visualized	315		541		856	
Men, number of fractures	2	0.6	15	2.7	17	1.9
Women, vertebrae visualized	292		760		1,052	
Women, number of fractures	4	1.4	26	3.3	30	2.8
Newburgh (2,007 vertebrae):						
Men, vertebrae visualized	457		588		1,045	
Men, number of fractures	5	1.1	14	2.3	19	1.8
Women, vertebrae visualized	329		633		962	
Women, number of fractures	2	.6	28	4.2	30	3.0

asked: First, is the probability of diagnosing osteoporosis the same for both trials? The McNemar test is appropriate for testing this proposition and indicates a probability of less than 0.01 for both osteoporosis and vertebral fractures that differences as great or greater could have occurred by chance alone. Second, is frequency of like diagnoses no greater or less than can be attributed to chance? Tests of statistical significance show that concurrence of like

diagnoses is far beyond the likelihood of chance for each of the three abnormalities.

It may be inappropriate to compare the prevalence of osteoporosis, fractured vertebrae, and aortic calcification in Kingston and Newburgh residents by limiting the analysis to those persons having like X-ray readings on both examinations. Nevertheless, this procedure was used, and again no significant or consistent differences between the two cities were seen.

**Table 9. Calcification of thoracic aorta visualized in X-rays of residents living in Kingston and Newburgh, N.Y., since 1945, by sex and age groups, 1966-67**

City	55-64 years		65 years and over		Total	
	Number of X-rays	Percent of total with calcification	Number of X-rays	Percent of total with calcification	Number of X-rays	Percent of total with calcification
<b>Kingston (199 X-rays):</b>						
Men, X-rays visualized.....	36	-----	56	-----	92	-----
Men with calcification.....	2	5. 6	9	16. 1	11	12. 0
Women, X-rays visualized.....	30	-----	77	-----	107	-----
Women with calcification.....	3	10. 0	32	41. 6	35	32. 7
<b>Newburgh (215 X-rays):</b>						
Men, X-rays visualized.....	49	-----	66	-----	115	-----
Men with calcification.....	3	6. 1	15	22. 7	18	15. 7
Women, X-rays visualized.....	34	-----	66	-----	100	-----
Women with calcification.....	2	5. 9	24	36. 4	26	26. 0

**Table 10. Comparison of two independent readings for osteoporosis, calcification of aorta, and collapsed vertebrae of the same lateral chest X-rays of 429 patients**

Condition on first reading	Second reading			
	No osteoporosis	Osteoporosis	Inadequate film	Total
Total.....	124	292	13	429
No osteoporosis.....	88	79	0	167
Osteoporosis.....	25	202	1	228
Inadequate film.....	11	11	12	34
	No calcification	Calcification	Inadequate film	Total
Total.....	329	93	7	429
No calcification.....	302	19	3	324
Calcification.....	20	70	0	90
Inadequate film.....	7	4	4	15
	No collapsed vertebrae	Collapsed vertebrae	Inadequate film	Total
Total.....	398	29	2	429
No collapsed vertebrae.....	369	5	0	374
1 or more collapsed vertebrae.....	29	24	0	53
Inadequate film.....	0	0	2	2

## Discussion

As indicated earlier, these studies were undertaken with a foreknowledge of their inadequacies and as preliminary work to a more definitive examination of an appropriate sample of comparable populations in the two cities. The inconsistencies revealed in two readings of 429 lateral chest X-rays emphasize the limitations of the approach used. Significant differences were not observed, however, between the two cities for any of the variables studied. Somewhat similar methods of determining the presence of osteoporosis, fractured vertebrae, and aortic calcification by lateral lumbar X-rays were used in the North Dakota study (1).

If the study data are accepted as evidence of the lack of an observable effect on bone density of 1 ppm of fluoride in the community water supply for a period of 22 years, several possible explanations for the negative results should be considered.

Perhaps 22 years of exposure to 1 ppm of fluoride is too short a period to determine the effects on bone density. Jackson and Weidmann (13), in their study of the fluoride content of bone collected at autopsies of residents of two English cities—one with a water supply having natural fluoride levels of 0.8 and 1.9 ppm and one without fluoride—showed that the level of fluoride in the bones increased with age and reached a plateau at 51 years, where it remained stable in the older groups. This finding suggested to the authors that it may take 51 years, perhaps including infancy, to achieve a fluoride equilibrium in bone.

The level of 1 ppm of fluoride in water may be too low to produce the effect observed by Bernstein and others (1).

The population studied may have been too old to register differences in genesis of osteoporosis owing to differences in fluoride intake since fluoridation was instituted after they had already reached adulthood.

Other characteristics significant to the pathogenesis of osteoporosis may have been distributed unequally between the study and control population in such a way as to neutralize any positive effect of fluoridation on bone density; for example, chronic illness, calcium in diet, hormonal intake, and so on.

Different X-ray techniques and statistical

limitations, introduced by the small number of persons studied, also must be considered.

Because of the potential significance of fluoridation to public health, it seems important to develop an adequate, well-controlled study in populations with lifetime exposure to a negligible level and to 1 ppm of natural fluoride in drinking water. In the battery of applied clinical tests, a method like that devised by Sorenson and Cameron for assessing bone density is essential (14). Their technique, using an iodine-125 radiating source and spectroscopic determination of the degree of bone penetration, allows accurate and reproducible assessment of osteoporosis. The test can be performed in the clinic setting in about 5 minutes per patient.

## Summary

The New York State Department of Health has studied the incidence of hip fractures (1964–66) and wrist fractures (1966) in persons over 40 years of age living in the cities of Kingston and Newburgh, N.Y., since 1945. Kingston has negligible amounts of fluoride in the community water supply; Newburgh's water supply has been fluoridated at 1 ppm since 1945.

All hip fracture cases listed in records of the hospitals in the two cities were used for study purposes; wrist fracture cases were ascertained from records of central X-ray facilities in the two communities where all such work is done. No significant sex and age specific differences were observed in fracture rates between the two cities; however, striking increases occurred among women and with aging.

The age and sex specific prevalence of osteoporosis, collapsed vertebrae, and calcification of the aorta in persons over 55 years of age in the two cities also was studied. The samples consisted of 210 persons from Kingston and 219 from Newburgh who had resided in the cities for more than 22 years and who had a lateral chest X-ray during 1966–67. The status of chronic disease in the two comparison groups was roughly the same. The study variables were assessed by a radiologist without knowledge of the city of residence. No significant or consistent differences in prevalence of these three conditions were seen between the two cities although,

again, increased incidence with age, especially among women, was observed.

The same radiologist read the 429 lateral chest X-rays twice without knowing the city of residence or his first interpretation. A comparison of these two readings revealed the major inconsistencies inherent in this diagnostic technique. However, the prevalence of osteoporosis, by age and sex, collapsed vertebrae, and aortic calcification, among persons for whom there was agreement on both readings again failed to show significant or consistent differences between the two cities.

A more meaningful research design is needed to assess whether a community water level of 1 ppm of fluoride has any effect on the prevalence and severity of osteoporosis.

#### REFERENCES

- (1) Bernstein, D. S., et al.: Prevalence of osteoporosis in high- and low-fluoride areas in North Dakota. *JAMA* 198: 499-504, Oct. 31, 1966.
- (2) Saville, P. D.: Letter to the editor. *JAMA* 199: 105, Jan. 2, 1967.
- (3) Leone, N. C., et al.: The effects of the absorption of fluoride. II. A radiological investigation of five hundred and forty-six human residents of an area in which the drinking water contained only a minute trace of fluoride. *AMA Arch Ind Health* 21: 326-327, April 1960.
- (4) Ansell, B. M., and Lawrence, J. S.: Fluoridation and the rheumatic diseases. A comparison of rheumatism in Watford and Leigh. *Ann Rheum Dis* 25: 67-75 (1966).
- (5) Hilleboe, H. E.: History of the Newburgh-Kingston caries fluoride study. *J Amer Dent Assoc* 52: 291-295, March 1956.
- (6) Schlesinger, E. R., Overton, D. E., Chase, H. C., and Cantwell, K. T.: Pediatric findings after ten years. *J Amer Dent Assoc* 52: 296-306, March 1956.
- (7) Hodge, H. C.: Fluoride metabolism: Its significance in water fluoridation. *J Amer Dent Assoc* 52: 307-314, March 1956.
- (8) Ast, D. B., Smith, D. J., Wachs, B., and Cantwell, K. T.: Combined clinical and roentgenographic dental findings after ten years of fluoride experience. *J Amer Dent Assoc* 52: 314-325, March 1956.
- (9) Alffram, P. A.: An epidemiologic study of cervical and trochanteric fractures of the femur in an urban population; analysis of 1,664 cases with special reference to etiologic factors. *ACTA Orthop Scand*, supp 65, 1964.
- (10) Alffram, P. A., and Bauer, G. D. H.: Epidemiology of fractures of the forearm; a biomechanical investigation of bone strength. *J Bone Joint Surg (Amer)* 44A: 105-114, January 1962.
- (11) Goggin, J. E., Haddon W., Hambly, G. S., and Hoveland, J. R.: Incidence of femoral fractures in postmenopausal women. *Public Health Rep* 80: 1005-1012, November 1965.
- (12) Iskrant, A. P.: The etiology of fractured hips in females. *Amer J Public Health* 58: 485-490, March 1968.
- (13) Jackson, D., and Weidmann, S. M.: Fluorine in human bone related to age and the water supply of different regions. *J Path Bact* 76: 451-459 (1958).
- (14) Sorenson, J. S., and Cameron, J. R.: A reliable in vivo measurement of bone-mineral content. *Bone Joint Surg (Amer)* 49A: 481-497, April 1967.

# Decline in Mortality From Carcinoma of the Cervix in Beverly, Mass.

LESLIE LIPWORTH, M.B., Ch.B., HUMPHREY E. D. LLOYD, M.D., M.R.C.P.,  
and ROBERT FIENBERG, M.D.

**I**N 1967 approximately 500,000 Massachusetts women underwent exfoliative cytological examination for uterine neoplasm (unpublished data from Massachusetts Laboratory Survey, Massachusetts Department of Public Health, 1968). These examinations entailed a large investment of time and effort of already overburdened physicians. The need to evaluate cervical cytology as a screening procedure with regard to death rates for cancer of the cervix has been documented recently (1, 2). This paper discusses the decline in mortality from cancer of the cervix in Beverly, Mass.

A cervical cytology screening program began in Beverly in 1955. An investigation conducted by Fienberg and Lloyd showed that up to 1961, 62 cases of invasive and in situ cancer of the cervix had been detected at the Beverly Hospital laboratory among patients from Beverly and the surrounding towns. No decrease in the annual incidence of invasive cancer in the period 1955-61 was found when compared to the years preceding the screening program. Some cases of

invasive cancer were discovered as a result of cytological screening, and discovery of these cases was associated with a decrease in the average age of patients with invasive cancers and with a larger number of patients with localized cancers.

An eventual decrease in the incidence of invasive cancers was, however, predicted in the written description of the investigation. In the years following 1961, we noted an increase in the proportion of patients with carcinoma in situ among those with newly diagnosed cancer of the cervix treated at the hospital. In 1967 this proportion was 90 percent or 18 patients with in situ cancer compared with two patients with invasive cancer of the cervix. A second study of the data to include the years following 1961 was therefore undertaken.

Investigation of the effect of cervical cytological screening is particularly appropriate in Beverly for the following reasons. All physicians in Beverly are associated with the Beverly Hospital, and the number of smears they sent to the pathology division increased from 24 in 1955 to more than 6,000 by 1966. Since 1958 cervical smear examination has been recommended for all women admitted to the hospital.

Detailed records extending back many years are maintained both in the hospital record room and in the pathology division. The hospital has had a tumor registry since 1908. In 1955-56 an average annual total of 122 new cases of malig-

---

*Dr. Lipworth is medical director of the statistical unit, bureau of chronic disease control, Massachusetts Department of Public Health. Dr. Lloyd is pathologist, and Dr. Fienberg is chief pathologist, pathology department, Beverly Hospital, Beverly, Mass. The statistical analysis was assisted by project PH 43-64-13 of the End Results Section of the National Cancer Institute, Public Health Service.*



nant disease of all sites among the 31,000 Beverly residents was reported to the hospital tumor registry—an annual incidence of nearly 3.9 per 1,000. Compared with an incidence of 3.4 in 1960 reported to the Connecticut registry, which has nearly complete coverage for that State (3), the reported incidence in Beverly indicates that a very high proportion of cancer patients in Beverly are known to the hospital.

## Method

*Collection and interpretation of smears.* Two vaginal smears were obtained from each patient: one specimen was taken from the vaginal pool and the other by scraping the region of the external uterine os with a wooden spatula. Immediate fixation of the wet smear in 95 percent ethanol was followed by routine hematoxylin and eosin staining. This technique is similar to that used in the cytology laboratory of the Mayo Clinic (4). One of three diagnoses was rendered:

1. Negative for neoplastic cells. This group included Papanicolaou classes I and II.
2. Positive for atypical cells. This was equivalent to Papanicolaou class III.
3. Positive for neoplastic cells. This group included Papanicolaou classes IV and V.

When smears were positive, a course of action was suggested to the referring physician. Cold-knife conization rather than punch biopsy of cervix was recommended for patients with positive smears. For patients with atypical cells we proposed repeated smears followed by biopsy if atypical cells persisted.

Analyses of doubtful and positive smears taken in 1955–61 showed that 29 percent of the doubtful and 74 percent of the positive smears were from patients later shown to have carcinoma in situ or invasive cancer of the cervix. The 74 percent of the smears classified as positive correspond roughly to Papanicolaou class IV (4). Since 1961 the proportion of positive smears from patients later shown to have carcinoma in situ has increased to more than 90 percent.

*Analysis.* The death records of all Beverly residents who died between January 1, 1955, and December 31, 1967, were searched to determine which deaths were due to carcinoma of the cervix. Beverly Hospital tumor registry

data were examined to find the annual incidence in Beverly of both invasive carcinoma of the cervix and carcinoma in situ during the same period. The same sources of information were used to obtain incidence and mortality figures for cancer of the uterine body. Nosological separation of endocervical cancers, which were included among cervical cancers, from cancers of the uterine body was made by the pathologist, who discussed with the gynecologist all cases in which uncertainty arose.

Sections of specimens from all patients with invasive carcinoma of the cervix were reexamined microscopically, and those with limited invasion, defined as less than 1 low-power field beyond the epithelium, were separated from those with more extensive invasion.

The numbers of women given exfoliative cytological examinations of the cervix each year were obtained from the laboratory records. These records included those of all patients whose smears were processed at the hospital laboratory and were therefore not restricted to Beverly residents, as were the figures for deaths and new cases of uterine cancer. Random samples were taken from the laboratory data of patients who had exfoliative cytological examinations in 1960 and 1965. Fifty-five percent of the patients so examined in 1960 were Beverly residents, as were 56 percent in 1965. The average ages of these Beverly patients were 46 years in 1960 and 41 years in 1965.

The number of women who have undergone a total hysterectomy in the area covered by a study such as this is important. If this number is large enough, it could affect the incidence rate both for cancer of the uterine cervix and uterine body. Therefore, the hospital records were searched to obtain an estimate of the number of such women.

## Results

The chart shows the numbers of cytological examinations of the cervix in the Beverly Hospital laboratory since 1955, the incidence of new cases of invasive and in situ cancer of the cervix in Beverly residents as reported to the hospital tumor registry, and the numbers of Beverly residents whose deaths were attributed to cancer of the cervix. There were 16 deaths during the period of the first investigation, that

is, in the 7 years 1955-61. In the subsequent 6 years there were two deaths compared with 13.7 expected on the basis of the 16 deaths reported for the earlier period ( $P < 0.01$ ).

No adjustment was made for the population growth, which for Beverly women over 20 years of age increased from 10,800 in 1955 to 12,200 in 1965. According to the latest available figures for cervical cancer mortality in Massachusetts, an 8 percent decline in the age-adjusted mortality occurred in the period 1962-65 when compared with 1958-61. The corresponding figures for Beverly over the same periods show a decrease of 80 percent.

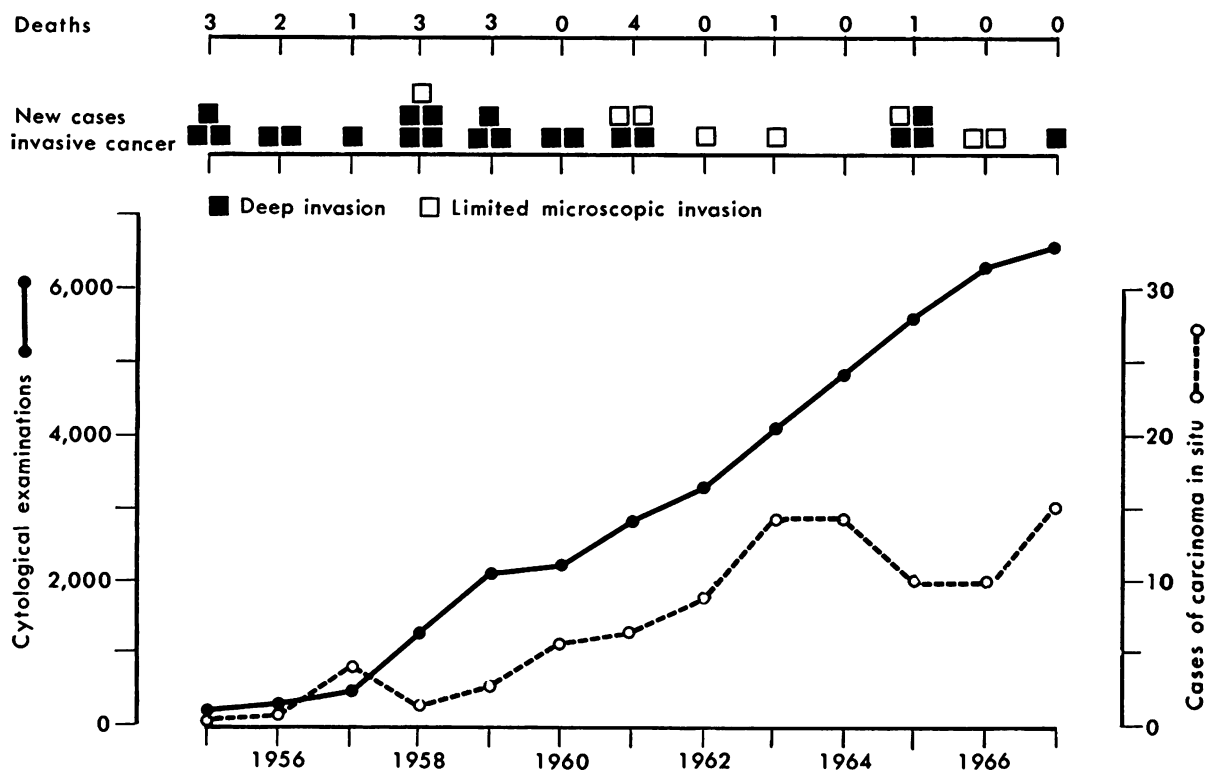
The drop in the annual incidence of invasive cervical cancer is less marked than that of the mortality from this tumor (see chart). This decline was not unexpected because many women were having their first cytological examination each year, leading to the detection of some growths that, in the absence of screening, would have been diagnosed later. This assumption is supported by the large number of patients

found in the later years with limited invasion but no symptoms (see chart). Twenty patients with invasive cancer were treated in 1955-61 compared with nine (17 expected) treated subsequently. There were 17 patients with deep invasion in 1955-61 and four (14.6 expected) in 1962-67.

Three patients were admitted for invasive cancer of the cervix within 12 months of a negative smear and one after 17 months. The patient admitted after 17 months was the only one with limited invasion. The appearance of invasive cancer in patients between annual screenings is not infrequent and has been reported before (5).

There were 13 deaths among the 29 patients reported to the hospital registry with cancer of the cervix in the period 1955-67. All the dead patients were known to the registry and were known to have died with recurrence or further spread of the neoplasm. As a test of the accuracy of death certification and coding relevant to the study, the identification data of these pa-

**Cervical cytological examinations by Beverly Hospital laboratory, incidence of carcinoma of the cervix, and deaths due to uterine cancer, Beverly, Mass., residents, 1955-67**



tients were matched with the death records. All 13 deaths had been coded to cancer of the cervix in these records and are included among the 18 deaths from 1965 to 1967. Similarly, all 18 deaths, with the exception of one patient who died in 1965, were of patients who had been registered with cancer of the cervix in the hospital.

Five deaths of Beverly residents in the period 1955-67 were attributed to carcinoma of corpus uteri, three before 1961 and two after that year. Seven other patients who died were known to the hospital tumor registry as having had treatment for cancer of the uterine body. The deaths of six of these patients, three of whom had an autopsy, were thought to be due to other causes, and the seventh patient died of uterine cancer while residing elsewhere. Twenty-four patients with cancer of the uterine body were reported to the tumor registry in 1955-61 and 19 (20.6 expected) in 1962-67.

The average annual numbers of total hysterectomies at the Beverly Hospital in successive quinquennia were 40 in 1941-45, 68 in 1946-50, 107 in 1951-55, 114 in 1956-60, and 126 in 1961-65. If allowance is made for population growth in Beverly and the surrounding towns, there has been little or no increase in the hysterectomy rate after 1950.

A sample consisting of all patients who had a total hysterectomy in the years 1956 and 1960 showed that 54 percent were Beverly residents. Thus, in the period of the study an estimated average of 64 hysterectomies were performed on Beverly women each year at the Beverly Hospital. Although we do not know how many Beverly residents had total hysterectomies at other centers, judging by the coverage of the hospital cancer registry, apparently the great majority of Beverly patients elected to have surgical procedures at the Beverly Hospital.

## Discussion

In Beverly deaths due to cervical cancer decreased after 1961, the seventh year of a cervical cytology program. Three factors may have accounted for the decrease.

First, there was the detection of patients with carcinoma in situ of the cervix. Lange's study (6) showed that the risk of developing invasive cancer of the cervix is greater for older patients

with carcinoma in situ of the cervix. The average age of patients with carcinoma in situ in the period 1955-61 in our study was 41 years. In the majority of the studies reviewed by Lange, the average age of patients with carcinoma in situ was 35-40 years.

The second factor is the discovery through the screening program of patients with limited cancerous invasion of the cervix that was not clinically detectable and of patients with localized invasive cancer of the cervix.

The third factor relates to the decline in mortality from cervical cancer which has preceded the commencement of cervical cytology screening in many areas. For example, in Massachusetts the age-standardized death rate from cancer of the cervix has decreased by 36 percent from 1947 to 1965 (7). Examination of the decrease in different age groups shows that the greatest decline has been in women over 60 years of age. Further, the mortality from cervical cancer was already decreasing before 1955 when exfoliative cytology was less widely practiced.

Other factors besides screening procedures are therefore likely to be partly responsible for the decrease in mortality from cervical cancer. Possibly, a considerable number of women have had total hysterectomies. In this study, however, the number of deaths due to cervical cancer appears to have decreased suddenly after 1961 and is therefore likely to be associated with the marked increase in cervical cytological screening during 1958-59.

The decline in mortality rates for cervical cancer in Massachusetts after 1961 was small by comparison. Some idea of the effect of total hysterectomies can also be gained from the following reasoning. If the yearly number of total hysterectomies exceeds the natural increase of women, the number of women at risk of cervical cancer would decrease and consequently so would the crude numbers of new cases of this disease.

The average annual number of hysterectomies performed on Beverly residents in their hospital, namely 64, can be compared with the average annual increase in Beverly of women over 20 years of age, which was 140 during the period of the study. Assuming that only 50 percent of hysterectomies on Beverly residents

were performed in the Beverly Hospital, there would still have been as many women at risk of cancer of the cervix from 1955 to 1961 as from 1962 to 1967.

A recent report of data from the National Health Survey (8) shows that women from lower socioeconomic areas, who have a higher incidence rate of cancer of the cervix than the female population as a whole, are not more likely to have had a total hysterectomy.

If no other factors were operative, a decline in the incidence of cervical cancer after cytological screening, which was not accompanied by a corresponding drop in the incidence of cancer of the uterine body, would indicate that hysterectomies were not responsible for the decline. The numbers of new cases of invasive cancer of the uterine body reported to the Beverly Hospital tumor registry did not decrease after 1961 to the same extent as the cervical cancers, but this difference was not significant.

Further, the incidence of cancer of the uterine body probably was affected by the large numbers of women being screened for the first time in the later years of the study, as explained in the case of cervical cancer. Thus, the comparison of the trends shown by these two forms of uterine cancer cannot, by itself, be used to indicate that the incidence of hysterectomies did not contribute to the decline of the death rate due to malignant disease of the cervix.

### Conclusion and Summary

A cervical cytology program was introduced in Beverly, Mass., in 1955. A preliminary study of the program's data up to December 1961 showed no decrease in the incidence of invasive cancer of the cervix in Beverly after 1955. However, in the period 1962-67 there was a statistically significant decrease in the mortality from this disease. This decrease could not be accounted

for by the estimated numbers of women who had undergone a hysterectomy.

Further analysis of the data after 1967 should show the importance of detection of cases of in situ carcinoma of the cervix as compared with the importance of detecting patients with early invasion in preventing deaths from cancer of the cervix.

Studies in small areas like Beverly have some obvious advantages but, because of the correspondingly small number of women involved, these studies require repetition elsewhere before final conclusions can be drawn concerning the value of cervical cytology screening programs.

### REFERENCES

- (1) Dunn, J. E., Jr.: Presymptomatic diagnosis of cancer with special reference to cervical cancer. Symposium No. 8. *Proc Roy Soc Med* 59: 1198-1204 (1966).
- (2) Ahlwalla, H. S., and Doll, R.: Mortality from cancer of the cervix uteri in British Columbia and other parts of Canada. *Brit J Prev Soc Med* 22: 161-164, July 1968.
- (3) Connecticut State Department of Health: Cancer in Connecticut. Hartford, 1960.
- (4) Soule, E. H., and Dahlin, D. C.: Cytodetection of preclinical carcinoma of the cervix: Twelve years' experience with initial screening and repeat cervical smears. *Proc Staff Meetings of Mayo Clinic* 35: 508-513, Aug. 31, 1960.
- (5) Dunn, J. E., Jr.: Preliminary findings of the Memphis-Shelby County uterine cancer study and their interpretation. *Amer J Public Health* 48: 861-873, July 1958.
- (6) Lange, P.: Clinical and histological studies on cervical carcinoma. *Acta Path Microbiol Scand* 50: (Supp 143), 1960.
- (7) Annual report on the vital statistics of Massachusetts. Public Document No. 1. Commonwealth of Massachusetts, Department of Public Health, Boston, 1947-65.
- (8) U.S. National Center for Health Statistics: Age at menopause, 1960-62. PHS Publication No. 1000, Series 11, No. 19. U.S. Government Printing Office, Washington, D.C., 1966.

# Functions of Independent Variables in Research and Program Planning

CHARLES O. CRAWFORD, Ph.D.

**T**HE SIGNIFICANCE of the differences among the relationships of demographic, ideological, and behavioral variables as independent variables to the dependent variable or variables under study is not often considered. Social researchers, when designing and reporting studies related to programs or when consulting with workers on research programs they are interested in undertaking, often consider independent variables in the research as a single group without making important distinctions in the types of independent variables.

Independent variables can be grouped into three broad categories, each of which has a definite usefulness when considered in an applied context. In designing research a first step after statement of objectives and hypotheses should be the identification, as explicitly as possible, of demographic variables (such as age, sex, and race) and those considered as ideological (elements of culture), and behavioral (such as obtaining medical and dental treatment). Although these distinctions are rather obvious, they are all too often overlooked or ignored by researchers and program administrators alike. Hyman (1), Rogers (2), and Rosenstock (3) noted that these distinctions are important.

The place and function of each independent variable in terms of its contributions to the solution of a particular problem should be con-

sidered. Once this distinction is made, the researcher and program administrator will then be in a position to determine if the number of demographic characteristics are adequate and whether the ideological and behavioral variables are appropriate to the project and amenable to change.

Identification of relevant variables could be immensely enhanced, of course, through review of relevant literature. After stating the objective and clarifying the variables considered, the researcher could then consider questions of measurement, sampling, data collection, and analysis.

Differences in independent variables and their importance should be noted early in designing the research, particularly when the dependent variable is an element of the objectives in planning a program. The researcher can then decide which independent variables will do which tasks.

One dimension along which independent variables might be placed or categorized could be called degree of changeability or manipulability. This dimension is extremely important to an administrator responsible for determining those elements in the situation which can be changed and then designing programs that will bring about these changes.

## Demographic Variables

Demographic variables have considerable value in program research or in applied research. They include age, nativity, sex, race,

---

*Dr. Crawford is director, Division of Behavioral Science, Pennsylvania Department of Health, Harrisburg.*

family size, income, education, and occupation. Demographic characteristics are computed for various units of analyses—individual persons, families, communities, and regions.

Relationships of demographic characteristics to dependent variables are important, not only in helping to account for variability in the dependent variable, but also in helping a health worker to identify those categories of the population in greatest need of his services. By using demographic information from the U.S. Census or other sources which are compiled by geographic areas, an administrator is in a better position to pinpoint those geographic areas under his jurisdiction that are likely to have the greatest need. Caution is obviously needed in making such an interpretation, but guidelines will be made available. Some demographic characteristics vary considerably in a community; not all parts of a State, county, city, or township will have the same level of income, education, age, or family size.

Observations from various studies can be used to illustrate this point. For example, if research results indicated that "children were less likely to receive attention [following referral from a school health program] if they were members of large families . . .," (4) an administrator interested in increasing referral followups could use census data to identify areas likely to have large families and strengthen programs in these areas. Or in a commonly encountered situation, if the practice of some recommended health behavior, such as annual physical examinations, is observed to be lower among low income groups, reference to census data will enable the administrator to pinpoint those communities or neighborhoods.

Hyman (1) stated that Lazarsfeld has pointed out that even if independent or causal variables cannot be changed, they can be adjusted to. He elaborated by noting that Suchman (5, 6) indicated "the more parochial an ethnic group's structure, the less 'scientific' the group members' attitudes and behavior in the health area." He commented further that although ethnicity cannot be changed, it might be useful for the health administrator to identify and use any existing ethnic clubs, see that some of the members of the project staff are of this ethnic background, and attempt to develop a

physical facility where members of the ethnic group can receive health services at the same location. These are principles that appear to be used currently in organizing many innercity programs (7).

A study reported by Lerner and Kirchner can be used as another example of relating demographic data to a behavioral variable (8). In their research, they related characteristics of age, sex, race, ethnic group, place of birth, annual family income, employment status, and marital status to use of free clinic services in municipal hospitals. In a summary of their observations they noted that users of free services were primarily adults, women of Negro or Puerto Rican background, under 45 years of age, and born chiefly in New York City or elsewhere in the United States. Such data can be useful to administrators of municipal hospitals in their planning. Again, however, it needs to be pointed out that these variables cannot be changed.

In earlier research I related demographic characteristics of communities to voting behavior regarding a referendum to establish a county health department (9). The percentage of affirmative votes for a county health department was related to population growth, population mobility, income levels, and educational levels. These observations can and have been used to identify those municipalities with populations likely to vote for establishing a county health department, those municipalities with populations likely to vote against establishing them, and those where the outcomes could not be predicted.

Although demographic variables are valuable in explaining variations in dependent variables and in helping the administrator locate and work with subpopulations, they nevertheless cannot be altered or controlled through program activities. They, therefore, do not contribute to a more active and direct solution of the difficulty. Helpful as demographic variables may be in identifying high-risk populations, variables such as age, sex, nativity, and race cannot be changed by education or other mechanisms. Even though not biologically determined, income, education, family size, and occupation are also normally thought of as "givens" within which a more specialized pro-

gram must be administered. They are subject to change but usually only after a long period of time or by comprehensive action programs which include employment, education, housing, nutrition, and all other facets of everyday living.

### **Ideological and Behavioral Variables**

Distinct from demographic variables, which I maintain are unalterable, are categories of variables which for brevity I label ideological and behavioral. These can be altered, although not always easily. Ideological variables as I conceive of them in this paper are elements of the culture of a person which, although not behaviors in themselves, have a clear effect on behavior. Ideological variables can be further divided into the cognitive and affective (10). Cognitive variables involve knowledge or belief and are rather neutral in meaning. Affective components of ideology, however, are emotionally charged because they include the element of feeling or affectivity.

In health programs, for example a poliomyelitis immunization program, cognitive elements would include knowledge or beliefs relating to the manner in which the vaccine prevents poliomyelitis, where the information about the program was obtained, and where the immunization could be received. Rosenstock discussed two variables which he asserts are important, both of which are cognitive in nature (3). These are perceived seriousness or severity and perceived susceptibility. Affective components would include the fear, anxiety, emotionalism, or skepticism surrounding the procedure of immunization or real or imagined biological aftereffects. Such ideological variables definitely have an effect on behavior.

Behavioral variables are usually considered as dependent rather than as independent variables. Obtaining topical fluoride treatments for the teeth of children, semiannual visits to dentists, and procuring immunization against poliomyelitis are all behaviors which are usually program goals and serve as dependent variables in research associated with these programs. With far less frequency is one behavior considered as an alternative means to achieve change in some other behavior. It is conceivable, however, that a particular behavior  $B_1$  might be related to

another,  $B_2$ , and, if this is so, then when  $B_2$  is the object of change, work on  $B_1$  may cause some change in  $B_2$ .

The role diet and exercise play in preventing heart disease is an example. It is fairly well accepted that the heart is adversely affected by obesity. Therefore, if weight is controlled by diet and exercise, the risk of heart disease is reduced. Thus, if eating behavior and patterns of exercise can be ascertained and levels measured, specific programs can be initiated to change these behaviors as a means of reducing heart disease. Brushing the teeth is a behavior important in maintaining good dental health.

### **Relationships Among Different Variables**

Research on demographic characteristics of areas with high and low rates of the dependent or program variables of interest would provide knowledge of characteristics of participants and nonparticipants in a program. That is, are younger or older persons, men or women, more likely to participate in a diabetes screening, or would some other program be more acceptable? Research on the relationship of ideological and behavioral characteristics to the dependent variable would provide information on correlated factors which might be changed so as to increase immunization rates or achieve some other program objective. That is, are mothers who have a greater knowledge about how measles vaccine works more likely to have their children immunized than are those who do not have such knowledge?

Going one step further, demographic variables could be related to ideological and behavioral variables so that, in addition to knowing where certain types of users and nonusers are located, the demographic characteristics associated with certain attitudes, knowledge, beliefs, and behaviors would also be known. Once variations in these factors are specified in relation to demographic variables and identified according to geographic area, the program administrator is in a position to direct his efforts to those areas where need is greatest. He can locate high-risk populations geographically through analysis of demographic characteristics and use of census data, and he can effectuate programs based on the ideological and behavioral factors identified as important in this group.

To illustrate this last point more concretely, we might consider a screening program for cervical cancer. The relationship of demographic variables to participation in the screening program would tell us the demographic characteristics of those who participate and those who do not (if differences by demographic characteristics are noted). Then, using census data, we could plot those areas having the demographic characteristics associated with high and low participation. In addition, if questions tapping the cognitive and affective dimensions associated with participation were included in the research and responses were to be related to demographic variables and rates of participation, the administrator is in a much better position to know where (low income areas or areas with a median age of 20-24 years) to concentrate change efforts and in what way (through changes in beliefs, fears, and anxieties).

### Summary

Health programs that use social and related data obtained through surveys or other methods need to distinguish among so-called independent variables. Three groups of independent variables are (a) demographic (age, nativity, sex, race, family size, income, education, and occupation), (b) ideological elements relating to culture and further subdivided into cognitive (knowledge) and affective (emotion), and (c) behavioral variables (patterns of exercise, brushing of teeth, and other health habits).

Demographic variables could be related to ideological and behavioral variables so that the administrator would know what demographic characteristics are associated with certain attitudes, knowledge, beliefs, and behaviors. Once variations in these factors are specified in relation to demographic variables and identified according to geographic area or some other criteria, efforts can be directed to areas where need is greatest.

Demographic variables cannot be changed by

education or other mechanisms. Ideological and behavioral characteristics can be changed, but not easily. Research on demographic characteristics of high and low usage areas would provide knowledge of characteristics of participants and nonparticipants in a program. Research on the relationships of ideological and behavioral characteristics to dependent variables would provide information on factors which might be the objects of change so as to increase immunization rates or achieve some other program objective. Behavioral variables are usually, but not always, program goals.

### REFERENCES

- (1) Hyman, M. D.: Medicine. In *The uses of sociology*, edited by P. F. Lazarsfeld, W. H. Sewell, and H. L. Wilensky. Basic Books, Inc., New York, 1967, pp. 119-155.
- (2) Rogers, E. S.: Public health asks of sociology. *Science* 159: 506-508, Feb. 2, 1968.
- (3) Rosenstock, I. M.: Why people use health services. *Milbank Mem Fund Quart* 44: 94-126, July 1966, pt. 2.
- (4) Cauffman, J. G., Peterson, E. L., and Emrick, J. A.: Medical care of school children. Factors influencing outcome of referral of a school health program. *Amer J Public Health* 57: 60-73, January 1967.
- (5) Suchman, E. A.: Socio-medical variations among ethnic groups. *Amer J Sociol* 70: 319-331, November 1964.
- (6) Suchman, E. A.: Social patterns of illness and medical care. *Health Hum Behav* 6: 2-16, spring 1965.
- (7) Kupchik, G. J.: Environmental health in the ghetto. *Amer J Public Health* 59: 220-225, February 1969.
- (8) Lerner, R. C., and Kirchner, C.: Social and economic characteristics of municipal hospital outpatients. *Amer J Public Health* 59: 29-39, January 1969.
- (9) Crawford, C. O.: Variables related to a referendum vote on creating a county health department. *Public Health Rep* 84: 639-646, July 1969.
- (10) Gold, J., and Kolb, W. L.: A dictionary of the social sciences. Free Press, New York, 1964, p. 13.



# Federal Publications

**Nursing Careers in Mental Health.** *PHS Publication No. 1051; revised October 1968; 15 pages; 30 cents.* A 15-page illustrated booklet addressed to young men and women who may be considering nursing careers in mental health and to those who are already in training or practice who may wish to specialize. Discusses such questions as: What is psychiatric-mental health nursing? What are the educational requirements? What financial aid is available through National Institute of Mental Health training programs and from other sources? Describes various training programs, ranging from 2-year programs to postgraduate education.

**Environmental Health Planning Guide.** *PHS Publication No. 823; revised 1968; 99 pages; \$1.* This guide deals primarily with the process of bringing together certain fundamental data pertaining to various physical aspects of the environment. Includes a limited list of environmental aspects which encompass those categories where obvious and direct hazard to health has been widely recognized. Gives emphasis to the evaluation of health-related utilities and services that readily lend themselves to long-range planning such as water, sewerage, solid wastes, air pollution, and housing programs. Covers health department inspectional services in an organizational sense and refers to existing rating schedules for a number of these vital services.

**Electronics for Hospital Patient Care.** *PHS Publication No. 930-D-25; by Noyce L. Griffin; 1968; 66 pages; 70 cents.* Presented in two parts. Part I contains a revision and expansion of publication No. 930-D-12, "Electronic and Related Electrical Equipment in Hospitals, 1963." Part II contains a report of a recent onsite study of current practices of

electronic monitoring of patients, needs of facilities and equipment, and trends in the use of electronics that are expected to stimulate development and improvement of equipment, affect future planning of facilities, and emphasize the need for enlightenment in bioelectronics. Provides an overall picture for those not concerned with technical details. Includes appendixes which offer further particulars, statistics, and illustrations.

**Hospital Electrical Facilities.** *PHS Publication No. 930-D-16; By Noyce L. Griffin; 1969; 36 pages; 50 cents.* Contains guidelines that have been rewritten to reflect changes in current practices, to provide up-to-date references to applicable codes and standards, and to conform with recommended design practices that should be followed in the construction of hospitals and health facilities.

**Regulations, Standards, and Guides Pertaining to Medical and Dental Radiation Protection.** An annotated bibliography. *PHS Publication No. 999-RH-37; by David R. Snavelly, Larry G. Kumbier, Mark J. Thompson, and Lloyd R. Setter; 1969; 73 pages.* Annotated bibliography of standards, regulations, and guides pertaining to medical and dental ionizing radiation protection. Includes annotations of general standards, guides, and recommendations; standards on the safe operation, handling, and design of radiation equipment and sources; and standards and guides pertaining to radiation measurement. Annotated documents are designated as class A (established or adopted by a governmental body acting under the authority of an act, law, or statute), class B (adopted by consensus of committees or commissions of technical competence in standards-setting organizations), or

class C (not adopted by a standards-setting organization, but contains information pertinent to the preparation of suitable standards or regulations). Annotations include identification of the document, type of standard, intended complier, intended benefiter, limits and specifications, and general guidance.

**Special Report: First United States Mission on Mental Health to the U.S.S.R.** *PHS Publication No. 1893; 1969; \$3.50.* Reports the observations of the delegation and compares and contrasts the organization and delivery of mental health services in Russia with the provision of mental health care in the United States. Concentrates on the organization, structure, and delivery of mental health services in the U.S.S.R. but includes as well some observations on Soviet mental health research and therapy. A major portion concerns the interface between Russian psychiatry and the law. Also contains many photographs of Russian psychiatric personnel and facilities.

**1969 Directory of Migrant Health Projects Assisted by Public Health Service Grants.** *Revised March 1969; 178 pages.* Lists grant-assisted public and private nonprofit agencies which provide health services for migrant farmworkers and their families. Identifies location, project director, number of migrants eligible, and services provided by each project. Lists State contact persons for migrant health.

---

This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared with Federal support.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington, D.C. 20201.

The Public Health Service does not supply publications other than its own.

---

**COLOMBOTOS, JOHN** (Columbia University School of Public Health and Administrative Medicine): *Personal versus telephone interviews: Effect on responses. Public Health Reports, Vol. 84, September 1969, pp. 773-782.*

Telephone interviews have practical and administrative advantages over face-to-face interviews, particularly if the respondents are scattered over a wide area. But it has been argued that lengthy telephone interviews in which the respondent is asked about complex topics are not

feasible and that responses in attitude surveys conducted by telephone, even if they are obtained, are not as "valid" as those collected in face-to-face interviews.

Previous research has indicated that personal interviews are more likely to elicit socially acceptable re-

sponses than self-administered questionnaires because of the "social component of involvement" between interviewer and respondent. The telephone interview falls between the personal interview and the self-administered questionnaire in the opportunity for such involvement.

Data from two surveys of physicians show that there are essentially no differences in the proportions who give socially acceptable responses according to whether they are interviewed in person or by telephone.

**GLICK, CHARLES A.** (Department of the Army), and **WEDUM, ARNOLD G.:** *Leak tests by high-velocity impact of infectious specimen containers. Public Health Reports, Vol. 84, September 1969, pp. 783-786.*

Thirty replicates of three types of packages commonly used for transmittal of infectious diagnostic fluid specimens in test tubes by postal mail were impacted on concrete at average velocities of 130 to 133 feet per second (89 to 90 miles per hour). This impact velocity is representative of the calculated and experimentally determined net impact on a

container during a crash takeoff or landing of aircraft. The test impact velocity, however, was attained in 6 feet by sudden acceleration, and the actual total effect on the test packages was greater than that caused by terminal impact at 130 feet per second.

Although most of the inner test tubes broke and a spot of dye showed

through the outer container of one package, there was no leakage of contents through the outermost mailing tube. These mailing tubes met the packaging requirements for domestic mail and, although they did not comply completely with U.S. Postal Manual section 221.325 c.(2) for international mail, they easily met the intent of that regulation, which is to insure no leakage under conditions ordinarily incident to handling during transportation.

**SIKES, R. KEITH** (National Communicable Disease Center, Public Health Service): *Human rabies immune globulin. Progress report. Public Health Reports, Vol. 84, September 1969, pp. 797-801.*

A total of 2,500 ml. of rabies immune globulin of human origin (HRIG) has been produced by the Rabies Unit of the National Communicable Disease Center, Public Health Service, and is now being tested in human beings. This globulin

has passed all safety tests, and it contains 165 international units per ml., which is equal to the potency of antirabies serum of equine origin (ARS) now prescribed in the United States for persons exposed to rabid animals.

Human rabies immune globulin gave animals challenged with rabies virus as much protection as ARS. The next step is to develop for human use a satisfactory regimen of HRIG in conjunction with rabies vaccine. Being a homologous globulin, this HRIG should preclude serum sickness in exposed persons who are sensitive to equine serum.

**ALEXANDER, RAYMOND S.** (New York City Health Department) and **PODAIR, SIMON:** *Educating New York City residents to benefits of Medicaid. Public Health Reports, Vol. 84, September 1969, pp. 767-772.*

On June 6, 1967, officials of New York City's departments of health and social services started a campaign to enroll all persons eligible for Medicaid. Of the more than 3 million persons who were eligible under the original New York State Medicaid law, 2 million had not enrolled.

Keeping eligible persons from enrolling were a general lack of knowledge of Medicaid and its benefits, confusing the program with Medicare, and a belief that one had to be on relief to be eligible.

Target groups for the campaign were families whose income was above the public assistance level and the aged who could obtain additional services not covered by Medicare, such as prescription drugs, dentistry, extensive podiatry, and optical services.

To overcome apathy and arouse public interest, health educators in

30 health districts were mobilized by the bureau of public health education to obtain community support. Many types of volunteers were used—professional leaders, active lay leaders, informal leaders (such as active block workers), volunteers from the police auxiliary, and persons from antipoverty programs.

Techniques used to inform the public about Medicaid were (a) Neighborhood Medicaid Days—sound trucks at busy locations manned by district health educators and volunteers, who answered questions of passers-by, (b) Medicaid Shoppers Days—an information table placed in three department stores in Brooklyn to reach shoppers who might be eligible for Medicaid, and (c) literature distributed in the streets and through department stores, banks, post offices, supermarkets, and schools.

Newspaper, radio, and television publicity, although previously difficult to obtain, were part of the campaign, and health department officials made personal appearances on TV. Car cards were placed in the city subway systems, and posters were distributed at hospital outpatient clinics, health centers, and antipoverty offices for posting.

Approximately 450,000 persons applied for Medicaid during and immediately following the campaign. Among other benefits realized from the efforts was the demonstration that two large public agencies in a metropolis could work together to heighten public interest in health care.

The public was introduced to the components of wide spectrum health care—preventive medicine, the importance and significance of choosing a source of health care before illness, the significance of early and proper treatment of disease, and the contributions of dentists, podiatrists, optometrists, and other members of the health team.

**JACKSON, CHARLES L.** (Oklahoma State Department of Health): *State laws on compulsory immunization in the United States. A review. Public Health Reports, Vol. 84, September 1969, pp. 787-795.*

A review of State compulsory immunization laws revealed that 26 States and the District of Columbia now have legislation requiring immunization against a disease or diseases as a prerequisite to school entry. The legal base for such laws is the U.S. Supreme Court ruling of 1905 that upheld the constitutionality of the Massachusetts compul-

sory law on smallpox vaccination. Although initial State legislation on compulsory immunization pertained to smallpox only, by the late 1930's compulsory laws including other diseases were enacted.

Analysis of the structure of State laws on compulsory immunization revealed that most State laws of this type now require compliance from

the parents of children in public, private, or parochial schools. Almost all diseases that can be prevented by immunization are included. The children of parents who object because of medical or religious reasons are exempted. The penalty for non-compliance is considered a misdemeanor and usually is not enforced.

The value of State compulsory immunization laws continues to be controversial. Arguments for and against such legislation are analyzed.

**GORWITZ, KURT** (Maryland Department of Mental Hygiene): *Survey of State-level programs in mental health statistics. Public Health Reports, Vol. 84, September 1969, pp. 803-811.*

Of the 48 State directors of mental health statistics responding in a 1968 survey, 23 had only a bachelor's degree, 17 had also received a master's, and five had attained the doctorate. Three had not graduated from college. These figures were essentially unchanged from comparable survey results in 1965. The average length of continuous employment in mental health statistics was 5.5 years, a slight reduction from a 1965 survey result.

The median salary of the directors was \$11,333, or \$3,483 higher than the median obtained from a survey

conducted in September 1963. The 1968 median salary was equal to a compound annual increase of 8 percent. Salaries were related to the highest degree attained. The range was from \$6,875 for three directors with no college degree to \$18,750 for five directors with a doctorate.

State mental hospital statistics programs had an average of 4.4 clerical employees and 1.4 professional employees—a slight increase in both categories since 1965. The directors indicated a need for an additional 174 professional employees and 164 clerical employees in the

next 5 years. Should this additional personnel materialize, the currently authorized professional staffs would be doubled and the clerical forces increased by 50 percent.

A majority of the directors indicated that they or their staffs had neither presented papers at professional meetings nor published any papers in professional journals during the preceding 3 years. Comparable figures had been noted in 1965.

The average budget for statistics was \$38,888. The total expenditures for these programs in all States was estimated to be between \$4 million and \$4½ million, or approximately 0.25-0.30 percent of the total cost of operations.

**CRAWFORD, CHARLES O.** (Pennsylvania Department of Health): *Functions of independent variables in research and program planning. Public Health Reports, Vol. 84, September 1969, pp. 831-834.*

Health programs that use social and related data obtained through surveys or other methods need to distinguish among so-called independent variables. Three groups of independent variables are (a) demographic (age, nativity, sex, race, family size, income, education, and occupation), (b) ideological elements relating to culture and further subdivided into cognitive (knowledge) and affective (emotion), and (c) behavioral variables (patterns of exercise, brushing of teeth, and other health habits).

Demographic variables could be related to ideological and behavioral variables so that the administrator would know what demographic characteristics are associated with certain attitudes, knowledge, beliefs, and behaviors. Once variations in these factors are specified in relation to demographic variables and identified according to geographic area or other criteria, efforts can be directed to areas where need is greatest.

Demographic variables cannot be changed by education or other

mechanisms. Ideological and behavioral characteristics can be changed, but not easily. Research on demographic characteristics of high and low usage areas would provide knowledge of characteristics of participants and nonparticipants in a program. Research on the relationships of ideological and behavioral characteristics to dependent variables would provide information on factors which might be the objects of change so as to increase immunization rates or achieve some other program objectives. Behavioral variables are usually, but not always, program goals.

*Public Health Reports*, published since 1878 under authority of an act of Congress of April 29 of that year, is issued monthly by the Public Health Service pursuant to the following authority of law: United States Code, title 42, sections 241, 245, 247; title 44, section 220. Use of funds for printing this publication has been approved by the Director of the Bureau of the Budget, August 26, 1963.

---

**ORDER BLANK FOR PHR**

**To: Superintendent of Documents  
Government Printing Office  
Washington, D.C. 20402**

Please enter my Subscription for Public Health Reports. I am enclosing Money Order ☐ Check ☐ for this subscription. (\$6.50 a year; \$1.75 additional for foreign mailing. A discount of 25 percent is allowed for orders of 100 or more subscriptions. Subscriptions are accepted also for 3-year periods, for the convenience of subscribers, at the established annual rate.)

Please address the PHR as follows: \_\_\_\_\_



UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON, D.C. 20402. 1969

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Subscription price \$6.50 a year, \$1.75 additional for foreign mailing.

Price for a single copy of this issue is 55 cents.

Digitized by Google



U. S. DEPARTMENT OF  
HEALTH, EDUCATION AND WELFARE  
PUBLIC HEALTH SERVICE  
BETHESDA, MD. 20014

OFFICIAL BUSINESS



POSTAGE AND FEES PAID  
U. S. DEPARTMENT OF H.E.W.

If you do not desire to continue receiving this publication, please CHECK HERE ☐;  
cut off this label and return it to the above address. Your name will then be  
promptly removed from the appropriate mailing list.

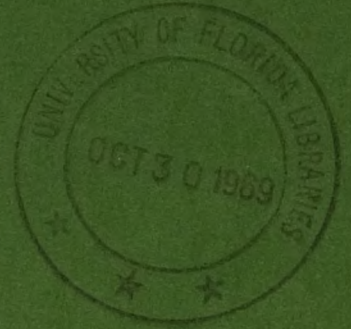
Public Health Report

ph  
r



OCTOBER 1969 Volume 84 Number 10

# PUBLIC HEALTH REPORTS



## *In this issue*

Requests to a Mental Health Center

A Curriculum for Health Planners

Meshing Medicare and Health Planning

Pulmonary Mycoses in North America

Status Report on Some FA Techniques



U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE  
Public Health Service

Digitized by Google

614.0973  
45p







CONTENTS	Page
Proposed standard measure of recurrence of out-of-wedlock births to adolescents..... <i>John J. Dempsey</i>	839
Availability and use of medical services in an Alaskan Eskimo community..... <i>Robert Fortune</i>	845
Some proposed "comparability areas" for U.S. statistics on cause of death..... <i>David Hewitt, Jean Milner, and Adele Csima</i>	857
Undergraduate program for training health planners and administrators..... <i>Marshall W. Raffel</i>	864
A comparative study of the pulmonary mycoses of Canada and the United States. Epidemiologic aspects..... <i>Libero Ajello</i>	869
Epidemiology of stroke in a rural area. Second year of the Mid-Missouri Stroke Survey..... <i>Philip T. Eckstrom, Frank R. Brand, Stanley A. Edlavitch, and Henry M. Parrish</i>	878
Influence of the prevalence of infection on tuberculin skin testing programs..... <i>James F. Jekel, Richard A. Greenberg, and Benjamin M. Drake</i>	883

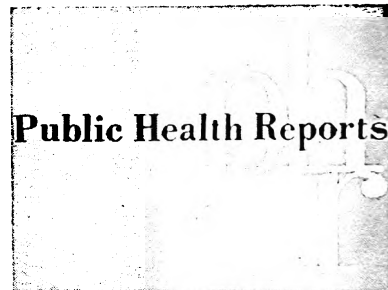
continued

### frontispiece

When an Alaskan health team visits a community, dogsleds are often used to carry medical supplies and equipment from the airplane to the field clinic. Medical services available to the people of a remote Eskimo village are described in the article on pages 845-856.

CONTENTS—continued

Fluorescent antibody techniques for <i>Salmonella</i> and other enteric pathogens. A status report.....	887
<i>William B. Cherry and Berenice M. Thomason</i>	
Partnership for health and Medicare. Their potential for augmenting each other.....	899
<i>John W. Cashman</i>	
Prevalence of ascariasis and amebiasis in Cherokee Indian school children.....	907
<i>George R. Healy, Neva N. Gleason, Robert Bokar, Harry Pond, and Margaret Roper</i>	
Status of health services in Micronesia since the 1963 poliomyelitis epidemic.....	915
<i>Mathew Lee, Howard A. Rusk, and Eugene J. Taylor</i>	
An analysis of requests for help to a mental health study center.....	923
<i>Richard A. Mackey, Harvey A. Taschman, and Julie Kisielewski</i>	
Short reports and announcements:	
Grants for family planning services.....	856
Public Health Service staff appointment.....	863
Pollution-free cars.....	882
New Medicaid regulations.....	898
New program to finance nonprofit hospitals begins with Illinois hospital.....	905
Program notes.....	906
Link between XYY syndrome and criminality not clear.....	914
Long-term care beds total more than 1 million.....	922
Standards for skilled nursing homes.....	928
Federal publications.....	929
Synopses.....	930



**MANAGING DIRECTOR**  
**EDWARD J. McVEIGH**  
*Assistant Administrator for Information,  
 Office of Information, Health Services  
 and Mental Health Administration.*



**STAFF**  
**Keith Kost, M.P.H.** *Editor*  
**Marian K. Priest** *Managing Editor*  
**Esther C. Gould** *Asst. Managing Editor*  
**Eugene Fite** *Art Editor*

*Address correspondence to Editor, Public Health Reports, Public Health Service, Department of Health, Education, and Welfare, Lee Building, 6935 Wisconsin Avenue, Chevy Chase, Md. 20015.*

*Opinions expressed are the authors' and do not necessarily reflect the views of Public Health Reports or the Public Health Service. Trade names are used for identification only and do not represent an endorsement by the Public Health Service.*

**For subscriptions to *Public Health Reports*, please use the order form on the inside back cover.**

## U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

**ROBERT H. FINCH, Secretary**

**ROGER O. ECEBERG, Assistant Secretary for Health and Scientific Affairs**

### PUBLIC HEALTH SERVICE

**HEALTH SERVICES AND MENTAL HEALTH ADMINISTRATION**

**JOSEPH T. ENGLISH, Administrator**

# Proposed Standard Measure of Recurrence of Out-of-Wedlock Births to Adolescents

JOHN J. DEMPSEY, M.S.W., Dr.P.H.

**I**LLEGITIMACY has long commanded considerable space in the professional and non-professional literature. The subsubject of illegitimate births to adolescent girls also has been an interesting and challenging subject in its own right. Reports on recurring out-of-wedlock births—more than one child born to the girl—have been the exception. Awareness of the magnitude of this phenomenon is of recent vintage and, since it is often referred to as recidivism, it tends to be associated with welfare abuses, moral degradation, and the attitudes generally directed toward second offenders and three-time losers.

The recidivistic event, or repeated illegitimate births, is destined to be among the most troublesome problems besetting adolescents in the decade ahead. Its mushrooming “popularity” is attributable to the number of health, education, and welfare programs serving adolescents during the experience of out-of-wedlock pregnancy—usually a first out-of-wedlock pregnancy. The pioneers of these programs who have

taken the time to follow up their service populations have found without exception an alarmingly high recurrence rate. Accordingly, an increasingly popular index of a program's success or failure is the degree to which such recurrent events can be reduced. In addition to this internal evaluation, interest is growing in comparative evaluation to assess the relative magnitude of repeated illegitimate births in the variable populations served by similar or disparate intervention systems.

The basic focus of this paper, therefore, is the need of administrators of programs to follow up their service populations beyond a period of service to determine the extent of repeated births within those populations. The basic question is: How can administrators express the magnitude of recurrence within their service populations in a standard and, therefore, comparable way? A proposed answer to this question is outlined in the following three steps. First, the basic unit of measure, as adapted to recurrence, is discussed briefly. Second, the literature on recurrence is discussed in terms of the comparability of measures that have been used. And, third, a standard rate is recommended and defended.

## Unit of Measure of Recurrence

The basic question, as stated previously, fundamentally concerns measuring the incidence of an event; the somewhat obvious initial answer is the construction of an incidence rate.

---

*Dr. Dempsey is assistant professor in the department of population and family health, Johns Hopkins School of Hygiene and Public Health, Baltimore, Md. This article is based on a paper read at the Johns Hopkins Faculty Seminar on Research in Maternal and Child Health, November 21, 1968, and is drawn from continuing research supported by contract PH-1600 from the Children's Bureau, U.S. Department of Health, Education, and Welfare.*

The basic appeal of an incidence rate is its simplicity since it consists of only three components: the numerator, the denominator, and the unit of time, expressed as

$$\frac{\text{Number of events}}{\text{number at risk of event}} \text{ per unit of time}$$

The infant mortality rate, for example, is an incidence rate, expressed as the number of events of death over the first year of life in a specified at-risk population of live-born infants. Accordingly, the adolescent illegitimacy recurrence rate becomes

$$\frac{\text{Number of repeated events of illegitimacy}}{\text{number who are at risk of repeating}} \text{ per unit of time}$$

Unfortunately, nothing is simple when the possibility of complications exists, and examination of the literature reveals that such repetition has an unusually rich potential for complication and confusion.

### Studies of Recurrent Illegitimate Births

The literature was searched for followup studies of repeated illegitimate births within an adolescent service population. Only five usable studies were found, and all had been published in the past few years. The researchers worked independently and without precedent; consequently, their pioneering work was most appropriately described as exploratory. Interest in recurrence ranged from minor or incidental to major or dominant. Although the populations studied tended to be uniformly of the lower class and predominantly nonwhite, the administrative auspices of the service programs ran the gamut of health, education, and welfare agencies.

Following is a brief description of the five usable studies; they are alluded to specifically only occasionally hereafter:

1. Barglow: Published July 1968; followup of 78 adolescents, primarily from a psychiatric point of view, with major emphasis on recurrence (1).

2. Crumidy: Published August 1966; followup of 100 adolescents, with only incidental interest in recurrence (2).

3. Howard: Published 1968; followup of 487 adolescents, with major and detailed interest in recurrence (3).

4. Sarrel I: Published July 1966; followup of 123 adolescents, with major interest in recurrence (4).

5. Sarrel II: Published August 1967; followup of 50 adolescents, with undetailed interest in recurrence (5).

For these five studies, the denominator, the numerator, and the unit of time of the adolescent illegitimacy recurrence rate are considered.

*Denominator.* The denominator consists of adolescents in a service program who are at risk of repeating illegitimate births. The index event in the literature that qualifies a person for being at risk is consistently an out-of-wedlock delivery—for the most part in the literature, the first out-of-wedlock delivery. Therefore, the at-risk population is one of primiparas. At least one program, however, also contained multiparas; thus the at-risk population now becomes those who have delivered at least once out of wedlock, and the incidence rates can be made specific for parity if the population does not uniformly consist of primiparas.

*Numerator.* The numerator, or number of recurrent events among those at risk, is much more complicated. The first, and probably the major, difficulty lies in deciding whether the event is an out-of-wedlock conception or pregnancy or an out-of-wedlock delivery. (Needless to say, not all out-of-wedlock pregnancies end in out-of-wedlock delivery because abortions, stillbirths, or marriages change the event.) In the literature no investigator clearly, specifically, or consistently defined the repeated event as an out-of-wedlock pregnancy or as an out-of-wedlock delivery. Although the word "pregnancy" was used more frequently, it seemed to be used often as a synonym for delivery.

Marriage complicates both the denominator and the numerator. If a girl marries after the index event but before the repeated event, is she considered at risk and therefore enumerated in the denominator? This issue generally received minor or no consideration from the authors, except Howard (3). Another type of situation reinforces the need to define the repeated event clearly. If a primipara conceives out of wedlock a second time and marries before the delivery, she could or could not be considered a repeater, depending on whether the event had been defined as an out-of-wedlock pregnancy or an out-

of-wedlock delivery. Although stillbirths are infrequent and abortions are usually concealed, marriage is neither infrequent nor concealed and therefore should and can be considered quantitatively.

*Unit of time.* This factor is very important. How long after the index event, the out-of-wedlock delivery, should each person be followed to determine whether another illegitimate birth has occurred? As with the numerator and the denominator, the literature reflects no convention. The length of followup ranges from 1 to 5 years and, in some studies, the length of followup is not uniform for all members of the at-risk population nor is it clearly specified.

The denominator, numerator, and unit of time for each study are defined in the table. Other readers of these studies may very well define the denominators, numerators, and units of time differently. The authors did not specifically define their rates, and the definitions I have used are my best estimates of the intention of the authors. The obvious lack of uniformity produced widely disparate incidence rates.

That varied definitions are found among independent pioneering investigators is not surprising. Several studies are excellent pieces of research, but despite their individual excellence, little collective, comparative value resulted from the studies because the basic units of measure were not even remotely comparable. Curiously, one collective value of these followup studies

is the suggestion that some convention be developed promptly so that current researchers can express comparable findings.

### Proposed Rate

The current need is for a basic, flexible, conventional recurrence rate. Rather than reason to a rate, I propose the following one and will defend it.

$$\frac{\text{Number of repeat out-of-wedlock deliveries}}{\text{total number of out-of-wedlock deliveries}} \text{ per 24 months after the index delivery}$$

The proposed rate, conceptually optimized according to the following grossly stated specifications, must fulfill these requirements:

1. A simple and generally useful single rate that is defined clearly enough to be accepted as a convention and, consequently, to generate comparable data among independent researchers.
2. Practical in the sense that the collection of data is not a Herculean task and that the data are useful to the program administrator.
3. Flexible enough to be separated into component parts and to be specific for selected variables. The infant mortality rate, for instance, can be broken down into the components of neonatal and post neonatal mortality, and the total rate or either component can be made specific for variables such as birth weight, mother's age, and so on.
4. Relevant to the intention of service, which will be discussed.

### Definitions of denominator, numerator, and unit of time used by investigators in constructing adolescent illegitimacy recurrence rates from followup studies

Author	Denominator	Numerator	Unit of time	Proportion of repeaters
Barglow.....	Number of 1st out-of-wedlock deliveries by adolescents remaining single at least up to the 2d conception.	Number of 2d out-of-wedlock pregnancies.	Not clear.....	26 of 78.
Crumidy.....	Number of out-of-wedlock deliveries.	"Unwed mothers".....	18 months.....	19 of 100.
Howard.....	Number of out-of-wedlock deliveries.	Not clear whether delivery or pregnancy. Legitimate 2d births apparently were included.	Varies, but is clear.	Rates for 487 expressed in various ways.
Sarrel I.....	Number of out-of-wedlock deliveries not lost to followup.	Deliveries, apparently including legitimate.	5 years.....	95 of 100.
Sarrel II.....	Number of out-of-wedlock deliveries.	"Pregnancy".....	Not stated.....	1 of 50.

5. Adaptable to conventional evaluation designs. Devising a recurrence rate for a service group in a way that defies measurement in a control group makes little sense. Attempts to conform to these specifications should be evident in the following consideration of the denominator, the numerator, and the unit of time for the proposed rate.

The denominator consists of all out-of-wedlock deliveries in the original service population. The at-risk population could be defined as those with an index out-of-wedlock pregnancy since most programs are initially in contact with the adolescents during the prenatal period. However, a few would marry before the delivery and therefore be dropped from the denominator.

Losing part of the population to followup presents a dilemma; dropping them from the denominator is an unpleasant necessity. I am assuming that the experience of recurrence for those found and those lost is the same—probably an invalid assumption but one an investigator must live with until the nature and extent of bias can be specified. (A study now in progress should yield information on such a bias.)

Adolescents who marry before the recurrent event should also be dropped from the denominator. This statement does not imply that the event of marriage is of no interest to the programs. On the contrary, it is so important that it warrants measurement as a subject unto itself. Separate treatment of the subject removes this group from consideration of a recurrent event, of which they are not immediately at risk. Cohort analysis, whenever feasible, is the method of choice because it allows expression of the incidence of many events in addition to recurrent ones.

The denominator, then, consists of all out-of-wedlock deliveries in the original service population minus those lost to followup and those marrying before the recurrent event.

The numerator consists of all out-of-wedlock deliveries among the population enumerated as at risk in the denominator, as stated before. For the following three reasons, I decided to define the recurrent event as an out-of-wedlock delivery rather than as an out-of-wedlock pregnancy.

1. A delivery is a discrete event and allows more precise measurements than a pregnancy;

it occurs at one point of time rather than over a period of many months.

2. Illegitimacy refers to both the mother and the infant and is better described by the delivery than by the pregnancy, which only describes the mother's potential contribution to illegitimacy.

3. In evaluative research, it is conventional to identify a control group and to measure recurrent events within that group as well as within the service group. The author can conceptualize many good, bad, and indifferent evaluative designs requiring the use of birth records for information on the control group. Birth records provide information on delivery but not on pregnancy, and in 35 States the legitimacy of delivery is reported on the birth certificate (6).

Whenever possible, all sequences to all outcomes should be identifiable from service records. The sequence of delivery→marriage→conception→delivery is not the same as the sequence of delivery→conception→marriage→delivery, although the outcome in both sequences is legitimate delivery; and neither these sequences nor the outcome resembles the sequence of delivery→no marriage→no conception. In the last sequence the adolescent is not a repeater although she was at risk because of an index out-of-wedlock delivery and a continuing single marital status.

The unit of time presents more conceptual and methodological problems than either the denominator or the numerator. Just how long does one follow a service population to determine the extent of recurrence? One can err in the direction of too short or too long a followup. A followup of less than 1 year, for instance, would identify only those few who deliver twice within 12 months. At the other extreme, one could follow each girl for 20 or 30 years or for the duration of her reproductive years—an obvious impracticality. Even with the more practical followup of 2, 3, 4, and 5 years, one has to weigh gains and losses carefully.

The major gain as length of followup increases is a more complete picture of the recurrence experience. But three major losses result from lengthy followup. First, a greater and greater proportion of the service population is lost to followup as time increases, which intro-

duces a bias of unknown type and magnitude. Second, the major purpose of evaluation is to help the administrator build a better program, and if there is a 5-year wait for evaluative data, progress is very slow indeed. Third, the preventive benefit of a program decreases over time. Realistically, can a program be given either the credit or the blame for a low or high recurrence rate except during the period of service and shortly thereafter?

The objective, then, is to choose the shortest possible followup time that supplies "adequate" knowledge about "recidivism" among the at-risk population.

To select an appropriate cutoff point, it would be helpful to know the frequency distribution of repeated deliveries by length of time between the index and the repeated deliveries. To this end the records of a municipal hospital were searched, and it was found that both mode and median of the distribution were encountered before 21 months following the first delivery. The curve steeply ascended to the mode soon after 1 year, with a gradual decline and a final leveling off at low frequency. The same type of curve was found in Howard's work (3).

Followup at least to 21 months, then, benefits the program by including most "early" repeaters. Fortuitously, two additional benefits are derived. A relatively minor benefit is that two out-of-wedlock deliveries following the index delivery within 21 months are virtually impossible; thereby the thorny issue of double events is avoided. Of major importance, however, is the relevance of 21 months to the intention of service. With 9 months of gestation, conceptions in the year after the index delivery will reach the outcome of delivery before 21 months. That is, a girl who conceives 12 months after her index delivery, with 9 months of gestation, will deliver at 21 months. Girls who conceive before 12 months will deliver before 21 months. Thus followup to 21 months is really a measure of those who conceive within 1 year after the index delivery. Since most service programs can be expected to follow the adolescents for at least 6 to 12 months after the index delivery, it is reasonable that conceptions occurring during this period may be counted as a measure of the success or effectiveness of such programs.

Followup at least to 21 months, therefore, will include most early repeaters and will conform to a minimum and logical period of accountability by the service programs.

To enhance the acceptability of this proposed rate, I recommend that the standard unit of time be changed to 24 months. Not much is lost by extending the unit to 24 months, and more than acceptability is gained. With 24-month data, a 21-month rate can still be expressed for those who appreciate its logic. A 24-month rate includes a multiple of calendar years, which is a convention unto itself, and allows easier comparisons with routine tabulations, such as vital statistics. It is farther from the mode than 21 months, which reduces the magnitude of bias from differential prematurity (defined by gestation time rather than by birth weight) in two or more populations. It also has the benefit of reducing the chance of bias from a shifting curve—a phenomenon described later.

## Discussion

There is no such thing as an all-occasion rate. One rate can serve only as a starting point for describing recurrences in a service population, and the rate that I have proposed is a conventional starting point.

Several points that I have not considered deserve mention. There are practical considerations such as whether the entire at-risk population should be included in followup or whether some sampling scheme should be used. Perhaps even more basic is deciding for which of the infinite number of possible variables the basic rate should be made specific. The rule of thumb is to make it specific for variables associated with higher or lower than "normal" rates. For instance, neonatal mortality rates are generally made specific for birth weight, a variable predictive of chances for survival. This procedure is especially important in comparative analysis since an apparent difference in recurrence rates between two programs may be attributable to differences in the populations served, differences in effectiveness of service, or both.

More time also should be devoted to the dangers of inferring to recurrences beyond 24 months. For instance, since the causes of death in the neonatal period are different from the

causes of death in the post neonatal period, inferences to causes of post neonatal mortality from observed causes of neonatal mortality are invalid. Similarly, variables that are predictive of "early" recurrence may or may not be predictive of "delayed" recurrence. And since we have little information on which variables are predictive of recurrences, the basic rate should probably be made specific for at least the conventional variables of age, race, parity, and socioeconomic status.

This proposed conventionalized rate becomes a convention only if it is widely used, and many investigators probably will not choose to use it. Most people never become aware of a proposed convention; of those who do, many are not interested and more than we care to admit arbitrarily reject the proposal. There are also those who have good reason not to conform to the proposed convention, and most of the reasons seem to be related to the unit of time. In this period when program funding has more up's and down's than a manic depressive, many program administrators simply have insufficient resources to follow up study groups at all, much less for 24 months.

Other program administrators may have evidence that in their populations the distribution of repeated events over time shows a mode and median beyond 21 months, requiring a longer followup for an adequate study. An increasingly intensive service intervention possibly may have no impact but to delay the repeated event a few months, which would shove the graph curve to the right without changing its shape. If such a phenomenon occurred, following a service population and an unaffected control group to 24 months would show a spuriously lower recurrence rate for the service group.

Some programs may assign a higher priority to objectives other than recidivism. A school program, for instance, with the primary interest of keeping girls in school may require a 3-year followup program.

For those who cannot or will not follow up for as long as 24 months, there can be limited contribution to a literature that could become so conventionalized. For those who must or choose to follow up for a longer period, recurrence rates can be expressed in 24-, 30-, or 36-month rates.

No conclusion is appropriate for a paper such as this, but much is lost if no convention is adopted by independent investigators.

#### REFERENCES

- (1) Barglow, P., et al.: Some psychiatric aspects of illegitimate pregnancy in early adolescence. *Amer J Orthopsychiat* 38: 672-687, July 1968.
- (2) Crumidy, P. M., and Jacobziner, H.: A study of young unmarried mothers who kept their babies. *Amer J Public Health* 56: 1242-1251, August 1966.
- (3) Howard, M.: The Webster School. U.S. Children's Bureau Research Report No. 2. U.S. Government Printing Office, Washington, D.C., 1968.
- (4) Sarrel, P. M., and Davis, C. D.: The young unwed primipara. A study of 100 cases with 5-year follow-up. *Amer J Obstet Gynec* 95: 722-725, July 1, 1966.
- (5) Sarrel, P. M.: The university hospital and the teenage unwed mother. *Amer J Public Health* 57: 1308-1313, August 1967.
- (6) U.S. National Center for Health statistics: Trends in illegitimacy: United States, 1940-1965. PHS Publication No. 1000, Series 21, No. 15, p. 72. U.S. Government Printing Office, Washington, D.C., 1968.

#### Tearsheet Requests

Dr. John J. Dempsey, Department of Population and Family Health, Johns Hopkins University School of Hygiene and Public Health, Baltimore, Md. 21205.



# Availability and Use of Medical Services in an Alaskan Eskimo Community

ROBERT FORTUINE, M.D.

THE INDIAN HEALTH Service of the Public Health Service has the difficult task of providing health care of high quality to a large population which is diverse in culture and for the most part economically disadvantaged, poorly educated, widely scattered, and living under harsh environmental conditions. Perhaps nowhere in the United States are these conditions more evident than in some of the remoter parts of Alaska, where poverty, climate, and isolation are extreme.

This paper describes the unusual problems encountered in making medical services available to a remote Eskimo community and the pattern of utilization of these services by the people of the community. The findings may be of some assistance to other persons concerned with the health needs of a population living under similar adverse circumstances.

During 1966, the staffs of the Alaska Native

Hospital at Bethel and the Alaska Area Native Health Service at Anchorage collaborated in a special intensive study of a large Eskimo community, Hooper Bay, on the coast of the Bering Sea. Except for its size, this village was considered fairly typical of other communities in southwestern Alaska in its economy, cultural patterns, relative isolation, and health status.

The materials used in the preparation of this paper include: (a) written and oral trip reports from various health professionals who visited the community during the year, (b) inpatient, field clinic, and radio records from the Bethel hospital, which is the only medical facility in the region, (c) X-ray survey reports, (d) an environmental survey of the village, (e) a census enumeration of the residents of the village, (f) a health attitude survey, (g) several published reports, and (h) conversations with a number of village residents.

---

*Dr. Fortune is with the Indian Health Service, Health Services and Mental Health Administration, Public Health Service. The study was carried out while he was director of the Service Unit at the Public Health Service Alaska Native Hospital, Bethel. Advice and support for the study were provided by Dr. Holman R. Wherritt, director, and Dr. Enrico Leopardi, deputy director of the Alaska Area Native Health Service, at the time of the study, and Mrs. Nan Hampton, assistant administrative officer at the Bethel hospital.*

## The Community and its People

Hooper Bay is an old village site located between the Bering Sea and the western edge of the vast treeless tundra of southwestern Alaska. The winters are long and cold and the summers are cool and wet. The mean annual temperature is 30.7° F. and the precipitation 17 inches.

In 1966, 70 Eskimo family groups, with an average of 7.6 members, lived at Hooper Bay. All but one of the families were Yupik, or south

Alaskan, in origin. The only non-Eskimo residents were a number of teachers and their families, a few VISTA workers, and a Catholic priest, all of whom were excluded from the study. A breakdown by age and sex of the 535 Eskimo residents is shown in table 1.

The population of the community grew from 307 in 1950 to 535 in 1966. Most of the increase was due to a high excess of births over deaths, rather than to migration into the village. In 1966 there were 19 live births, one stillbirth, and one infant death in this population. Predictably, this is a young population, with 53 percent of the total under 15 years old and only 2 percent over age 65. The majority of the people were born in or near the village. In recent years, however, an increasing number of mothers have been using the hospital for delivery.

Few older adults have had more than 4 years of formal schooling, although most children and young adults now complete eight grades and many go on to high school away from the village. Roughly half of the Eskimos over age 30 need the help of an interpreter when talking to a physician or a nurse.

More than 85 percent of the families received less than \$3,000 in cash income and nearly half of the total received under \$2,000 in 1966. These figures are especially impressive in view of the large average family size and the fact that prices for food and clothing in this part of Alaska are often nearly twice the price of comparable goods in the other States. Sources of cash income include seasonal jobs, trapping of fur-bearing mammals, sale of craftwork, and welfare assistance from the State and Bureau of Indian Affairs. Only a few persons have full-time work—at the school, airline, post office, or store. Balancing, of course, to some extent the low cash income is the fact that many Eskimos of Hooper Bay still depend in large measure on local resources for food and clothing.

Fish—fresh, frozen, or dried—is the dietary staple. Sea mammals, particularly seals, are used for food as well as for waterproof clothing. The tundra around Hooper Bay is one of the best breeding grounds in North America for a variety of waterfowl, particularly geese. During the winter the men trap mink, ermine, otter, fox, hare, and muskrat. Although most pelts are sold

**Table 1. Distribution of Eskimo population of Hooper Bay, 1966, by age groups and sex**

Age group (years)	Male	Female	Total	Percent
Under 1-----	8	10	18	3. 2
1-4-----	39	42	81	15. 2
5-14-----	93	91	184	34. 5
15-24-----	49	55	104	19. 5
25-44-----	47	42	89	16. 6
45-64-----	26	23	49	9. 1
65 and over-----	4	6	10	1. 9
All ages---	266	269	535	100. 0

for cash, some are used by the women to make clothing for the family.

Of the 70 houses in the village, 64 are of frame construction and the remainder are made of driftwood logs. Nearly all are heated by stoves in which driftwood is used for fuel. About 40 percent of the homes have only one room. The average occupancy rate is 4.1 persons per room.

All but eight families regularly get their water from the 125-foot well dug in 1964 by the Indian Health Service under the authority of Public Law 86-121. The remainder, because of distance, use a lake 300 yards south of the village. The well water is chlorinated before distribution and the average daily usage is 1.7 gallons per capita.

All the families use "honey-buckets" for human excreta. The children usually empty these containers once a day into one of four bunkers at the periphery of the village. Trash is often indiscriminately discarded near the home, although residents are urged by the village council to incinerate it or carry it to a nearby lake reserved for this purpose. A census of dogs in February 1966 revealed a total of 370. Most were kept tethered a safe distance from the homes.

Hooper Bay has a Bureau of Indian Affairs school, with an enrollment of 188 in 1966, two churches, a store operated by an Eskimo cooperative, and a community hall. It also has an Indian Health Service Health Station—a clinic building opened for use early in 1966—which contains living quarters for visiting health workers, two examining rooms, a waiting room, and a small laboratory.

The community is located 155 air miles from



*Left. Eskimo woman looks for clams at low tide. Right. Villagers prepare for seal hunting*



**Beaching boat on frozen tundra requires many hands**

Bethel and nearly 550 air miles from Anchorage. The nearest Eskimo community is 20 miles to the eastward. Hooper Bay is accessible for passengers from distant points only by air—either by the twice weekly twin-engine propjet mail plane (fare \$35 one way), or by a single-engine air taxi charter (about \$135 round trip) from Bethel. Heavy freight comes in by ship once a year from Seattle. Locally, the villagers use boats, including kayaks and skin-covered oomiaks, during the summer and dogs or motorized sleds in the winter. There are five short-wave radio transmitters in the community, each of which can reach Bethel or more distant points.

During 1966 the villagers who were potential health resources included a health aide and her assistant, whose jobs are described more fully later, a sanitarian aide employed by the Indian Health Service, a teacher who was a registered nurse, and an Eskimo lay pastor who had had considerable experience in performing dental extractions and placing temporary fillings. A local woman assisted with the occasional childbirth in the village, but she had little or no training in this work.

The people of Hooper Bay have regular access to three types of medical service, similar to the situation in most southwestern Alaska communities: (a) hospitalization at Bethel, (b) physician visits to the village, and (c) consultation by radio. Two other minor sources—correspondence between physicians and patients and outpatient services at the Bethel hospital—are not considered further in this report. Each of the three major types is briefly described, with reference to the manner in which it is provided, its availability, and how it is used.

### Hospital Care

The first and most conventional type of medical care is the hospital inpatient service provided by the 65-bed, fully accredited Alaska Native Hospital at Bethel. This facility had a staff of five physicians and one dentist in 1966. Patients with complex illnesses requiring specialist consultation are discussed by telephone, teletype, or letter with the staff at the Alaska Native Medical Center in Anchorage, where patients are transferred if necessary.

**Table 2. Admissions to Bethel hospital, per 100 population of Hooper Bay, 1966, by age groups and sex**

Age group (years)	Male	Female	Total	Percent of total	Admission rate
Under 1-----	11	3	14	12.5	77.8
1-4-----	17	11	28	25.0	34.6
5-14-----	7	8	15	13.4	8.2
15-24-----	5	5	10	9.0	9.6
25-44-----	1	27	28	24.9	31.4
45-64-----	2	8	10	9.0	20.4
65 and over--	1	6	7	6.2	70.0
Total--	44	68	112	100.0	21.0

The distance between Hooper Bay and Bethel of course limits somewhat the use the villagers can make of the hospital. Generally, the hospital pays the cost of travel for a patient only if the trip has been authorized in advance by radio, telegram, or letter. The uncertainty of the weather often delays or cancels scheduled flights between Hooper Bay and Bethel, especially since Hooper Bay, close as it is to the Bering Sea, has many stormy days, particularly in the fall and spring. Because travel is uncertain and expensive, many persons wait until an illness is far advanced before they try to reach the hospital.

In 1966, 87 persons (32 males and 55 females) or 16.3 percent of the residents of Hooper Bay were admitted to the Bethel hospital. Because some of these persons were admitted more than once, the total number of admissions was 112. Excluding 19 obstetrical patients, the overall male-to-female ratio was 0.9 to 1.0. More than three-fifths of the patients were in the age group 0-14 years (table 2).

Fifteen Hooper Bay mothers delivered babies at the Bethel hospital in 1966, and four others delivered in the village. A fifth village delivery ended in stillbirth. All 19 mothers of live-born infants had had three or more previous deliveries: in fact, 12 had been pregnant nine or more times. Fourteen of the women were over 30 years of age and four were over 40. All but one who delivered at the hospital had had at least one prenatal visit, averaging 1.6 visits at the hospital and an additional 1.2 visits in the village. Most women now prefer to deliver at the hospital, and they usually pay their own fare to Bethel several weeks before term to as-

sure that they are not stranded in the village when they go into labor.

The villagers spent a total of 1,368 days, or 3.75 man-years, in the Bethel hospital during the study year—an average of 12.2 days per admission. This figure is slightly above the hospital average of 10.4 days for 1966. The longer-than-average hospital stay for the villagers may be explained by the uncertain travel conditions to and from the village. Delays in arrival, with consequent increased severity of illness, and delays in departure after medical discharge are both factors to be considered.

Thirteen patients from Hooper Bay were referred by the Bethel hospital to the Alaska Native Medical Center during the study year; four for suspected or proved active tuberculosis, four for elective surgery, two for hydatidiform moles, and three for the diagnosis or treatment of difficult clinical conditions. The nine nontuberculosis patients spent a total of 0.9 man-years at Anchorage, with an average hospital stay of 36.8 days.

#### Field Clinics

The second major type of personal medical service available to the villagers is that provided by physicians and others during periodic visits to the community. Most of the visiting physicians are from the Bethel hospital, although occasionally visits are made by the State tuberculosis control officer, research physicians from the Arctic Health Research Laboratory, or Army physicians on training maneuvers. Public health nurses of the Alaska Department of Health and Welfare also visit regularly, usually about quarterly, and occasionally research

nurses come while engaged in special projects. The hospital dentist also visits from time to time. Although the primary purpose of some of these visits may be other than the provision of direct care, it is traditional for all visiting professionals to hold "sick call" to the extent their time and skills allow.

The only medical visits to Hooper Bay in 1966 were made by Indian Health Service physicians, who held clinics in February, April, June, and October. The February clinic was held by a pediatrician from the Alaska Native Medical Center at Anchorage, while the other three clinics were held by general medical officers from Bethel. The February, June, and October visits averaged about 7 days each—sufficient time to accommodate all persons who wished to see the physician—whereas the April visit lasted only 3 days. Except for a few persons with acute conditions, the pediatrician's clinic was restricted to children.

During the four visits, a total of 791 patients attended the clinics, with females predominating by a substantial margin even if obstetrical visits are excluded. About one-fourth of the patients had a physical examination only; many of these were for followup of a previously diagnosed illness. The number of visits to the four field clinics, by age and sex of the patients, is shown in table 3.

In order to provide a baseline more reliable than 1 year, an analysis was made of all 29 field medical clinics at Hooper Bay since 1960. A random sample of 15 families from the 1966 census was used as a population base. An average of 26.5 patients of a mean total of 91.4 persons in the sample were seen at each clinic.

**Table 3. Number of visits to physicians at four field clinics, Hooper Bay, 1966, by age groups and sex of patients**

Age group (years)	Male	Female	Total	Percent of total	Average visits per person
Under 1.....	23	23	46	5.8	2.6
1-4.....	89	109	198	25.0	2.4
5-14.....	107	128	235	29.7	1.3
15-24.....	24	40	64	8.1	.6
25-44.....	31	92	123	15.5	1.4
45-64.....	32	59	91	11.5	1.9
65 and over.....	9	16	25	3.2	.9
Unknown.....	2	7	9	1.1	----
All ages.....	317	474	791	99.9	1.5

The percentage of patients seen varied from a high of 83.2 to a low of 8.1, with an average of 28.9 percent. The distribution of the reasons for the visits to the clinics is shown in table 4.

Two-fifths of the visits were for complaints of more than 1 week's duration. A substantial number of these were vague abdominal or joint pains, most commonly in adult females. Most of the acute conditions were minor accidents or infectious diseases in children.

For the 15-family sample, the total number of visits by each person was compared with the theoretically possible number if the person had seen a physician on each of his trips to the village. As expected, wide variation was observed. Two men did not see a physician at all in the 7-year period, whereas two women made 24 and 19 visits out of a possible 29. The average number of visits per person in the sample was 8.4, or 1.2 visits per person per year. In general, males and females were seen about equally often until the age of 25, after which women greatly outnumbered men. In the age-span 26-45, women saw the physician 4.9 times more frequently than men. Only a small part of this difference can be explained by obstetrical visits or by the fact that men were more often away from the village.

#### Medical Consultation by Radio

Perhaps the most unique feature of medical care in arctic and subarctic regions of Alaska is the so-called radio medical traffic. Nearly every village in the western and northern part of Alaska can contact the nearest Indian Health Service hospital by shortwave radio. At Bethel,

**Table 4. Reasons for visits of 15-family sample to 29 field clinics, Hooper Bay, 1960-66<sup>1</sup>**

Reason	Average number of patients per clinic	Percent of total
Acute illness (symptoms less than 7 days)-----	6.3	23.8
Chronic condition (symptoms more than 7 days)-----	10.6	40.0
Injuries (within 7 days)-----	.6	2.2
Eye refractions-----	.8	3.0
Prenatal and postnatal-----	1.9	7.2
Physical examinations-----	6.3	23.8
Total-----	26.5	100.0

<sup>1</sup> Mean total of persons in the sample was 91.4.

the physicians are available at a scheduled time for medical traffic every day of the year and can generally be reached for emergencies also. A patient contacts the physician through an intermediary known as the community health aide, who is usually a young woman appointed by the local village council with the approval of the nearest hospital. She has a period of formal training at the hospital, supplemented by on-the-job training during visits of the various health professionals to the village (1).

The aide takes a medical history and reports by radio the patient's symptoms or signs to the physician, who then discusses the case and seeks further information from the aide as necessary. Based on this evaluation, the physician makes his recommendation. If medication is needed, the aide is instructed by radio on the dosage and the method of dispensing from a limited

**Table 5. Medical consultation calls by radio for Hooper Bay residents, 1966, by age groups, sex, and rate**

Age group (years)	Male	Female	Total	Percent	Average number calls per person
Under 1 -----	67	36	103	16.2	5.7
1-4-----	89	90	179	28.2	2.2
5-14-----	37	44	81	12.8	.4
15-24-----	18	36	54	8.5	.5
25-44-----	28	89	117	18.6	1.3
45-64-----	22	41	63	9.9	1.3
65 and over-----	5	11	16	2.5	1.6
Unknown-----	7	14	21	3.3	----
All ages-----	273	361	634	100.0	1.2





**Wounded Eskimo is transported to hospital**

range of prescription and nonprescription drugs made available to the village by the hospital. Most aides hold "sick call" daily in the village and report only those patients they feel warrant the physician's attention.

At Hooper Bay during the study year, one regular aide and her assistant made 242 scheduled radio contacts with the hospital (an average of 4.7 per week) and five emergency calls. A total of 634 patients, 273 males and 361 females, were reported (table 5). Most of the calls

were for infants and preschool children. As with the field clinics, a preponderance of females sought medical advice, particularly in the older age groups. The overall male-to-female ratio, excluding obstetrical consultations, was 0.8 to 1.0.

Eighty-four radio contacts (13.3 percent) were made for followup of previously reported patients, and 35 (5.5 percent) were simply for drug refills. Thus, a total of 515 illness episodes were discussed—an average of 0.96 per person in the village. The illnesses of 34 patients, or 6.6 percent of those reported, were serious enough to warrant their transportation to the hospital at Government expense.

### **Health Conditions at Hooper Bay**

An analysis of admissions, field visits, and radio calls by diagnosis showed health conditions to be poor and characteristic of the region. The devastating effect of tuberculosis in the past is demonstrated by the fact that more than half of the adults in the random sample of 15 families had been hospitalized at some time for tuberculosis. Of 207 persons over age 15 who had a chest X-ray in 1966, 80 percent showed evidence of healed tuberculosis and 5 percent showed signs of previous chest surgery.

Other respiratory diseases, particularly pneumonia, bronchitis, and upper respiratory illnesses, accounted for 21.2 percent of hospital admissions and approximately the same percentage of field clinic visits in 1966; nearly 40 percent of the patients in this group were under 5 years old. Almost 40 percent of the radio calls were for respiratory infections, which peaked in March and early fall.

Otitis media was observed in 79 persons by a physician either at the village or at the hospital, and 37 more cases were reported by radio. Half of all the patients with otitis media were in the 1-4 age group. Ten persons with gastroenteritis were hospitalized, 10 were seen at field clinics, and 44 were reported by radio—nearly all of them were infants and preschool children.

Accidents accounted for seven hospital admissions, 24 field clinic visits, and 27 radio calls. Nearly two-thirds of these accidents were in

the pediatric age group. Laceration was the most common type of injury reported.

As mentioned earlier, there were 19 live births and one stillbirth during the year. Fifteen of the mothers delivered at the Bethel hospital; none of these had serious complications, although breast infection occurred in two. Four women were known to have aborted and two had hydatidiform moles.

Mental disorders were diagnosed in five patients admitted to the Bethel hospital. Two patients had known schizophrenia temporarily out of control, two had a minor psychoneurosis, and one was a child with mental retardation. The clinical impression of the physicians visiting the village was that minor anxiety and adjustment problems were common, especially among women, but no reliable figures are available.

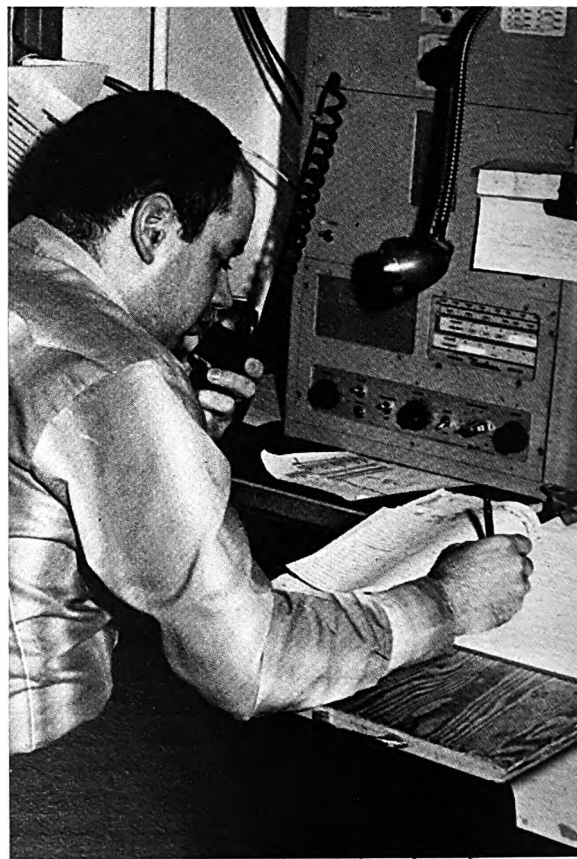
### Discussion

Health conditions in western Alaska are among the worst in the United States (2). The infant mortality for the period July 1964 through June 1967 averaged 104 per 1,000 live births for the population served by the Bethel hospital. More than 60 percent of the infant deaths were from infectious diseases; the principal killers were diarrhea and respiratory disease, according to records compiled by the hospital. Tuberculosis, although no longer the epidemic disease of several decades ago, is still a major threat to health and economic security (3). Acute respiratory disease (4), otitis media (5), meningitis (6), diarrhea (7), and certain parasitic diseases (8) are serious and widespread in this area. Cancer, particularly of the esophagus (9), is being increasingly recognized as a problem. Accidents, especially drownings, are the most common cause of death among adults (10). On the other hand, certain common killers in the general population, notably arteriosclerotic heart disease (11) and diabetes mellitus (12), are distinctly unusual in the Eskimo population of this region, for reasons which are not clear.

The people of Hooper Bay and nearby villages thus generally have an excessive burden of disease, although conditions are considerably

better now than they were a decade ago. In addition, because of their isolation and the uncertainty of travel and communication, these people also have a necessarily limited access to medical services. The system of medical care described has evolved to cope with these difficulties, which to some extent are characteristic of the way of life in northern regions.

Most of the persons who participated in this study felt that the people of Hooper Bay had a positive attitude toward health workers and readily made use of the health services available to them. The only resistance to modern medicine was usually among a few of the elderly, who feared the hospital or some method of treatment which they did not understand completely. Although traditional shamans (medicine men) are still active in some communities on the Bering Coast, I know of none who were practicing at Hooper Bay in 1966.



**Shortwave radio is an important means of medical consultation in Alaska**





**Family receives medical supplies from Public Health Service Hospital**

The difficulties of delivering quality health care to an isolated community such as Hooper Bay are substantial, especially in view of the serious health problems. The only fully satisfactory care is given in the hospital itself, but admission to the hospital depends on many factors often beyond the control of the patient or the hospital. Too often inclement weather prohibits air transportation, sometimes for as long as a week. Also, the cost of travel may be a limiting factor for either the patient or the hospital. Commonly, the men cannot afford to leave their fishing, hunting, or trapping long enough for a needed trip to the hospital.

Field medical visits are made on a scheduled basis but weather, emergencies elsewhere, and other factors may upset the schedules. As the study findings indicate, most of the patients

come to the field clinics for preventive services or for relief of chronic complaints. In addition to their more conventional duties, the physicians also frequently perform eye refractions and some of the more urgent dental extractions. Acute illness and injuries are of course taken care of when they are encountered, but the probability of such a concurrence of physician and patient is rather low.

The radio medical traffic is the nearest equivalent to the usual physician-patient contact in an office or clinic. Here again the weather or solar disturbances can interfere, though less commonly, by upsetting radio signals. At least several times a month the radio reception is so poor that no contact is possible between Bethel and Hooper Bay. At other times it is only by the exquisite patience of both aide and phy-

sician that a meaningful dialog can be carried on.

Even under the best circumstances, however, the physician and patient are both at a disadvantage when using the radio, since the patient must use an intermediary (who is often an interpreter as well) and the physician does not have the benefit of a physical examination or laboratory tests. He also has only a limited number of possible forms of treatment at his disposal.

Another important feature of the radio medical traffic is the fact that anyone can tune in with a home shortwave receiver. Nearly every family has such a receiver and regularly listens to "the doctor's sched." Privacy and confidentiality are of course impossible to maintain under the circumstances, since the physician generally has to identify the patient in order to treat him adequately. Patients, physicians, and aides accept this situation, however, and symptoms and signs, no matter how intimate, are discussed openly over the airwaves. This seeming disadvantage also has its positive aspects. Many people listening in, particularly the aides themselves, learn a great deal about the home management of common medical conditions. Most physicians recognize the potential for health education that this situation offers and may insert comments for the wider audience into their discussions of a person's illness.

Despite the limitations of the radio, however, both patients and physicians recognize how essential it is for adequate medical care in

**Table 7. Hospital discharge rates per 1,000 for Hooper Bay residents, 1966, and U.S. population, fiscal year 1964 <sup>1</sup>**

Age group (years)	Discharge rates	
	Hooper Bay	United States
Under 15.....	201	68
15-24.....	96	151
25-44.....	314	156
45-64.....	204	154
65 and over.....	700	226
All ages.....	210	134

<sup>1</sup> U.S. data from reference 14.

the north. It is by far the most readily available and hence most dependable means by which the villagers can receive medical advice.

To get some idea of the relative utilization rates for medical services by the people of Hooper Bay and the U.S. population generally, a comparison was made of the average number of physician contacts per year from all sources (table 6). Hooper Bay residents, despite their poor health conditions, had an average rate of 2.9 physician contacts per person in 1966, some 36 percent below that of the U.S. population generally in 1964 and 12 percent below that of the U.S. nonwhite population. The largest relative deficiency was in the age groups 15-24 and over 45, whereas in the 0-4 age group the Eskimos actually exceeded the rate of the U.S. population.

**Table 6. Physician contacts for Hooper Bay residents, 1966, compared with U.S. population, fiscal year 1964 <sup>1</sup>**

Age group (years)	Hooper Bay				U.S. general	U.S. nonwhite
	Hospital admissions	Field clinics	Radio calls	Total		
0-4.....	0.4	2.5	2.8	5.7	5.5	3.3
5-14.....	.1	1.3	.4	1.8	2.8	1.4
15-24.....	.1	.6	.5	1.2	4.3	3.2
25-44.....	.3	1.4	1.3	3.0	4.5	3.9
45-64.....	.2	1.9	1.3	3.4	5.0	4.7
65 and over.....	.7	.9	1.6	3.2	6.7	5.6
All ages.....	.2	1.5	1.2	2.9	4.5	3.3

<sup>1</sup> U.S. data from reference 13.

On the other hand, as shown in table 7, hospitalization rates for the Hooper Bay population were considerably higher than for the U.S. population, except for the 15-24 age group in which a sizable number of persons are away at boarding school most of the year. In part, the generally high rate can be explained by the large number of serious illnesses, especially in infants and preschool children. Also, because of the distance to the hospital and the unpredictability of the weather, a few patients who have relatively minor illnesses have to be admitted to the hospital because they have no other place to stay while receiving outpatient care.

Medical care patterns in western Alaska are not likely to change substantially in the next decade or so. The three main types of medical care will remain much the same except that transportation will perhaps become more readily available, field visits will be more frequent, and communications will be technically improved. Direct medical services can go only so far, however, in elevating the health status of these people. Eventually, significant improvements in health will come about only as a result of better education, housing, employment opportunities, and a safer environment. Whatever the changes brought by the future, the Eskimos of Hooper Bay will have to contend with the isolation, harsh unpredictable weather, and other difficult conditions which have been their lot since long before the first physicians came to their tundra home.

## Summary

A study of the availability and use of medical services during 1966 at Hooper Bay, an isolated Alaskan Eskimo community, revealed that the 535 people of this village depend almost entirely on a 65-bed hospital, 155 air miles away, for their medical care. Three types of medical service are available to this population: (a) hospitalization, (b) periodic field clinics held by visiting physicians and other health workers, and (c) medical consultation by shortwave radio between the community health aide and the hospital staff.

Hospitalization rates in 1966 were higher for most age groups, particularly for children, than

for the general U.S. population in 1964. The field clinics, held at irregular intervals during the year, were used mostly for preventive examinations and for the care of chronic conditions, chiefly among the women.

Medical consultation by radio was the only available day-to-day means of contact with a physician. Most of the shortwave radio calls were concerned with illnesses or injuries of infants and preschool children. The Hooper Bay residents had an average of 2.9 physician contacts per person in 1966, 36 percent below the national average of 4.5 in 1964.

## REFERENCES

- (1) Harrison, T. J.: Training for village health aides in the Kotzebue area of Alaska. Public Health Rep 80: 565-572, July 1965.
- (2) Fortune, R.: Health conditions among the Eskimos of the Yukon-Kuskokwim Delta, Alaska. Polar Notes 6: 1-16 (1966).
- (3) Comstock, G. W., and Phillip, R. N.: Decline of the tuberculosis epidemic in Alaska. Public Health Rep 76: 19-24, January 1961.
- (4) Maynard, J. E., et al.: Surveillance of respiratory virus infections among Alaskan Eskimo children. JAMA 200: 927-931, June 12, 1967.
- (5) Brody, J. A., Overfield, T., and McAlister, R.: Draining ears and deafness among Alaskan Eskimos. Arch Otolaryng (Chicago) 81: 29-33, January 1965.
- (6) Fortune, R.: Acute purulent meningitis in Alaska Natives: epidemiology, diagnosis and prognosis. Canad Med Assoc J 94: 19-22, January 1966.
- (7) Brenneman, G., and Fortune, R.: Enteropathogenic *Escherichia coli* diarrhea in western Alaska. Alaska Med 8: 56-63 (1966).
- (8) Hitchcock, D. J.: Parasitological study on the Eskimos in the Bethel area of Alaska. J Parasit 36: 232-234, June 1950.
- (9) Fortune, R.: Characteristics of cancer in Eskimos of southwestern Alaska. Cancer 23: 468-474, February 1969.
- (10) Boyd, D. L., Maynard, J. E., and Hammes, L. M.: Accident mortality in Alaska 1958-1962. Arch Environ Health (Chicago) 17: 101-106, July 1968.
- (11) Maynard, J. E., Hammes, L. M., and Kester, F. E.: Mortality due to heart disease among Alaskan Natives, 1955-65. Public Health Rep 82: 714-720, August 1967.
- (12) Mouratoff, G. J., Carroll, N. V., and Scott, E. M.: Diabetes mellitus in Eskimos. JAMA 199: 961-966, Mar. 27, 1967.
- (13) U.S. National Center for Health Statistics: Volume of physician visits, by place of visit and

type of service: United States, July 1963-June 1964. PHS Publication No. 1000, Series 10, No. 18. U.S. Government Printing Office, Washington, D.C., 1965.

- (14) U.S. National Center for Health Statistics; Hospital discharges and length of stay: Short-stay hospitals; United States, July 1963-June 1964.

PHS Publication No. 1000, Series 10, No. 30, U.S. Government Printing Office, Washington, D.C., June 1966.

#### Tearsheet Requests

Dr. Robert Fortune, 3727 East 31st St., Tulsa, Okla. 74135

## Grants for Family Planning Services

Family planning service grants, totaling about \$12 million for 79 projects, were awarded to 41 States during the 1969 fiscal year; \$9,185,426 will be used to provide for family planning services in model cities.

The grants, administered by the Children's Bureau, are authorized under the 1967 Amendments to title V of the Social Security Act. In addition, the Children's Bureau administers grants to the States for maternal and child health services, of which family planning is a part. In 1968, 425,000 women received family planning services under these mostly rural maternal health programs.

According to Secretary Robert H. Finch, "The Department of Health, Education, and Welfare is determined that poor families have the same choice that families in middle or upper income levels have: to plan the size and spacing of their families. These grants are for that purpose. They are also designed to improve maternal health and to reduce infant mortality, especially in those areas where poor people live and where our infant mortality rates are highest. We are receiving increasing evidence that programs which provide good maternity and infant care and family planning services *do* reduce infant mortality. In New York, for example, in 10 target areas served by maternity and infant care projects, there is a greater decline in infant mortality rates than there is in other parts of the city where such services are not concentrated."

In other major cities with maternity and infant care projects, the following decreases have occurred in the infant mortality rate from 1964-67: Baltimore, 31.0 to 26.8; District of

Columbia, 34.5 to 32.6; and Houston, 28.4 to 22.1.

Briefly, current Department activities in the extension of family planning services to the poor are these:

- At least 6 percent of Federal appropriations for maternal and child health authorized by title V of the Social Security Act must be spent in family planning activities. For the fiscal year just ended, the Congress earmarked \$18.5 million of the appropriation for this purpose. For fiscal 1970, the Children's Bureau is requesting that \$31.5 million of the appropriation for the maternal and child health programs be earmarked for family planning.

- States may include family planning services in their federally aided Medicaid program.

- Federally aided public assistance programs of Aid to Families with Dependent Children must offer family planning services to their clients. Federal funds can be used for 75 percent of the cost.

- Demonstration funds are being used to support projects designed to mobilize community leaders in family planning efforts, to plan programs for school-age pregnant girls, to offer genetic counseling, to prevent school dropouts because of pregnancy, and to aid migrant workers.

- Basic research is underway to develop improved contraceptive techniques.

- Plans are underway to support broad studies in demography and population as well as family planning. More knowledge about cultural and social problems is needed if family planning services are to be improved.

# Some Proposed "Comparability Areas" for U.S. Statistics on Cause of Death

DAVID HEWITT, M.A., JEAN MILNER, M.S.A., and ADELE CSIMA, M.A.

THE EPIDEMIOLOGIST or public health worker who finds some striking geographic contrast in the mortality attributed to a particular disease is often so inhibited by doubts about the uniformity of diagnostic practices that he dare not draw any firm conclusion. As a rule he has neither the resources nor, perhaps, the legal right to pursue his inquiry beyond this inconclusive stage. A highly instructive exception to this rule, however, was provided by Anderson's recent study of geographic variation in deaths due to bronchitis and emphysema in Canada (1). At an earlier stage of Anderson's work it had appeared that, in comparison with Canada as a whole and with neighboring Ontario in particular, the province of Manitoba had very high death rates for "emphysema without mention of bronchitis"—I.C.D. 527.1 (2) and low rates for chronic bronchitis—I.C.D. 502.0 (2). He was therefore faced with the question, "Do physicians in Manitoba . . . fail to diagnose and mention chronic bronchitis in . . . patients who die from emphysema while their confreres in Ontario nearly always do; or do men in Manitoba . . . develop a 'dry' form of emphysema . . . while men in Ontario develop a 'wet' form characterized by bronchitis?"

---

*The authors are with the department of epidemiology and biometrics, University of Toronto, Canada. Mr. Hewitt is an associate professor, Mrs. Milner is a fellow, and Mrs. Csima is an assistant professor.*

Not content with leaving the question open, Anderson traced and questioned individual physicians who had prepared certificates assigning death to various chronic respiratory conditions. Their replies revealed that much of Manitoba's apparent excess mortality from emphysema was indeed due to a preference on the part of Manitoba physicians for diagnostic terms less commonly used elsewhere. Moreover, the reason for this preference, as many of the physicians perceived, was that at the University of Manitoba "undergraduate teaching for many years was such as to discourage a physician from making a clinical diagnosis of chronic bronchitis" (3). Because of the rapid rise in mortality attributed to emphysema, epidemiologists had, of course, already been alerted to the likelihood that fashion in diagnosis was an important influence on the statistics of death from this cause. A parallel situation is that of the mortality attributed to pulmonary and other venous embolism, and here again the rate for Manitoba, based on A86 of the Intermediate List (2), deviates further from the Canadian norm than that for any other Province (4).

It might at first seem unlikely that imprinting of a particular viewpoint on undergraduates at one medical school could have a determining influence on the mortality statistics for an entire Province, but more than half of the physicians in Manitoba were trained at this one school. In a random sample of 155 Manitoba physicians drawn from the medical directory

(5), 92—59.4 percent—were found to have graduated from the University of Manitoba. The situation in Manitoba is therefore extreme, but by no means unique. In Arkansas, Indiana, Kentucky, South Carolina, and Vermont, more than 50 percent of all physicians in each State were products of a single medical school in 1959 (6). A high degree of professional self-sufficiency is as likely to give rise to spurious differences between the death rates of States as of Canadian Provinces, and cause-specific rates for these five States should therefore be regarded with special caution. On the other hand, there are certainly States in which the medical corps has been recruited in a much more eclectic fashion, so that less than 10 percent of the physicians come from any one school (as in California, New York, and seven other States) and, with regard to diagnostic practices, these States should be reasonably comparable with one another and with the United States as a whole. There are in addition certain groups (for example, five of the six New England States) within which the distributions by school of origin are similar, even while they differ markedly from the national aggregate.

These considerations suggest that it would sometimes be wise, as an insurance against lack of comparability, to restrict interstate mortality comparisons to groups of States whose physicians exhibit some minimum degree of measured resemblance in respect to their medical schools of origin. In this paper, we suggest several such groups, which we propose to call "comparability areas," by analogy with the registration areas devised by the Bureau of the Census (7), which are still used for some purposes by the National Center for Health Statistics. These comparability areas parallel the registration areas in that: (a) comparisons within one such area are expected to have greater validity, on the average, than comparisons involving jurisdictions outside the areas; and (b) with the passage of time and without any change in the conditions for admission, these areas may be expected to include progressively more States. There is, however, an important distinction. Admission of a State to the registration areas betokens the attainment of some standard of completeness not yet reached by States outside the area. No such connotation, however, is in-

involved in the admission of any State to, or its exclusion from, a comparability area; no judgment of the "quality" of diagnosis is at any time intended or implied. We do not claim to have devised even a partial solution to the vexing problem of comparability in epidemiologic studies, but we hope that our proposal will stimulate further discussion and study.

### Calculation of Comparability Index

Although a particular State may legitimately be said to have a high or low average level of comparability, no single axis exists along which States could be ranged in the order of some supposed characteristic of general comparability. Rather, interstate comparability is a property of particular pairs of States, and any measure of it will, in the first instance, have to be calculated separately for every possible pair. Such a measure is conveniently expressed in the form of an index taking values between zero and unity; a value of zero would mean that no medical school is represented in both States; a value of unity would mean that the two States contain an identical "mix" of medical graduates. Between these extremes the comparability index previously suggested elsewhere (4) is defined as

$$C_{12} = \sum (P_{i1} P_{i2}) / \sqrt{(\sum P_{i1}^2)(\sum P_{i2}^2)},$$

in which the subscripts 1 and 2 distinguish the States to be compared and  $P_i$  is the proportion of physicians in either State who have graduated from the  $i$ th medical school. Either term in the denominator tends to be small (and the index value large) when the quantities  $P_i$  are all of similar magnitude, as they are, for example, in California but not in Indiana. The index also tends to be large when the larger values of  $P_{i1}$  in the numerator coincide with the larger values of  $P_{i2}$  (as when Virginia and West Virginia are taken together).

It seems likely that there are varying degrees of resemblance and contrast between particular medical schools. However, for lack of any usable information on this point, we have been obliged in our formulation to treat each school as unique. Consequently a low value of  $C$  for a pair of States means only that spurious mortality differences could be important, not that they

are positively to be expected. On the other hand, a high value of  $C$  does mean that interstate comparison is unlikely to be affected by bias of the type under consideration.

All the figures used for the calculations reported in our paper have been derived from tables in the Health Manpower Source Book No. 11, Medical School Alumni (6). These tables show, by State of residence, the number of graduates from each of 78 individual, currently active medical schools; graduates of these 78 schools accounted for 87.2 percent of the physicians located in mid-1959 in the United

States, its territories, or on temporary foreign assignment. We were obliged to treat all those who graduated in Canada (2.3 percent) as coming from a single school, likewise those from foreign countries (6.3 percent), those from "extinct" schools (4.4 percent), and those whose school of origin was not ascertained (0.1 percent). Figures were available and used for residents of each of the 50 States, the District of Columbia, Puerto Rico, and the U.S. Territories, but we did not use the figures for Federal physicians. Thus the data for our calculation occupied a table of 82 rows (corresponding to

**Membership of complete comparability areas with average internal comparability value of 0.5**

State	Area number													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Alaska.....	X	X	X	X	X	X	X	X	X					
Arizona.....	X	X	X	X	X	X	X	X	X	X				
California.....	X	X	X	X	X	X	X	X	X	X				
Florida.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Hawaii.....	X	X	X	X	X	X	X	X	X	X				
Idaho.....	X	X	X	X	X	X	X	X	X					
Illinois.....	X	X	X	X	X	X	X	X						
Montana.....	X	X	X	X	X	X	X	X	X					
Nevada.....	X	X	X	X	X	X	X	X	X	X				
New Jersey.....	X	X	X	X	X	X	X	X	X	X				
New Mexico.....	X	X	X	X	X	X	X	X	X	X	X	X		
North Dakota.....	X	X	X	X	X	X	X	X	X					
South Dakota.....	X	X	X	X	X	X	X	X	X					
Utah.....	X	X	X	X	X	X	X							
Washington.....	X	X	X	X	X	X	X	X	X					
Wyoming.....	X	X	X	X	X	X	X	X	X					
Puerto Rico.....	X	X	X		X	X				X				
U. S. Territories.....	X	X	X	X	X	X	X	X		X				
Colorado.....	X													
Minnesota.....		X												
Missouri.....			X											
Nebraska.....				X										
New York.....					X					X				
Oregon.....						X								
Texas.....							X						X	
Connecticut.....										X				
Delaware.....								X	X					
Maine.....										X				
Massachusetts.....										X				
New Hampshire.....										X				
North Carolina.....									X				X	
Pennsylvania.....								X	X					
Rhode Island.....										X				
Alabama.....											X	X		
Georgia.....														X
Louisiana.....											X	X		
Mississippi.....											X	X		
Tennessee.....											X			
Virginia.....												X		
West Virginia.....												X		

the physicians' schools of origin) and 53 columns (corresponding to their current residence). The output obtained from the computer consisted of a 53 by 53 symmetric matrix of comparability values.

The highest value of  $C$  was 0.9058, for the comparison of Maine with Massachusetts; the lowest was 0.0086 for Nebraska with South Carolina. All four States with the highest average values of  $C$  (unweighted arithmetic means) were all without any medical school of their own (Arizona, Hawaii, New Mexico, and Nevada) while the fifth (Florida) was also well known as a heavy net importer of physicians from all over the country. At the other extreme, the lowest average values of  $C$  were those for South Carolina, Vermont, Arkansas, Georgia, and Indiana. As already mentioned, four of these States received more than 50 percent of their physicians from a single source; two medical schools in Georgia had graduated 60 percent of the State's complement of physicians.

#### Membership of Comparability Areas

A knowledge of the individual values of  $C$  could be directly useful in the planning of a study when the investigator wishes either (a) to identify States acceptable for comparison with a particular State in which he is interested (if he were, for example, a public health official in that State) or (b) to select groups of States whose mortality statistics may safely be used together in testing some hypothesis, for example, as representatives of mainly agricultural versus industrial populations or of seaboard versus inland regions. However, most geographic studies of mortality are frankly exploratory, seeking to generate rather than to test hypotheses, so that the investigator has no prior interest in comparisons involving particular States. In such a situation, it is desirable to base the study as broadly as possible, but to avoid including regions too disparate in nosology, diagnostic practice, or medical vocabulary. These opposing requirements may best be reconciled in a complete comparability area, which we define as follows:

A comparability area comprises a number of States so selected that the average value of the comparability index for all interstate comparisons within the area exceeds some chosen level; such an area will be

called complete if no further State can be introduced without depressing the average internal comparability below the chosen level.

It should be noted that this definition refers only to comparisons between entire States: smaller subdivisions of these areas, such as counties, are likely to have much lower levels of comparability with one another.

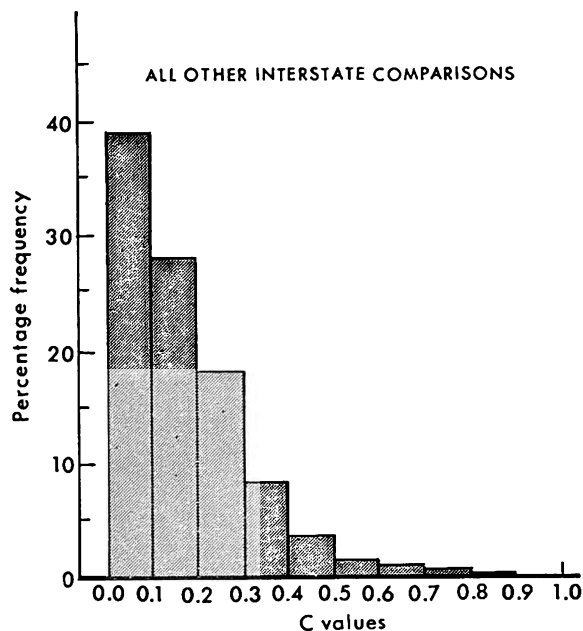
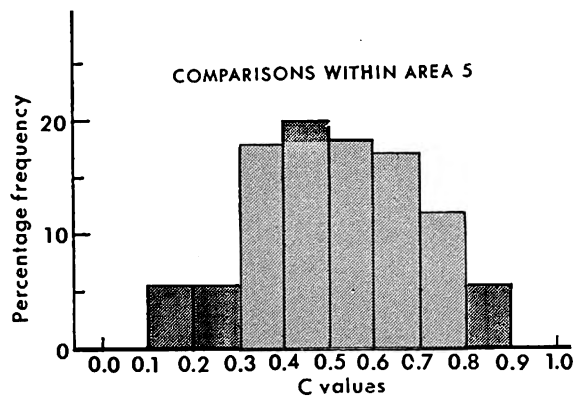
A routine for selecting the members of a complete comparability area which has proved amenable to computer treatment is as follows:

1. Select any pair of States for which  $C$  exceeds the chosen level.
2. Find the third State in such a way that the average of the three values of  $C$  linking members of the first pair to the third State and to one another is as high as possible.
3. Test whether this average value of  $C$  exceeds the chosen level and, if it does, find a fourth State in such a way that the six relevant values of  $C$  will have as large an average as possible.
4. Repeat the test and, if necessary, continue in the same way to recruit a fifth, sixth,  $n$ th . . . member until the average value of  $C$  does fall below the chosen level.
5. The  $n$ th State is then disqualified, and the preceding ( $n-1$ ) are held to constitute a complete comparability area.
6. Select a new starting point and repeat steps 2 to 5.
7. Repeat steps 1 to 6 until all possible starting points have been exhausted.

We have followed this routine, using a chosen level of 0.5 for the average value of  $C$  within comparability areas. Some areas with identical membership were reached by different routes (that is, with members recruited in a different sequence). After elimination of such duplications, 14 distinguishable areas remained, ranging in size from two to 19 States (see table). Areas 1 through 7, consisting of 18 or 19 members each, have a common core of 17 members. Only three of these core members (Florida, Illinois, and New Jersey) and only two of the alternate members (Puerto Rico and New York) lie wholly east of the Mississippi River. Presumably this over-representation of western States in the main comparability areas reflects the mingling together in the West of many streams of migrants, including physicians, who



**Frequency distribution of a measure of comparability between States, based on the mix of medical graduates in each State**



have come from older and more separated communities in the East. Areas 8, 9, and 10 also contain many western States from the core membership of areas 1 to 7, but with the addition of some representation from the north-eastern seaboard. In particular, area 10 contains five of the six New England States together with New York. Areas 11 to 14 are smaller groups with some representation of the Southeast. Thirteen States do not appear in the table because they did not qualify for membership in any comparability area at the chosen level of 0.5.

The figure shows the frequency distribution of

$C$  for 171 comparisons internal to area 5 and the very different distribution for the balance of all other interstate comparisons. These data give the impression that a mortality study extending over about one-third of the States, if suitably chosen, will be much safer than one in which States are compared indiscriminately. Of course, this safety has to be bought at a price. Deciding to use strictly defined comparability areas would in some ways be like adopting a more stringent criterion of statistical significance; in each instance the object would be to reduce the risk of what statisticians call type 1 error (8). In the present context, the type 1 error is one that is made when we give credence to a spurious difference in mortality rates. The price to be paid for a reduction of this risk is some increase in the risk of type 2 errors—those errors made when we fail to detect a genuine difference in mortality. States with the highest degree of mutual comparability, as here defined, also tend to be similar in respect to various factors influencing disease risk. Hence the safest comparisons are not necessarily the most fruitful. Even so, they can yield results of interest. Thus, the most highly comparable pair of States (Maine and Massachusetts) can readily be shown to differ significantly. For example, age-specific comparisons restricted to white males show that the proportion of deaths in Massachusetts attributed to cirrhosis of the liver is about double the corresponding proportion in Maine (9).

### Discussion

Concern over the effects on mortality statistics of variations in diagnostic fashion inclines some persons to discount all such data as valueless. This judgment, however, seems to us to be overly fastidious. At the other extreme, there may be some persons who believe that problems of comparability become serious only at the level of international comparisons. In support of the latter view, one could point to the likelihood that many of the differences between individual physicians will be canceled out in the statistics for any moderately large population and could also note that evidence of bias arising from differences between groups of physicians is largely anecdotal. Even if such bias were an important factor, it could only be brought to

light by extensive cross-tabulation of the causes of death against the characteristics of the physicians signing the death certificates. If this cross-tabulation were ever to be undertaken on a large scale, the results would still be difficult to interpret because the characteristics of the physicians might well be confounded with the real differences in the proportions of patients dying from particular causes. In other words, the uneven distribution by region and by type of practice of physicians from different backgrounds of training and experience has a double consequence. First, it makes the nature and amount of diagnostic variation difficult to measure. Second, it makes the statistical effects of any such variation more serious for epidemiologic studies than they would otherwise be.

We have attempted to set up a rationally based position somewhere between the extremes mentioned. In order not to waste expensively acquired data and at the same time not to run unnecessary risks of being misled, we propose, in effect, to grade the data and distinguish those parts which may be misleading from those which deserve greater credence. This grading is not an attempt to rate diagnostic performance on some scale of merit or to adjudicate between differing usages in disease nomenclature. What are graded are the actual building blocks of a statistical mortality study—the comparisons between pairs of rates.

Other proposals for reducing the risk of mistaken inference from mortality statistics have generally been concerned with the reliability of individual rates, or even with the reliability of the individual death certificates contributing to these rates. A number of authors have pointed out that diagnosis tends to be more clear-cut in young patients than in the elderly. Moreover, according to one view (10), it may be prudent not to use data on causes of death of persons beyond the age of 65 (a procedure which would exclude 60 percent or more of all deaths). Another approach is to restrict attention to rates based on rather broad cause-of-death categories, so that differences in allocation will occur mainly within, rather than between, categories (11). In the method we propose there need be no ban on the study of elderly groups nor on the use of fairly fine diagnostic categories.

The procedure we have outlined could be

varied in a number of ways. The chosen level of  $C$  could be set lower so as to obtain larger comparability areas, but at some cost to the validity of the results expected. This variation could be achieved with the same source material and the same computer programs that we have already used. Also with the same material, but with some modification of the program, comparability areas could be constituted so that all internal comparisons, not just their average, would have a  $C$  value above the chosen level. Again with material from the same source (6), but data not used here, differences in physicians' ages could be taken into account, possibly by treating fellow alumni of a medical school as coming from different schools unless they graduated in the same decade. Finally, as H. I. Sauer, supervisory statistician, Heart Disease Control Branch, Public Health Service, suggested in a personal communication to us in 1968, "the hospital in which a physician serves as intern may influence his vocabulary in certifying cause of death even more than does his medical school." It would, of course, be easy to substitute a classification by internships for the classification by undergraduate schools used here—provided that the basic information were available.

### Summary

After becoming qualified at a particular medical school, physicians do not disperse uniformly all over the United States but tend to take up practice in circumscribed regions. Because of variations in diagnostic preferences and in the medical vocabulary among medical schools, and consequently among their graduates, these geographic patterns of physician settlement can give rise to spurious differences between States in statistics on causes of death. An index is therefore proposed for measuring the degree of comparability between any pair of States, together with a method for building up "comparability areas" in which interstate comparisons will have some assurance of validity. Fourteen comparability areas are proposed, based on the known geographic distributions of medical school alumni in 1959. All but 13 States have a place in one or more of these areas.

## REFERENCES

- (1) Anderson, D. O.: Geographic variations in deaths due to emphysema and bronchitis in Canada. *Canad Med Assoc J* 98: 231-241 (1968).
- (2) World Health Organization: Manual of the international statistical classification of diseases, injuries, and causes of death. Revision 7. Geneva, 1957.
- (3) Anderson, D. O.: Observations on the classification and distribution of pulmonary emphysema in Canada. *Canad Med Assoc J* 89: 709-716 (1963).
- (4) Hewitt, D.: Mortality from cardiovascular-renal diseases in Ontario and elsewhere. 1. Descriptive. 2. Analytic. *J Chronic Dis* 21: 323-340 (1968).
- (5) Feasby, W. R., editor: Tenth annual Canadian medical directory. Secombe House, Toronto, 1964.
- (6) Stewart, W. H., and Pennell, M. Y.: Health manpower source book. Medical school alumni. PHS publication No. 263, sec. 11. U.S. Government Printing Office, Washington, D.C., 1961.
- (7) Linder, F. E., and Grove, R. D.: Vital statistics rates in the United States 1900-1940. U.S. Government Printing Office, Washington, D.C., 1943, pp. 95-100.
- (8) Hoel, P. G.: Introduction to mathematical statistics. Ed. 3. John Wiley & Sons, Inc., New York, 1962.
- (9) National Office of Vital Statistics: Vital statistics of the United States for the years 1961-1965. U.S. Government Printing Office, Washington, D.C., 1963-1967.
- (10) Sigurjonsson, J.: Index rates for comparing the importance of arteriosclerotic and degenerative heart diseases as a cause of death. *Amer J Med Sci* 250: 395-401 (1965).
- (11) Reid, D. D., and Rose, G. A.: Assessing the comparability of mortality statistics. *Brit Med J* No. 5422: 1437-1439, Dec. 5, 1964.

## Tearsheet Requests

Dr. David Hewitt, Department of Epidemiology and Biometrics, School of Hygiene, University of Toronto, Toronto 5, Canada

## Public Health Service Staff Appointment

**Dr. Raymond T. Moore** has been appointed associate commissioner of the Environmental Control Administration, an element of the Consumer Protection and Environmental Health Service of the Public Health Service.

Dr. Moore was acting director of the Bureau of Radiological Health since 1968 and deputy director of the radiological health program since January 1967.

Dr. Moore practiced general medicine in Sequin, Tex., from 1949 to 1958. He has had broad experience in occupational health, industrial medicine, and radiological health. Following studies under an Atomic Energy Commission fellowship in industrial medicine at the University of Rochester, Rochester, N.Y., he joined the Public Health Service as a commissioned officer.

His early assignments in the Service included studying the effects of low-level radiation on radiation workers, lecturing on occupational health at the University of Pittsburgh, and advising on medical aspects of radioactive fallout.

Between 1963 and 1967 Dr. Moore served as medical officer at the Nevada Test Site, project officer for two research grants in medical diagnostic radiology, national coordinator for the Medical Liaison Officers Network, and program director in radiological health for Public Health Service Region VII in Dallas, Tex. He also represented the Public Health Service in planning and implementing the health program for the NS *Savannah*.

Dr. Moore was born and educated in Arkansas. He received his B.S. degree from Arkansas State Teachers College at Conway in 1939 and his M.D. from the University of Arkansas in 1944. He served his internship at the Baptist Memorial Hospital in San Antonio, Tex., in 1945. Dr. Moore also received a master of industrial science degree from the University of Rochester in 1959. He is a member of the American Academy of Occupational Medicine, the American Medical Association, the American Public Health Association, and the Industrial Medical Association.

# Undergraduate Program for Training Health Planners and Administrators

MARSHALL W. RAFFEL, Ph.D.

**A**N ENORMOUS need exists for health planners, health administrators, and health service evaluators. Health agencies and universities across the land are handicapped by having too few personnel that are academically trained in these fields. The demand shows no signs of tapering off; indeed, there are indications of increased demands due to legislative and executive recognition of the need for expanded and new programs and for better yardsticks in allocating resources.

Widespread adoption of the planning-programming-budgeting (P-P-B) system is likely to increase the demand for planners and evaluators. P-P-B has to date focused largely on budgeting, but increased attention to planning will come about. Planning is a continuous process and must address itself to some purpose—to the development of programs to achieve certain goals or objectives. Implicit in planning is evaluation; evaluation of direction and achievement is inevitable.

A further indication of the demand for plan-

ners and evaluators comes from a developing Federal trend toward authorizing the administrative reservation of 0.5 to 1.0 percent of grant funds for purposes of evaluation. Authority for fund reservations has already been given for formula and project grants under sections 314 (d) and (e) of the Public Health Service Act, and for child health programs, Regional Medical Programs, Community Mental Health Centers, and other programs. Health programmers have nearly always expressed an interest in evaluation and have outlined how they proposed to evaluate their services. But to a large extent evaluation has been focused not on whether services have maintained or improved the health of the consumer but rather on whether the planned services were actually generated and were of the quality desired.

The need to deviate from measurement of activity and focus on measurement of impact is implied by authorized fund reservations and by those who have been most closely concerned with the administrative policies relating to them. It is clear that because of the enormous social problems faced by society, future allocations of resources for health systems will depend largely on ability to generate good data on program effectiveness; specifically, in terms such as lives to be saved, disease to be prevented, and disability to be reduced.

Increased demand for planners and evaluators also comes from the proliferation of comprehensive health planning agencies generated

---

*Dr. Raffel is professor of health planning and director, division of biological health, College of Human Development, Pennsylvania State University, University Park. This paper is an extension of remarks before the medical care teaching session sponsored by the joint committee on medical care education of the American Public Health Association at the 96th annual meeting in Detroit, Mich., November 11, 1968.*

by sections 314 (a) and (b) of the Public Health Service Act. The enormity of health program planning needs is compounded by the widespread need for planners who are comprehensively trained. The shortage of trained administrators also is critical. We have only to note the unfilled positions in health agencies across the land and the subsequent inability of these agencies to administer desired programs.

Response to the pressing need for public health workers has usually been at the graduate level, where students have a mixed background, many from medicine and the basic medical sciences. Such training, while useful, often is not as appropriate as it might be for graduate study in health planning, administration, and evaluation. Basic solutions to many major health problems today are not clinical but rather economic and political. In any event, the need for people educated in these fields is so great that, no matter what the existing graduate programs are accomplishing, the number of graduates cannot possibly counterbalance the number of unfilled positions.

The logjam in meeting today's needs should not disillusion us. We should recognize and accept the fact that the solution to this manpower shortage will come only by persuading more students to opt for the health field. Undergraduate programs in health planning and administration can effectively educate people for these jobs without violating either the myth or the reality of a liberal education. A great number of students could thereby be channeled into the health field. Programs including appropriate health courses can offer a liberal education that is solidly founded on the basic biological and social sciences; in addition, they can offer undergraduate students four important opportunities:

1. To do good for people
2. To work in a pleasant professional environment
3. To be well paid
4. To be a generalist early in a career

#### **Outline of Training Program**

At Pennsylvania State University, the College of Human Development has such a program. This college focuses on the applied behavioral, social, and biological sciences. It

seeks to take knowledge about man and apply it to the service of man. While the program in health planning and administration is centered administratively in the college's division of biological health, all appropriate resources of the college and university are being used.

The program requires students to study intensively in two of four social or behavioral sciences: political science, economics, psychology, and sociology. The expected typical pairing is (a) political science and sociology or psychology and (b) political science and economics. For example, students may take various courses in political science and carry on through pressure groups and local government. In economics, the student can progress through State and local taxation and through advanced public finance. Students following this path probably will take at least two or three courses in sociology and psychology. The work in the basic behavioral and social sciences, however, will be supplemented by at least 15 credits in applied behavioral and social science studies from courses offered by other divisions of the College of Human Development. Typical courses might include the following:

*Division of community development.* Dimensions of Community Development and Social Change, Planning and Evaluating Human Service Programs, and Socioeconomic Change and the Process of Dislocation.

*Division of man-environment relations.* Computer Technology for Human Services Programming, and Environmental Programming.

*Division of individual and family studies.* Functional and Dysfunctional Variations in Individual Development, Problems in the Analysis of Individual Development, and Conceptions in Development.

Our concern with the behavioral and social sciences and their application does not suggest that we ignore the biological sciences on which health services also depend. Students normally will take courses in physiology, epidemiology, and nutrition, and one in the clinical practice of medicine. The clinical course will be taught largely by physicians on the college staff and from other units of the university. We believe that the health planner and administrator should know a good deal about man's growth, development, and health.

While the scientific bases including the biological sciences, political science, economics, psychology, and sociology in their theoretical and applied aspects are our foundation stones, the students' major will be in health planning and administration. Courses in the major include medical or health care organization, public health administration, principles of health planning, health services evaluation, health economics, policy issues for health planning, and health planning methods including special applications, biostatistics, operations research, and health systems engineering.

The courses are structured for meaningful integration of the health studies materials with the knowledge acquired from earlier and concurrent studies in the basic disciplines. Additional courses will be developed, particularly those on administrative behavior and principles. While most instruction will be carried out at the main campus of the university, some courses will be offered at several of the university's Commonwealth campuses.

Although the number of majors cannot be

projected with certainty, we anticipate that within 5 years the number will range from 40 to 70 graduates per year. This assumption is reasonable for any new baccalaureate program at this university. In addition, we expect the program offerings to be used by students in the basic social science fields, particularly economics, political science, and sociology, and by students in other divisions of the college, which should facilitate their meaningful interaction with health professionals in later work environments.

Students are free to select from a wide range of courses in many departments of the university and can achieve maximum flexibility in program design. Some students might decide to study economics or political science intensively; some might elect to do less work in economics and more in sociology; others might emphasize the statistical phases of health work. The accompanying program illustrates what one student's study plan might be. The program covers three terms a year—unless the student elects to attend summer classes.

## Major in Biological Health

### Option in Health Planning and Administration (130 credits)

First term		10 credits	Introductory macroeconomic analysis and policy		3	Ninth term		12 credits
Composition and rhetoric	-----	3	Introduction to clinical medicine	-----	3	Epidemiology	-----	3
Introductory chemistry	-----	3	Political behavior	-----	3	Advanced public finance	-----	3
Government and politics in modern society	-----	3	Sixth term	10 credits		Principles of health planning	-----	3
Physical education	-----	1	Introduction to medical care organization	-----	3	Socioeconomic change and the process of dislocation	-----	3
Second term		10 credits	Maternal and child health	-----	3	Tenth term		12 credits
The writing of ideas	-----	3	Public finance	-----	3	Methodology of sociology	-----	3
Life science	-----	3	Physical education	-----	1	Health planning methods	-----	3
American national government	-----	3	Seventh term	12 credits		Conceptions in development	-----	3
Introduction to human development	-----	1	State and local taxation	-----	3	Operations research and human systems engineering	-----	3
Third term		10 credits	American local government and administration	-----	3	Eleventh term		10 credits
Effective speech	-----	3	Principles of public health administration	-----	3	Field projects	-----	4
Psychology	-----	3	Man and moral value	-----	3	Planning and evaluating human service programs	-----	3
Physical education	-----	1	Eighth term	12 credits		Health planning methods, special applications	-----	3
Fourth term		10 credits	Bureaucracy and public policy	-----	3	Twelfth term		10 credits
Nutrition of the family	-----	3	Dimensions of community development and social change	-----	3	Health services evaluation	-----	3
Government and politics of the American States	-----	3	Social and political philosophy	-----	3	Field projects	-----	2
Introductory microeconomic analysis and policy	-----	3	Statistics	-----	3	Computer technology for human services programming	-----	3
Physical education	-----	1				Policy issues for health planning	-----	2
Fifth term		12 credits						
Introductory sociology	-----	3						

Concurrently with these courses, the faculty and advanced undergraduates will attempt to refine the definitions and objectives of the courses, making certain that they are relevant to the tasks that will confront the graduates in work situations. The program will entail field-work and the study of agencies and ongoing health planning programs. The results of this research will contribute to the improvement of the Pennsylvania State University program and should help in structuring graduate programs at other universities. The information could lead to accurate job descriptions for health planners, health administrators, and health service evaluators.

The undergraduate program, as stated, will not be confined to the classroom. For effective application of the social sciences, we advocate field experience and student participation in research. All students will be required to take at least six credits in field projects, participating in a meaningful work or research exercise in health planning or evaluation.

*Health agency experience.* Students will be encouraged to work in a health agency on a faculty-approved project. For example, each term we plan to place a number of students in community-setting positions that will give them meaningful work experiences. The college will program this work for the students and approve in advance the appropriateness of the tasks. During the term, a faculty member will conduct a series of colloquia for the students in the community locale to discuss with them the significance of their experience. A number of Federal, State, and local agencies already have indicated a desire to cooperate in this effort.

*University research project.* The university expects to carry out a number of research projects on comprehensive community planning and health system design studies, from which both undergraduate and graduate students can learn and to which they can contribute.

Graduates from this program will find satisfying employment and many growth opportunities in health and health-related agencies at all levels of government, in regional and community agencies, in hospitals, and in the supporting industries. Students who wish to go on to graduate study will be qualified to enter nearly any graduate school of public health. Alternatively,

they could attend the College of Human Development's graduate program in Social Systems Planning, Administration, and Evaluation.

### Undergraduate vs. Graduate Education

A number of undergraduate programs are being developed throughout the country in health administration. Some are of limited scope; nearly all are geared to middle management. The Pennsylvania State University program bypasses day-to-day administrative management to encompass, instead, planning and policy administration. Its curriculum is designed for top management skills. We do not expect that new graduates with bachelor of science degrees only will "take over" large institutions, but rather that they will have the "turn of mind" and some of the basic skills and understanding necessary to move up a career ladder.

Naturally, I do not want to suggest that graduate education is no longer desirable or necessary. Graduate education is invaluable, particularly if the student has a solid base on which to build. This university is providing such a base. Consider what can be done with a graduate student whose undergraduate preparation took him through State and local government, pressure groups, political sociology, taxation and fiscal policy, advanced public finance, and statistics. This substantive work, normally taught undergraduates, is extremely appropriate for health planning and administration. If these studies are applied in health planning and administration courses, then a graduate school has something solid on which to build and students channeled to it. If on the other hand the student elects to terminate his formal education with the B.S. degree, he is, by virtue of his training, prepared to embark on a useful career in the health field.

Some people have questioned the appropriateness of teaching graduate school courses to undergraduates. We at the university believe that tradition should not shackle a curriculum. Students today are better prepared, more sophisticated, and more mature than they were a decade or two ago. Whoever teaches undergraduates in health must take these facts into account. The sciences generally have done so.

College material is now being taught in high schools, and graduate school material is being taught to undergraduates.

### Short-Term Training and Research

With the undergraduate program established the faculty plans to fulfill the university's commitment to continuing education and short-term training. We believe that a publicly supported university has such an obligation. First, we propose to develop continuing education courses at several of the 20 Commonwealth campuses of the university located throughout the State. These campuses are the main centers of undergraduate study during the first 2 years of training and the locale for much continuing education. Second, the university plans to have a number of intensive short-term training workshops at selected Commonwealth campuses as well as at University Park, directed mainly at health agency personnel who want to improve their planning, administrative, and evaluating skills.

Research and teaching go hand in hand, and the college does not plan to divorce the two. Interdisciplinary and applied research are missions of the college, as is the involvement of both undergraduate and graduate students in all research projects. Research will be encouraged in the following main categories related to the instruction program:

1. *Planning.* The college is interested in identifying and testing planning techniques and, just as important, in developing criteria for assessing or evaluating the planning process. What techniques are useful in planning and for what purposes? How does one determine

whether a planner or planning agency or a planning process is effective? What criteria are appropriate for assessing planning effectiveness?

2. *Evaluation.* The college will work with health service agencies to identify impact measures; that is, measures indicating how the health of the consumer is maintained or improved. Current impact measures are not precise. The college believes that only through the identification and use of impact measures can the health system obtain a rational basis for allocating resources and for claiming additional resources.

3. *Health indexes and a common health index.* The generation of impact data on health services, while contributing to better decisions, will still create dilemmas between many competing categorical programs. How does one decide the ranking of an air pollution project, a kidney dialysis project, and a family planning project? The college is interested in pursuing the identification and testing of indexes common to all health services. The desirability of this search, despite methodological problems, is evident from the funding dilemmas posed by the recent Federal decategorization of funds under section 314(e) of the Public Health Service Act.

The undergraduate program is now operational. Experienced faculty has been recruited. The first courses were offered in the spring term of 1969, and a full range of courses is being offered in the 1969-70 academic year.

#### Tearsheet Requests

Dr. Marshall W. Raffel, College of Human Development, Pennsylvania State University, University Park, Pa. 16802



## A Comparative Study of the Pulmonary Mycoses of Canada and the United States

LIBERO AJELLO, Ph.D.

A COMPARATIVE study of the pulmonary mycoses of Canada and the United States shows a basic similarity in the types of diseases that occur in these two countries. Coccidioidomycosis is the only systemic mycotic disease that is present in one country (the United States) and not in the other. All the other mycoses are shared; however, there are significant national differences in their prevalence and incidence.

This paper describes, from an epidemiologic point of view, the pulmonary mycoses that prevail in these two northern countries. The diseases are discussed under two categories: endogenous and exogenous infections.

### Endogenous Pulmonary Mycoses

In the category of endogenous pulmonary mycoses are the mycoses caused by organisms that are not known to be free-living in nature but are normal components of the body's microflora. The two diseases caused by such organisms are actinomycosis and candidiasis.

*Actinomycosis.* Human actinomycosis is caused exclusively by *Actinomyces israelii*. Until recently this organism had been confused with *Actinomyces bovis*, the etiologic agent of

bovine actinomycosis, but these two closely related anaerobic actinomycetes have been proved to be separate and distinct species on the basis of their antigenic and biochemical properties (1, 2).

There are no acceptable records of the recovery of *A. israelii* from soil or any inanimate source. This actinomycete appears to be uniquely adapted to live as a commensal in the human oral cavity. It is assumed that early in life this highly specialized anaerobe is transferred from parent to child and becomes established in the infant's oral cavity. In a recent survey that used specific fluorescent antibody procedures for identification, 30 tonsils out of 116 (26 percent) obtained from routine tonsillectomies contained *A. israelii* (3).

Despite the high prevalence of *A. israelii* infestation among human beings, the number of active clinical cases of pulmonary actinomycosis that develop yearly is believed to be low. But since the mycoses are not notifiable diseases, we do not really know how many cases of pulmonary actinomycosis do occur. In recent years, few cases have been reported from Canada and the United States.

The circumstances that sever the apparently innocuous relationship between *A. israelii* and man are not known; however, aspirations of *A. israelii* cells and granules from the oral cavity as well as lowered host resistance may be two factors.

*Candidiasis.* The fungus *Candida albicans* is the most frequent cause of human primary and secondary candidiasis. This yeast is a well-known commensal of the human normal oral

---

*Dr. Ajello is chief of the Mycology Section, Laboratory Division, National Communicable Disease Center, Health Services and Mental Health Administration, Public Health Service, Atlanta, Ga. This paper was presented at the 16th Congreso Latinoamericano de Tuberculosis y Enfermedades del Aparato Respiratorio y 13o Congreso Nacional de Neumología y Cirugía de Tórax at Mexico, D. F., April 13-18, 1969.*

cavity, intestine, and vagina (4). *C. albicans* becomes established in our bodies at birth during passage through the birth canal. Rarely, infections may have an intrauterine origin (5, 6).

*C. albicans* is a notorious opportunistic fungus. The delicate relationship that keeps this fungus innocuous can be upset by many factors. The protracted administration of antibiotics, corticosteroids, or immunosuppressants as well as heavy doses of X-ray and cobalt irradiation so often interferes with defense mechanisms that candidiasis develops in the lungs and other organ systems. Debilitating bacterial and malignant diseases also permit *C. albicans* to become invasive and cause severe secondary infections. As a result, opportunistic infections caused by *C. albicans* have increased tremendously (7, 8), not only in Canada and the United States but throughout the world. Thus, in the differential diagnosis of pulmonary diseases, it is imperative that the possibility of primary or secondary infections caused by *C. albicans* be considered. An arbitrary decision that *C. albicans* is a contaminant of clinical materials, especially of blood, body fluids, and sputum from patients with bronchopulmonary diseases, could prove to be disastrously tragic for a patient.

Although many species of lower animals harbor *C. albicans*, they are not known to take part in the transmission of infection to man. *C. albicans* is occasionally isolated from inanimate sources in nature (9, 10), but this is not considered indicative of a saprophytic existence. Its presence in these substrata is best interpreted as a transitory one resulting from animal and human contamination.

### Exogenous Pulmonary Mycoses

All the diseases caused by aerobic actinomycetes and fungi that exist or are presumed to exist as saprophytes in nature are exogenous pulmonary mycoses. Most of the systemic mycoses fall into this category. The following discussion includes aspergillosis, blastomycosis, coccidioidomycosis, cryptococcosis, and histoplasmosis.

**Aspergillosis.** *Aspergillus fumigatus* is the predominant cause of aspergillosis within the United States and Canada. This fungus is widespread in nature where it exists as a saprophyte on a wide variety of nonliving substrata (9).

It is surprisingly abundant, especially in decomposing vegetation which yields visible clouds of spores when stirred (10).

Other species of aspergilli occasionally cause pulmonary infections. Members of the following groups have been incriminated: *Aspergillus flavus*, *Aspergillus nidulans*, *Aspergillus niger*, and *Aspergillus terreus* (9, 11). These fungi are also widely distributed in nature as saprophytes, where they are significant in the decomposition of organic matter. Some of the members of the groups mentioned possess latent abilities to grow in animals and cause disease.

*Aspergillus* spores are produced in such great numbers that they are frequently isolated from the air. Spore counts have varied from 600 per cubic meter in the open air to 2,300 per cubic meter in a hospital ward and an impressive 12 to 21 million per cubic meter in barns (9).

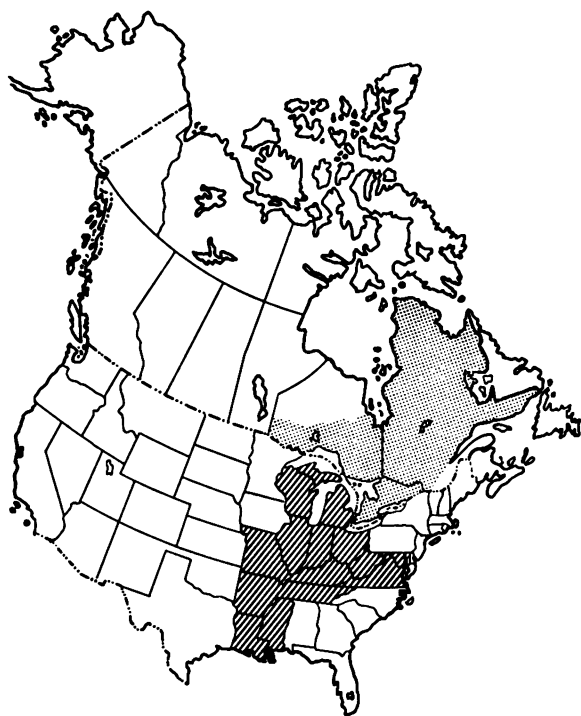
Aspergillosis occurs in man through the inhalation of spores. However, mere inhalation of spores even at high dosage levels does not generally result in infection. Predisposing factors that inactivate or reduce the efficacy of the host's defense mechanisms are needed before aspergillus spores germinate and begin to invade the tissues of the host.

Although aspergillosis is a common disease of lower animals, there is no reason to believe that they transmit it to man.

Data on the prevalence of aspergillosis in Canada and the United States are not available. However, the disease is not rare, and in this era of therapy with antibiotics, corticosteroids, and immunosuppressive drugs that alter resistance mechanisms, more and more cases of aspergillosis are being recorded (7, 12).

A word of caution is needed regarding the significance to be placed on the isolation of aspergilli from clinical materials. Isolation alone does not constitute *prima facie* evidence of infection. Many isolates merely represent inhaled spores that persisted in the mucous lining of the respiratory apparatus and were coughed up by the patient and cultured. Interpretation of the recovery of basically saprophytic fungi in a diagnostic situation must always be correlated with the clinical status of the patient and other laboratory findings.

**Blastomycosis.** Blastomycosis is caused by *Blastomyces dermatitidis*, a fungus long



**Figure 1. Blastomycosis endemic areas in Canada and the United States**

thought to be geographically restricted to North America. But a growing number of autochthonous cases of blastomycosis have been diagnosed in Africa (13). In addition, there is some tenuous evidence that the disease exists in Latin America (13). But the vast majority of cases have been reported from the United States and to a lesser extent from Canada.

The endemic areas in these two countries are essentially confined to their eastern portions (fig. 1). In Canada most cases have been reported from the Provinces of Ontario and Quebec (14). Eastward, only three cases have been noted—two in New Brunswick and one in Nova Scotia. To the west, Manitoba (eight cases) and Saskatchewan (one case) are the only other Provinces with recorded cases of blastomycosis.

Within the United States the endemic area centers in the States of Arkansas, Kentucky, Louisiana, Mississippi, North Carolina, and Tennessee (15, 16). Radially from these States the number of cases diminishes radically toward the northeast, southeast, and west. Appreciable numbers of cases have been re-

corded only in the States north of this region: Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, and Wisconsin.

Information on the endemic areas of blastomycosis depends on case records because of the present inadequacy of blastomycin, the skin-testing antigen. This crude preparation lacks specificity and potency and therefore cannot be used in determining and mapping sensitivity levels in the general population. We also remain ignorant of the possible existence of a benign subclinical form of blastomycosis.

The predominant victims of blastomycosis are 30- to 50-year-old men. The ratio of male-to-female cases is variously estimated to range from 6:1 to 15:1 (16, 17). There seem to be no differences in racial susceptibility (15), and the majority of cases have occurred in persons who work close to the soil.

Such observations, coupled with indications that blastomycosis is primarily a pulmonary disease acquired through the inhalation of airborne spores, lead to the belief that *B. dermatitidis* exists in nature as a saprophyte. In fact, isolations of *B. dermatitidis* from soils collected in Georgia and Kentucky have been reported (18, 19). However, these findings need to be duplicated and extended before the natural habitat of *B. dermatitidis* can be discovered and characterized. This statement is based on the puzzling nature of the positive soils and collection sites that yielded the fungus only once. Repeated culturings of a once "positive" specimen failed to yield the fungus again. Similarly, additional specimens from the original "positive" site always proved negative.

Blastomycosis in lower animals is frequent, and the dog appears to be the most susceptible. In the United States more than 180 cases in dogs have been reported (20, 21); the States with the highest prevalence were Arkansas, Illinois, Iowa, and Kentucky. Only three cases of blastomycosis in dogs have been reported from Canada.

Interestingly, the only other lower animal victims of *B. dermatitidis* have been a horse in Iowa (22) and a Steller's sea lion (*Eumetopias jubata*) held captive in an Illinois zoo (23).

Despite the high prevalence of canine blastomycosis, there is no evidence that the infection is transmitted to man. Nor is there reason to sus-

pect transference of the disease from one person to another.

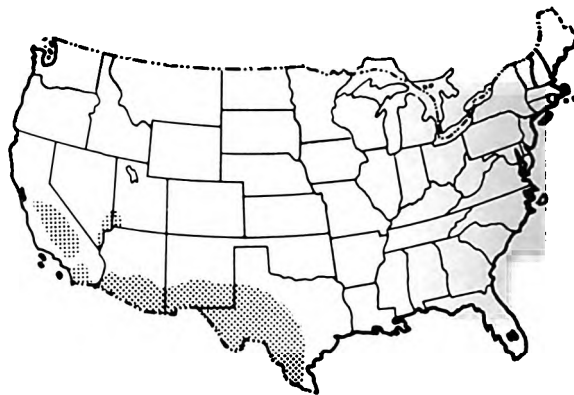
**Coccidioidomycosis.** Coccidioidomycosis is the one systemic mycotic disease present in the United States that is not native to Canada. The etiological agent *Coccidioides immitis* is a highly specialized soil organism found only in the semiarid regions of the United States and Latin America.

According to Maddy (24) the conditions to which *C. immitis* is superbly adapted are "an arid or semiarid climate, alkaline soil, relative freedom from severe frosts and a very hot dry season of several months, followed by some rain. July mean temperatures from 26°C. to about 32°C., January mean temperatures from 4°C. to about 12°C., and an annual rainfall of about 5 to 20 inches." Such conditions are found in suitable portions of Arizona, California, New Mexico, Nevada, Texas, and Utah (fig. 2). In these areas during the extended periods of extreme heat and aridity, *C. immitis* survives just below the uninhabitable hot surface of the soil or in rodent burrows. After the rainy season, it reinvades the surface where in a partially sterilized environment it sporulates heavily. Then, as the soil dries, winds pick up the highly infectious spores and disseminate them into the air.

The airborne spores are inhaled by people and lower animals and give rise to infections. The clinical spectrum of coccidioidomycosis ranges from a benign asymptomatic form to an acute pulmonary mycosis that may be self-limited or that disseminates and affects all vital organs.

An estimated 60 percent of all *C. immitis* infections are asymptomatic. Persons with this form of the disease do become sensitized to the antigens of *C. immitis* and thus their sensitivity can be detected by coccidioidin, the skin-test antigen. This antigen is invaluable for use in discovering and delimiting endemic areas and in determining levels of infection in the general population.

There is strong immunological evidence that infections by *C. immitis* not only induce hypersensitivity and the development of humoral antibodies but confer a certain degree of immunity to reinfection. This latter phenomenon has led to the development of experimental vaccines



**Figure 2. Coccidioidomycosis endemic areas in the United States**

against coccidioidomycosis (25). These hold high promise and, when perfected and fully evaluated, may be of great value in protecting high-risk groups. In the interim, preventive measures center around dust abatement programs including planting of grass and oiling of exposed ground areas.

Although a wide variety of domesticated and wild animals are infected by *C. immitis* (13), there is no evidence that coccidioidomycosis is transmitted from animals to man or from man to man. All infections are traceable to a common source—soil.

Several cases of coccidioidomycosis have been diagnosed in Canada (26–29). These cases, however, occurred in persons who had either traveled to or worked in the endemic areas of Mexico and the United States and became infected there (27–29) or had apparently come in contact with materials contaminated with *C. immitis* exported from the United States (26).

The Canadian cases illustrate the need for public health workers to be prepared to diagnose diseases that occur far from their points of origin.

**Cryptococcosis.** Cryptococcosis, unlike blastomycosis and coccidioidomycosis, is a cosmopolitan disease. Cases have been reported from all parts of the world. It is caused by the imperfect yeast *Cryptococcus neoformans*, which lives as a saprophyte in soil.

Ecological studies carried out by Emmons (30) first revealed a significant relationship between pigeons (*Columba livia*) and *C. neoformans*. This fungus was isolated from 63 of

111 (63 percent) pigeon nests. Subsequent surveys of pigeon and other bird nests and droppings, carried out by investigators throughout the world, have confirmed this association (13). The role of birds in the ecology and epidemiology of cryptococcosis is believed to be indirect, since spontaneous avian infections have yet to be diagnosed.

Staib (31, 32) has provided an apparently logical explanation for the affinity of *C. neoformans* to bird dung. His studies showed that bird manures serve as enrichment media for *C. neoformans* by virtue of their chemical makeup. Staib postulated that creatinine, one of the constituents of bird urine, can be assimilated by *C. neoformans* but not by other cryptococci and yeasts of other genera. Thus there is an apparent biochemical basis for the frequency of *C. neoformans* in avian habitats.

Striking concentrations of *C. neoformans* undoubtedly exist in our environment. Some pigeon manure studied by Emmons (10) contained 50 million viable cells of this yeast per gram of dried material. However, the prevalence of infections among the general population

is unknown. Lack of a specific and sensitive antigen precludes determination of sensitivity to *C. neoformans* in population groups. Educated guesses regarding the incidence of cryptococcosis in the United States range from 200 to 300 cases of cerebral meningitis per year for the country as a whole (33) to a rate of 5,000 to 15,000 cases of subclinical or clinical pulmonary cases in New York City alone (34). Deaths attributed to *C. neoformans* in the United States have averaged 72 per year during the 10-year period of 1957-66 for a total of 724 (35). Comparable data on Canada are not available. Based on the few cases reported, however, it appears that cryptococcosis may be a rare disease in Canada (36-41).

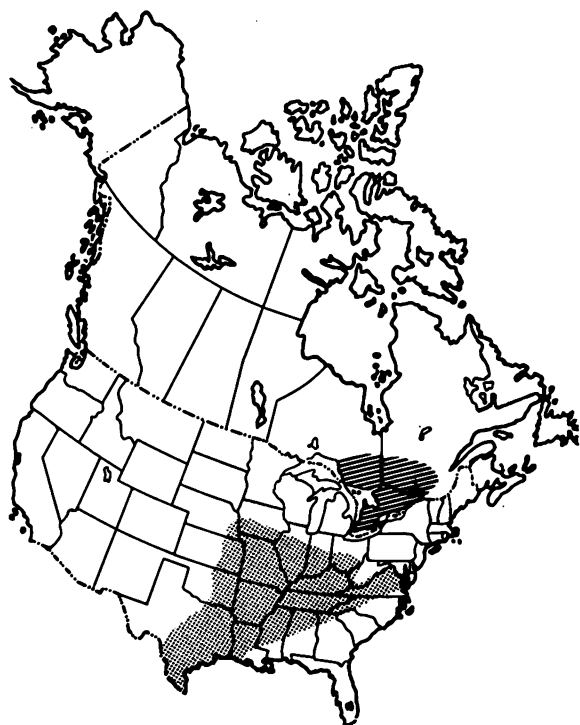
*C. neoformans* has been observed in a wide variety of mammals (13), but there is no evidence that animals are directly involved in the transmission of cryptococcosis to man. Cryptococcosis is an airborne disease with soil as the ultimate source of infection.

**Histoplasmosis.** In the United States and Canada histoplasmosis is undoubtedly the most prevalent of all the systemic mycoses caused by exogenous fungi. Based on extensive skin-test surveys, an estimated more than 30 million U.S. inhabitants have been infected by *Histoplasma capsulatum* (42). In some of the endemic areas, more than 90 percent of the residents have positive reactions to histoplasmin (43).

The high prevalence of infections in the United States is reflected in the number of fatalities attributed to histoplasmosis. An average of 75 deaths per year has been recorded over the 10-year period from 1957 to 1966, for a total of 746 (35).

Yearly, hundreds of patients with acute, disseminated, and chronic histoplasmosis require hospitalization. A search for histoplasmosis among patients in tuberculosis sanatoriums throughout the United States led to the conclusion that as many as 8,200 patients with serologic evidence of histoplasmosis are admitted to such institutions. One-fourth of these patients or 2,050 could be proved to have active cases of histoplasmosis by culture procedures (44).

Based on skin-test surveys and casefinding, it is known that the principal U.S. area in which histoplasmosis is endemic is located in the Mississippi-Ohio River valleys (fig. 3). This en-



**Figure 3. Histoplasmosis endemic areas in the United States and Canada**

compasses all or parts of Arkansas, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Mississippi, Missouri, Ohio, Oklahoma, Tennessee, and Texas. In these States the prevalence of histoplasmin sensitivity ranges from 40 to 90 percent (43). Beyond these States, sensitivity levels drop or may be virtually absent in the general population. But there may be foci of relatively high sensitivity levels in localized areas such as occur in Georgia (45), Iowa (46), Michigan (47), and New York (48).

In contrast to the United States, the incidence and prevalence of histoplasmosis in Canada is relatively low. As shown in table 1, histoplasmin surveys have revealed sensitivity levels ranging from 0 to 68 percent among selected regional groups (49, 50). The highest rates, however, with the exception of St. Thomas, occurred among persons who had traveled outside of Canada and may have become sensitized elsewhere. In Canada the Provinces of Ontario and Quebec seem to be the areas with the highest prevalence of autochthonous infection. This concentration is confirmed by the geographic distribution of the relatively few reported cases of acute and fatal Canadian histoplasmosis. All cases of this type, confirmed by histological or culture findings, originated in those two Provinces (50-66). The only lower animal case reported was in a dog in Ontario (67).

Ecological investigations have incontrovertibly established that *H. capsulatum* is a soil fungus that flourishes as a saprophyte in avian and chiropteran habitats. In the United States

**Table 2. U.S. species of bats infected by *Histoplasma capsulatum***

Bat species	Locality
<i>Eptesicus fuscus</i> (big brown bat)...	Indiana, Maryland, Tennessee.
<i>Leptonycteris sanborni</i> (long-nosed bat).	Arizona.
<i>Myotis austroriparius</i> (southeastern myotis).	Florida.
<i>Myotis grisescens</i> (gray myotis)...	Alabama, Tennessee, Virginia.
<i>Myotis lucifugus</i> (little brown bat).	Indiana, Montana.
<i>Myotis sodalis</i> (Indiana myotis)...	Tennessee.
<i>Nycticeius humeralis</i> (evening bat).	Mississippi.
<i>Tadarida cynocephala</i> (Florida free-tailed bat).	Alabama.
<i>Tadarida brasiliensis mexicana</i> (Mexican free-tailed bat).	Arizona, Texas.

SOURCE: reference 70.

and elsewhere, such studies have shown that this fungus is most frequently recovered from soils enriched with the excreta of bats and birds (13). It is believed that the chemical components of those soils give *H. capsulatum* a competitive advantage over other organisms. But climatic and other factors must also operate in the distribution and occurrence of this fungus in nature. *H. capsulatum* is not found in all bat and bird habitats. The ecological factors that essentially restrict it to specific habitats within certain regions are complex, and intensive studies will be required before they can be defined. As yet, there are no records of the recovery of *H. capsulatum* from Canadian soil.

The role of bats in the epidemiology of histo-

**Table 1. Prevalence of histoplasmin sensitivity in Canada**

Area surveyed	Study group	Number tested	Percent positive
Abitibi (east), Quebec.....	Indian population.....	161	5
Beloeil, Quebec.....	School children.....	75	27
Elgin County, Ontario.....	General population.....	3,364	29
Halifax, Nova Scotia.....	University students.....	310	1
Kingston, Ontario.....	do.....	( <sup>1</sup> )	20-30
Montreal, Quebec.....	Chest clinic patients.....	100	21
Newfoundland.....	General population.....	157	0
Saint Agathe des Monts, Quebec.....	Tuberculosis sanatorium patients.....	270	10
Saint Thomas, Ontario.....	Residents.....	230	68
Toronto, Ontario.....	University students without calcification.....	134	10
Do.....	do.....	63	57
Winnipeg, Manitoba.....	Hospital patients.....	440	5

<sup>1</sup> Not stated.

SOURCES: references 49 and 50.

plasmosis remains unknown. These flying mammals, in contrast to birds, are susceptible to histoplasmosis (68, 69). As shown in table 2, *H. capsulatum* has been isolated from nine species of bats in the United States (70). This has led to ill-founded speculation that bats are active in the epidemiology of histoplasmosis (71). There is no basis for statements such as "the bat is the source of the infective agent" or "it is reasonable to predict that an increase can be expected in the number of microfoci of *H. capsulatum* in nature and possibly in geographic areas in which the disease has not heretofore been found." *H. capsulatum* evolved long ago, and undoubtedly was present in the New World in suitable ecological habitats that were established and invaded in prehistoric times. The geographic distribution of *H. capsulatum* does not seem to be correlated with that of bats.

Bat surveys are useful in discovering new foci of infestation and in determining the prevalence of the fungus in a given area. Their value as an epidemiologic tool became evident when cave bats were collected and cultured for *H. capsulatum* in Florida and Arizona. Although both States have been considered outside the endemic areas of histoplasmosis, positive bats were found (69, 70, 72). It is evident that microhabitats suitable for *H. capsulatum* exist beyond the borders of the classic endemic areas.

Many genera and species of mammals besides bats are infected by *H. capsulatum* (13). But as with the other deep mycoses, there is no evidence of transmission of the disease to man.

Numerous outbreaks of acute pulmonary histoplasmosis with occasional fatalities among persons who inhaled airborne spores of *H. capsulatum* that arose from disturbed avian habitats have been recorded and have led to the development of control measures (47, 48, 73). Field trials with repeated applications of 3 percent formalin eliminated *H. capsulatum* from the surface of a naturally infected area (74); 233,000 gallons of formalin were applied to a 5-acre site at a cost of \$4,000. This amount of formalin approximated 1.7 inches of rainfall. During a 10-month followup, *H. capsulatum* was not isolated from the surface of the sterilized area.

Other methods have been tested and evalu-

ated (75, 76). One most economical yet effective control measure is the overlaying of an infested site with 6 to 8 inches of soil which is free of *H. capsulatum* (75). A combination of fungicides and soil overlays may prove to be the most effective procedure for eliminating the danger of infections in circumscribed sites.

## Conclusions

With the exception of coccidioidomycosis, Canada and the United States share the same pulmonary mycoses; however, there are significant differences in their incidence and prevalence.

Lack of suitable habitats for the survival and growth of *C. immitis* undoubtedly accounts for this organism's absence from Canada. Canada simply does not possess a climate that creates and maintains semiarid regions similar to those of the North American southwest in which *C. immitis* flourishes.

Climatic differences may also account for the disparity in the extent of *B. dermatitidis* and *H. capsulatum* infections in the two countries—a high infection rate in the United States and a relatively low infection rate in Canada. But the systemic mycoses do take a heavy toll of lives and have high morbidity rates; thereby, they constitute a serious public health problem. Knowledge of the epidemiology of these diseases, when applied judiciously for control purposes, will reduce their incidence.

## REFERENCES

- (1) Pine, L., Howell, A., and Watson, S. J.: Studies of the morphological, physiological, and biochemical characters of *Actinomyces bovis*. *J Gen Microbiol* 23: 403-424 (1960).
- (2) Georg, L. K., Robertstad, G. W., and Brinkman, S. A.: Identification of species of *Actinomyces*. *J Bact* 88: 477-490 (1964).
- (3) Blank, C. H., and Georg, L. K.: The use of fluorescent antibody methods for the detection and identification of *Actinomyces* species in clinical material. *J Lab Clin Med* 71: 233-293 (1968).
- (4) Kozinn, P. J., and Taschdjian, C. L.: *Candida albicans*: Saprophyte or pathogen? *JAMA* 198: 170-172 (1966).
- (5) Sonneschein, H., Taschdjian, C. L., and Clark, D. H.: Congenital cutaneous candidiasis. *Amer J Dis Child* 107: 260-266 (1964).
- (6) Rhatigan, R. M.: Congenital cutaneous candidiasis. *Amer J Dis Child* 116: 545-546 (1968).

- (7) Hutter, R., and Collins, V. P.: The occurrence of opportunistic fungus infections in a cancer hospital. *Lab Invest* 11: 1035-1045 (1962).
- (8) Hersh, E. M., Nies, B. A., and Freireich, E. J.: Causes of death in acute leukemia. *JAMA* 193: 105-109 (1965).
- (9) Raper, K. B., and Fennell, D. L.: The genus *Aspergillus*. Williams & Wilkins Co., Baltimore, 1965.
- (10) Emmons, C. W.: Natural occurrence of opportunistic fungi. *Lab Invest* 11: 1026-1032 (1962).
- (11) Pore, R. S., and Larsh, H. W.: Experimental pathology of *Aspergillus terreus-flavipes* group species. *Sabouraudia* 6: 89-93 (1968).
- (12) Landrigan, P. L., Wasty, G., and Nigam, S.: Pulmonary aspergillosis. Report of seven cases. *Canad Med Assoc J* 98: 642-645 (1968).
- (13) Ajello, L.: Comparative ecology of respiratory mycotic disease agents. *Bact Rev* 31: 6-24 (1967).
- (14) Grandbois, J.: La blastomycose Nord-Américaine au Canada. *Laval Med* 34: 714-731 (1963).
- (15) Chick, E. W., Peters, H. J., Denton, J. F., and Boring, W. D.: Die nordamerikanische Blastomycose. *Ergebn Allg Path* 40: 34-98 (1960).
- (16) Furcolow, M. L., et al.: Blastomycosis: An important medical problem in the central United States. *JAMA* 198: 529-532 (1966).
- (17) Busey, J. F.: Blastomycosis. I. A review of 198 collected cases in Veterans Administration hospitals. *Amer Rev Resp Dis* 89: 659-672 (1964).
- (18) Denton, J. F., McDonough, E. S., Ajello, L., and Ausherman, R. J.: Isolation of *Blastomyces dermatitidis* from soil. *Science* 133: 1126-1127 (1961).
- (19) Denton, J. F., and DiSalvo, A. F.: Isolation of *Blastomyces dermatitidis* from natural sites at Augusta, Georgia. *Amer J Trop Med* 13: 716-722 (1964).
- (20) Menges, R. W.: Blastomycosis in animals. *Vet Med* 55: 45-54 (1960).
- (21) Menges, R. W., et al.: Clinical and epidemiologic studies of seventy-nine canine blastomycosis cases in Arkansas. *Amer J Epidem* 81: 164-179 (1965).
- (22) Benbrook, E. A., Bryant, J. B., and Saunders, L. Z.: A case of blastomycosis in the horse. *J Amer Vet Med Assoc* 112: 475-478 (1948).
- (23) Williamson, W. M., Lombard, L. S., and Getty, R. E.: North American blastomycosis in a northern sea lion. *J Amer Vet Med Assoc* 135: 513-515 (1951).
- (24) Maddy, K. T.: Ecological factors possibly relating to the geographic distribution of *Coccidioides immitis*. In *Proceedings of Symposium on Coccidioidomycosis*. PHS Publication No. 575. U.S. Government Printing Office, Washington, D.C., 1957, pp. 144-157.
- (25) Kong, Y. M., and Levine, H. B.: Experimentally induced immunity in the mycoses. *Bact Rev* 31: 35-53 (1967).
- (26) McLetchie, N. G. B., Reid, N., and Simpson, D. M.: Coccidioidomycosis. *Canad Med Assoc J* 67: 655-658 (1952).
- (27) Bain, G. O., Carmichael, J. W., and Elliott, J. F.: Residual pulmonary coccidioidal granuloma. *Canad Med Assoc J* 75: 216-218 (1956).
- (28) Mankiewicz, E., Henderson, J. A. M., and Beland, J. E.: Pulmonary coccidioidomycosis. *Canad Med Assoc J* 99: 1003-1006 (1968).
- (29) Howes, J. M., Penny, S. F., and Chamberlain, G. E.: A solitary pulmonary lesion due to *Coccidioides immitis*. *Canad Med Assoc J* 90: 1007-1008 (1968).
- (30) Emmons, C. W.: Saprophytic sources of *Cryptococcus neoformans* associated with the pigeon (*Columba livia*). *Amer J Hyg* 62: 227-232 (1955).
- (31) Staib, F.: Vogelkot, ein Nahrsbstiat für die Gattung *Cryptococcus*. *Zbl Bakt [Naturwiss]* 186: 233-247 (1962).
- (32) Staib, F.: Kreatinin-Assimilation, ein neues Spezifikum für *Cryptococcus neoformans*. *Zbl Bakt [Naturwiss]* 186: 274-275 (1962).
- (33) Utz, J. P., quoted by W. Grigg: Deadly fungus found in several D.C. areas. *The Evening Star*, Washington, D.C., November 16, 1964.
- (34) Littman, M. L., and Schneierson, S. S.: *Cryptococcus neoformans* in pigeon excreta in New York City. *Amer J Hyg* 69: 49-59 (1959).
- (35) National Communicable Disease Center: Morbidity and mortality weekly report, annual supplement, summary 1967, vol. 16, No. 53. Atlanta, Ga., November 1968.
- (36) Ring, E. D., and William, T. H.: Torulosis. *Canad Med Assoc J* 67: 360-361 (1952).
- (37) Lauze, S.: Infection à torula chez un individu traité aux antibiotiques et à la cortisone. *Un Med Canada* 81: 935-940 (1952).
- (38) Holmes, S. J., and Hawks, G. H.: Torulosis of the central nervous system. *Canad Med Assoc J* 68: 143-146 (1953).
- (39) Eisen, D., Shapiro, I., and Fischer, J. B.: A case of cryptococcosis with involvement of lungs and spine. *Canad Med Assoc J* 72: 33-35 (1955).
- (40) Bakerspigel, A., Campsall, E. W. R., and Hession, B. L.: A case of cryptococcal meningitis in southwestern Ontario. *Canad Med Assoc J* 79: 998-1002 (1958).
- (41) Butas, C. A., and Lloyd-Smith, D. L.: Cryptococcal meningitis: Treatment with amphotericin B. *Canad Med Assoc J* 87: 588-591 (1962).
- (42) Furcolow, M. L.: Epidemiology of histoplasmosis. In *Histoplasmosis*, edited by H. C. Sweany. Charles C Thomas, Publisher, Springfield, Ill. 1960, pp. 113-148.
- (43) Manos, N. E., Ferebee, S. H., and Kerschbaum, W. F.: Geographic variation in the prevalence of histoplasmin sensitivity. *Dis Chest* 29: 649-668 (1956).



- (44) Furcolow, M. L., et al.: Serologic evidence of histoplasmosis in sanatoriums in the U.S. JAMA 180: 109-114 (1962).
- (45) Aronson, D. L., and Edwards, P. Q.: An urban focus of histoplasmin sensitivity. Amer Rev Tuberc 79: 83-86 (1959).
- (46) Tosh, F. E., et al.: The second of two epidemics of histoplasmosis resulting from work on the same starling roost. Amer Rev Resp Dis 94: 406-413 (1966).
- (47) Dodge, H. J., Ajello, L., and Engelke, O. K.: The association of a bird-roosting site with infection of school children by *Histoplasma capsulatum*. Amer J Public Health 55: 1203-1211 (1965).
- (48) Cronk, G. A.: Pulmonary calcification and histoplasmin sensitivity in New York State. New York State J Med 51: 1919-1924 (1951).
- (49) Haggard, R. A., Brown, E. L., and Toplack, N. J.: Histoplasmosis in southwestern Ontario. Canad Med Assoc J 77: 955-961 (1957).
- (50) Brown, E. L.: Histoplasmosis in southern Ontario: A further report. Canad Med Assoc J 87: 545-551 (1962).
- (51) Green, P.: Pulmonary calcification and histoplasmin sensitivity. Canad Med Assoc J 63: 143-146 (1950).
- (52) Jones, W. A.: The solitary pulmonary focus—carcinomatous or otherwise, with particular reference to histoplasmosis. J Canad Assoc Radiol 4: 15-19 (1953).
- (53) Mankiewicz, E., Blank, F., and Rubin, J. H.: Pulmonary histoplasmosis with cavitation. Canad Med Assoc J 71: 386-387 (1954).
- (54) Grant, W. G.: Histoplasmosis. Canad Med Assoc J 75: 1024-1027 (1956).
- (55) Karnauchow, P. N., and Marciniak, J. L.: Fatal disseminated histoplasmosis. Canad Med Assoc J 75: 929-931 (1956).
- (56) Methot, Y., Blank, F., and Masson, A. M.: Gingivitis caused by *Histoplasma capsulatum*. Canad Med Assoc J 79: 836-837 (1958).
- (57) Walker, W. J., and James, E. C.: Pulmonary histoplasmosis. Canad Med Assoc J 81: 486-488 (1959).
- (58) Blanchard, A. J., and Olin, J. S.: Histoplasmosis with sarcoidlike lesions occurring in multiple myeloma. Canad Med Assoc J 85: 307-311 (1961).
- (59) Haust, M. D., Wlodek, G. K., and Parker, J. O.: Histoplasmosis endocarditis. Amer J Med 32: 460-466 (1962).
- (60) Pugsley, H. E., Brown, A. S., and Cheung, O. T.: Chronic cavitary histoplasmosis of the lung. Canad Med Assoc J 88: 646-649 (1963).
- (61) Vost, A., and Moore, S.: Disseminated histoplasmosis in Quebec. Canad Med Assoc J 88: 571-574 (1963).
- (62) Cooperberg, A. A., and Schwartz, J.: The diagnosis of disseminated histoplasmosis from marrow aspiration. Ann Intern Med 61: 289-295 (1964).
- (63) Leznoff, A., et al.: Histoplasmosis in Montreal during the fall of 1963, with observations on erythema multiforme. Canad Med Assoc J 91: 1154-1160 (1964).
- (64) Lauze, S., and Fontaine, V.: Enquête morphologique sur l'histoplasmosse primaire dans la province de Quebec. Un Med Canada 93: 264-269 (1964).
- (65) Jean, A.: Un cas d'histoplasmosse généralisé. Un Med Canada 93: 953-954 (1964).
- (66) Telner, P., Leznoff, A., and Frank, H.: A relationship between erythema multiforme and histoplasmosis. J Invest Derm 45: 135-138 (1965).
- (67) Fish, N. A., Schroder, J. D., and Fischer, J. B.: A laboratory report on a case of canine histoplasmosis in Ontario. Canad Med Assoc J 74: 734-735 (1956).
- (68) Emmons, C. W.: Association of bats with histoplasmosis. Public Health Rep 73: 590-595, July 1958.
- (69) Tesh, R. B., and Schneidau, J. D.: Naturally occurring histoplasmosis among bat colonies in southeastern United States. Amer J Epidem 86: 545-551 (1967).
- (70) DiSalvo, A. F., Ajello, L., Palmer, J. W., and Winkler, W. G.: Isolation of *Histoplasma capsulatum* from Arizona bats. Amer J Epidem 89: 606-614 (1969).
- (71) Campbell, C. C.: The epidemiology of histoplasmosis. Ann Int Med 62: 1333-1336 (1965).
- (72) DiSalvo, A. F., et al.: Histoplasmosis in Florida. II. Bat and soil studies. Amer J Epidem. In press.
- (73) Lehan, P. H., and Furcolow, M. L.: Epidemic histoplasmosis. J Chronic Dis 5: 489-503 (1957).
- (74) Tosh, F. E., et al.: The use of formalin to kill *Histoplasma capsulatum* at an epidemic site. Amer J Epidem 85: 259-265 (1967).
- (75) Emmons, C. W., and Piggott, W. F.: Eradication of *Histoplasma capsulatum* from soil. Mycologia 55: 521-527 (1963).
- (76) Morehart, A. L., and Larsh, H. W.: Laboratory examination of organic fungicides against zoopathogenic fungi in soil. Appl Microbiol 15: 1248-1251 (1967).

#### Tearsheet Requests

Dr. Libero Ajello, National Communicable Disease Center, Atlanta, Ga. 30333

# Epidemiology of Stroke in a Rural Area

PHILIP T. ECKSTROM, M.D., M.S.P.H., FRANK R. BRAND, M.D.,  
STANLEY A. EDLAVITCH, M.S.P.H., M.A., and HENRY M. PARRISH, M.D., Dr. P.H.

THE IMPACT of stroke is difficult to evaluate. Mortality data are full of complicating considerations, and they provide few clues about the medical, social, and psychological problems encountered by persons who have stroke. An approximate figure for countries reporting mortality from stroke is one death for each 1,000 persons per year, and the mortality rate for the United States is not far from this average (1, 2).

Incidence, prevalence, and survivorship data will help to fill gaps in the knowledge of the epidemiology of stroke, and the data are necessary for planning service programs. The purpose of this paper is to add data related to the second year's experience with the Mid-Missouri Stroke Survey. Parrish and co-workers (3) reported on the incidence of stroke by age, sex, county, and race for the first year of the study, and Goldner and associates (4) reported on the prognosis for survival after stroke for the same period.

## Method

The Mid-Missouri Stroke Survey is a descriptive epidemiologic study which began July 1, 1963, and which attempts to gather information about all strokes occurring in a three-county area of central Missouri. This paper covers the period from July 1, 1964, to June 30, 1965, and the same categories of data reported on by Parrish and Goldner (3, 4).

Data were collected from multiple sources to minimize underreporting. Physicians were visited monthly during the entire 2-year period by a representative from the Division of Health

of Missouri. Hospitals in the area reported patients who signed out with diagnoses of cerebrovascular disease. Records of hospitals bordering the area were checked to find cases of cerebrovascular disease among persons residing in the study area but who were hospitalized outside of it. Death certificates registered at the Missouri Division of Health were checked for the entire 2-year study period and for a year following the study's completion. Study investigators reviewed charts to detect all hospitalized patients. Early in the survey nursing home records were surveyed, but this source was abandoned because the records generally were meager and because this kind of survey failed to uncover an appreciable number of definite cases which were not reported by physicians or hospitals or on death certificates.

Strokes were divided into major and minor categories on the basis of the patient's residual neurological deficit after 72 hours. The patient's physician made this decision, and the clinical records of hospitalized patients were reviewed by the study team. Generally, the physician's assessment coincided with that of the study team, but a few cases were deleted from the

---

*Dr. Eckstrom is in private practice in Menominee, Mich. Dr. Brand is chief of the Public Health Service's Ecology Field Station, Columbia, Mo., and Mr. Edlavitch is a statistician at the Service's Epidemiology Field Station, San Francisco, Calif. Dr. Parrish is professor of epidemiology, University of Missouri School of Medicine, Columbia. At the time of the study Dr. Eckstrom and Mr. Edlavitch were on the staff of the field station at Columbia.*

study because of the probability that their cerebral symptoms were caused by metastases. We felt that adequate etiological classification of the types of stroke could not be made because of differences in diagnostic procedures, case descriptions, and laboratory tests used by the various hospitals and private physicians.

## Incidence

A total of 189 patients with major strokes during the second year of the study were recorded. Of this total, 1 (0.5 percent) was age 25-44, 5 (2.6 percent) were age 45-54, 23 (12.2 percent) were age 55-64, 43 (22.8 percent) were age 65-74, and the remaining 117 (61.9 percent) were 75 or over. Table 1 gives the total number of strokes by age groups, race, and sex and table 2 the age-specific rates for the same groups. Populations were estimated by linear extrapolation using 1950 and 1960 census data as the base.

As expected, the increase in rate occurred with increasing age. The rates for white men and white women are approximately the same, with the rates for men being consistently a little higher.

The rates for nonwhite persons are consistently higher than those for white persons, and as in white persons, the rates for men are higher than those of women. Rates for nonwhite persons are based on smaller populations and fewer cases and are therefore more subject to random variability.

However, the racial differential is essentially the same as in the first year's data, which tend

**Table 1. Number of strokes recorded in Mid-Missouri Stroke Survey, July 1, 1964-June 30, 1965, by age, race, and sex**

Age (years)	White		Nonwhite		Total <sup>1</sup>
	Men	Women	Men	Women	
25-34-----	0	1	0	0	1
35-44-----	0	0	0	0	0
45-54-----	1	0	2	2	5
55-64-----	12	9	2	0	23
65-74-----	18	14	6	5	43
75-84-----	31	40	4	2	77
85 and over..	17	20	2	1	40
Total...	79	84	16	10	189

<sup>1</sup> 95 men, 94 women; 163 white patients, 26 non-white patients.

to support the hypothesis that there is a real difference. This difference is in the range of two-fold. Nichaman (5), in a study of mortality in Charleston, S.C., found a much greater difference in prevalence of stroke among white persons as compared with nonwhite persons.

Table 3 gives the age-adjusted rate by county, sex, and race, and the overall age-adjusted rate for the total population. Again, numbers in the

**Table 2. Age-specific rates per 1,000 for major stroke, by race and sex, Mid-Missouri Stroke Survey, July 1, 1964-June 30, 1965**

Race and age (years)	Number of strokes	Projected population	Rate per 1,000
<b>Males</b>			
White:			
25-34-----	0	4,424	0
35-44-----	0	3,779	0
45-54-----	1	3,824	.3
55-64-----	12	3,060	3.9
65-74-----	18	2,424	7.4
75-84-----	31	1,319	23.5
85 and over---	17	321	52.8
Nonwhite:			
25-34-----	0	330	0
35-44-----	0	230	0
45-54-----	2	195	10.3
55-64-----	2	265	7.5
65-74-----	5	216	27.7
75-84-----	2	131	30.5
85 and over---	1	25	83.3
<b>Females</b>			
White:			
25-34-----	1	3,761	.3
35-44-----	0	3,992	0
45-54-----	0	3,907	0
55-64-----	9	3,523	2.6
65-74-----	14	3,036	4.6
75-84-----	40	1,777	22.5
85 and over---	20	451	44.2
Nonwhite:			
25-34-----	0	293	0
35-44-----	0	258	0
45-54-----	2	269	7.5
55-64-----	0	273	0
65-74-----	5	259	19.4
75-84-----	2	136	14.6
85 and over---	1	21	47.6
<b>Both sexes</b>			
Both races:			
25-34-----	1	8,614	.1
35-44-----	0	8,281	0
45-54-----	5	8,192	.6
55-64-----	23	7,121	3.2
65-74-----	43	5,935	7.2
75-84-----	77	3,364	22.9
85 and over---	40	819	48.8

various subcategories are too small to test for significance, even when the numbers are combined with the first year's data.

## Survival

Turning to case fatality rate after stroke for white persons, in the first year Goldner and associates (4) found a 1-week mortality rate of 33 percent, a 1-month rate of 50 percent, and a 1-year rate of 67 percent. These rates were calculated on the basis of survival after the first major stroke during the year and were computed without regard to prior stroke experience or number of strokes during the year.

Table 4 gives the 1-week, 1-month, and 1-year case fatality rates for the second year of the study. For white persons 1-week case fatality rates ranged from zero to 54 percent in age-specific groups, with an overall rate of 46 percent. The 1-month case fatality rates ranged from zero to 76 percent, with an overall rate of 61 percent, and the 1-year case fatality rates ranged from zero to 81 percent, with an overall rate of 74 percent. The age gradient in the 1-year case fatality rates shows younger patients surviving longer than the older patients. This trend is not nearly as pronounced in the 1-week and 1-month rates.

## Discussion

Data from the 2 years of this study represent a reasonable effort to define the morbidity and mortality of stroke. Eisenberg (6) and Kurland (7) have obtained results from comparable studies with incidence figures similar to the Mid-Missouri survey. However, certain trends began

**Table 3. Age-adjusted rates for stroke per 1,000 persons,<sup>1</sup> by county, race, and sex, Mid-Missouri Stroke Survey, July 1, 1964–June 30, 1965**

County and sex	White	Nonwhite	Both races
Boone:			
Male.....	2.3	3.8	2.4
Female.....	2.0	3.5	2.1
Cooper:			
Male.....	2.6	5.4	2.8
Female.....	1.3	4.2	1.4
Howard:			
Male.....	1.8	8.7	2.5
Female.....	2.0	2.7	2.1
Total.....	2.0	4.5	2.2

<sup>1</sup> Based on estimated 1964 Missouri population.

during the second year of the study which were of concern to us.

The total number of cases reported during the study was 219 during 1963–64 and 189 during 1964–65. The number of nonwhite patients reported increased from 24 in the first year to 26 in the second year, relatively no change. The number of cases reported in white persons decreased from 195 to 163 (–17 percent). This difference in reporting in these years (32 cases) was not statistically significant at the  $\alpha=0.05$  level ( $0.05 < P_{\chi^2} < 0.10$ ).

Age groups 35–74 years accounted for the major portion of the difference in reporting from the first year to the second year (80 cases compared with 54 cases,  $P_{\chi^2} < 0.05$ ). The reduced number of younger patients in the second year of the study and the consistent increase for the second year in the case fatality rates for white

**Table 4. Death rates among white patients who had a major stroke, by age and period of survival, Mid-Missouri Stroke Survey, July 1, 1964–June 30, 1965**

Age (years)	Number with stroke	Lived 1 week		Lived 1 month		Lived 1 year	
		Number died	Percent died	Number died	Percent died	Number died	Percent died
45–54.....	1	0	0	0	0	0	0
55–64.....	21	9	42.9	10	47.5	11	52.4
65–74.....	32	13	40.6	21	65.6	22	68.8
75–84.....	71	32	45.1	40	56.3	57	80.3
85 and over.....	37	20	54.1	28	75.7	30	81.1
Total.....	162	74	45.7	99	61.1	120	74.1

persons in all time periods (1 week, 1 month, 1 year) led us to suspect that we were not obtaining reports for all milder strokes.

This study was heavily dependent on physicians' reporting for noninstitutionalized patients with presumably milder strokes. This experience could be accounted for by waning interest in reporting cases. We hasten to add that these busy practitioners extended themselves during the study in the spirit of cooperativeness alone and with no additional benefits to themselves or their patients.

Two methodological considerations should be kept in mind when interpreting these data.

1. Random variation in numbers of stroke deaths by year would be expected.

2. Population estimates in small areas for noncensus years are often inaccurate.

The method of linear extrapolation tends to ignore sharply changing trends in population composition. We do not feel these considerations invalidate the general mortality figures presented. However, we hesitate to interpret minor differences in incidence rates within county and age groups as being meaningful.

### Recommendations

Combining a survey of this type with a program of professional education or community service should help to maintain the motivation of the physicians. Such a program was considered in the Mid-Missouri Stroke Survey but was not enacted because of lack of personnel.

In establishing the length of the study, careful consideration should be given both to the expected duration of physicians' interest and potential of the study to meet certain of the needs of the community. The practicing physician should not be burdened with case reporting when other sources are available.

Assistance in making difficult and differential diagnoses should be made available to community physicians. Encouragement could be provided for increasing autopsy rates through these interpersonal consultations.

This study was a joint effort of the Missouri Division of Health, the University of Missouri, and the Public Health Service. Participation by agencies with these varying scopes of interest gave us excellent coverage in both the counties studied and in the health structure of mid-

Missouri. However, the presence of several interested, active groups in the study hampered the fixing of primary responsibility and authority with one investigator or agency. The agency responsible for collecting the information did not have the necessary authority to obtain records as needed. We feel when several agencies are participating in this type of community study, the agency responsible for assembling data should have direct access to all the sources.

Several factors which could be important in other community-based studies became apparent with time. In these rural counties surveys of the nursing homes produced no new cases of stroke which we had not found through physician reports of hospital record review. We did not approach the families of stroke patients and thereby missed an important source of data on the natural history of stroke. Finally, review of completed records on receipt would provide an opportunity to query the physicians concerning patients recently treated (of course, delay in completion of records should be reduced when possible).

### Summary

The Mid-Missouri Stroke Survey was an epidemiologic study conducted by the University of Missouri Medical School, the Division of Health of Missouri, and the Public Health Service from July 1, 1963, to June 30, 1965. The study covered Boone, Cooper, and Howard Counties. Data were collected from physicians, hospitals, and death certificates to minimize underreporting.

In the second year of the study, 189 cases of stroke were revealed among persons over 25 years old. This is an age-adjusted rate of 2.2 per 1,000 persons based on the estimated 1964 population.

In the first year of the study the mortality rate for white persons was 33 percent for 1 week, 50 percent for 1 month, and 67 percent for 1 year. These rates were calculated on the basis of survival after the first major stroke during the year and were computed without regard to prior stroke experience or the number of strokes during the year.

In the second year case fatality rates for white persons for 1 week ranged from zero to 54 percent in age-specific groups, with an over-

all rate of 46 percent. The 1-month case fatality rates ranged from zero to 76 percent, with an overall rate of 61 percent, and the 1-year case fatality rates ranged from zero to 81 percent, with an overall rate of 74 percent. Fewer younger patients in the second year led to the suspicion that milder strokes were not being reported, possibly as a result of waning interest of participating physicians.

Long-term surveys of this type should be combined with professional education or community service to maintain the participants' motivation. The agency responsible for collecting data should have access to all sources.

#### REFERENCES

- (1) Goldberg, I. D., and Kurland, L. T.: Mortality in 33 countries from diseases of the nervous system. *World Neurol* 3: 444-465 (1962).
- (2) Stallones, R. A.: Epidemiology of cerebrovascular disease. A review. *J Chronic Dis* 18: 859-872 (1965).
- (3) Parrish, H. M., et al.: Mid-Missouri stroke survey. A preliminary report. *Missouri Med* 63: 816-821, October 1968.
- (4) Goldner, J. C., Payne, G. H., Watson, F. R., and Parrish, H. M.: Prognosis for survival after stroke. *Amer J Med Sci* 253: 129-133, February 1967.
- (5) Nichaman, M. Z., Boyle, E., Jr., Lesesne, T. P., and Sauer, H. I.: Cardiovascular disease mortality by race. Based on a statistical study in Charleston, S. C. *Geriatrics* 17: 724-737 (1962).
- (6) Eisenberg, H., Morrison, J. T., Sullivan, P., and Foote, F. M.: Cerebrovascular accidents. Incidence and survival rates in a defined population, Middlesex County, Conn. *JAMA* 189: 883-888, Sept. 21, 1964.
- (7) Kurland, L. T., Choi, N. W., and Syme, G. P.: The epidemiology of cerebrovascular diseases. Presented at the Cerebrovascular Disease Conference, Houston, Tex., January 1966.

#### Tearsheet Requests

Dr. Frank R. Brand, U.S. Public Health Service, Ecology Field Station, University of Missouri Medical Center, Columbia, Mo. 65201

## Pollution-Free Cars

Two contracts have been awarded by the National Air Pollution Control Administration, Public Health Service, to further the development of a practically pollution-free powerplant for the family car.

The Thermo Electron Corp. of Waltham, Mass., was awarded \$174,173, with a 1-year completion deadline, for the design of an integrated propulsion system using the Rankine cycle engine. A contract for studying the combustion characteristics of the heat-generating portion of such a power system was awarded to the Marquardt Corp. of Van Nuys, Calif., in the amount of \$96,683, also with a 1-year completion time. Automobiles powered by Rankine cycle vapor system were popular in the 1920's.

The integrated propulsion system design contract will provide a complete set of plans from which a powerplant and vehicle could be built. In selecting and linking together such components as combustors, steam generators, vapor condensers, pumps, and controls, con-

sideration will be given to current availability, cost, and potential for mass production. The design will show how the powerplant would be placed in a vehicle and would indicate space requirements.

The study of combustion characteristics will provide information from which to design a burner system that would result in the lowest possible emissions of hydrocarbons, carbon monoxide, and oxides of nitrogen.

In the Rankine cycle propulsion system, fuel ignition takes place in a burner outside the engine, which permits relatively complete combustion and, therefore, relatively low emissions. The combustion characteristics study will investigate ways of changing different components of the burner system to reduce the emissions still further. Consideration will be given to size and shape of the combustion chamber, types of burners, location and method of introducing fuel, and other factors affecting the production of air contaminants.

# Influence of the Prevalence of Infection on Tuberculin Skin Testing Programs

JAMES F. JEKEL, M.D., M.P.H., RICHARD A. GREENBERG, Ph.D., M.P.H.,  
and BENJAMIN M. DRAKE, M.D., M.P.H.

THE Surgeon General's Task Force on Tuberculosis Control in 1963 recommended a "child-centered program" to control tuberculosis. This plan calls for skin testing of children at least twice during their school experience, once when they enter school and once in junior high school (1, 2). Such a program, if applied throughout the United States, would require at least 7 million skin tests per year, tests which would have to be performed by community agencies such as health departments or schools.

When yearly screening of this magnitude is to be accomplished, the screening test must have several characteristics in addition to accuracy. It must be quick, inexpensive, and easy to administer and be acceptable to the health professionals and to the public, especially children. Unless a test has these operating characteristics, overworked public health personnel simply will not use it often. The multiple puncture tuberculin tests, such as the tine, Heaf, and Mono-Vac, have advantages over the intradermal Mantoux test in most of these operating characteristics. Largely because of widespread doubts about their accuracy, however, the

multiple puncture tests have not gained the popularity that might be expected on the basis of these advantages. The doubts about these tests have arisen chiefly as a result of published studies comparing them with the intradermal Mantoux test (3-7) and from certain experiences with them in school tuberculin testing programs.

## Comparative Studies

The intradermal Mantoux test, in which 5 tuberculin units of purified protein derivative (PPD) are used, has long been considered the standard of comparison, and the rates of error for multiple puncture tests are usually computed on the basis of disagreement of their results with those of the Mantoux test. In such studies the authors usually, although it is not always so stated, assume zero rates of error for the Mantoux test. Greenberg and Jekel, in addition to questioning the zero error rates that are usually assumed for the Mantoux test in comparative studies, have shown that an incorrect assumption that the rates of error for one test are zero will result in maximum estimates of the error rates for the other test and hence lead to unjustified pessimism about its accuracy (8).

The recommended dose for Mantoux tuberculin tests is 5 tuberculin units of PPD in 0.1 ml. of solution, which is relatively dilute compared with the dose of 250 tuberculin units per 0.1

---

*Dr. Jekel is assistant professor of public health and Dr. Greenberg is associate professor of biometry at the Yale University School of Medicine, New Haven, Conn. Dr. Drake is the health director of Gaston County, N.C.*

---

## Another View of Tuberculin Testing

The authors very properly point out the statistical basis for estimation of the prevalence of testing error and also very properly reemphasize that the multiple puncture tests are screening tests. They assume, however, that the advantage of the multiple puncture test justifies the principle of using screening tests.

I question the validity of this assumption for the following reasons:

1. Our experience has been that the needle Mantoux test is just about as acceptable to children as a screening test.

2. The actual cost of the Tine and the Mono-Vac is higher than that of the Mantoux, assuming the use of a disposable multiple dose syringe with individual disposable needles.

3. A well-trained team can do a Mantoux test as rapidly as the Heaf or the Stern test. The small amount of time saved by using the Mono-Vac or the Tine test is more than offset by the need for another visit for retesting. We have found that in the long run a considerable amount of time, money, and effort is saved by doing the Mantoux test alone.

4. The authors do not mention that the Tine test is painful as compared with the other tests.

In short, while the statistical analysis is sound and well worth stressing, I do not believe that it is sufficient in itself to justify the use of a screening test in view of the many other factors to be considered.—M. STUART LAUDER, M.D., *Director, Tuberculosis Control Program, Kentucky State Department of Health.*

---

ml. used in the second strength test, a test which has also been used in the past (9, 10). The relatively low dose of antigen increases the specificity of the test and leads to fewer false positives, but by the same token it would be expected to decrease the sensitivity somewhat, thus increasing the rate of false negative tests. This expected increase in false negative tests from a more specific test may be very small, and in the currently recommended Mantoux test, it probably is. Greenberg and Jekel showed that one kind of disagreement between the two tests would contribute to the false negative error of the Mantoux test or to the false positive error of the multiple puncture test, but not to both. If there had been any appreciable false negative error in the PPD Mantoux test in the comparative studies, even one as small as 0.5 to 1 percent, most of the published studies would have demonstrated false positive errors of much less than 10 percent for the multiple puncture tests. Bearman and others have pointed out that there are many possible sources of error in the intradermal Mantoux test (11).

### Prevalence of Infection

The main concern of local public health workers about multiple puncture tests probably originates from their observations while using them in the tuberculin testing of school children. In most schools in this country, the prevalence of tuberculosis infection is low, less than 5 percent.

In fact, in most first grade classes, the prevalence of infection is less than 2 percent. We have observed or heard of numerous instances in which local health workers have found, when testing school children with multiple puncture tests (particularly with the tuberculin tine test), that most of the positive reactors were negative when retested with PPD Mantoux. The workers have then reached what seemed to them to be a reasonable conclusion, namely, that the tuberculin tine test is not very useful because of the high proportion of false positive tests. In fact, however, neither the accuracy nor the usefulness of a screening test can be determined with certainty from an examination of the proportion of test positives which have been correctly identified. The reason is that not only the false positive error of the screening test, but also the low prevalence of tuberculosis infection, is responsible for the results observed.

### False Positive and False Negative Rates

In any discussion of the false positive and false negative errors of a test, the numerator and denominators must be clearly defined. In a true rate, the denominator consists of only those persons who are at risk of being in the numerator. Thus, only those persons who are actually not infected with tuberculosis are at risk of being falsely identified as positive. The proper equation for the false positive error is therefore as follows:



False positive error (alpha) =  

$$\frac{\text{number of false positives}}{\text{number of true negatives.}}$$

By similar reasoning, the equation for the false negative error rate becomes:

False negative error (beta) =  

$$\frac{\text{number of false negatives}}{\text{number of true positives.}}$$

Therefore, what is most obvious to the public health workers—the ratio of false positives to the total number of tuberculin reactors—is not the rate of false positive error, but rather the effect of that rate combined with the prevalence of tuberculosis in the population being skin tested.

### Influence of Prevalence

The prevalence of tuberculosis infection is not always considered when the results of a skin testing program are being evaluated. Yet a clear understanding of what is going on depends on consideration of the effect of prevalence. The practical effect of the prevalence of a condition upon the result of screening can be seen in the table. Here a false positive error of 6 percent and a false negative error of 4 percent are assumed for the screening test. (These error rates, incidentally, seem reasonable for the tuberculin tine test in the light of what has been found in the better comparative studies.) The table shows the results of applying these error rates to several populations of 100 persons each with a different proportion of persons infected with tuberculosis. As the prevalence of infection drops from 50 to 1 percent, the number of reactors correctly identified would, on the average,

drop from 48 of 100 tests to one of 100 tests. At the same time the number of false positives found would increase, on the average, from three of 100 tests to the maximum of six of 100. The actual false positive error does not exceed the error rate we assumed in creating the table, but the proportion of reactors who are actually false positives has increased from 6 to 86 percent. It is not surprising that many health officers have become discouraged when using a screening test in populations with low prevalence. Moreover, it should be emphasized that the same principle would apply when performing any screening test (chest X-ray, diabetes screening, and so forth) in populations with a low prevalence of the condition under study.

### Implications for Tuberculosis Control

What are the implications of the decreasing prevalence of tuberculosis for tuberculin testing? Do the multiple puncture tests have any value? The answer, in our opinion, is a definite affirmative. In the table, the positives, as a proportion of tests performed, would not on the average exceed the false positive error rate no matter how high the ratio of false positives to test positives. In effect, what the screening test does is to identify that 5 to 10 percent or so of the population among whom all, or nearly all, of the infected persons will be found. This information enables the health officer to apply his more specific but less acceptable PPD Mantoux test to only this small subset of his study population. A screening test—and this is how the multiple puncture tests should be regarded—always requires a followup diagnostic test

### Variation in the proportion of test positives who are true positives as the prevalence of a test condition in the population changes <sup>1</sup>

Percent of prevalence	Expected true positives per 100 tests	Expected false positives per 100 tests	Expected percent of true positives among all test positives	Expected percent of false positives among all test positives
50-----	48	3	94 (48 of 51)	6 (3 of 51)
25-----	24	5	83 (24 of 29)	17 (5 of 29)
10-----	10	5	67 (10 of 15)	33 (5 of 15)
5-----	5	6	45 (5 of 11)	55 (6 of 11)
3-----	3	6	33 (3 of 9)	67 (6 of 9)
1-----	1	6	14 (1 of 7)	86 (6 of 7)

<sup>1</sup> Assuming that the false positive error is 6 percent (number of false positives  $\times 100 \div$  number of true negatives) and that the false negative error is 4 percent (number of false negatives  $\times 100 \div$  number of true positives).

before a diagnosis can be made, but the screening test is still invaluable if it makes the case-finding feasible in the first place.

An actual example of the value of the multiple puncture test can be seen in the following tuberculin testing results from Gaston County, N.C., where Drake is health officer.

Tine tests read.....	4,963	(100 percent)
Tine reactors.....	239	(4.8 percent)
PPD reactors.....	55	(1.1 percent)
PPD reactors among tine reactors.....	$\frac{55 \times 100}{239}$	(23 percent)

$$\frac{\text{Number of false positives} \times 100}{\text{number of PPD nonreactors}}$$

= estimated maximum false positive rate

$$= \frac{(239 - 55) \times 100}{4,963 - 55} = \frac{18,400}{4,908} = 3.7 \text{ percent.}$$

Only about 25 percent of the persons with positive reactions in the Lederle Company's tuberculin tine test also reacted to 5 tuberculin units of PPD in the intradermal Mantoux test. These results can be satisfactorily explained in a population with a tuberculosis prevalence of 1.1 percent by assuming a rate of false positive error for the tine test of 3.7 percent. The tine test was used because of its operating advantages—speed combined with acceptability to both the public health nurses and the school children. In all, less than 5 percent of the tine reactors needed to be retested with PPD, and only 23 percent of those retested needed further followup with chest X-rays. We believe that this combined approach was quicker and easier than using the Mantoux test on 5,000 children. A simple cost-benefit study showed that the total cost of this tuberculin testing program, including overhead and travel, was approximately 50 cents per child tested, or approximately 8 cents per child in the school system. Use of the tine test followed by Mantoux tests on the tine reactors proved acceptable to nurses, the school system (including administrators), children, and parents.

Thus, it was possible to establish the screening

phase of an ongoing, child-centered program of tuberculosis control for approximately 8 cents per school child per year.

#### REFERENCES

- (1) U.S. Public Health Service: The future of tuberculosis control. PHS Publication No. 1119. U.S. Government Printing Office, Washington, D.C., 1963.
- (2) U.S. Public Health Service: A child-centered program to prevent tuberculosis. PHS Publication No. 1280. U.S. Government Printing Office, Washington, D.C., 1965.
- (3) Affronti, L., Parlett, R. C., Pierson, F., and Anello, C.: An epidemiologic comparative study in Delaware of the tine and Mantoux tests. *Amer Rev Resp Dis* 95: 81-88, January 1967.
- (4) Badger, T. L., Breitwieser, E. R., and Muench, H.: Tuberculin tine test. *Amer Rev Resp Dis* 87: 338-353, March 1963.
- (5) Capobres, D. B., Tosh, F. E., Yates, J. L., and Langeluttig, H. V.: Experience with the tuberculin tine test in a sanatorium. *JAMA* 180: 1130-1132, June 30, 1962.
- (6) Maha, G. E.: Comparative study of tuberculin tine and Mantoux tests in 676 college students. *JAMA* 182: 304-305, Oct. 20, 1962.
- (7) Maxwell, K. W., Dietz, T., Marcus, S., and Hill, G. A.: Comparative sensitivity of tuberculin tine test and Mantoux test in guinea pigs. *Amer Rev Resp Dis* 89: 926-928, June 1964.
- (8) Greenberg, R. A., and Jekel, J. F.: Some problems in the determination of the false positive and false negative rates of tuberculin tests. *Amer Rev Resp Dis*. In press.
- (9) Badger, T. L., et al.: Tuberculin skin-testing techniques: Current status. Statement of the committee on diagnostic skin testing. *Amer Rev Resp Dis* 87: 607-610, April 1963.
- (10) Hsu, K. H. K., Carreon, A. T., Jeu, F., and Jenkins, D. E.: Today's concept of the tuberculin test. *Dis Chest* 46: 648-664, December 1964.
- (11) Bearman, J. E.: A study of variability in tuberculin test reading. *Amer Rev Resp Dis* 90: 913-919 (1964).

#### Tearsheet Requests

Dr. James F. Jekel, Yale University School of Medicine, 60 College St., New Haven, Conn. 06510

# Fluorescent Antibody Techniques for *Salmonella* and Other Enteric Pathogens

WILLIAM B. CHERRY, Ph.D., and BERENICE M. THOMASON, B.S.

**O**UR OBJECTIVE is to clarify the present status of immunofluorescence tests for the detection of *Salmonella*, *Shigella*, and enteropathogenic *Escherichia coli* in clinical specimens and foodstuffs. Among enteric bacteria, these genera are of primary importance as incitants of human infections.

## **Salmonellae**

The detection of salmonellae by fluorescent antibody (FA) procedures is not as easy as some workers have suggested. Two major potential applications are the screening of fecal specimens and commercial foods and feeds. Infections due to salmonellae are a major public health problem because of the frequency with which these organisms occur in milk, meat, seafoods, eggs, and poultry. The last four of these products are not always decontaminated before being transported into the home or into commercial food preparation areas. Thus, infections may occur in human beings following consumption of rare meat, undercooked eggs, shellfish, or foods contaminated by contact with meat, poultry, or seafood containing salmonellae. Pasteurized liquid milk is not a source of infection unless it becomes contaminated with salmonellae after pasteurization. If salmonellae are present in liquid milk, however, these organisms

may survive the drying process. Liquid, frozen, and dried eggs may contain viable salmonellae posing a threat to the consumer if the eggs or other foods to which they are added are not heated sufficiently to destroy the organisms. Contaminated water supplies may occasionally be the cause of outbreaks of salmonellosis, an excellent example being the 1965 Riverside, Calif., epidemic of *Salmonella typhimurium* (1).

Early work by Thomason and associates (2) directed toward the development of FA procedures for detecting salmonellae in feces was discouraging. Cross-reactions with normal intestinal flora were numerous when either monovalent or polyvalent conjugates were used for staining. These results were based on the staining of smears prepared directly from suspensions of feces in buffered-glycerol-saline preservative or from suspensions of stool specimens in physiological saline. Poor results were due to several factors: (a) enteric bacteria which were serologically related to salmonellae, (b) the presence of "normal antibodies" against enteric bacteria in the serum of the rabbits providing the conjugates, and (c) the use of conjugates of lower titer and poorer quality than those which can be prepared today.

The serologic specificity of the Vi antigen suggested the possibility of using the FA procedure to rapidly screen fecal specimens from known or suspected typhoid carriers. The work of Thomason and McWhorter (3) proved that the FA procedure was at least equal in sensitivity and specificity to the cultural examination for detecting typhoid bacteria in the fecal specimens of 129 registered chronic carriers. The

---

*The authors are with the Laboratory Division of the National Communicable Disease Center, Health Services and Mental Health Administration, Public Health Service, Atlanta, Ga. Dr. Cherry is chief of the Bacterial Chemistry Unit, Bacteriology Section, and Mrs. Thomason is a research microbiologist in that unit.*

specificity of the reagents that these workers used is well illustrated in table 1.

Ninety-one of the stool specimens from the 129 carriers were positive by culture; 90 were positive by the FA test. Six of the carriers who were positive by culture were negative by the FA procedure, and five of the carriers positive by the FA procedure were negative by culture. Both the O, Vi (*Salmonella typhi*) conjugate and the sorbed Vi (*Citrobacter freundii*) conjugate were used—the O, Vi reagent for detecting Vi negative cells. With these conjugates, Thomason and McWhorter observed no fluorescent organisms in fecal specimens from 64 normal persons. The slight differences between the two conjugates in results obtained on the carriers' specimens were not considered significant. Chronic carriers apparently excrete predominantly Vi positive cells. If true, this is a fortunate circumstance. It permits use of the highly specific sorbed Vi conjugate to detect typhoid bacteria without risk of obtaining false positive tests from other salmonellae of group D or from enteric bacteria possessing somatic antigens 9, 12, or related moieties.

In the work just reported a single FA examination was made with each of the two conjugates. Culturally, however, eight opportunities existed to isolate *S. typhi* since each specimen was streaked on one plate of MacConkey's agar, one plate of *Salmonella-Shigella* agar, and two plates of bismuth-sulfite agar, both before and after enrichment in selenite broth. The cultural results represent the totals from all media. Thus, the FA test may ultimately prove to have far greater sensitivity than conventional cultural isolation procedures for *S. typhi*. The specificity of the O, Vi and the Vi conjugates used in the study by Thomason and McWhorter is undoubtedly a function of their high titer (1:80), which reduces cross-staining of serologically related bacteria and almost eliminates nonspecific staining of tissue cells and debris.

Because of the success achieved with the FA test on carriers, detection of the typhoid bacillus in the stools of patients in the acute or convalescent stage was not expected to be difficult. This view, however, has been shown to be naive. In collaboration with Dr. Merrill Snyder at the University of Maryland, we have demonstrated that it is not unusual to obtain FA negative re-

**Table 1. Reactions of representative strains of *Salmonella* antigenically related to *Salmonella typhi***

<i>Salmonella</i> strains tested	Antigenic schema of strains	Fluorescence with labeled globulins	
		O, Vi (1:80)	Vi (1:80)
<i>S. typhimurium</i> ---	1, 4, 5, 12	1+ to 2+	Negative.
<i>S. paratyphi</i> B---	1, 4, 5, 12	2+	Do.
<i>S. saintpaul</i> -----	1, 4, 5, 12	2+	Do.
<i>S. derby</i> -----	1, 4, 5, 12	1+ to 2+	Do.
<i>S. javiana</i> -----	1, 9, 12	2+	Do.
<i>S. pullorum</i> -----	9, 12	2+	Do.
<i>S. dublin</i> -----	1, 9, 12	2+	Do.
<i>S. gallinarum</i> -----	1, 9, 12	2+	Do.
<i>S. enteritidis</i> -----	1, 9, 12	2+	Do.
<i>S. typhi</i> 0901-----	9, 12	2+	Do.
<i>S. typhi</i> Me 1325.	9, 12, Vi	4+	4+
<i>S. typhi</i> 2V-----	9, 12, Vi	4+	4+
<i>S. paratyphi</i> C---	6, 7, Vi	1+ to 2+ <sup>1</sup>	1+ to 2+ <sup>1</sup>

<sup>1</sup> Approximately 1 percent of the cells were stained. Results of the slide test for Vi agglutination were doubtful.

SOURCE: reference 3.

sults on fecal specimens from experimentally infected human volunteers who yield a large number of typhoid bacillus colonies upon culture. The fecal typhoid bacteria resisted staining with the sorbed Vi conjugate and stained poorly with the O, Vi reagent. Yet, following growth on isolation media (or enrichment in tetrathionate or selenite broth), the bacteria fluoresced brilliantly. These results emphasize the necessity of enriching the bacteria in appropriate selective media before staining them with FA reagents.

These observations suggest several possibilities, namely, (a) the inhibition of staining by blocking antibody, (b) the removal of the Vi antigen or failure to synthesize it in organisms within the intestinal tract, and (c) the possible blocking of immunofluorescent staining by slime-wall formation. The ease with which most salmonellae form slime walls on phosphate agar (4) suggests that if slime-wall polysaccharide formed in vitro is found to inhibit FA staining of salmonellae, the possibility of slime-wall formation in the intestinal tract should be investigated.

These experiences have led to the hypothesis that the inability of the patient's defense mechanisms or of his intestinal flora to prevent the

synthesis of Vi antigen in the typhoid bacillus may produce the chronic carrier state.

An outbreak of typhoid fever at Stanford University provided an opportunity for Bissett and associates (5) to compare the FA detection of *S. typhi* with conventional isolation procedures on specimens from patients with acute disease. Examinations were performed directly on fecal specimens in the manner reported by Thomason and McWhorter (3) and also with selenite-F enrichment cultures. The enrichment cultures proved more sensitive, yielding positive FA results from 40 of the 41 patients positive by culture. There were nine positive and two questionable FA results on specimens that were negative by culture. *Citrobacter* organisms which fluoresced with the Vi conjugate were isolated from three of the specimens. Only one specimen was negative by the Vi FA test and positive by culture—a specimen from a patient undergoing treatment. It is unfortunate that the *Citrobacter* which was isolated was not studied further to see if it was *C. freundii* 029, Vi or another *Citrobacter* for which the rabbits had “normal” antibodies.

At present, sorbed Vi conjugate for detecting typhoid bacteria can be recommended for use in monitoring known carriers, in searching for new carriers, or for use on specimens from persons having acute cases of typhoid fever. It may be used on selenite or tetrathionate enrichment cultures but not directly on smears of fecal suspensions.

Demissie (6) successfully used high-titered (1:500) conjugates prepared with Roschka-type antigens to detect *Salmonella tubigen* in tetrathionate enrichment cultures of fecal specimens obtained during an outbreak. He also identified colonies from plates by FA staining of smears. The staining of smears prepared directly from saline suspensions of feces was unsatisfactory because of the small number of organisms present and their poor staining characteristics.

Similarly, Stulberg and associates (7) prepared individual and pooled OH conjugates. A mixture of *Salmonella typhimurium* and *Salmonella paratyphi* B conjugates was used to stain formalin-killed cells in suspensions. These cells had been collected by centrifugation of dextrose broth cultures of feces which had been

incubated overnight. Stulberg and associates used this method with considerable success in monitoring the progress of an extensive outbreak of *S. typhimurium* infection in infants in a nursery. The reliability of the diagnosis depended upon the specificity conferred by the FA identification of flagellar antigens. For reasons not apparent, specificity was confined to specimens from infants; specimens from adults frequently contained organisms giving good somatic (O) staining in the absence of stained flagella. Cultures of such specimens were always negative.

Recently, national attention has been focused on salmonellosis, partly because of the decline of other communicable diseases and partly because of rapid increases in the consumption of foods processed from animal products which may be contaminated with salmonellae. Federal laws require that the ingredients of these foodstuffs must be free of *Salmonella* before they are released into interstate commerce. Conventional bacteriological examination for this genus requires a minimum of 36 to 48 hours. Thus, manufacturers are highly motivated to devise more rapid methods for screening their products for these organisms. These stimuli have resulted in a reexamination of the use of FA tests for this purpose.

Although foodstuffs present some special obstacles to the use of FA tests, they usually do not contain the large number and species of cross-reacting bacteria found in feces. All foods must be inoculated into selective enrichment media before they are examined; some require pre-enrichment in a noninhibitory medium followed by selective enrichment. These steps serve to hydrate dried food products and to permit multiplication of the salmonellae along with concurrent synthesis of fresh surface antigen so that good fluorescence is achieved.

Several research groups, including ours, are attempting to develop techniques to use in screening raw materials and finished food products for salmonellae (8-17). Success may provide reagents also suitable for use on fecal specimens. Some workers have used the indirect FA procedure to avoid labeling multiple antibody solutions (8-10, 13). The disadvantages of the longer staining period and the increased cross-staining, however, have outweighed the

advantages of using a single labeled reagent. For example, Silliker and associates (13) found that their commercial goat-antirabbit conjugate required careful titration because, at low dilution, it stained a variety of enteric organisms.

Most current work is being done by direct FA staining, using antigen mixtures for antibody production (6, 7, 12, 15). Both formalin-killed and Roschka- (heat-, acetone-, and alcohol-treated) type antigens are being used. Conjugates prepared from polyvalent OH serums appear promising. Serums prepared with boiled antigens are unsatisfactory (6), and their use may explain the low titers and poor results that we and some other earlier workers have reported.

In short, FA tests for salmonellae are needed in the clinical laboratory to screen fecal specimens for the presence of all common serotypes of the genus. Further improvements undoubtedly will be made, but at present reliable FA tests have been developed for detecting the typhoid organism in specimens from chronic carriers and persons with acute disease. In at least two instances, considerable success has been achieved in detecting the specific serotypes that have been shown, by isolation, to be incitants of outbreaks. Progress is also being made in developing polyvalent conjugates for screening foodstuffs (16, 17). All of the data are not in, but apparently the requirements for success are (a) use of high-titered serums made with unheated antigens, (b) inoculation of specimens into suitable pre-enrichment and selective enrichment media, and (c) use of OH conjugates to enhance the specificity of the staining reagents. The mechanics of a screening procedure for detecting salmonellae by FA tests is shown in the flow chart.

Commercial FA reagents for salmonellae may not be a good investment because we do not yet know what types of reagents or what ancillary methods will prove most advantageous.

### Shigellae

Several difficulties arise in devising a procedure for fluorescent antibody staining of shigellae in fecal specimens. Preparing sorbed conjugates for each *Shigella* serotype is not practical, although the work of LaBrec and associates (18) indicated that highly specific reagents could be obtained this way. These

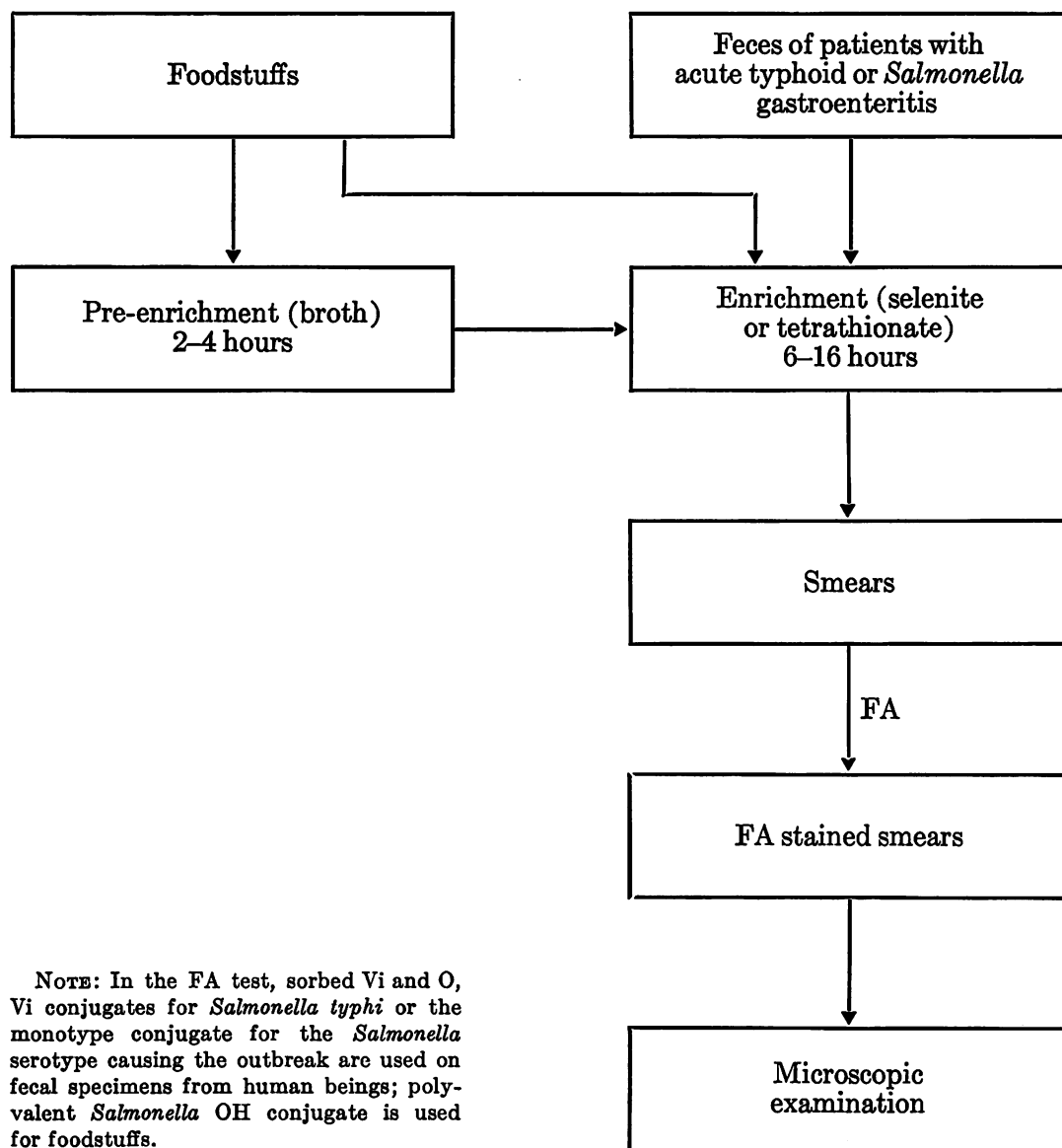
workers also reported that the indirect method was not satisfactory because the available sheep-antirabbit globulin contained normal antibody against various strains of shigellae. The requirement of the public health or hospital laboratory for FA reagents for shigellae can be met by preparing conjugates for the four serogroups A, B, C, and D. Such reagents should be usable at fairly high titer, require little, if any, sorption, and be highly specific for shigellae.

The detection of *Shigella dysenteriae* (A) and *Shigella boydii* (C) serotypes presents profound but not necessarily insoluble difficulties related to specificity (19). *S. dysenteriae* 2 and *Escherichia coli* 0112:B11 are serologically identical, as are *S. dysenteriae* 3 and *E. coli* 0124:B17 (see subsequent section on enteropathogenic *E. coli*). In addition, conjugates for *S. dysenteriae* 3 may be expected to cause strong fluorescence of some strains of types 21 and 22 of *Klebsiella pneumoniae*. The Group A and C shigellae, however, are of minor importance, each accounting for less than 1 percent of the total isolates of shigellae in the United States each year (20). Little evaluation of the FA reagents of these organisms has been done.

The detection of *Shigella flexneri* by FA tests also presents special problems. Because of the multiplicity of antigens within the group, cross-reactions with other enterobacteriaceae can be expected. Furthermore, the importance of culturing fecal specimens immediately after collection in order to obtain the greatest number of *S. flexneri* isolations possible is apparent in all the studies we have conducted (19, 21). There is no satisfactory selective enrichment medium for isolating shigellae, and apparently the *S. flexneri* organisms do not compete well in viability and cultivability with intestinal flora. Transport media commonly used also are inadequate for maintaining the viability of these organisms. Further studies are needed in both these areas.

FA staining for the detection of *S. flexneri* is extremely sensitive and can be expected to give an excess of FA positive results which cannot be confirmed by conventional isolation methods. This fact may reflect the inadequacies of the cultural procedure and the cross-staining of other enteric organisms. In the most recent

**Flow chart for fluorescent antibody (FA) detection  
of salmonellae in foodstuffs and feces**



**NOTE:** In the FA test, sorbed Vi and O, Vi conjugates for *Salmonella typhi* or the monotype conjugate for the *Salmonella* serotype causing the outbreak are used on fecal specimens from human beings; polyvalent *Salmonella* OH conjugate is used for foodstuffs.

study in our laboratory (21), 76.7 percent of the specimens positive for *S. flexneri* by FA also were culturally positive. This proportion compares favorably with the 53.3 percent and the 39.3 percent which could be confirmed by culture in previous studies (19). Although the specificity of the FA tests for *S. flexneri* may be improved, results should be interpreted with caution. Use of commercial reagents should be restricted to evaluating the technique in comparison with isolation methods.

*Shigella sonnei* is one species of shigellae for which a definitive statement about FA tests can be made. *S. sonnei* may be detected with a high degree of reliability by applying an appropriate conjugate to smears prepared from fecal suspensions. As Taylor and Heimer (22) have shown, this test is of great value in England, where *S. sonnei* causes approximately 98 percent of all bacillary dysentery. Its value is somewhat less in the United States, although *S. sonnei* serotypes are accounting for an increasing pro-

portion (54 percent) of all cases of bacillary dysentery (20). Taylor and Heimer (22) compared results from FA and cultural methods and found them to agree in 95.6 percent of the 388 specimens cultured; of the remaining specimens, 1.8 percent were FA positive but culturally negative; and 2.6 percent were positive by culture only. These authors reported to the physicians by telephone all positive FA tests on specimens from patients with acute diarrhea. The report could usually be made within an hour, but they emphasized that it should be regarded as provisional and subject to confirmation by culture.

In four studies at the National Communicable Disease Center, we have evaluated the detection of *S. sonnei* by FA staining (19, 21). The correspondence of the total positive and negative direct FA results with the cultural data in these four studies agreed very closely with the 95.6 percent reported by Taylor and Heimer (22), as the following table shows:

Author	Percent of agreement between FA and cultural results	Percent of cultural recoveries from FA positive specimens <sup>1</sup>
Taylor and Heimer, 1964 (22)-----	95.6	96.1
<i>NCDC studies</i>		
Thomason, Cowart, and Cherry, 1965 (19)-----	{ 98.3 94.6 96.0	{ 70.8 45.4 80.0
Thomason, Nahmias, and Mathews, 1967, (21)-----	97.6	84.2

<sup>1</sup> Positive cultures ÷ FA positives × 100.

As the table shows, cultural recoveries of *S. sonnei* from FA positive specimens in the four studies were 70.8, 45.4, 80.0, and 84.2 percent. The comparable figure that Taylor and Heimer reported is 96.1 percent. Low recovery—45.4 percent—from the 1965 NCDC study was expected because 25 of the 37 patients were receiving antimicrobial treatment at the time the specimens were collected.

Thus, adequate data are available to insure confidence in the FA test as a detector of *S. sonnei*. A word of caution, however, about reagents is in order. A conjugate made from serum prepared with form 1 antigen must be used. Form 1 is the in vivo antigen, and organisms containing it stain more brilliantly with the FA

reagent than those containing form 2 antigen. Cells in form 2 were not highly fluorescent even when treated with the undiluted homologous conjugate. The change from form 1 to form 2 antigen occurs rapidly in vitro.

If an outbreak of bacillary dysentery is due to *S. sonnei*, FA screening of specimens is a highly effective method of defining the scope of the disease and of selecting specimens for culture. When commercial reagents become available, the FA test for *S. sonnei* will be ready for use in public health and clinical laboratories. Before being used, these reagents should be titrated against both of the antigenic forms of *S. sonnei*.

In contrast to enteropathogenic *E. coli*, the number of stained shigellae organisms seen in smears from patients with acute dysentery is low. As with *S. typhi*, negative FA smears are occasionally found on shigellae specimens whose isolation plates yield numerous colonies. These inconsistencies are unexplained.

The best method of handling fecal specimens before preparing smears for FA testing is not known. Taylor and Heimer (22) obtained excellent results with smears prepared from suspensions of feces in phosphate-buffered saline (pH 8.0). In our laboratory, smears of suspensions in physiological saline and smears prepared from rectal swabs transported in a soft medium gave the best results. The transport medium consisted of 0.25 percent of agar in distilled water, dispensed into 13 by 100 mm. tubes in 1.0 ml. amounts and autoclaved. Smears of fecal specimens enriched in broth yielded many more FA positive results than we obtained by any other method. A large percentage of these positive results, however, could not be confirmed by culture, and we have to assume that they represented false positive fluorescence. Hornung found that staining the fecal bacteria in suspension before the smears were prepared was not successful (23). We do not recommend this procedure because clumps of agglutinated organisms form that make the results difficult to interpret.

#### Enteropathogenic *Escherichia coli*

The use of immunofluorescence in detecting enteropathogenic *Escherichia coli* (EEC) is well established, and its effectiveness has been



affirmed in numerous studies (24). It is well adapted for diagnosis in hospitals or institutions and for the surveillance of infant diarrhea caused by *E. coli*. The procedure can be used to screen infants before admission to hospital nurseries, to rapidly determine (in 1 to 2 hours) the appearance of diarrhea induced by *E. coli*, to monitor the infant population at risk of possible colonization with EEC before symptoms appear, to follow the patient's excretion of EEC during the convalescent period, and to detect the presence of nonculturable EEC excreted during drug therapy.

These are things the FA procedure will do for the clinician; there are also things it will not do. First, the staining of EEC by FA reagents prepared from OB grouping serums does not result in definitive identification of *E. coli*. Such identification can be achieved only by determining the O, B, and H antigens after they have been titrated with appropriate antisera in a laboratory specializing in such work. Thus, FA staining is not a substitute for complete serologic identification. In most hospital laboratories, however, the serologic study of EEC consists of performing slide agglutination tests on typical colonies obtained from isolation plates. Ample evidence shows that FA staining with OB serums gives results which are at least as reliable as those obtained with slide agglutination (25):

<i>E. coli</i> identified	Positive reactions	
	Agglutination	Fluorescent antibody
Enteropathogenic.....	118	118
Nonenteropathogenic..	24	4
Total.....	142	122

The four cultures which gave positive reactions in the FA test also gave positive agglutination reactions. They consisted of (a) the *Citrobacter* species, related to *E. coli* 0127; (b) and (c) *E. coli* 071, K antigen related to B 15; and (d) *E. coli*, O antigen undetermined but no known relationship to EEC.

Only certain serotypes of some OB groups are judged, based on epidemiologic data, to be incitants of infant diarrhea. These serotypes cannot be distinguished by FA staining from the other serotypes within the OB group, since typing depends upon precise analysis for all

antigens. However, in many evaluations over a number of years, in which all FA positive isolates of EEC have been typed, the great majority of cultures encountered belonged to serotypes known to be epidemiologically significant in human infections. This typing was done in Dr. W. H. Ewing's laboratory in the Enteric Bacteriology Unit at the National Communicable Disease Center.

Second, the FA test does not provide a culture of *E. coli* for detailed serologic study or for the important determination of sensitivity to antibiotics.

Third, the FA test is not a shortcut to cheap diagnosis by untrained laboratory workers. Proficiency in using fluorescence equipment and experience in interpreting stained smears are essential for reliable results.

The sensitivity of the FA tests in detecting EEC in fecal smears has been evaluated in several ways. The necessity for this evaluation arose from the fact that most workers found that fluorescent staining yielded at least 30 percent more positive results than conventional plating and isolation techniques. This result should not surprise anyone, since nonviable cells which are serologically intact and organisms of which the growth is inhibited by drugs, biological antagonists, or other agents retain their specific fluorescence. Nevertheless, one is more comfortable with a satisfactory explanation of the discrepancy between FA and cultural results.

The proponents of the FA test are no more required to prove that the excess of FA positive results over those obtained by culture represents true positives than the culture advocates are required to prove that the excess does not represent false negative cultural results. The time has come to re-examine the thoughtless acceptance of cultural results as the standard against which all detection procedures are judged. Enumerating all cultivable organisms of a given species is a worthy objective, but the result should not be equated with the actual viable content of the species in the specimen. If one wishes to demonstrate the actual presence of organisms in a specimen or the number of organisms irrespective of viability, the FA test frequently furnishes an estimate which is at least as accurate as that obtained by culture. The

only direct method of proving this estimate consists of repeatedly culturing the original FA positive, culturally negative specimen. When Moody and associates (26) did this, they recovered group A streptococci from 47 percent of the specimens from throat swabs which had been negative by culture. Upon re-examination, Cherry and associates (25) recovered EEC from an additional 12.5 percent of the specimens which had been culturally negative but FA positive when examined several weeks earlier.

Shaughnessy and associates (27) called attention to certain internal evidence in their data which supported the accuracy of the FA results. For example, of 12 FA positive, culture negative results, six were from patients from whom the epidemic strain of *E. coli* had been isolated by culture in other specimens that were taken either before or after the negative culture.

Freid and Lepper (28) and Freid and associates (29) showed that the FA test, in comparison with cultural tests for EEC, is from 10 to 100 times more sensitive. They concluded that the "body of unconfirmed FA-positive results obtained by screening populations during epidemic and endemic periods is largely due to the presence of EEC in numbers too small to be cultured." These authors derived their data from two sources: (a) cultural and FA examination of feces seeded with known numbers of EEC and (b) comparison of FA-positive tests with culturally positive tests of specimens from patients with and without diarrhea.

Chadwick and Abbott (30) and Chadwick (31), using the microcolony method of preparing smears for FA examination, reached similar conclusions. They showed that their method of staining coverslip impressions of the growth on plates that had been incubated for 3½ hours was sufficiently sensitive to allow detection of as few as 10 organisms in the original inoculum. This method was approximately 100 times as sensitive as direct smear examination by FA. Detection was essentially independent of the ratio of the background flora to that of EEC. Conversely, the investigators concluded that the recovery of EEC by culture was unlikely unless these bacteria constituted as much as 10 percent of the cultivable flora.

Hospital and institutional workers should be aware of observations by Boris and co-workers (32) that the EEC nasopharyngeal carrier rate was high in asymptomatic persons who had been closely associated during epidemic periods with infants who had diarrhea. Persons so colonized may transmit EEC to susceptible infants. In such carriers, the nasal rate of carriage may be three times or more the rate demonstrable by fecal examination.

In the United States at present, nine serogroups of *E. coli* can be implicated epidemiologically as the etiologic agents of infant diarrhea. These are:

026:B6

055:B5

0111:B4

0127:B8

086:B7

0119:B14

0125:B15

0126:B16

0128:B12

Carefully prepared reagents for these serogroups are remarkably specific when used on fecal smears. The key to their specificity and reliability for diagnostic use is the B antigen of *E. coli*. Conjugates prepared from OB serums have high staining titers and give brilliant peripheral staining. Conjugates from O serums have low titers and tend to produce a duller, uniform staining. As previously mentioned, when conjugates are used at appropriate working dilutions, few cross-reactions with fecal flora are encountered. An interesting enterococcus-like organism, which has not been isolated, is common in human fecal specimens and fluoresces brightly with most EEC conjugates (33). Its appearance is confusing to the novice, but with a little experience the organism can easily be differentiated, morphologically, from EEC. Usually, such organisms are also stained by several or all of the conjugates—a fact which aids in making the correct interpretation.

Thomason and associates (33) and Davis and Ewing (34) have pointed out some of the potential opportunities for cross-reactions with other *Enterobacteriaceae*. The laboratory worker should keep these possibilities in mind when

applying FA staining procedures. Practical experience, however, has proved that it is unusual to encounter, in fecal smears, non-EEC bacteria that morphologically and serologically resemble EEC and that stain with the specific conjugates. In our laboratory, examination of 4,652 fecal specimens in addition to those documented in the table on page 893 yielded 492 cultures which were FA positive for EEC. All except 26 (5.3 percent) of these specimens were confirmed as EEC. Six cultures were too rough to type, 10 were *E. coli* known to be related to EEC, six were *E. coli* not known to be related to EEC, five were *E. coli* of undetermined O groups, three were *Citrobacter*, and one was a *Proteus*. These cross-reacting organisms were positive by slide agglutination and FA tests.

In addition, 26 *E. coli* were isolated which were positive for one of the nine serogroups of EEC by slide agglutination tests but negative by FA examination. These cultures belonged to serogroups of *E. coli* other than the nine pathogenic ones. Thus, FA and slide agglutination tests showed the same degree of nonspecificity.

Conjugates for *E. coli* 0112:B11 and 0124:B17 should be excluded from pooled FA conjugates used for screening fecal smears. The reasons are that (a) these serogroups occur only rarely in the United States; (b) the OB antigen of *Shigella dysenteriae* 2 is identical to 0112:B11, and *S. dysenteriae* 3 is identical to 0124:B17; (c) 0124:B17 produces strong fluo-

rescence of some strains of types 21 and 22 of *Klebsiella pneumoniae*, two types apparently very common in feces.

For several years we have attempted, with little success, to persuade manufacturers not to include 0112:B11 and 0124:B17 in pools of *E. coli* FA conjugates. The difficulty with the 0124:B17 conjugate is well illustrated in a study by Batshon (35). About 15 percent of the pregnant women in his study were found to be excreting EEC, as determined by FA staining, whereas only 2.4 percent were positive by culture. More than one-half, 33 of 62, of the total positive FA reactions for EEC were attributed to the 0124:B17 conjugate. However, not one culture of this serogroup was isolated. Thus, these reactions almost certainly represented false positive results and led to an estimate of the EEC excretion in the pregnant women which was at least twice the actual one. Freid and Lepper (28) were able to culture 0124:B17 (not definitely identified) from only three of 44 specimens which were FA positive, although the occurrence of FA positive specimens was correlated significantly with diarrheal patients. However, the variability of the FA results in repeated tests on the same patient led Freid and Lepper to exclude the 0124:B17 group from further consideration.

Generally, FA tests should be restricted to the examination of specimens from persons in the age group predominantly affected by EEC (birth to 2 years). Some workers have reported increased difficulty with cross-staining when the

**Table 2. Fluorescent antibody and cultural study of fecal specimens of control groups for enteropathogenic *Escherichia coli***

Type and status of patients	Number of specimens examined	Number of specimens positive		Serotype of EEC isolated
		FA	Culture	
Hospitalized children, no diarrhea.....	32	<sup>1</sup> 4	3	0126:B16:NM; 055:B5:H7; and 0128ac:B12:H12.
Hospitalized adults, with diarrhea.....	25	0	0	0
Normal adults.....	25	0	0	0

<sup>1</sup> One specimen was positive for 0126 by fluorescent staining, but the organisms could not be isolated.

SOURCE: reference 33.

reagents are applied to fecal smears from older persons. In our somewhat limited experience, however, such difficulties have not arisen (table 2).

The effectiveness of FA tests in detecting EEC is well documented, and the tests are practical. They can be applied advantageously to the rapid presumptive diagnosis of infant diarrhea and to the surveillance of EEC dissemination within hospitals or other institutions housing children in the age range from birth to 2 years. FA tests are valuable for screening, since their sensitivity makes cultural examination of specimens which are FA negative unnecessary.

A 14-minute, 16-mm., color-sound film entitled "Fluorescent Antibody Detection of Enteropathogenic *Escherichia coli*" was produced by the National Medical Audiovisual Center in 1967. It may be obtained on short-term loan, free of charge, from the National Medical Audiovisual Center (Annex), Atlanta, Ga. 30324—Sta. K or purchased from the Du-Art Film Laboratories, Inc., 245 West 55th Street, New York, N.Y. 10019.

This film, prepared for bacteriologists, medical technologists, general practitioners, pediatricians, and medical students, is designed to stimulate an awareness of the dangers of infant diarrhea and to teach the use of the FA technique in the rapid detection of EEC.

The availability of satisfactory reagents is vital to the routine use of FA methods. Fortunately, suitable reagents are available from some commercial companies. Much needs to be done, however, to standardize their production and to insure consistent performance. All commercial reagents should be titrated and checked for specificity in the user's laboratory. Qualified laboratories may obtain stock cultures, conjugates for control purposes, and guidance from the National Communicable Disease Center.

When effective reagents have been developed and the importance of enteropathogenic *E. coli* has been shown to the medical profession, progress will be made toward reducing a disease which in a 1961 outbreak in Chicago had an age-specific attack rate as high as 3,700 per 100,000 (36). After this outbreak, Dr. Warren Wheeler, editor of the *American Journal of Diseases of Children* and a pediatrician of note,

wrote a hard-hitting editorial pointing out that our failure to recognize and cope with institutional diarrhea caused by EEC is a national disgrace (37). He has reiterated these sentiments in the introductory and concluding remarks to the film.

### Summary

Industrial and public health laboratories are seeking to develop a reliable FA test for the detection of salmonellae in foods, feeds, and raw materials. Results indicate that conjugates prepared from OH serums may be useful in screening selective enrichment media for salmonellae. More information is needed, however, before specific recommendations can be made. However, a reliable FA test has been developed for detecting *Salmonella typhi* in fecal specimens obtained from chronic carriers and from persons with acute typhoid fever.

Several groups have evaluated conjugates for *Shigella flexneri* and *Shigella sonnei*. One difficulty in the use of *Shigella* conjugates is the inability to isolate *S. flexneri* from many of the FA positive specimens. Whether this difficulty is due to false positive FA reactions or to the failure of isolation procedures is not clear. The *S. sonnei* reagent has proved both sensitive and specific.

FA tests for enteropathogenic *Escherichia coli* are well adapted to the diagnosis and surveillance of infant diarrhea. The tests have proved to be 10 to 100 times more sensitive than cultural procedures. FA examination should be restricted to specimens from children up to 2 years of age.

### REFERENCES

- (1) National Communicable Disease Center, Public Health Service: Morbidity and Mortality Weekly Report. Vol 14, No. 21, May 29, 1965; No. 22, June 5, 1965; and No. 23, June 12, 1965.
- (2) Thomason, B. M., Cherry, W. B., and Edwards, P. R.: Staining bacterial smears with fluorescent antibody. VI. Identification of salmonellae in fecal specimens. *J Bact* 77: 478-486 (1959).
- (3) Thomason, B. M., and McWhorter, A. C.: Rapid detection of typhoid carriers by means of fluorescent antibody techniques. *Bull WHO* 33: 681-685 (1965).
- (4) Anderson, E. S.: Slime-wall formation in the salmonellae. *Nature (London)* 190: 284-285 (1961).
- (5) Bissett, M. L., Powers, C., and Wood, R. M.: Im-

- munofluorescent identification of *Salmonella typhi* during a typhoid outbreak. *Appl Microbiol* 17: 507-511 (1969).
- (6) Demissie, A.: Studies on epidemiological salmonellosis by fluorescent antibody technique. *Acta Path Microbiol Scand* 67: 393-400 (1966).
  - (7) Stulberg, C. S., Caldwell, W. J., Kennedy, D. W., and Caldronney, G.: Epidemiologic and diagnostic application of immunofluorescence in a *Salmonella* outbreak. *Amer J Epidem* 83: 518-529 (1966).
  - (8) Haglund, J. R., et al.: Detection of *Salmonella* in eggs and egg products with fluorescent antibody. *Appl Microbiol* 12: 447-450 (1964).
  - (9) Schimmelpfennig, H.: Zur Anwendung der Fluoreszenzserologie in der bakteriologischen Diagnostik. *Zentral Veterinar* 11: 633-643 (1964).
  - (10) Georgala, D., and Boothroyd, M.: A rapid immunofluorescence technique for detecting salmonellae in raw meat. *J Hyg (London)* 62: 319-327 (1964).
  - (11) Georgala, D., and Boothroyd, M.: A system for detecting *Salmonella* in meat and meat products. *J Appl Bact* 28: 206-212 (1965).
  - (12) Georgala, D., and Boothroyd, M.: Preparation of fluorescent polyvalent *Salmonella* antisera. *Nature (London)* 205: 521-522 (1965).
  - (13) Sillicker, J. H., Schmall, A., and Chiu, J. Y.: The fluorescent antibody technique as a means of detecting salmonellae in foods. *J Food Sci* 31: 240-244 (1966).
  - (14) Ayres, J. C.: Use of fluorescent antibody for the rapid detection of enteric organisms in egg, poultry, and meat products. *Food Tech* 21: 145-154 (1967).
  - (15) Georgala, D., Boothroyd, M., and Hayes, P. R.: Further evaluation of a rapid immunofluorescence technique for detecting salmonellae in meat and poultry. *J Appl Bact* 28: 421-425 (1965).
  - (16) Insalata, N. F., Schulte, S. J., and Berman, J. H.: Immunofluorescence technique for detection of salmonellae in various foods. *Appl Microbiol* 15: 1145-1149 (1967).
  - (17) Schulte, S. J., Witzeman, J. S., and Hall, W. M.: Immunofluorescent screening for *Salmonella* in foods: Comparison with culture methods. *J Assoc Off Anal Chem* 51: 1334-1338 (1968).
  - (18) LaBrec, E. H., Formal, S. B., and Schneider, H.: Serological identification of *Shigella flexneri* by means of fluorescent antibody. *J Bact* 78: 384-391 (1959).
  - (19) Thomason, B. M., Cowart, G. S., and Cherry, W. B.: Current status of immunofluorescence techniques for rapid detection of shigellae in fecal specimens. *Appl Microbiol* 13: 605-613 (1965).
  - (20) National Communicable Disease Center, Public Health Service: *Shigella* surveillance report No. 18, for 4th quarter, 1968, Mar. 3, 1969.
  - (21) Thomason, B. M., Nahmias, A. J., Mathews, A. D.: Further evaluation of immunofluorescence techniques for detection of shigellae in fecal specimens. *Appl Microbiol* 15: 912-915 (1967).
  - (22) Taylor, C. E. D., and Heimer, G. V.: Rapid diagnosis of Sonne dysentery by means of immunofluorescence. *Brit Med J* No. 5402: 165-166, July 18, 1964.
  - (23) Hornung, J. E.: Immunofluorescent studies of *Shigella* in infants and young children. *Amer J Med Techn* 31: 239-255 (1965).
  - (24) Cherry, W. B., and Moody, M. D.: Fluorescent-antibody techniques in diagnostic bacteriology. *Bact Rev* 29: 222-250 (1965).
  - (25) Cherry, W. B., Thomason, B. M., Pomales-Lebrón, A., and Ewing, W. H.: Rapid presumptive identification of enteropathogenic *Escherichia coli* in faecal smears by means of fluorescent antibody. 3. Field evaluation. *Bull WHO* 25: 159-171 (1961).
  - (26) Moody, M. D., Siegel, A. C., Pittman, B., and Winter, C. C.: Fluorescent-antibody identification of group A streptococci from throat swabs. *Amer J Public Health* 53: 1083-1092 (1963).
  - (27) Shaughnessy, H. J., et al.: An extensive community outbreak of diarrhea due to enteropathogenic *Escherichia coli* 0111: B4. II. A comparative study of fluorescent antibody identification and standard bacteriologic methods. *Amer J Hyg* 76: 44-51 (1962).
  - (28) Freid, M. A., and Lepper, M. H.: Endemicity of enteropathogenic *Escherichia coli*. Studies of screening procedures. *Arch Environ Health* 10: 742-746 (1965).
  - (29) Freid, M. A., Hafermann, D. R., and Lepper, M. H.: *In vitro* comparison of fluorescent antibody technique with culture and slide agglutination for the detection of enteropathogenic *Escherichia coli*. *Amer J Med Sci* 252: 75-77 (1966).
  - (30) Chadwick, P., and Abbott, L.: Specificity and sensitivity of a microcolony technique for fluorescent antibody identification of pathogenic *Escherichia coli* serotypes. *Canad J Microbiol* 10: 853-859 (1964).
  - (31) Chadwick, P.: The relative sensitivity of fluorescent antibody and cultural methods in detection of small numbers of pathogenic serotypes of *Escherichia coli*. *Amer J Epidem* 84: 150-155 (1966).
  - (32) Boris, M., et al.: A community epidemic of enteropathogenic *Escherichia coli* 0126:B16:NM gastroenteritis associated with asymptomatic respiratory infection. *Pediatrics* 33: 18-29 (1964).
  - (33) Thomason, B., Cherry, W. B., Davis, B. R., and Pomales-Lebrón, A.: Rapid presumptive identification of enteropathogenic *Escherichia coli* in faecal smears by means of fluorescent antibody. 1. Preparation and testing of reagents. *Bull WHO* 25: 137-152 (1961).
  - (34) Davis, B. R., and Ewing, W. H.: Serologic relations that may lead to erroneous diagnoses of

- Escherichia coli* infections by means of fluorescent antibody technics. Amer J Clin Path 39: 198-202 (1963).
- (35) Batshon, B. A.: Identification of enteropathogenic *Escherichia coli* in pregnant women, using cultural and fluorescent antibody technic. Amer J Clin Path 45: 125-128 (1966).
- (36) Kessner, D. M., et al.: An extensive community outbreak of diarrhea due to enteropathogenic *Escherichia coli* 0111:B4. I. Epidemiologic studies. Amer J Hyg 76: 27-43 (1962).
- (37) Wheeler, W. E.: Where is our nosocomial conscience? Amer J Dis Child 104: 43-44 (1962).

#### Tearsheet Requests

Dr. William B. Cherry, Bacteriology Section, Laboratory Division, National Communicable Disease Center, Atlanta, Ga. 30333

## New Medicaid Regulations

Secretary of Health, Education, and Welfare Robert H. Finch has issued a regulation limiting fees paid to physicians, dentists, and other individual providers of medical services under Medicaid.

The HEW regulation will limit payments to providers participating in State Medicaid programs to those received in January 1969, unless payments are below the 75th percentile of customary charges. It does not cover payments for prescription drugs, nursing home services, hospital care, or other services.

States whose payment structures provided payments below the 75th percentile of customary charges on January 1, 1969, may request permission from the Secretary to raise payments to that level. States whose payment structures provided fees above the 75th percentile of customary charges must adjust their payments so that they do not exceed reasonable charges as determined under title XVIII-B of the Social Security Act (Medicare).

The action became effective July 1, 1969, and remains in effect until July 1, 1970.

After July 1, 1970, States may request permission to increase fees paid to physicians and dentists only if two conditions are met: (a) the average percentage increase requested above the 75th percentile of customary charges on January 1, 1969, may not exceed the percentage increase in the all-services component of the Consumer Price Index (adjusted to exclude the medical component) or in an alternate index designated by the Secretary of Health, Education, and Welfare, and (b) evidence must be clear that the providers and

the States have cooperatively established effective utilization review and quality control systems.

Regardless of which payment level was in effect in fiscal year 1970, in a given State, the 75th percentile of customary charges will provide the floor above which allowable Consumer Price Index increases will be measured.

The regulation requires States to revise their State Medicaid plans to include descriptions and details of their payment structures. A State that wishes to revise its payment structure for practitioners' services or to change the payments authorized under it may not do so until the proposed changes have been approved by the Secretary or his representative.

States that begin their Medicaid programs after July 1, 1969, must arrange their payment structures so that fees do not exceed the 75th percentile of customary charges.

The regulation implements the Secretary's budgetary decision to set Federal standards for vendor payments to physicians, dentists, and other medical practitioners to control escalating Federal and State expenditures for the program.

The Secretary appointed an Advisory Committee on Payments to Individual Practitioners under title XIX, chaired by Dr. James Haughton, first deputy administrator of the New York City Health Services Administration, to consider alternatives that would curb rising costs of payments to individual practitioners. Emphasis was to be placed on the control of future escalation.

# Partnership for Health and Medicare

JOHN W. CASHMAN, M.D.

THE WORDS "fragmentation," "overlap," "waste," "duplication," and "gaps" have increasingly crept into the jargon of persons concerned with improving the delivery of health care in the United States. It appears that this terminology will be with us as long as medical care remains a collection of bits and pieces or until we can transform the "nonsystem" of health care into an integrated system in which needs and efforts are closely related.

As those of us in the Federal Government strive to overcome these obstacles to providing the American public with the most efficient and economical care, we should be acutely aware of the parallel challenge we face in carrying out our own organizational missions. We cannot allow fragmentation in Federal health programs if we are going to progress toward integration of the total health picture. Last fall, the opportunity to meet this type of challenge head-on emerged with the formation of the Community Health Service. This new organization, one of the nine major components comprising the Health Services and Mental Health Administration, includes programs and activities formerly in the Division of Medical Care Administration (DMCA) and the Office of Comprehensive Health Planning (OCHP). Among its many responsibilities, DMCA was charged with developing, evaluating, and recommending minimum standards for health care providers under Title XVIII, the Medicare Program. OCHP had the responsibility of administering the Partnership for Health Program.

## Current Separation of Programs

Medicare and Partnership for Health share a philosophy and, as time goes on, they can develop effective operational linkages. The em-

phasis has to be on the word "can": "can build," "can develop," and "can interrelate." At present, the two programs tend toward splendid isolation, which is not surprising. They were conceived in response to different problems, and interested and involved different groups during their legislative development and implementation.

*Problems.* Medicare grew out of the need to find better mechanisms to assist the aged in financing their health care costs. Incidentally, or maybe not quite so incidentally, hospitals and other providers of services were helped with some of their touchy money problems.

Initial agitation for the Partnership for Health legislation came principally from State health departments. They were tired of the frustrations caused by multiple, rigid formula grant programs and set about to revise one of the basic laws governing the activities of the Public Health Service.

Since a major piece of legislation was being overhauled, there was time and opportunity to resolve another problem: namely, the need to encourage a more orderly review of the health scene on a nationwide basis. So planning and support for public health-oriented activities were coupled in the revised legislative package. Then as the shape of the final law became more apparent, the legislation was seen as a vehicle for molding intergovernmental as well as governmental-nongovernmental relationships.

---

*Dr. Cashman, an Assistant Surgeon General, is director, Community Health Service, Health Services and Mental Health Administration, Public Health Service. This paper is based on one presented before the Missouri Hospital Association, St. Louis, November 14, 1968.*

In its final form, the law and its regulations blended three separate and distinct interests.

1. Planning to expose the health problems of the nation.

2. A partnership to work on the problems.

3. Money, a goodly portion of which is allocated to State health and mental health departments, to help reduce identified health problems.

*Persons involved.* Early development of each program delineated its specific functions. So too did the fact that different people were involved in implementing each program.

To some extent, this fact is logical. Medicare has involved an unprecedented number of agencies, institutions, associations, and personnel in its operations. At least during its early stages, the Partnership for Health Program is involving fewer and less diverse people, most of whom are in governmental positions or with areawide hospital or health and welfare councils.

Even if one agency participates in both programs, different people are involved. For example, many State health departments have responsibilities to both programs, but most frequently one group in the department carries out Medicare certification activities, another group works in health planning, and too rarely do the two groups get together. Similarly, many hospital associations probably have separate committees appointed for the two programs.

The observation about diverse personnel is not offered as criticism. People absorbed in the implementation of each program had to meet rigid deadlines, and they worked to capacity resolving the operational difficulties entailed by each program. The necessity for total concentration on a single program was a fact of life. Nevertheless, a second fact of life has become the tendency to perpetuate the narrow focuses of concentration; to encourage development of an individual momentum for each program; in short, to consider each program as a separate entity.

#### **Factors Precluding Program Isolation**

This tendency toward separatism may be expedient, but too many factors are at work which will discourage if not preclude it.

*The programs share a philosophy.* Medi-

care and the Partnership for Health Program have compatible conceptual bases. Each, in its own way, emphasizes the importance of comprehensive health services.

Of the two, the Partnership for Health legislation speaks out most explicitly on comprehensive health services. Familiarity with the words of the preamble has not reduced their challenge. "The Congress declares that the fulfillment of our national purpose depends on promoting and assuring the highest level of health attainable for every person, in an environment which contributes positively to healthful individual and family living. . . ." As if to remove all doubt, the preamble continues ". . . that the Federal financial assistance must be directed to support the marshalling of all health resources—national, State and local—to assure comprehensive health services of high quality for every person. . . ."

Admittedly, the term "comprehensive health" is subject to many definitions, depending upon the person speaking and the context within which the phrase is being used. Within the context of this legislation, however, the term unquestionably is used to embrace both environmental and personal health needs.

As to personal health, the preamble carries two connotations. One relates to the potential need of persons for preventive, diagnostic, therapeutic, and rehabilitative services—a series of words easy to recite, but such services are not always given. The second connotation relates to the resources required to meet these individual needs. These resources include hospitals, extended care facilities, home health agencies, laboratories, personnel, and so forth. Obviously, these resources must be available if Medicare benefits are to be more than a paper promise.

Medicare's involvement in comprehensive health care stems as much from economic and political concerns as from philosophical convictions. Insuring only hospital care easily could lead to heavy reliance on hospitals as a dominant location in which to care for the aged.

Acknowledging this potential reliance, the designers of Medicare accepted the idea of including posthospital extended care and home health services as benefits. Then, in the political climate of the time, the argument about the cost of physicians' services quickly led to the addi-



tion of Part B benefits. Influential as these political and economic arguments were, the expansion of benefits would not have occurred if it had been contrary to the philosophy of the program's supporters.

So, in a very real sense, Medicare is the practical application of the charge in the preamble to the Partnership for Health Act. Medicare excludes preventive care and some diagnostic services, but it provides other diagnostic as well as therapeutic and rehabilitative opportunities. Further, through various administrative devices, Medicare encourages provision of these services in the most appropriate setting. Providing services leads to focusing on the availability and interrelationships between resources which, in turn, are concerns of comprehensive health planning.

*Programs cannot realize full potential independently.* By sharing interests and problems, the two programs can gravitate naturally toward each other. This gravitation will accelerate because neither program can reach its full potential independently.

Medicare is basically an action-oriented program. This orientation creates the program's strengths and weaknesses. Based on patterns established by voluntary insurance, Medicare covered selected health care costs for selected groups of people. Medicare was never intended to serve simply as a collection and redistribution mechanism or to maintain a neutral role in health care. From the beginning, through congressional sanction of standards, Medicare began influencing quality of services.

In addition to causing positive changes, Medicare has highlighted problem areas including the (a) power of a financing program which aggravated personnel shortages, (b) potential for disrupting organizational patterns even while fostering some improvements, (c) poor health practices, (d) dilemma of quality versus availability of health services, and (e) a legion of other difficulties. Because it is such a massive and therefore influential financing program, Medicare has the potential for supporting improvements in the organization of care. However, Medicare does not provide the framework to encourage simultaneous attention to the interlocking problems. This lack can be remedied by comprehensive health planning.

In contrast to Medicare, which has a well-defined task, the Partnership for Health Program is more theoretical and encompassing. This orientation gives the Partnership for Health Program strength ever while saddling it with handicaps.

The Partnership for Health Program begins with a loose confederation of ideas. The first several sections relate to planning. Only a general charge is issued to the planning agencies under the guidelines for this program.

1. Make the scope of planning broad.
2. Consider the whole State and all its residents.
3. Be concerned with all health and associated problems that affect the well-being of people.
4. Consider all types of health services, facilities, and manpower available or to be developed.
5. Undertake a variety of informational, consultative, and promotional activities including recommendations for actions by public and voluntary agencies, public and private institutions, and persons from all sectors.

The planning sections of the act are followed by those authorizing formula and project grants. In concept, the two sections are viewed as interrelated, with the first laying out problems and the second part serving as a tangible, financial commitment to help meet the problems. In practice, considerable portions of the formula grant funds necessarily must be devoted to supporting usual public health activities.

The guidelines in the Partnership for Health Program provide unusual (and, to some people, frustrating) leeway, but their generality was essential. The program is not directed toward solving specific, delimited conditions. It is intended to establish a framework and mechanisms for cooperative efforts. The program concentrates on structure and process, properly leaving to States and localities responsibility for spelling out specific topics to be considered.

Although the generality leaves room for adaptation to local need, it also can contain pitfalls. Possible objectives for the planning activity can become overwhelming. For example, one agency listed 22 objectives (1). All these objectives were reasonable; but their number alone, not to mention their complexity, could well intimidate the best of planners.

The complexity of present health issues also can stymie efforts. It automatically invites the collection and analysis of vast data and stimulates study after study. The complexity can lead to members of advisory councils grappling at meeting after meeting with seemingly unmanageable problems. No one will be satisfied unless the process will lead to visible results. Medicare can help comprehensive health planning avoid pitfalls by providing tangible, well-defined problems.

*National concerns will force cooperative activity.* Combining the theoretical and practical can be beneficial to both programs. The cooperative approach will be given a strong incentive by nationwide concerns which cannot be quieted or ignored any longer.

Rising health care costs continue to be a headline issue. Admittedly this is not a new issue. Nor are the rising costs totally unwelcome, since they reflect many beneficial changes. Better pay for hospital personnel, improved technology, and more people receiving services are only a few of the advantages. Nevertheless, the commonplace prediction of \$100 per day costs for hospital care cannot be accepted complacently.

Furthermore, concerns over costs are coming into perspective. In the past, the impact of costs affected the population in a scattered fashion. Some patients felt it when they were discharged from the hospital; management and labor experienced it during collective bargaining; Blue Cross, when requesting a rate increase; and hospitals when they heard from Blue Cross.

This diffusion of impact is a phenomenon of the past, however. Medicare, the largest payment program in the country, changed this. When Medicare is affected by rising costs, Government officials must take cognizance of the fact. When, as the law requires, the Secretary of Health, Education, and Welfare announces an increase in the deductible, aged citizens, hospitals, and many others soon feel the impact.

The natural response to the coalesced reaction is to look hard at the reasons for the rise to sort out the justifiable causes from those which are evidence of ineffective use of the health dollar. From there it is only a short step to seeing a potential relationship between Medicare and comprehensive health planning.

## Mutual Interests and Support

Circumstances and a natural compatibility create an active relationship between the two programs. Medicare engenders problems for attention and comprehensive health planning provides the environment for dealing with them. Then Medicare, in turn, can provide tools and information to reinforce the planning process. As a starting point for collaborative effort, two questions might well be asked: "What services are needed?" and "How good are they?"

*What services are needed?* Traditionally the question about needed services has been answered in terms of number of hospital beds, number of nursing home beds, and on down the list of requirements. The result too frequently was a disjointed recitation.

Both Medicare and the Partnership for Health legislation are forcing changes to be introduced in methods used to calculate need. Partnership for Health stresses the broad overview on an areawide as well as State basis. Medicare supports this view through its broad benefit structure, and it emphasizes that the continuum of care desired for aged persons depends upon a range of services. Medicare emphasizes extended care and home health services as desirable complements and alternatives to hospital care. In effect, a payment program is breathing life into the concept of progressive patient care.

Patient requirements should be the dominant factor in spelling out community and State needs for services and facilities. Nevertheless, legislative and administrative requirements can exert their influence. For instance, Medicaid (not Medicare) now requires that a beneficiary entitled to skilled nursing home services also be entitled to home health services. In other words, home health services are being further emphasized, and State health authorities would do well to recognize it. These developments are not remote from hospital associations or individual hospitals. To the contrary, they have a vital role to play.

It is one thing to say that refined measures for determining facility requirements are badly needed; it is another to acquire the data and techniques to make the determination. Medicare

provides data which can be used to profile health facilities in a community and permit evaluation of their interrelationships.

Hospitals can add to the data. Hospitals' utilization review committees are noting people who do not need to be in hospitals but cannot be discharged because there is no adequate way to continue their care. Frequency of these instances suggests the need for out-of-hospital services. Data on needed outpatient services are not a scientific basis for planning, but they are a practical beginning and should be brought to the attention of State and areawide planning agencies.

Medicare and Partnership for Health Programs can foster comprehensive health and progressive patient care; they can build administrative mechanisms into their programs to encourage adoption of the concepts. In the final analysis, however, patients, physicians, and hospitals have to apply the concepts in established practice.

Hospitals can demonstrate their acceptance of these concepts—and the concepts will become the prevailing ideas—in numerous ways. For example, hospitals can introduce extended care and home health services. There is some movement in this direction. Approximately 650 hospitals have extended care units, providing a little less than 15 percent of the beds. Some 160 have home health programs.

As an alternative to being directly responsible for out-of-hospital services, hospitals can work actively with other agencies in the community. There is no record of what really is being done, but there are plenty of opportunities for cooperation. Transfer agreements between hospitals and extended care facilities represent one method of cooperation. There is nothing to prevent hospitals from taking the initiative in using this admittedly minimal requirement as a foundation for encouraging a pattern of cooperative efforts.

*How good are the services?* The question of what services are needed may well be the most absorbing concern in the immediate future, but it would be foolhardy not to consider the quality of these services at the same time. The certification process of Medicare exposes existing weaknesses. Hospital personnel would do well to urge

that proposals for overcoming deficiencies in services be included in the State planning agency's recommendations. Also, these persons might encourage State health departments to arrange, sponsor, and fund from formula grant monies supportive activities which cannot be financed through Medicare.

Among such activities already underway are training programs to upgrade skills of personnel, to make specialists available for consultation, and to encourage shared use of scarce personnel. These activities are beneficial to the public's health and quite appropriately a concern of State health departments.

### **Form and Effect of Interrelationships**

Availability and quality of services are of mutual interest to hospitals, Partnership for Health, and Medicare. Receiving increasing attention is how formal the link between the two Federal programs should be and what effect this relationship will have upon hospitals.

*Form of relationship.* The link can be tangential, with Medicare simply offering a topic for consideration by comprehensive health planning. The interweaving can occur informally, with persons intimately involved in Medicare serving on advisory councils to State and areawide planning agencies.

There is some suggestion that the links might well be constituted on a more formal basis. One suggestion that has found its way into print (2) is that conditions of participation in Medicare be expanded to include a requirement related to planning.

Capital expenditures can be a link. It was proposed, as part of the 1967 social security legislation, that when institutions participating in Medicare make substantial capital expenditures that are not in accordance with statewide health plans, the Department of Health, Education, and Welfare would have authority to reduce the reimbursements to the institutions or to terminate their participation in the program.

Although this idea was adopted by the Senate, it was dropped in conference. That proposal, which would have been the tightest link between the programs, was intended to augment the amendment to comprehensive health planning legislation, enacted in 1967, which requires

State planning agencies to assist each health care facility to develop a program for capital expenditures which is consistent with an overall State plan. Some form of program interrelationship is inevitable because planning, services, and financing for both programs cannot be carried out separately.

*Effect of relationships.* The most immediate effect of the anticipated interrelationship between the programs is fear. Fear should not be brushed aside lightly; its basis deserves careful thought.

Fear of Government intervention is often expressed. Standing alone, Medicare and comprehensive health planning each can be highly influential forces. Functioning together, they can be more so. It is essential that their influence always is constructive and beneficial. Following the traditions of this country, both programs have built-in protection mechanisms to see that this occurs.

Medicare is far from being a federally dominated program. The active and sometimes vocal participation of fiscal intermediaries, States, and the hospitals themselves assures a tempering effect when it is needed. The protective device in the Partnership for Health Program is provided by the mandatory advisory councils, with the requirement that the majority of the representatives be consumers.

Fear of domination is not a one-sided phenomenon. The Government has much at stake in regard to the health of citizens and also has a responsibility to the public. Government can no more afford to leave the responsibility for the nation's health totally to the private health sector than can the voluntary sector relinquish all its responsibilities to Government.

The fear would be diminished if it were expressed properly. The approach to effective health programs is not "public" or "private," it is "public and private." The problem is how to accomplish a blending of interests effectively and to establish a bona fide partnership for health.

Accompanying fear of domination is fear of loss of autonomy. Planning automatically will raise questions about location of special services, possession of sophisticated equipment, conversion of under-utilized hospitals into extended care facilities, withholding reimbursements

from substandard facilities, or constructing new facilities of questionable need.

The questions will cause cries of indignation. Having a hospital is important to a community. Benefactors are willing to donate money for a building but understandably derive little satisfaction in underwriting a transportation system to move patients to a nearby facility. Physicians pressure hospitals to compete with other institutions. Hospitals are reluctant to trust their futures to outside influences.

Fears engendered by interrelating health programs can be alleviated if voluntary and official health agencies and vendors of services stop thinking in terms of facilities and concentrate instead on patient needs. A patient does not need hospital care alone, he needs a spectrum of services. Most hospitals now cannot meet the total needs of the patient; they already depend upon other agencies and institutions. Community health systems already exist; it is important to make them effective. Independent and isolated efforts cannot be effective; coordinated effort must be substituted.

Once the hesitancy to cooperate is overcome, another fear may well set in. This is the fear of inability to plan well. Planning is a relatively new discipline in the health professions, and its widespread acceptance has been artificially stimulated. Concern is growing that results of planning will not be evident quickly enough.

Most statements about planning to date have been optimistically laudatory. It might be far better to take the realistic approach and listen to the advice of Professor May (3).

Since 1930, planning for optimal health services has been viewed as desirable. First interest on the part of knowledgeable leaders in the health field, later large sums of money, and now a public mandate have been provided in support of the movement. Yet it remains in its adolescence. Whether it matures into a responsible, creative adult, or remains a groping unsure teenager, is a function not of the amount of money poured into it or the number of words poured out by the agencies and others involved, but rather of the wisdom and expertise brought to bear on the problem by the people involved and the intelligence and receptivity of people whom the planning process affects.

Finally, it helps to remember that all health programs are only intended to help achieve better health and better health care. There

can be no quarrel with the desired end. This intention provides incentive for making the programs perform well.

#### REFERENCES

- (1) U.S. Public Health Service: Hospital and medical facilities series (under the Hill-Burton Program). Series B—Community planning: Procedures for areawide facility planning. A guide for planning agencies. PHS Publication No. 930-B-3. U.S. Government Printing Office, Washington, D.C., 1963.

- (2) Somers, A. R.: Medicare: Way to make planning effective. *Mod Hosp* 108: 100-103, 172, June 1967.

- (3) May, J. J. P.: Health planning: Its past and potential. *Health Administration Perspectives* No. A5. Center for Health Administration Studies, Graduate School of Business, University of Chicago, Chicago, Ill., 1967, p. 52.

#### Tearsheet Requests

Michael F. White, Community Health Service, Ballston Center Tower 1, 800 N. Quincy St., Arlington, Va. 22203

## New Program to Finance Nonprofit Hospitals Begins with Illinois Hospital

A hospital construction project to cost \$24,853,812 will begin soon in Rock Island, Ill., under a new Federal program that involves both the Department of Housing and Urban Development and the Department of Health, Education, and Welfare. The project is the first to be approved for construction under the Nonprofit Hospital Insurance Program, which was enacted under title XV of the Housing and Urban Development Act of 1968 (Public Law 90-448).

The program provides for mortgage insurance by HUD's Federal Housing Administration to finance new and modernized hospitals, including major movable equipment to be used in operating them. The mortgage amount for a hospital project may not exceed \$25 million or 90 percent of the estimated replacement cost of the project and equipment. The mortgage term is 25 years, and the current maximum interest rate is 7½ percent. The hospital must be owned and operated by nonprofit corporations and associations. Plans for expansion or new construction are approved by HEW's Health Facilities Planning and Construction Service, which administers the nationwide Hill-Burton program. No application for mortgage insurance is approved unless the State Hill-Burton agency has certified that a need exists for the facility and that reason-

able minimum standards for licensing and operating hospitals are in force.

FHA has issued a commitment to insure a 25-year \$21 million loan to replace St. Anthony Hospital, established in 1893, by a large new complex to be renamed the Rock Island Franciscan Hospital. It will have 261 general hospital beds, 50 mental health beds, 40 rehabilitation beds, and full outpatient services. New construction will include an eight-story building, a two-story mental health center, and a total energy plant to supply heat and electricity for both buildings.

In addition to the mortgage loan, the hospital will receive grants from the National Institute of Mental Health, \$920,264; the Illinois Mental Health Program (for the hospital's Comprehensive Community Mental Health Center), \$332,075; and the Public Health Service's Hill-Burton program (for rehabilitation facilities and the diagnostic and treatment center), \$580,200.

Upon completion of the new hospital on a 38-acre site in 1971, it is expected that two wings of the present hospital will be converted to an extended care facility. The existing hospital has 212 beds, only 49 of which conform to Hill-Burton standards. The new complex will serve an area with a population of about 80,000.

# Program Notes

## Alcoholism Services

The Baltimore (Md.) City Health Department has established a new program of alcoholism services in the city's southern health district. Under the program, Mrs. Alice E. Gracie, alcoholism counselor in the health department, will assist public health nurses with the problems of alcoholism and the care and treatment of alcoholics.

Each week a public health nurse will meet with Mrs. Gracie and present the case of a patient who is, or is suspected of being, an alcoholic. Together they will visit the patient's home. Mrs. Gracie will evaluate the patient and make recommendations. According to Dr. Robert E. Farber, Baltimore City Commissioner of Health, all public health nurses in the southern district will eventually receive such help.

## Colorado's High Nurse Ratio

Colorado has 29.4 full-time public health nurses per 100,000 population, compared with an average of 18.8 for the United States. Forty-one percent of all nurses employed in public health in the State are between the ages of 40 and 59; 56 percent are under 40. In the United States, 59 percent of such nurses are between 40 and 59.

Of the 697 nurses engaged in public health work in Colorado, 60 percent have a bachelor's degree or higher, and 58 percent have had public health preparation. Of the 603 working full time, the percentage with a bachelor's degree or higher is 64 percent.—*Colorado's Health*, March-April 1969.

## Tough Antipollution Laws

On June 25, 1969, Governor Richard B. Ogilvie of Illinois signed into law several bills giving the attorney general of the State broad new powers to act against water and air polluters. Attorney General William J.

Scott, who sponsored the administration-backed bills, commented that the result is "the toughest anti-pollution enforcement laws in the United States."

Two of the bills permit the State to close down sources of pollution anywhere in Illinois by filing mandamus or injunction suits. Two other bills increase maximum penalties of water and air polluters. Fines of \$5,000 instead of \$500 can be levied; daily fines are increased from \$100 to \$200; the 30-day maximum jail sentence is increased to 6 months.

## Housing Patients' Relatives

After operations or at other times when a patient's condition becomes critical, relatives can stay for short periods on the premises of the Lakeville Hospital of the Massachusetts Department of Public Health at minimal cost and receive their meals in the hospital cafeteria.

Parents of children with cerebral palsy who are admitted for short-term treatment and intensive physiotherapy can also be housed. The parents are permitted to participate in treatment and to learn methods of physiotherapy and occupational therapy applicable to the care of their children. These aspects of treatment can then be carried on more effectively at home.—*THIS WEEK in Public Health* (Massachusetts Department of Public Health), June 23, 1969.

## "Brush-Ins" for Dental Health

To try to bring about partial prevention of dental decay among children, the division of dental health of the Montana State Department of Health has initiated a program of "brush-ins" in elementary schools. By the end of the 1968-69 school year, the program had been carried out in two schools in Billings and in the Ravalli County schools.

Conducted in cooperation with local dentists, these brush-ins, or self-

application programs, include teaching children to brush their teeth in the proper way while using acidulated phosphate fluoride paste as a vehicle to provide the fluoride ion. An educational program in dental health is included. Mothers serve as volunteers after being trained in the proper method of toothbrushing and other essentials.

Dr. A. Jack Terrill, director of the division of dental health, considers the procedure of self-application effective enough to be carried out empirically in any area of Montana, based on results of the program to date in Montana and the results of laboratory tests in North Dakota. The North Dakota study, he pointed out, indicated that penetration of the acidulated phosphate fluoride by self-application seemed to exceed that from a solution application.—*Treasure State Health*, July 1969.

## Screenings and Treatment Lapses

Seventy-two of 505 employees of the Colorado State Department of Highways and the State Patrol who were screened in a recent multiphasic program were found to have at least one abnormal test result. Subsequently, 38 of the 72 were confirmed as having previously unrecognized chronic disease—diabetes, high blood pressure, chronic lung disease—and 28 persons were put on active treatment regimens. One year later only 15 persons remained on their prescribed treatment.

"Evaluation of the educational impact of the screening program showed an increase in the target population's knowledge of chronic diseases but no evidence of favorable effect on behavior," according to Dr. Edward Gilmore, heart disease and stroke control officer, Public Health Service.—*Colorado's Health*, March-April 1969.

*Items for this page: Health departments, health agencies, and others are invited to share their program successes with others by contributing items for brief mention on this page. Flag them for "Program Notes" and address as indicated in masthead.*

# Prevalence of Ascariasis and Amebiasis in Cherokee Indian School Children

GEORGE R. HEALY, Ph.D., NEVA N. GLEASON, M.S., ROBERT BOKAT, M.D.,  
HARRY POND, M.D., and MARGARET ROPER, R.N.

PHYSICIANS at the Public Health Service Indian Hospital on the Cherokee North Carolina Indian Reservation diagnosed several cases of severe clinical ascariasis in children in 1964-65 and recorded the death of a child caused by what was believed to be an overwhelming infection with *Ascaris lumbricoides*. A preliminary survey in one part of the reservation in 1963 indicated that 50 percent of the children were infected with *Ascaris* worms.

To determine the prevalence of the roundworm and other intestinal parasites in the Cherokee population, a collaborative study in 1965 between physicians at the hospital and the Parasitology Section of the National Communicable Disease Center, Public Health Service, was initiated. Because of logistical problems in obtaining specimens from persons living in the

mountainous area of the reservation, it was decided to examine stool specimens from children attending the elementary school close to the hospital. Moreover, the 655 children in the elementary school would represent a sample of the approximately 5,000 residents of the reservation. More important, such examinations would indicate the prevalence of intestinal parasites in the group most likely to be affected by any species of clinical importance.

## Materials and Methods

One-half pint waxed cardboard cartons labeled with each child's name were distributed to the children at the elementary school along with instructions to bring a stool specimen, preferably a morning one, on the following day. The cartons were collected at the school from each pupil in the morning, and all specimens were processed within 6 hours. The stools were preserved in 10 percent formalin; those which were watery, loose, or soft were also placed in polyvinyl alcohol (PVA) fixative (1). When all the stools of a particular day had been preserved, a direct saline and iodine wet mount of the formalinized sediment was examined, as well as a subsequent formalin ether (FE) concentration (2). The stools preserved in PVA were stained with Wheatley's trichrome (3) and examined for protozoan trophozoites.

To determine the correlation between seropositivity and etiological results, serum speci-

---

*Dr. Healy is chief of the Helminthology and Protozoology Unit, Parasitology Section, Laboratory Division, National Communicable Disease Center, Public Health Service, and Miss Gleason is in charge of the unit's Protozoology Diagnostic and Research Laboratory. Dr. Bokar, now in private practice in Brunswick, Maine, was formerly service unit director of the Cherokee Indian Hospital, Cherokee, N.C. Dr. Pond, who is currently at the James Buchanan Brady Urological Institute, Johns Hopkins Hospital, Baltimore, Md., served as staff physician at the hospital. Miss Roper is a public health nurse at the Cherokee Indian Health Station, Cherokee.*



mens were collected from as many children as possible and tested for antibody to *Entamoeba histolytica* and *A. lumbricoides*. Results of the *Ascaris* serology will be reported elsewhere. The amebiasis serology was conducted by using tanned, sensitized sheep red blood cells in the indirect hemagglutination test of Kessel and associates (4) as modified by Milgram and associates (5). The tests were run in microtitration plates, and titers of 1:128 or greater were considered positive. The antigen employed in the test was a sonicated, lyophilized extract of *E. histolytica* strain DKB, grown with *Mycoplasma* organisms. Stock cultures of the amebae had been furnished by Dr. William K. Lewis, University of California, Los Angeles.

### Results

Stools were submitted by 631 children (302 boys and 329 girls), representing 96 percent of the 655 students enrolled in the elementary school.

**Helminths.** The impression of the hospital physicians that *Ascaris* infections were common in the school population was borne out by the observation that 49 percent of the children were infected with the worms. The overall prevalence of *A. lumbricoides* and the other intestinal parasites is shown in table 1. Among the other helminths, only *Trichuris trichiura* was present to a considerable degree (38 percent). All the *Ascaris* and *Trichuris* eggs were detected in the direct wet mount or FE concentrate with the exception of a single infertile *Ascaris* egg found in the PVA stained slide of a stool specimen from an 11-year-old boy. A greater number of hookworm infections would have been detected if a more sensitive technique, such as the culture method of Harada and Mori (6), had been employed. Pinworm infections are not generally detected by stool examinations, but the few cases that were detected are included in the results. Although only 14 children had positive *Enterobius vermicularis* infections, 92 percent were infected with one or more parasites; in only one of the infections caused by *E. vermicularis*, did such eggs represent the sole parasitic stages recovered.

**Protozoa.** Sixty-seven (11 percent) of the children were found to be passing cysts, trophozoites of *E. histolytica*, or both. One-third or

**Table 1. Prevalence of intestinal parasites in stool specimens from 631 Cherokee Indian elementary school children**

Parasite	Specimens positive	
	Number	Percent
<b>Helminths:</b>		
<i>Ascaris lumbricoides</i> .....	312	49
<i>Trichuris trichiura</i> .....	240	38
Hookworm.....	19	3
<i>Trichostrongylus</i> species.....	1	( <sup>1</sup> )
<i>Enterobius vermicularis</i> .....	14	2
<b>Protozoa:</b>		
<i>Entamoeba histolytica</i> .....	67	11
<i>Entamoeba hartmanni</i> .....	220	35
<i>Entamoeba coli</i> .....	251	40
<i>Endolimax nana</i> .....	289	46
<i>Iodamoeba bütschlii</i> .....	34	5
<i>Giardia lamblia</i> .....	59	9
<i>Dientamoeba fragilis</i> .....	68	11
<i>Trichomonas hominis</i> .....	72	11
<i>Chilomastix mesnili</i> .....	19	3
Unidentified protozoa.....	7	1
1 or more parasites.....	579	92
No parasites found.....	52	8

<sup>1</sup> 0.2 percent.

more of the children harbored the commensal amebae—*Entamoeba hartmanni*, *Entamoeba coli*, and *Endolimax nana*. Protozoa were detected in seven stool specimens, but specific identification was not possible because of poor fixation or paucity of organisms. No parasitic organisms were detected in 52 (8 percent) of the 631 stools examined.

The prevalence of six parasite species in boys and girls is compared in table 2. Analysis of the data indicated no difference by sex in parasitization by *Ascaris* (154 males, 158 females) or by *Trichuris* (112 males, 128 females). The number of hookworm infections was too small for adequate comparison (eight males, 11 females). In the stools of 37 boys and 22 girls, the pathogenic, or potentially pathogenic, protozoan *Giardia lamblia* (7) was found. Specimens from 37 boys and 31 girls were positive for *Dientamoeba fragilis*, a parasite with questionable capacity to cause symptoms (8). Although the prevalence of *E. histolytica*, *G. lamblia*, and *D. fragilis* appears greater in males than in females, an analysis of parasitization by sex was not possible. Stools from both sexes were examined after FE concentration, but there was a disproportionately larger number of PVA stained



slides from boys (62) than from girls (50). The data, therefore, are biased in favor of stool specimens from boys.

The prevalence of the parasites in the children by school grade is presented in tables 3-5. Even though *Ascaris* and *Trichuris* were more prevalent in the lower grades (table 3), at least one-third of the children in the higher grades

also harbored roundworms and whipworms. Results in the category "no parasites found" include examinations for helminths and protozoa. The largest number of stools with no parasites found were from children in the fourth, sixth, and seventh grades, a result indicating no specific pattern and certainly no evidence of a diminution of infection in the older children.

**Table 2. Prevalence of selected parasites in stool specimens from 631 Cherokee Indian elementary school children, by sex**

Parasite	All children		Boys		Girls	
	Number	Percent	Number	Percent	Number	Percent
<i>Ascaris lumbricoides</i> .....	312	49	154	49	158	51
<i>Trichuris trichiura</i> .....	240	38	112	47	128	53
Hookworm.....	19	3	8	42	11	58
<i>Entamoeba histolytica</i> .....	67	11	39	58	28	42
<i>Giardia lamblia</i> .....	59	9	37	63	22	37
<i>Dientamoeba fragilis</i> .....	68	11	37	54	31	46

**Table 3. Percentage of 631 Cherokee Indian elementary school children with helminth parasites, by school grade**

Parasite	School grade								Overall prevalence
	1	2	3	4	5	6	7	8	
<i>Ascaris lumbricoides</i> .....	57	56	52	51	60	42	37	33	49
<i>Trichuris trichiura</i> .....	40	51	36	39	42	29	29	30	38
Hookworm.....	0	2	5	1	5	5	4	4	3
<i>Trichostrongylus</i> .....	0	0	0	0	1	0	0	0	(1)
<i>Enterobius vermicularis</i> .....	1	3	5	3	2	2	0	3	2
No parasites found <sup>2</sup> .....	4	8	5	14	4	11	15	7	8
Number of students.....	95	101	64	80	84	62	75	70	-----

<sup>1</sup> 0.2 percent.

<sup>2</sup> Includes protozoa and helminths.

**Table 4. Percentage of 631 Cherokee Indian elementary school children with protozoan parasites, by school grade**

Parasite	School grade								Overall prevalence
	1	2	3	4	5	6	7	8	
<i>Entamoeba coli</i> .....	40	41	39	34	48	47	33	37	40
<i>Endolimax nana</i> .....	52	37	50	49	51	29	43	56	46
<i>Iodamoeba bütschlii</i> .....	0	5	3	5	7	3	9	11	5
<i>Giardia lamblia</i> .....	14	11	9	6	10	13	6	4	9
<i>Dientamoeba fragilis</i> .....	18	7	8	9	12	11	15	6	11
<i>Chilomastix mesnili</i> .....	5	3	6	0	2	5	1	1	3
<i>Trichomonas hominis</i> .....	9	8	6	12	20	16	8	11	11
Unidentified protozoa.....	0	0	3	0	5	3	3	0	1
Number of students.....	95	101	64	80	84	62	75	70	-----

**Table 5. Percentage of 631 Cherokee Indian elementary school children with *Entamoeba histolytica* and *Entamoeba hartmanni* and the amebic prevalence rate, by school grade**

Parasite	School grade								Overall prevalence
	1	2	3	4	5	6	7	8	
<i>Entamoeba histolytica</i> .....	8	6	9	14	14	8	13	13	11
<i>Entamoeba hartmanni</i> .....	37	26	33	36	38	37	28	51	35
<i>E. histolytica</i> and <i>E. hartmanni</i> combined.....	39	26	34	40	43	38	35	56	39
Amebic prevalence rate.....	91	64	77	69	74	69	64	81	74
Number of students.....	95	101	64	80	84	62	75	70	
Amebiasis hemagglutination test positive (percent) <sup>1</sup> .....	2	2	2	1	1	2	4	1	2

<sup>1</sup> Indirect HA titers 1:128 or greater.

The seven species of protozoa in table 4 occurred without any appreciable diminution through the eighth grade. *E. coli* and *E. nana* were more prevalent than the other five species.

*E. histolytica* organisms were found in 67 children (39 boys, 28 girls)—an 11 percent prevalence rate (table 5). Forty-three (64 percent) of the *E. histolytica* infections were diagnosed from cysts found in the FE concentrates; seven (11 percent) were diagnosed from organisms found in both PVA stained slides and FE concentrates; 17 (25 percent) were diagnosed in the PVA stained slide only.

Distribution of the *E. histolytica* throughout the school grades was constant, with more infections in the older children (in the seventh and eighth grades) than in the younger ones (in the first, second, and third grades).

Of particular significance was the observation of an "amebic prevalence rate" (APR) of 74 percent. The APR, first described by Brooke and associates (9), is calculated by considering infections with one or more of the four amebae (*E. histolytica*, *E. coli*, *E. hartmanni*, and *E. nana*) as an "amebic" infection. Since the four organisms have comparable but not identical capabilities of surviving in the environment and are transmitted by ingestion of cystic stages, they are indicative of fecal contamination.

*Amebiasis serology.* Serum specimens were collected from 617 children. Specimens were obtained from all but one of the 67 children whose stools were positive for *E. histolytica*. The following summary of the correlation between etiological and serologic positivity in the 617 children is taken from a table in a previous study by Healy (10).

Test results	Number	Percent
<i>E. histolytica</i> in stools, IHA test positive.....	2	0.3
<i>E. histolytica</i> in stools, IHA test negative.....	64	10.4
No <i>E. histolytica</i> in stools, IHA test positive.....	10	1.6
No <i>E. histolytica</i> in stools, IHA test negative.....	541	87.7
Total.....	617	100.0

Ninety-eight percent of the 617 serums were negative for ameba antibody. Only two (0.3 percent) of the serum specimens were positive with the corresponding *E. histolytica* found in the stool specimens, whereas 10 (1.6 percent) of the serum specimens were positive without demonstration of the amebae in the stool specimens. Organisms recovered in stool specimens from children with positive IHA titers are listed in table 6.

## Discussion

Since our survey was concerned with intestinal parasites in elementary school children, no reference can be made to the extent of parasitism in the population of the Cherokee Indian Reservation. Direct examination of a single stool specimen and examination after FE concentration probably resulted in detection of all of the *Ascaris* infections and the majority of the *Trichuris*. The same cannot be said for the intestinal protozoa. Although all specimens were subjected to direct and FE concentrate examinations, only 112 of the 631 stools were preserved in PVA and subsequently examined after trichrome staining. The possibility of more widespread protozoan infections is suggested by table 7, which shows the parasite prevalence in the siblings of three families.

Eleven reports of parasitism among North American Indians have been published (11-21). The present study was concerned only with elementary school children from 6 to 16 years of age, whereas most other surveys have included all age groups. *Ascaris* eggs were reported in only three other studies (13, 14, 20); in the study

by Fournelle and associates (20), *Ascaris* eggs were found in only one of the 855 stools examined.

A recent survey of intestinal parasitism in the Southeast was conducted by Jeffery and associates (22) in a coastal area of South Carolina in Beaufort County among a rural Negro popula-

**Table 6. Parasites recovered from 12 Cherokee Indian elementary school children with positive titers for amebiasis in the indirect hemagglutination test**

Child's age, sex, and grade	IHA titer	Parasites found
7, F, 1st-----	1:256	<i>Ascaris lumbricoides</i> , <i>Trichuris trichiura</i> , <i>Entamoeba histolytica</i> , <i>Endolimax nana</i> .
8, M, 1st-----	1:128	<i>A. lumbricoides</i> , <i>T. trichiura</i> , <i>Entamoeba hartmanni</i> , <i>E. nana</i> .
8, M, 2d-----	1:256	<i>A. lumbricoides</i> , <i>T. trichiura</i> , <i>E. hartmanni</i> , <i>Trichomonas hominis</i> .
7, F, 2d-----	1:128	<i>A. lumbricoides</i> , <i>T. trichiura</i> , <i>Entamoeba coli</i> , <i>E. nana</i> .
8, M, 3d-----	1:128	<i>A. lumbricoides</i> .
10, F, 4th-----	1:256	<i>A. lumbricoides</i> , <i>E. coli</i> , <i>E. nana</i> , <i>Iodamoeba bütschlii</i> , <i>T. hominis</i> .
11, M, 5th-----	1:128	<i>A. lumbricoides</i> , <i>T. trichiura</i> , <i>E. histolytica</i> , <i>E. coli</i> .
12, M, 6th-----	1:128	Unidentified flagellate.
12, F, 7th-----	1:128	No parasites found.
14, M, 7th-----	1:128	<i>A. lumbricoides</i> , <i>T. trichiura</i> , <i>E. hartmanni</i> .
14, F, 7th-----	1:128	<i>T. trichiura</i> , <i>E. coli</i> .
14, F, 8th-----	1:128	<i>E. coli</i> , <i>E. hartmanni</i> , <i>E. nana</i> .

**Table 7. Occurrence of parasites among Cherokee Indian elementary school children from three family groups**

Sibling's sex and age	Parasites <sup>1</sup>										
	Al	Tt	Eh	Ehart	Ec	En	Ib	Df	Gl	Th	Cm
Family A:											
Boy, 7-----	x	x	x	x	x						
Girl, 8-----	x	x			x		x				x
Girl, 10-----	x	x		x	x	x	x				
Boy, 11-----	x	x	x		x	x	x				x
Boy, 13-----	x	x			x	x	x				
Boy, 14-----				x		x					
Family B:											
Girl, 6-----	x	x	x	x		x		x			
Girl, 8-----	x	x				x		x		x	
Girl, 10-----	x	x			x			x			x
Boy, 11-----	x	x		x	x						
Girl, 12-----	x	x									
Girl, 15-----	x	x		x			x				
Family C:											
Boy, 6-----	x				x						
Girl, 8-----					x				x		
Girl, 11-----	x			x	x	x			x	x	
Girl, 13-----	x					x		x	x	x	
Girl, 14-----	x			x	x	x		x	x	x	

<sup>1</sup> Key: Al—*Ascaris lumbricoides*  
Tt—*Trichuris trichiura*  
Eh—*Entamoeba histolytica*  
Ehart—*Entamoeba hartmanni*  
Ec—*Entamoeba coli*  
En—*Endolimax nana*

Ib—*Iodamoeba bütschlii*  
Df—*Dientamoeba fragilis*  
Gl—*Giardia lamblia*  
Th—*Trichomonas hominis*  
Cm—*Chilomastix mesnili*.

tion. They examined family units and found the following overall prevalence of parasites from 212 stools: *Ascaris* 64 percent, *Trichuris* 37 percent, *E. histolytica* 1.4 percent, *E. coli* 32 percent, *E. nana* 10 percent, *Iodamoeba bütschlii* 0.5 percent, *Trichomonas hominis* 0.5 percent, *Chilomastix mesnili* 1.4 percent, and *G. lamblia* 8 percent. Prevalence for *E. hartmanni* and *D. fragilis* was not given.

In the age groups comparable to those of the Cherokee school children (6-17 years), the survey of Jeffery and associates showed 60 of 74 children (81 percent) positive for *Ascaris* and 38 of 74 (51 percent) positive for *Trichuris*. There was no analysis of parasitization for the protozoa by age groups. Although the sample studied by Jeffery and associates was smaller, both for all persons infected and for children, these persons from South Carolina had a higher prevalence of *Ascaris* (64 percent overall and 81 percent in children) than did the Cherokee children (49 percent).

When our survey is compared with the one of Jeffery and associates, certain differences are noted. Our survey was conducted among American Indian children in western North Carolina in the Great Smoky Mountains while the survey of Jeffery and associates was conducted among American Negro families in the flat coastal plains of South Carolina.

The similar high prevalence of fecally transmitted intestinal parasites in the two groups, however, emphasizes the important point made by Jeffery and others, that "a high incidence of *Ascaris* in specific groups may not depend so much on the climate or topography, although certain favorable conditions are necessary, as on the particular habits and sanitation of the populations involved."

The survey of the Cherokee Indian children was conducted with three goals in mind. The first was to provide physicians of the Public Health Service Indian Hospital with information on the prevalence of *Ascaris* and other parasites in the school population. As suspected, the prevalence of *Ascaris* infections was high, and the amebic prevalence rate was as high as in some tropical areas.

The second goal was to determine the suitability of serologic tests for ascariasis and amebi-

asis. Evaluation of *Ascaris* serology is in progress. Results of the amebiasis serology enabled us to evaluate the specificity of the indirect hemagglutination (IHA) test for intestinal amebiasis. The results of our evaluation of 617 serum samples taken from infected children indicated no cross reactions with other intestinal parasites. The 617 serums from our survey along with the other serums tested (10) also showed that the IHA test was of little value in asymptomatic intestinal amebiasis. Such results are in keeping with the concept that positive serology is evident only where tissue invasion has occurred, as in amebic dysentery or amebic liver abscess. The serologic results corroborated the experiences of physicians from the Public Health Service Indian Hospital, who have recorded only rare instances of clinical amebiasis in the Cherokee Indian population.

The third, and perhaps most useful goal, was to document the prevalence of fecally transmitted parasites. With the exception of hookworm and pinworm, the presence of intestinal parasites indicates the status of a population's sanitation and personal hygiene. Therefore, data on prevalence from our survey would serve as a basis for judging any changes occurring subsequently as a result of improvements in sanitation, intensified health education, or regimens of drug prophylaxis directed against *Ascaris* or other parasites. For example, the effects of certain sanitary improvements that were being provided the Cherokee Indian Reservation under Public Law 86-121 at the time of our survey might be gauged by comparing the prevalence of *Ascaris* or other parasites that we found with the prevalence observed in a similar survey several years from now. (Public Law 86-121 included provisions for the construction of either a well-built, suitably placed outdoor pit privy or the piping in of water for use with an indoor toilet and with facilities for washing and bathing. The Indian householder was required to contribute a certain amount of labor to initiate the construction of either of the two kinds of sanitary facilities.)

### Summary

Single stool specimens, collected from each of 631 children at the Cherokee Indian Elementary School, Cherokee, N.C., were examined for

intestinal parasites. The organisms identified and their prevalence were as follows: *Ascaris lumbricoides*, 49 percent; *Trichuris trichiura*, 38 percent; hookworm, 3 percent; *Entamoeba histolytica*, 11 percent; *Entamoeba hartmanni*, 35 percent; *Entamoeba coli*, 40 percent; *Endolimax nana*, 46 percent; *Iodamoeba bütschlii*, 5 percent; *Giardia lamblia*, 9 percent; *Dientamoeba fragilis*, 11 percent; *Chilomastix mesnili*, 3 percent, and *Trichomonas hominis*, 11 percent.

Evidence of infection with one or more parasites was found in 92 percent of the children. The amebic prevalence rate, which can be used to measure the extent of ingestion of organisms through fecal contamination, was 74 percent. There was no difference in the prevalence of *A. lumbricoides* or *T. trichiura* between Indian boys and girls. Although there was a slight reduction in the prevalence of some parasites (*A. lumbricoides*, *T. trichiura*, and *G. lamblia*) in children of the higher elementary grades as compared with the lower ones, in many cases an equal or greater number of children in the higher grades were parasitized with *E. histolytica* and *E. hartmanni* as compared with children in the lower grades. In general, the survey revealed a high prevalence of intestinal parasites in children throughout the eight grades of the school.

An indirect hemagglutination (IHA) test for amebiasis was used to detect antibody in the serums of 617 of the children. Results showed no cross reactions with any other intestinal parasites. Only two of the serums (0.3 percent) from children having *E. histolytica* in the stools were positive by IHA; conversely, 10 of the serums (1.6 percent) from children in whom no *E. histolytica* was detected were positive. Results of the indirect hemagglutination test indicated that it was of little value in asymptomatic intestinal amebiasis. They did, however, corroborate the experience of the Public Health Service physicians, who had rarely found cases of clinical amebiasis in the Indian children.

Data obtained in the survey will serve as a basis by which to judge the results of projected activities designed to improve sanitation, intensify health education, and provide drug prophylaxis for ascariasis.

## REFERENCES

- (1) Brooke, M. M., and Goldman, M.: Polyvinyl alcohol-fixation as a preservative and adhesive for protozoa in dysenteric stools and other liquid media. *J Lab Clin Med* 34: 1554-1560 (1949).
- (2) Ritchie, L.: An ether sedimentation technique for routine stool examinations. *Bull U.S. Army Med Depart* 8: 326 (1948).
- (3) Wheatley, W. B.: A rapid staining procedure for intestinal amebae and flagellates. *Amer J Clin Path* 21: 990-991 (1951).
- (4) Kessel, J. F., Lewis, W. P., Molina Pasquel, C., and Turner, J. A.: Indirect hemagglutination and complement fixation tests in amebiasis. *Amer J Trop Med* 14: 540-550, July 1965.
- (5) Milgram, E., Healy, G. R., and Kagan, I. G.: Studies on the use of the indirect hemagglutination test in the diagnosis of amebiasis. *Gastroenterology* 50: 645-649, May 1966.
- (6) Harada, Y., and Mori, O.: A new method for culturing hookworm. *Yonago Acta Med* 1: 177-179 (1955).
- (7) Brandborg, L., et al.: Histological demonstration of mucosal invasion by *Giardia lamblia* in man. *Gastroenterology* 52: 143-150 (1967).
- (8) Kean, B. H., and Mallock, C. L.: The neglected ameba: *Dientamoeba fragilis*. A report of 100 "pure" infections. *Amer J Dig Dis* 11: 735-746 (1966).
- (9) Brooke, M. M., et al.: Studies of a water-borne outbreak of amebiasis, South Bend, Indiana. III. Investigation of family contacts. *Amer J Hyg* 62: 214-226 (1955).
- (10) Healy, G. R.: The use of and limitations to the indirect hemagglutination test in the diagnosis of intestinal amebiasis. *Health Lab Sci* 5: 174-179, July 1968.
- (11) Owen, W. B., Honess, R. F., and Simon, J. R.: Observations on the protozoan infestations of American Indian children in the United States. *J Parasit* 19: 178 (1932).
- (12) Owen, W. B., Honess, R. F., and Simon, J. R.: Protozoan infestations of American Indian children in Wyoming. *J Colorado-Wyoming Acad Sci* 1: 78 (1933).
- (13) Owen, W. B., Honess, R. F., and Simon, J. R.: Protozoal infestations of American Indian children. *JAMA* 102: 913-915 (1934).
- (14) Spector, B. K., Hardy, A. V., and Mack, M. G.: Studies of the acute diarrheal diseases. II. Parasitological observations. *Public Health Rep* 54: 1105-1113, June 23, 1939.
- (15) Saunders, L. G.: A survey of helminth and protozoan incidence in man and dogs at Fort Chipewyan, Alberta. *J Parasit* 35: 31-34 (1949).
- (16) Kelley, G. W., Jr.: Intestinal parasitism in an irrigated community of western Nebraska. *Amer J Trop Med* 4: 901-907 (1955).
- (17) U.S. Public Health Service: Health services for

- American Indians. PHS Publication No. 531. U.S. Government Printing Office, Washington, D.C., 1957.
- (18) Melvin, D. M., and Brooke, M. M.: Parasitologic surveys on Indian reservations in Montana, South Dakota, New Mexico, Arizona, and Wisconsin. *Amer J Trop Med* 11: 765-772 (1962).
  - (19) Meerovitch, E., and Eaton, R. D. P.: Outbreak of anebiasis among Indians in northwestern Saskatchewan, Canada. *Amer J Trop Med* 14: 719-723 (1965).
  - (20) Fournelle, H. J., Rader, V., and Allen, C.: A survey of enteric infections among Alaskan Indians. *Public Health Rep* 81: 797-803, September 1966.
  - (21) Becke, D.: Enteric parasites of Indians and Anglo-Americans, chiefly on the Winnebago and Omaha Reservations in Nebraska. *Nebraska State Med J* 53: 293-295, June 1968; 347-349, July 1968; 380-382, August 1968; 421-423, September 1968.
  - (22) Jeffery, G. M., et al.: Study of intestinal helminth infections in a coastal South Carolina area. *Public Health Rep* 78: 45-55, January 1963.

#### Tearsheet Requests

Dr. George R. Healy, Parasitology Section, National Communicable Disease Center, Atlanta, Ga. 30333

## Link Between XYY Syndrome and Criminality Not Clear

A link between the XYY syndrome—an in-born male chromosome abnormality—and criminal behavior is not clearly demonstrated at this time.

This was concluded by a panel of experts at a conference on the XYY syndrome, sponsored by the National Institute of Mental Health's Center for Studies of Crime and Delinquency, held in Chevy Chase, Md., June 19-20, 1969.

Chaired by Dr. Park Gerald of Boston's Children's Hospital, the conferees, including experts in genetics, psychiatry, psychology, sociology, and law, discussed in-depth research, ethical, and social policy issues related to the XYY syndrome.

A major focus was on development of broad and flexible guidelines for research procedures in studies designed to ascertain the true prevalence and frequency of the XYY chromosome constitution in the general population so that future studies can be combined and inter-related more effectively.

Regarding various legal questions which increasingly are being raised, consensus was that presently no definite conclusions can be drawn about the relationship between the presence of the XYY chromosome and deviant, criminal, and violent behavior. The general impression that the XYY chromosome is clearly related to criminal behavior is definitely mis-

leading, according to the specialists. They believe that this impression has created a public concern which is premature, since available research evidence is not adequate to support the assertion.

Dr. Saleem A. Shah, chief of the Center for Studies of Crime and Delinquency, said that a prime reason for the concern of the National Institute of Mental Health in this area is to obtain valid information about the prevalence of persons with the XYY syndrome in the general population, and to undertake careful and systematic research to ascertain the nature of the interactions between such chromosomal anomalies and complex social behavior. The shortage of information about the frequency of such cases makes it difficult to evaluate properly the meaning and significance of the XYY cases which have been found among various criminal populations. Shah expressed concern about the strong pressures that are being brought about in this, as yet, little understood area. Moves to change social policy are already outpacing and are out of touch with the present state of scientific knowledge, he said.

A brief publication summarizing the findings, conclusions, and recommendations of the conference will be available from the Center late in 1969.

# Status of Health Services in Micronesia Since the 1963 Poliomyelitis Epidemic

MATHEW LEE, M.D., M.P.H., HOWARD A. RUSK, M.D., and EUGENE J. TAYLOR, M.A.

**I**N THE SUMMER of 1965 a rehabilitation evaluation team visited the Trust Territory of the Pacific to evaluate and advise on the rehabilitation of victims of the 1963 poliomyelitis epidemic in Micronesia. In addition to onsite study, extensive consultations concerning rehabilitation needs and resources were held with High Commissioner Wilfred Goding and his staff, and with Dr. Ivar Larsen at the Shriners' Hospital in Honolulu, Dr. Richard Lee, director of the School of Public Health at the University of Hawaii, and Dr. Delmar Ruthig, associate director for program services in the Office of International Health, Public Health Service.

The administration and delivery of medical care and public health measures in Micronesia must necessarily be geared to the peculiar features of the area. The observations are reviewed and discussed in context with subsequent progress in health care and the outlook for the future.

Micronesia comprises 2,000 islands of volcanic or coral origin in four major archipela-

goes: the Carolines, the Marshalls, the Marianas, and the Gilbert Islands. The Gilbert Islands and Guam are excluded from the Trust Territory (fig. 1).

While temperatures are not generally excessive, rainfall is heavy and humidity averages 80 percent. Paradoxically, some of the islands near the equator suffer severe droughts. Major storms are characteristic of this part of the Pacific and are capable of inflicting damage of disastrous proportions.

Despite the fact that there are many similarities among the Micronesian populations, there are significant differences in customs and in the nine major languages which are spoken with dialectic variations. Most people know only the language that is used on their own home island.

Offsetting the difficulties related to geography, climate, population differences, and health personnel is the fact that the total population of approximately 95,000 lives on just under 100 islands. This relative concentration of population helps to reduce the problem of delivery of services to manageable proportions, assuming the availability of health resources and personnel and appropriate transportation facilities.

## The Epidemic and Its Initial Effects

Between January 4 and March 3, 1963, 196 cases of paralytic poliomyelitis were recognized in the Marshall Islands. Of these, 194 occurred among an indigenous population of only 16,000, and 90 percent of these patients were under 7 years of age.

---

*Dr. Lee was consultant in rehabilitation medicine, U.S. Department of Interior, Washington, D.C., and at present is an associate professor, department of rehabilitation medicine, New York University Medical Center. Dr. Rusk is professor and chairman of rehabilitation medicine, and Mr. Taylor is adjunct associate professor at the center. This paper is based on one read before the 45th annual session of the American Congress of Rehabilitation Medicine, Bal Harbour, Fla., August 30, 1967.*

A 9-year-old girl, living on Kwajalein Island, acquired an illness characterized by fever, headache, malaise, vomiting, and subsequent paralysis. This illness was the first clinically recognized case of paralytic poliomyelitis in the Marshall Islands. A week later a Marshallese boy, living on nearby Ebeye, another islet in Kwajalein Atoll, became paralyzed in his right leg.

During these episodes, two ships, the *Ran Annim* and the *Mieco Queen*, and a local schooner, sailed from Kwajalein throughout the neighboring atolls. The temporal relationship between a ship's arrival and the onset of epidemic poliomyelitis was well documented by Dr. James A. Bryan, a Public Health Service physician, and his associates in a report to the National Communicable Disease Center, and Dr. Carl R. Peterson, a Navy physician, in his report to the Navy's Preventive Medicine Unit at Honolulu. Figure 2 illustrates routes of the ships and the number of cases of poliomyelitis

reported on each island. The epidemic was most severe on Ebeye (56 cases) and Majuro (64 cases).

An immediate mass vaccination program with Sabin oral vaccine and enforcing strict quarantine regulations confined the epidemic to the Marshall Islands. A mass oral vaccination program also was started for all the territory.

### Medical and Rehabilitation Needs

In the acute phase of the illnesses there was a remarkable lack of pain and muscle spasm. Facial paralysis occurred in 29, or slightly less than 15 percent, of the patients with paralysis, and in 18 of these, or approximately 9.2 percent of all patients paralyzed, facial paralysis was an isolated finding.

In evaluating clinical severity, Bryan classified cases according to the following criteria.

1. Paralytic poliomyelitis with no residual paralysis
2. Minor residua

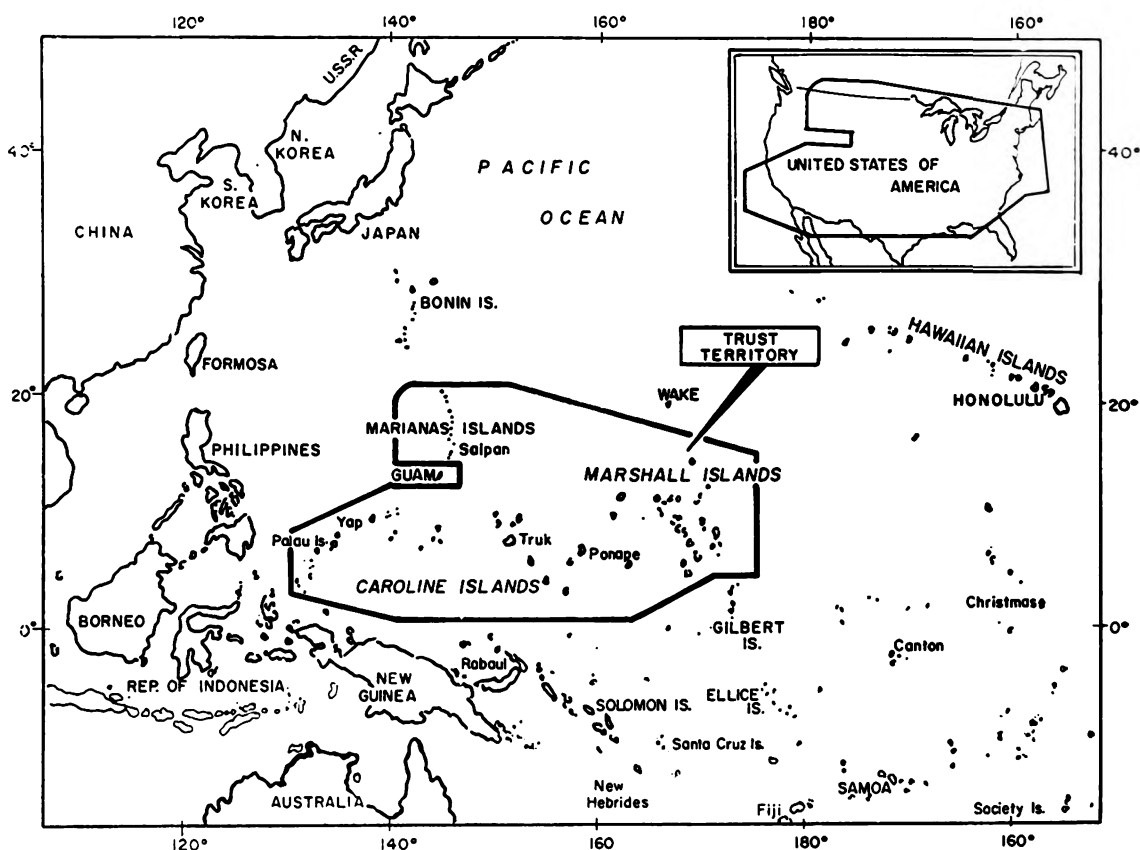


Figure 1. Trust Territory of the Pacific Islands



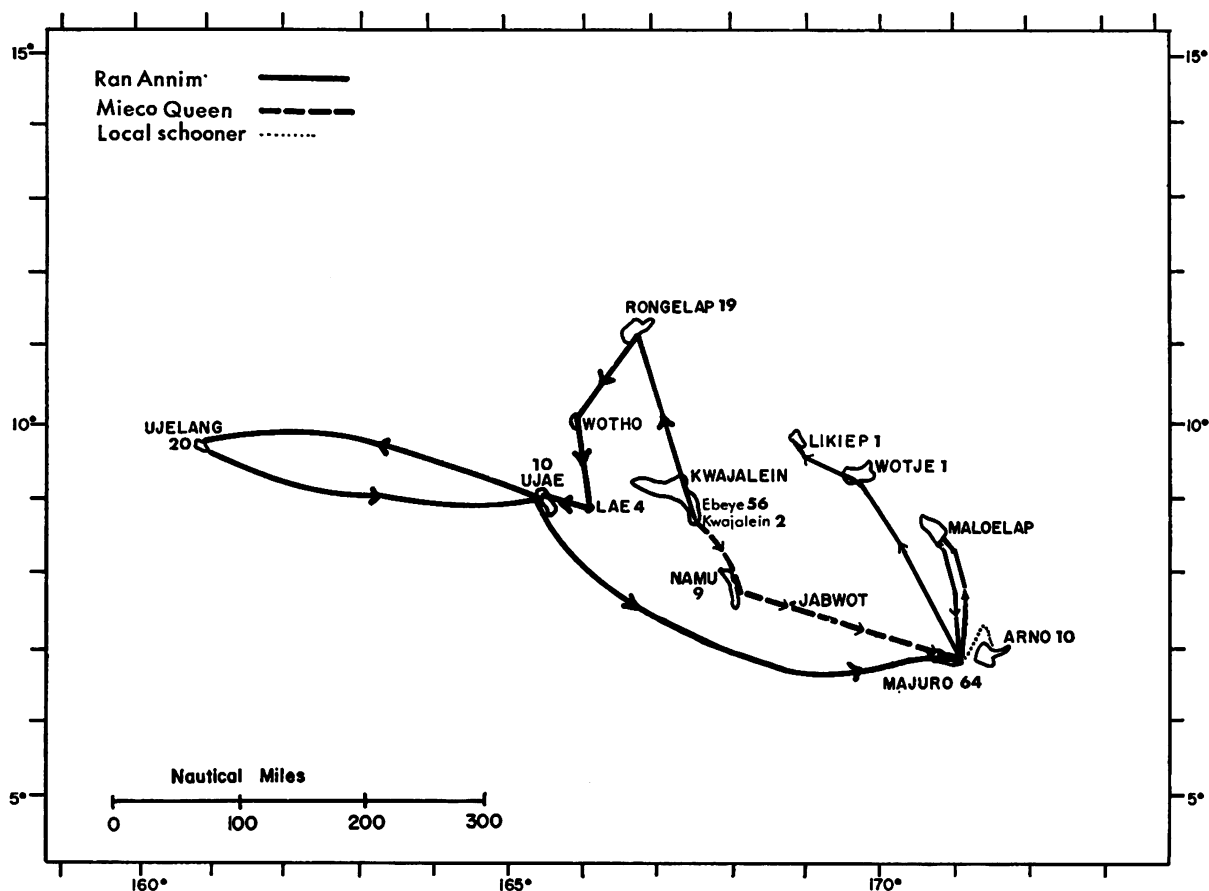


Figure 2. Routes of inter-island ships and distribution of cases of poliomyelitis, Marshall Islands, 1963

3. Significant residua leading to functional impairment of one or more limbs

4. Severe involvement leading to one or more limbs extensively involved, or severe trunk musculature involvement or both

5. Death

Table 1 shows the paralytic cases by severity, based on a 30-day post paralysis evaluation. Classes 3 and 4 required intensive rehabilitative care and followup because of the severity of the disease.

In assaying the medical needs of the patients, Dr. John E. Affeldt of the Rancho Los Amigos Hospital, Downey, Calif., and Dr. William H. Gullledge of the Shriners' Hospital for Crippled Children, Honolulu (Hawaii) Unit, in separate documents outlined extensively and comprehensively the total health needs of the 185 surviving patients.

Schneider and Tarlow (1) have described the

efforts to develop a rehabilitation program. Indeed, the therapy program provided favorable recovery of function despite limitations in staff and facilities.

*Medical treatment and surveillance.* In the majority of cases the patient's medical condition had stabilized by 1965. At least two patients will need custodial care the rest of their lives. Of the 80 severely paralyzed patients, only 66 were under treatment and surveillance, and only 30 of these patients were receiving regular treatment from a physical therapist (table 2). Residing on the outer islands were 54 patients seen by a physician only once during the epidemic.

*Braces and corsets.* The 1965 records indicated that 37 patients were using some type of extremity bracing and 15 were issued corsets, a total of 52 patients (table 3). These patients probably constituted the majority of those re-

quiring corrective and preventive surgery. The heat, humidity, and coral terrain take a heavy toll on the longevity of the braces and supportive abdominal devices.

*Family acceptance of disability and therapy.* Initially, the families expected complete, spontaneous recovery from the illness. As months elapsed, many parents began to grasp the significance of the need for therapy and commenced to learn to assist in their children's regimen.

Health professionals found it impossible to convince Marshallese parents to separate their children from the home for inhospital treatment. Therefore, one parent for each child was allowed to attend the children at the hospital, but often whole families moved into the wards.

Therapists reported that families' presence caused some inconvenience in giving therapy and in ward management. Parents sometimes felt "too sympathetic" toward their children, especially when prolonged bracing and tendon-stretching exercises were required to prevent and reduce contractures.

The involvement and training of families is crucial, however, to the rehabilitation and adjustment of patients in the community. Continued health education is mandatory to achieve maximum success from corrective surgical procedures.

*Social and vocational rehabilitation.* Of the patients receiving medical care, 19 required extensive vocational rehabilitation. Seventeen of these had primarily lower extremity involvement, and two had flail upper limbs. In 1965 there were 143 affected children over the age of 6 years, 20 of whom were 12 years of age or older. The urgent task of developing a program within the framework of the islands' en-

**Table 1. Severity of paralytic cases of poliomyelitis, Marshall Islands, 1963**

Class	Number	Percent
1.....	37	19
2.....	68	35
3.....	51	26
4.....	29	15
5.....	11	5
Total.....	196	100

**Table 2. Treatment status of 185 patients who had poliomyelitis during the Marshall Islands epidemic, 1963**

Status	Majuro	Ebeye	Outer islands	Total
Treatment and surveillance.....	39	27	0	66
Not under active care..... <sup>1</sup>	11	3	<sup>2</sup> 53	56
Completely discharged.....	10	12	30	52
Total.....	60	42	84	185

<sup>1</sup> Pending complete discharge.

<sup>2</sup> Required medical examinations relative to determining surveillance or treatment programs.

vironment and economy was increasingly apparent.

Realistically, social and vocational rehabilitation must be geared to the islands' sharply inhibited economic development and to their limited resources. Communities are small and the people live communally. The close relationship between daily living and the environment determine the kind and extent of vocational rehabilitation.

In 1965 there was little evidence of planning for the education and vocational rehabilitation of the patients. As a part of the planning of services, it was recommended that case records be compiled and that each patient be helped to function at his maximum potential.

#### Trust Territory Rehabilitation Center

The establishment of the Trust Territory Rehabilitation Center in Majuro, Marshall Islands, offered an unprecedented opportunity for the improved care of disabled patients throughout Micronesia. Proximity of the Armer Ishoda Memorial Hospital provided an opportunity for all patients to profit from rehabilitation medicine. This is exemplified by transfer of a young traumatized paraplegic to the rehabilitation center where he was trained in the activities of daily living and returned to Palau. With the addition of the rehabilitation center, a continued program of total health care was instituted. In 1965 the addition of 60 beds to the complex was contemplated, and a 15-bed section was opened as personnel became available.

Projected major functions of this center are to provide (a) selected patient care in rehabilitation medicine for the inhabitants of the Territory, (b) referral services for patients with chronic disease or who require long-term care, (c) compilations of data on amputees, paraplegics, and other disabled persons so that services can be given at the district hospitals, and (d) training of health personnel in the latest rehabilitative techniques.

It was recommended that, as the need for hospitalization of the poliomyelitis patients diminishes, the facility be used to rehabilitate the victims of other crippling diseases, such as strokes, and persons with injuries to the spinal cord or orthopedic problems. According to health authorities in the Marshalls, this expansion of services has begun.

Further recommendations were that the rehabilitation center be maintained as a dynamic center for active rehabilitation and that it not be allowed to settle into a custodial institution as it accumulated patients for whom no ready discharge seemed possible.

Pending the completion of the Rehabilitation Center, therapy was carried on at improvised structures at Majuro. In 1965 three old quonset huts were used to house patients and their families from the outer islands, while a fourth hut

was used for therapy. At Ebeye a small, inadequate building was in use and therapy was carried on in an adjacent hospital.

In 1965 the physical plant of the Trust Territory Rehabilitation Center had been largely completed and the basic rehabilitation equipment (whirlpool baths, heat modalities, and other units) had been delivered. The anodized aluminum structure contains a gymnasium, therapy rooms, dining and kitchen facilities, and two 30-bed wards separated by an outdoor therapeutic swimming pool which was not yet completed. In addition to recommendations regarding ventilation and proper use of the pool and equipment, a major recommendation was that the rehabilitation center be absorbed by the nearby Armer Ishoda Hospital, and that wards be opened in 15-bed units. In 1968, 30 beds were in use.

### The Situation and Recommendations in 1965

During the visit in 1965 a number of other recommendations were made. These were necessarily divided between those measures which were designed to deal with the immediate problem, and recommendations which would result in the development and improvement of permanent rehabilitation and health resources.

In the summer of 1965 the rehabilitation of patients with physical disabilities was being met on an adaptive basis using available resources and facilities. At the same time, the Trust Territory Rehabilitation Center was being organized to provide more appropriate and effective rehabilitation care.

Except during an emergency, no local medical officers were assigned to the direct management of these patients, although the physical therapists received medical instruction from the visiting orthopedist from the Shriners' Hospital in Honolulu. These physicians had been providing excellent orthopedic evaluations for the patients at 6-month intervals and, in addition to surgery performed at Majuro, occasionally patients were operated on in Honolulu. Recommendations were made for the intensification and improvement of the surgical program at Majuro, including pre- and post-operative care.

Before 1966, Majuro lacked facilities for surgery. However, after the activation of the Trust

**Table 3. Patients using braces and corsets, Marshall Islands, 1965**

Type of appliances	Majuro	Ebeye	Outer islands	Total
Bilateral long leg braces-----	10	3	0	13
Unilateral long leg brace-----	1	7	2	10
Bilateral short leg braces-----	0	0	1	1
Unilateral short leg brace-----	5	1	4	10
Unilateral long leg brace and unilateral short leg brace-----	1	0	0	1
Upper extremity bracing-----	<sup>1</sup> 1	1	0	2
Corset <sup>2</sup> -----	9	4	2	15
Total-----	27	16	9	52

<sup>1</sup> Patient had severe bilateral upper extremity involvement.

<sup>2</sup> Patients requiring corsets may also have required any of the other appliances.

Territory Rehabilitation Center, the program began. Approximately 30 patients received corrective surgery, and the majority of these operations were Grice procedures and peroneal tendon transfers.

Available paramedical personnel consisted of two American registered physical therapists (one at Ebeye Clinic and the other at the Majuro Clinic), two physical therapy aides at Majuro, one of whom had nurses' training, and a mechanic with the public works department who was being trained in bracing and prosthetics in Hawaii. Recommendations were made as to the more effective use of these paramedical personnel, and the assignment of an additional physical therapy aide to the Ebeye Clinic.

A skilled orthotist from Honolulu accompanied the orthopedists on their biennial visits. It was recommended that the local mechanic who was being trained be assigned maintenance responsibilities for braces. No wheelchairs were then available, although a dozen or more were needed. These would have to be modified for use on the difficult terrain, and it was recommended that the local mechanic do this.

### Prospects

When the poliomyelitis epidemic occurred in 1963, there was a severe shortage of health personnel. Since then significant steps have been taken to remedy the situation. These steps were aided in part by the new eligibility for Public Health Service grants. Two young physicians as well as a physical therapist have settled in the Marshall Islands. Funds are now available for a stateside supervising clinical nurse in each district as well as one or two supervising public health nurses in each district. Salaries are such that no difficulty in recruiting nurses is anticipated. Nevertheless, the shortage of health personnel is still considered acute.

In 1965 it was recommended that for the purpose of training rehabilitation personnel, the possibilities for liaison with New York University be explored and that the training relationship with the University of Hawaii be strengthened. The long-term goal should be to include an occupational therapist, vocational counselor, and social worker on staff of the rehabilitation center.

All recommendations were geared to dealing

with the ongoing need for rehabilitation while at the same time planning for the future.

The quality of health care in Micronesia, including rehabilitation, is closely bound to overall developments in the Trust Territory. The improved radio communication and rapid transportation obviously facilitate the delivery of health care. The availability of education and of professional and paraprofessional training both locally and elsewhere is clearly related to eliminating personnel shortages. The active collaboration of concerned health agencies with the appropriate Government authorities is of fundamental importance.

Basic public health laws are set forth in section 610-625 of the Trust Territory Code. As a result of the developments in health and education programs, the department of community services was separated into a department of education and a department of health, and a director of public health was appointed in June 1967. Local community planning and support for health and education programs are utilized to a considerable degree.

On the international level consultation and reporting activities are maintained with the World Health Organization (Western Pacific Region), the U.S. Public Health Service, and the University of Hawaii, among others. As a result of the Partnership for Health Act of 1967 the Trust Territory became eligible for Federal funds for comprehensive health planning.

In addition to the development of the Trust Territory Rehabilitation Center, three of the six district hospitals have been built since 1961. Three additional hospitals are scheduled for construction as well as a central training-referral hospital and three new units of a field hospital type. One hundred thirty-nine dispensaries and medical aid posts are scattered throughout the territory. The out-islanders are still physically difficult to reach. The first of a fleet of four administrative vessels to be used for health, education, and other community purposes has been acquired (2).

Referrals to the Crippled Children's Services have increased rapidly and many defects and deformities are now being treated. The Guam Naval Hospital continues to care for patients with complicated cases, and the Shriners'

**Table 4. Persons receiving the full course for immunization against certain communicable diseases, revaccinations, and boosters for selected immunizations, July 1967-June 1968**

Immunizing agent	Total
Smallpox:	
Primary.....	1, 994
Revaccination.....	4, 469
Poliomyelitis (trivalent-OPV).....	4, 277
Typhoid:	
Initial series.....	1, 780
Boosters.....	<sup>1</sup> 15, 121
Whooping cough (pertussis):	
Initial series.....	786
Boosters.....	628
Diphtheria:	
Initial series.....	1, 167
Boosters.....	2, 705
Tetanus:	
Initial series.....	1, 167
Boosters.....	<sup>1</sup> 14, 337

<sup>1</sup> About 70 percent of the typhoid and 81 percent of the tetanus boosters were given after typhoons in Yap and the Mariana Islands.

NOTE: Cholera, typhus, and influenza vaccines are given to special groups or when required for travel, but these are not included in the general vaccination program of the Trust Territory.

Source: Reference 2.

Hospital in Honolulu, which has provided services since 1965 as a result of the poliomyelitis epidemic, is now treating orthopedic conditions.

### Impact of Federal Programs

Significant advances are being made in the economic, health, and social fields. Education is developing at an accelerated pace at all levels as exemplified by school construction, higher enrollments, improvements in teaching education, and stress on vocational education. In 1968, 351 Micronesians were enrolled in schools in the United States and elsewhere. Federal programs increasingly active in the islands include Head Start, inclusion of the Territory in the Economic Opportunity Act (which provides community participation, individual development of skills, and remedial education), and broadened participation of the Public Health Service. The Peace Corps has also been making a major contribution.

As of June 1968, there were 125 nonindigenous (including 103 Peace Corps personnel) and 762 indigenous public health workers. Among them

50 were physicians, dentists, nurses, technicians, and various other health personnel (2).

Despite the significant advances that have been made, for the immediate future extensive rehabilitation services fully staffed with medical and paramedical personnel are not realistic. The continued delivery of effective rehabilitation care depends on the development of a pervasive rehabilitation philosophy among all health personnel, particularly those engaged in clinical care. In summary, it was recommended that the combined resources of the appropriate Government and community agencies be used in effecting rehabilitation where needed.

The National Communicable Disease Center has completed plans for a permanent epidemiologic surveillance system and is recruiting an epidemiologist. Plans for a crash immunization program have recently been approved. This plan was developed in conjunction with the National Communicable Disease Center, Public Health Service. A report of the total number of immunizations in the islands in the period July 1967-June 1968 was made in the 21st Annual Report on the Administration of the Trust Territory (table 4). Currently a comprehensive health plan which has been developed in conjunction with the University of Hawaii is being refined.

It is in the context of the overall advance in health, education, and community development that effective rehabilitation in Micronesia should continue to develop. The availability of trained indigenous personnel and the capacity to attract professionals from elsewhere to work in Micronesia is related to the developments which have already taken place and to the broad scale advances being planned.

### Summary

In the summer of 1965 a rehabilitation evaluation team visited the Trust Territory of the Pacific to evaluate and advise on the rehabilitation of patients following the 1963 poliomyelitis epidemic in Micronesia. In appraising the residual disability and the available medical, surgical, and rehabilitation care, the team observed that significant progress had been made. Rehabilitative services were being delivered on an improvised basis, and the Trust Territory Rehabilitation Center was being developed. The

center had been constructed, rehabilitation equipment had been received, and a limited number of personnel was available. Recommendations were made for improving the immediate rehabilitative care and planning for long-term growth. This growth included the extension of activities to treat orthopedic and other appropriate disabilities as the rehabilitation of patients who had poliomyelitis residua was stabilized.

The outlook for effective rehabilitation in the area is inevitably related to advances in social, economic, health, and community developments. Growth in education at all levels, improved transportation and communication, and developments in local activities and in international cooperation in the health affairs contribute to the attainment of the immediate goal, as well as for long-term care. A review of the developments in the Trust Territory, particu-

larly as reported to the United Nations in 1968, points to the creation of a favorable environment for the growth of rehabilitation services and long-term care in Micronesia.

#### REFERENCES

- (1) Schneider, D. J., and Tarlow, E.: Poliomyelitis rehabilitation programme. *South Pacific Bull* 15: 25-27, April 1965.
- (2) U.S. Department of State: Trust Territory of the Pacific Islands, July 1, 1967-June 30, 1968. Twenty-first annual report to the United Nations. Department of State Publication 8464 (International Organization and Conference Series 85). U.S. Government Printing Office, Washington, D.C., 1969.

#### Tearsheet Requests

Dr. Mathew Lee, Department of Rehabilitation Medicine, New York University Medical Center, 550 First Ave., New York, N.Y. 10016

## Long-Term Care Beds Total More Than 1 Million

The number of long-term care beds in the nation's nursing homes and related facilities has passed the 1 million mark, according to the American Nursing Home Association.

A survey of State licensing agencies, made by ANHA, showed that as of January 1, 1969, there were 23,013 licensed nursing homes and related long-term facilities with 1,024,510 beds. Of these facilities, 13,047 are licensed as nursing homes (providing at least 8 hours a day of licensed nursing supervision) with a bed capacity of 762,465.

The survey results show an increase in the total bed capacity of 110,011 over figures released by State licensing agencies a year earlier, including an increase of 55,281 in licensed nursing home beds. The net growth amounted to 301 beds per day.

The growth rate for nursing home beds for the year, 7.8 percent, was down somewhat from the 10 percent rate experienced over the past several years. But the rate of growth for

related facilities, such as personal care homes and homes for the aged, was more than 26 percent.

The net growths in number of nursing homes (only 135) and in number of beds (55,281) obviously indicate that many older homes have sought reclassification to meet needs for homes that offer a lesser degree of nursing service, have gone out of business, or have added to their bed capacities through expansion and modernization programs.

Under new Federal-State financing programs such as Medicaid, recognition has been given to facilities other than skilled nursing homes. Some homes, recognizing the need for the lower level of care, have chosen to be licensed under new categories such as intermediate or personal care homes, either with or without nursing supervision.

The average size nursing home, the survey showed, was 58.4 beds, compared to 54 beds in 1968, 44 in 1966, and 31 in 1961.

# An Analysis of Requests for Help to a Mental Health Study Center

RICHARD A. MACKEY, D.S.W., HARVEY A. TASCHMAN, Ph.D.,  
and JULIE KISIELEWSKI, M.A.

SINCE its beginning in 1948, the Mental Health Study Center, a branch of the National Institute of Mental Health, Public Health Service, has provided diagnostic and treatment services to residents of Prince George's County, Md. Experimentation with new techniques has been an important part of the center's mission almost from the beginning. One of the first innovations in the clinical program was started in 1951, when the center initiated a professional referral policy which required that all requests for diagnostic and treatment services be made by a professional person in the community, such as a physician or clergyman (1).

Although a family member might still call the center for help, that person or his family could not be considered for diagnostic or treatment services unless referred by a professional

---

*The authors were employed at the Mental Health Study Center, National Institutes of Health, Adelphi, Md., when this research was conducted. Dr. Mackey is now an associate professor, chairman of casework, and director, mental health projects, Boston College Graduate School of Social Work, Boston, Mass. Dr. Taschman is a consultant, Child Mental Health Services, National Institute of Mental Health, Health Services and Mental Health Administration, Public Health Service, and Mrs. Kisielewski is a psychologist, Computer Applications, Inc., Silver Spring, Md. Edward Marakovitz, a student at the Boston school of social work, assisted with the statistical computations.*

person. The change in the intake policy did not mean that the center would no longer accept inquiries from lay persons, but it did require that new ways be discovered to assist these people in considering different routes of obtaining help.

For a period of time a secretary took these telephone calls and explained the professional referral procedure. It was felt, however, that persons requesting help of any kind required skills which social workers on the staff possessed. Not infrequently the caller was upset, particularly if it was the first time he had ever asked for help. Sometimes a caller had to be directed elsewhere, and the social workers were knowledgeable about community resources.

This report is based on a study of 365 inquiries for help made by persons on their own initiative. These inquiries were received at the Mental Health Study Center between October 1, 1961, and December 31, 1963. Another study is now in progress of professional referrals to the center.

Although a few of these inquiries came from persons who had walked into the center, most of them were received by telephone. A few requests were made to seek help for a friend or to obtain information about the availability of community resources, but most were made by persons who were seeking help either for themselves or for other family members.

The special focus of this paper is to evaluate the reasons these people gave for seeking help. Our particular interest is related to the primary

problem which we defined as the most pressing conflict for which the caller appeared to be seeking professional assistance.

### Procedures

The data were taken from a one-page schedule designed to record information from inquiries of nonprofessional persons. This schedule had not been designed originally as a research tool and was used for more than 2 years before a decision was made to abstract data from it for this study. In addition to other kinds of information, each schedule included a description of the difficulty for which the person was seeking help. Generally, this description was a highly condensed version of what the person had told the social worker who had talked with him.

A random sample of completed schedules was studied to develop meaningful categories of presenting complaints. Through this procedure a classification of the difficulties was constructed which was based on the descriptions of symptomatic behavior recorded on each schedule. Four general categories were used for classifying the problems. They included (a) intrapersonal conflict, (b) intrafamilial conflict, (c) extrafamilial conflict, and (d) other. Following is a description of each category with examples of the kinds of symptoms recorded.

*Intrapersonal conflict.* This category included situations in which the symptom occurred within the person or referred to some behavior manifested by the person. Although we recognized that man does not ordinarily live in isolation and that the behavior which we categorized as an expression of an intrapersonal conflict may have been a reaction to interpersonal conflicts, nevertheless these types of behavior symptoms were markedly different from the ones classified as intrafamilial or extrafamilial. The intrafamilial and extrafamilial symptoms more obviously involved relationships between individual persons.

Examples of intrapersonal conflict were (a) specific somatic symptoms such as headaches, (b) irrational or bizarre thoughts, (c) nervous habits such as hair pulling, and (d) negative or hostile feelings.

*Intrafamilial conflict.* Included in this category were conflicts with members of the nuclear

family consisting of mother, father, and children under 21 years of age and conflicts with the extended family—inlaws, grandparents, adult siblings, uncles, aunts, and adult children.

Examples of these conflicts were (a) marital tension, (b) parent-child conflict, and (c) conflict with other relatives.

*Extrafamilial conflict.* Included in this category were conflicts which involved family members with members of the community or symptomatic behavior which was manifested outside of the family.

Examples of this category included (a) underachievement at school, (b) inability to work adequately, and (c) delinquent behavior in the community.

*Other.* This category included a variety of situations which could not be classified in the three categories previously mentioned. Many calls were about situations which were not described in terms of a difficulty but which were requests for information or for help from some other community agency.

Examples of this category included requests for technical and financial information and requests for information on community resources and on hospitalization of persons with psychiatric problems.

We coded the problems and symptoms reported on each of the 365 schedules. In addition, each of us made two kinds of judgments about the nature of the problem—first, the primary problem was selected, and second, all other problems reported were considered secondary and coded accordingly. Although there could be only one primary problem in each case, there could be multiple secondary problems and symptoms. Each of us independently coded every schedule, and the judgments were then compared. Whenever differences occurred about our judgments, a conference was held to resolve the differences. Our goal was to make every judgment unanimous. A two-thirds majority determined the specific categories in which the problems and symptoms were coded when judgments were not unanimous.

### Observations

Of 365 inquiries, 211 or 58 percent were concerned primarily with problems of an intrapersonal nature. The primary problem was identi-



fied as an interpersonal conflict within the nuclear or extended family in 14 percent of the calls and as an interpersonal conflict outside of the nuclear or extended family also in 14 percent of the calls. In 12 percent of the inquiries, the person calling seemed to be asking primarily for information about the availability of community resources or calling to complain about them. The frequency with which various symptoms were reported follows.

<i>Categories and symptoms</i>	<i>Number</i>
<b>INTRAPERSONAL</b>	
Negative or hostile feelings.....	100
Specific somatic symptoms.....	70
Diffuse anxiety and nervousness.....	66
Depressed feelings.....	50
Feelings of inferiority.....	40
Organic conditions.....	31
Phobic behavior.....	29
Reaction to recent trauma.....	22
Personal confusion and disorganization.....	21
Immaturity.....	20
Irrational behavior.....	19
Concern about diagnosis of psychosis.....	18
Suicidal thoughts.....	15
Diffuse somatic symptoms.....	12
Drinking problem.....	13
Concern about slow development.....	12
Other.....	35
<b>INTRAFAMILIAL</b>	
General family conflict, parents and children...	59
Parent-child conflict.....	46
Conflict between "grown child" (21 years or older) and parents.....	39
Marital conflict.....	30
Aggression with others in home.....	24
Conflict with other relatives.....	21
Other.....	25
<b>EXTRAFAMILIAL</b>	
Problems with other agency or professional person.....	72
Aggression at school.....	40
Inability to work adequately.....	37
Delinquent behavior with police involvement...	31
Sexual acting out.....	30
Learning problem other than underachievement or reading deficiency.....	26
Underachievement.....	23
Withdrawn from community.....	23
School dropout or refuses to go to school.....	16
Aggression in community without police involvement.....	14
Withdrawn at school.....	13
Other interpersonal conflict.....	15
Other.....	36

NOTE: 19 were not coded because of lack of information.

The most frequently mentioned symptoms were negative or hostile feelings in the person for whom the call was made. These symptoms were reported in 27 percent of the calls. In the intrapersonal category, specific somatic com-

plaints, diffuse anxiety, and depression were also mentioned with great frequency. Less than 1 percent were about senility, which may be because the people in the county are younger than the average for the United States.

Intrafamilial problems were most often described in terms of general family conflict involving both parents and children. Most frequently, the difficulties were described as parent-child conflicts and rarely as marital problems. Few conflicts were reported between a parent or parents and members of the extended family.

At the extrafamilial level, difficulties in relationships with other professional resources were most often mentioned. For example, persons calling the center complained about long waiting periods before intake at other community resources. More often, however, they complained or had questions about the service which they were receiving from other agencies, an issue that was raised in 20 percent of the calls.

Analysis of the role of the person calling in relation to the person called about showed that mothers seeking help for a child were more likely to call than any other group. Forty-two percent of the inquiries were made by mothers and most of these were for difficulties with sons. Only 8 percent of the calls were from fathers about their children.

Most parents who called about problems with their children defined them in intrapersonal terms, but fathers tended to do so more (70 percent) than mothers (55 percent). Conversely, mothers were slightly more inclined to view the primary difficulty in intrafamilial terms (11 percent) than were fathers (7 percent). These differences were not significant, however. Mothers were even more likely to identify the problems as extrafamilial, an observation that was statistically significant. Persons calling about extrafamilial problems as the primary problem in relation to other problems are shown in the following table.

<i>Caller</i>	<i>Extra-familial</i>	<i>Other</i>	<i>Total</i>
Mothers.....	39	113	152
Others.....	11	191	202
Total.....	50	304	354

NOTE: Chi-square=28.00;  $P=0.001$ .

The data further suggested that women were more likely to call for help for themselves. Eleven percent of the total inquiries were made by women seeking help for themselves as compared with 7 percent for men. These differences were not considered significant, however. Virtually no difference was observed in the number of inquiries of wives who called about problems with their husbands (4 percent) and of husbands who called about problems with their wives (3 percent).

The age of the person called about also seemed to make a difference in the way in which the primary problem was described. If the person called about was 20 years of age or older, there was more chance that the problem would be defined in intrapersonal terms. The problems of 68 percent of the persons 20 years of age or older were defined in intrapersonal terms, although the comparable percentage for persons under 20 years was 52. Whether the person 19 and under or 20 years or older called about had a primary problem that was intrapersonal in relation to other problems is shown in the following table.

Age	Intra- personal	Other	Total
19 years and under.....	97	82	179
20 years or older.....	106	46	152
Total.....	203	128	331

NOTE: Chi-square=7.10;  $P < 0.01$ .

Extrafamilial problems were reported more frequently for those under 20 years old. Whether the person 19 and under or 20 years or older had a primary problem that was extrafamilial in relation to all other problems is shown in the following table.

Age	Extra- familial	Other	Total
19 years and under.....	46	133	179
20 years or older.....	4	148	152
Total.....	50	281	331

NOTE: Chi-square=32.33;  $P < 0.001$ .

Twenty-five percent of inquiries about children but only 3 percent of inquiries about adults were described in extrafamilial terms. When the person who made the inquiry appeared to be asking primarily for information about the availability of community resources, the per-

centages were 8 percent for children and 15 percent for adults. Problems identified primarily with intrafamilial conflict accounted for approximately 10 percent of the inquiries for both children and adults. These observations were not statistically significant, however.

Another variable which seemed to influence the way in which the primary problem was defined was the source of referral to the center. Each caller was asked how he happened to call the center or who had suggested that he call. Sixty-seven percent of the people calling were self-referred. Generally, they had either found the number of the center in the telephone book or had seen the center's sign. The next largest group were people who had been referred by other mental health facilities (15 percent). Other sources of referral each accounted for less than 10 percent of the 365 inquiries.

When the referral source was a school or other nonpsychiatric resource, the primary difficulty was identified in intrapersonal terms in less than 50 percent of the inquiries. If the caller was referred to the center by a school, he was most likely to define the difficulty about which he was calling in extrafamilial terms. Forty-two percent of persons referred by schools and 12 percent of persons from all other referral sources described their difficulties in extrafamilial terms. School referrals in which the primary problem was extrafamilial are shown in relation to other sources in the following table.

Referral source	Extra- familial	Other	Total
School.....	11	15	26
Other.....	35	257	292
Total.....	46	272	318

NOTE: Chi-square=16.80;  $P < 0.001$ .

When the referral source was a current or former patient at the center, a psychiatrist, or a family physician, there was a tendency to describe the primary problem in intrapersonal terms in comparison to other referral sources. These differences, however, were not statistically significant.

## Discussion

Some interesting issues are raised by the aforementioned observations for caseworkers who are handling initial contacts with appli-

cants or potential applicants to social agencies. Although the first communication of a person seeking help may offer important clues to the underlying conflict with which he is struggling, that message also conveys the differential way in which each person defines his difficulty and identifies his needs.

Did mothers define the difficulties for which they were seeking help in extrafamilial terms because they were more involved and perhaps responsible for the activities of their children in the community? Or did this way of communicating their needs suggest that mothers were more prone to displace or project the difficulty onto a source outside of the home?

The observations suggested that the tendency toward displacement or projection, when it exists, was greatly enhanced by the impact of the referral source. That observation was particularly applicable to referrals from schools in which mothers, rather than any other family member, were almost always involved. Inquiries for help to the center initiated through a person in the school system were often identified with extrafamilial conflicts.

Although no significant differences were noted among other referral sources when each was matched with the primary difficulty, there was a tendency for people referred by medical sources to identify their difficulty in intrapersonal terms. That observation raised the issue as to whether people who went to physicians and psychiatrists viewed their conflicts in intrapersonal terms or whether they were influenced through their contacts with these professionals to define their problems in such terms. A mutual cause and effect relationship probably existed. That is, people go to medical resources with difficulties which they feel are internal either to themselves or to another family member, and this view is further reinforced by the orientation of the physician as he works with them.

Similarly, parents whose children were having difficulties in school may not only view the difficulty as a school-based problem, but that view may be further reinforced as the person in the school system communicated with the family member about the child.

Relatively few people called the center expressly to ask for help for themselves. Generally, people said they were calling for someone

else in the family, even when that person was over age 20. Perhaps we are dealing again with the issue of how much pain is involved in sharing one's conflicts with a stranger. Is it not less painful, for example, to ask for help for someone else who has a problem than to ask for help with one's self or one's relationship with another person? We think it is and the data support this position.

In general, the study told us something about how people come to terms with their problems as they move toward seeking help from a professional source. Regardless of etiology, there are specific environmental forces which significantly influence the ways in which persons seeking help communicate their concerns to a professional person. Because of the special meaning of this communication and the need for immediate diagnostic understanding and intervention, the study suggests that the most skilled professional staff should be responsible for this kind of service.

### Summary

An analysis was made of 365 inquiries for help from persons who telephoned or came to a mental health study center on their own initiative between October 1, 1961, and December 31, 1963. Most were seeking help for themselves or for family members.

A one-page schedule, containing a condensed version of what the person had told the social worker who talked with him, was the source of the data. Each author coded one primary problem in each case, although there could be multiple secondary problems and symptoms. If judgments were not unanimous, a two-thirds majority of the authors determined the coding category of the problem.

The authors classified problems as (a) intrapersonal conflict—specific somatic complaints such as headaches, irrational or bizarre thoughts, nervous habits (such as hair pulling), and negative or hostile feelings, (b) intrafamilial conflicts—marital tension, parent-child conflict, and conflicts with other relatives such as aunts and uncles, (c) extrafamilial conflicts—underachievement at school, inability to work adequately, and delinquent behavior in the community, and (d) other—requests for technical and financial information and requests for in-

formation on community resources and on the hospitalization of persons with psychiatric problems.

In analyzing the difficulties as perceived by the callers, the following differences were statistically significant.

Mothers who called about problems of a child were more likely to describe the problems in extrafamilial terms than were other callers.

The problems of persons under 20 years of age were more likely to be described in extrafamilial terms, while those of persons more than 20 years of age were more likely to be described in intrapersonal terms.

Among referral sources the only significant differences were for professional persons in

schools. Callers who were referred by school personnel tended to express the difficulties in extrafamilial terms.

Because of the special needs of the callers and the need for immediate diagnostic understanding and intervention, the analysis suggests that skilled professionals should answer incoming calls for help.

#### REFERENCE

- (1) Rooney, H. L., and Miller, A. D.: A mental health clinic intake policy project. *Ment Hyg* 39: 391-405, July 1955.

#### Tearsheet Requests

Dr. Richard A. Mackey, Boston College Graduate School of Social Work, McGulinn Hall, Chestnut Hill, Mass. 02167.

## Standards for Skilled Nursing Homes

Interim regulations describing the standards to be met by skilled nursing homes have been drawn up by the Medical Services Administration of the Social and Rehabilitation Service.

The new regulations require homes to maintain an organized nursing service supervised by a full-time registered professional nurse on duty during the day shift and either a registered professional nurse or licensed practical nurse on all other shifts.

By July 1, 1970, all licensed practical nurses in charge of nursing activities on any shift must be qualified by graduation from a State-approved school of practical nursing or have background equivalent to such training. Until this time, charge nurses on shifts other than the day shift may be licensed practical nurses whose qualifications are waived by the State licensing agency. Firmness of the 1970 deadline for educational qualifications is underscored by the requirement that any State not meeting this standard by December 31, 1969, must inform the Secretary of Health, Education, and Welfare of its plans for doing so.

If Federal funds are involved in paying homes for care given to patients, these standards must be met. Under the Medicaid program authorized by title XIX of the Social Security Act, skilled nursing home services are one of the five essential services that must be available to eligible patients over 21. More than 30 percent of the funds spent on medical assist-

ance are spent on nursing homes. In fiscal year 1968, the total amount was \$1,068,212,000.

Other standards for skilled nursing homes covered by regulations include:

- Meals in a skilled nursing home must be planned and supervised by qualified professional personnel.
- Standards relating to the maintenance of medical records, the dispensing of drugs, physician coverage, and environment and sanitation must match those in effect for extended care facilities under the Medicare program.
- Nursing homes must have agreements with local hospitals for inpatient hospital care when needed.
- After December 31, 1969, homes must meet the provision of the Life Safety Code of the National Fire Protection Association or a fire and safety code imposed by State law which adequately protects patients in nursing homes.
- The State agency administering Medicaid may grant waivers to standards affecting arrangements for inpatient hospital care and environment and sanitation under some conditions.

In general, standards in the interim regulations match those in the Handbook of Public Assistance Administration, Supplement D, that regulated services available in skilled nursing homes until January 1, 1969, with the exception of the 18-month waiver granted for the employment of charge nurses who are not qualified by formal training.



**Comprehensive Health Services Projects. Guidelines for projects under Section 314(e) of the Public Health Services Act, Division of Health Care Services, Community Health Service. February 1969; 18 pages.** Spells out the various desirable characteristics of a comprehensive health services project to assist applicants for grants under section 314(e) of the Partnership for Health Program.

**From Head to Toe. PHS Publication No. 1808; 1968; 15 pages; 15 cents.** Presents photographs with explanations as a patient goes through the automated multitesting laboratory—a program supported by the National Center for Chronic Disease Control.

**Publications Catalog, Community Health Service. PHS Publication No. 1907; 1969; 62 pages; 35 cents.** Lists approximately 200 publications related to Community Health Service programs, including those produced by the Community Health Service as well as other government and nongovernment sources. Includes brief description of each publication and identifies the source from which the publication may be obtained.

**The Role of Packaging in Solid Waste Management 1966 to 1976. PHS Publication No. 1855; by Arsen Darnay and William E. Franklin; 1969; 205 pages; \$2.25.** Presents, in three parts, the findings of a research effort to define the role of packaging in waste disposal in the 1966 to 1976 period. Part I presents historical packaging material consumption data for the 1958 to 1966

period, a forecast of packaging material consumption to 1976, and a discussion of the economic, technological, marketing, and demographic trends and forces underlying the forecast. Part II analyzes the disposability of packaging materials in 1966 and 1976. Discusses the quantitative solid waste burden imposed by packaging in the 2 years as well as collection problems engendered by packaging and packaging material resistance to disposal processing. Part III is an exploratory analysis of the various mechanisms that might be employed for mitigating the problems caused by packaging materials in waste disposal. Also contains two appendixes—Appendix I presents tabular materials which allow interested persons to follow the route by which the authors arrived at Disposal Resistance Index figures; Appendix II is a bibliography of literature used as background for this analysis.

#### **Statistics From the National Health Survey**

**INTERNATIONAL COMPARISONS OF MEDICAL CARE UTILIZATION.** A feasibility study. *PHS Publication No. 1000, Series 2, No. 33; June 1969; 74 pages; 70 cents.*

**COMPARABILITY OF MARITAL STATUS, RACE, NATIVITY, AND COUNTRY OF ORIGIN ON THE DEATH CERTIFICATE AND MATCHING CENSUS RECORD, United States, May–August 1960. PHS Publication No. 1000, Series 2, No. 34; May 1969; 47 pages; 50 cents.**

**COMPARISON OF TIMED AND UNTIMED PRESENTATION OF THE GOODENOUGH-HARRIS TEST OF INTELLECTUAL MATURITY PHS Publication**

*No. 1000, Series 2, No. 35. June 1969; 16 pages; 80 cents.*

**USE OF HOSPITAL DATA FOR EPIDEMIOLOGIC AND MEDICAL-CARE RESEARCH.** A report of the United States National Committee on Vital and Health Statistics. *PHS Publication No. 1000, Series 4, No. 11; June 1969; 9 pages; 25 cents.*

**CURRENT ESTIMATES FROM THE HEALTH INTERVIEW SURVEY, United States, 1967. PHS Publication No. 1000, Series 10, No. 52; May 1969; 73 pages; 70 cents.**

**CHARACTERISTICS OF PERSONS WITH CORRECTIVE LENSES, United States, July 1965–June 1966. PHS Publication No. 1000, Series 10, No. 53; June 1969; 44 pages; 50 cents.**

**ACUTE CONDITIONS, INCIDENCE AND ASSOCIATED DISABILITY, United States, July 1967–June 1968. PHS Publication No. 1000, Series 10, No. 54; June 1969; 59 pages; 60 cents.**

**MARITAL STATUS AND LIVING ARRANGEMENT BEFORE ADMISSION TO NURSING AND PERSONAL CARE HOMES, United States, May–June 1964. PHS Publication No. 1000, Series 12, No. 12; May 1969; 46 pages; 50 cents.**

**REGIONAL UTILIZATION OF SHORT-STAY HOSPITALS, United States, 1965. PHS Publication No. 1000, Series 13 No. 5; June 1969; 34 pages; 45 cents.**

---

This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared with Federal support.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington, D.C. 20201.

The Public Health Service does not supply publications other than its own.

---

**DEMPSEY, JOHN J.** (Johns Hopkins School of Hygiene and Public Health): *Proposed standard measure of recurrence of out-of-wedlock births to adolescents. Public Health Reports, Vol. 84, October 1969, pp. 839-844.*

Programs of service to adolescents who are pregnant out of wedlock have proliferated in recent years. Several researchers have reported followup studies with major or minor interest in recurrent illegiti-

mate births. Analysis of these studies reveals little similarity in measuring such recurrent events; consequently, the comparison of findings among programs is hazardous or impossible.

Within the specifications of administrative feasibility, relevance for service, and consonance with research designs, an incidence rate—number of repeat out-of-wedlock deliveries divided by the total number of index out-of-wedlock deliveries per 24 months after index delivery—has been recommended. Adoption of this measure will enhance the comparability of future findings.

**FORTUNE, ROBERT** (Public Health Service): *Availability and use of medical services in an Alaskan Eskimo community. Public Health Reports, Vol. 84, October 1969, pp. 845-856.*

A study of the availability and use of medical services during 1966 at Hooper Bay, an isolated Alaskan Eskimo community, revealed that the 535 people of this village depend almost entirely on a 65-bed hospital, 155 air miles away, for their medical care. Three types of medical service are available to this population: (a) hospitalization, (b) peri-

odic field clinics held by visiting physicians and other health workers, and (c) medical consultation by shortwave radio between the community health aide and the hospital staff.

Hospitalization rates in 1966 were higher for most age groups, particularly for children, than for the general U.S. population in 1964. The

field clinics, held at irregular intervals during the year, were used mostly for preventive examinations and for the care of chronic conditions, chiefly among the women.

Medical consultation by radio was the only available day-to-day means of contact with a physician. Most of the shortwave radio calls were concerned with illnesses or injuries of infants and preschool children. The Hooper Bay residents had an average of 2.9 physician contacts per person in 1966, 36 percent below the national average of 4.5 in 1964.

**ECKSTROM, PHILIP T.** (Menominee, Mich.), **BRAND, FRANK R.**, **EDLAVITCH, STANLEY A.**, and **PARRISH, HENRY M.**: *Epidemiology of stroke in a rural area. Second year of the Mid-Missouri Stroke Survey. Public Health Reports, Vol. 84, October 1969, pp. 878-882.*

The Mid-Missouri Stroke Survey was an epidemiologic study conducted by the University of Missouri Medical School, the Division of Health of Missouri, and the Public Health Service from July 1, 1963 to June 30, 1965. The study covered Boone, Cooper, and Howard Counties. Data were collected from physicians, hospitals, and death certificates to minimize underreporting.

In the second year of the study, 189 cases of stroke were revealed among persons over 25 years old. This is an age-adjusted rate of 2.2

per 1,000 persons based on the estimated 1964 population.

In the first year of the study the mortality rate for white persons was 33 percent for 1 week, 50 percent for 1 month, and 67 percent for 1 year. These rates were calculated on the basis of survival after the first major stroke during the year and were computed without regard to prior stroke experience or the number of strokes during the year.

In the second year case fatality rates for white persons for 1 week ranged from zero to 54 percent in

age-specific groups, with an overall rate of 46 percent. The 1-month case fatality rates ranged from zero to 76 percent, with an overall rate of 61 percent, and the 1-year case fatality rates ranged from zero to 81 percent, with an overall rate of 74 percent. Fewer younger patients in the second year led to the suspicion that milder strokes were not being reported, possibly as a result of waning interest of participating physicians.

Long term surveys of this type should be combined with professional education or community service to maintain the participants' motivation. The agency responsible for collecting data should have access to all sources.

**HEWITT, DAVID** (School of Hygiene, University of Toronto), **MILNER, JEAN**, and **CSIMA, ADELE**: *Some proposed "comparability areas" for U.S. statistics on causes of death. Public Health Reports, Vol. 84, October 1969, pp. 857-863.*

After becoming qualified at a particular medical school, physicians do not disperse uniformly all over the United States but tend to take up practice in circumscribed regions. Because of variations in diagnostic preferences and in the medical vo-

cabulary among medical schools, and consequently among their graduates, these geographic patterns of physician settlement can give rise to spurious differences between States in statistics on causes of death. An index is therefore proposed for

measuring the degree of comparability between any pair of States, together with a method for building up "comparability areas" in which interstate comparisons will have some assurance of validity. Fourteen comparability areas are proposed, based on the known geographic distributions of medical school alumni in 1959. All but 13 States have a place in one or more of these areas.

**JEKEL, JAMES F.** (Yale University School of Medicine), **GREENBERG, RICHARD A.**, and **DRAKE, BENJAMIN M.**: *Influence of the prevalence of infection on tuberculin skin testing programs. Public Health Reports, Vol. 84, October 1969, pp. 883-886.*

The primary component of the new child-centered approach to the prevention of tuberculosis is the tuberculin skin testing of all children at least twice during their school experience. Multiple puncture tuberculin skin tests have operating advantages over the intradermal PPD (Mantoux) test for large-scale screening programs. The multiple puncture tests, however, have not always been accepted, primarily because of doubts regarding their accuracy. These doubts have arisen, in

part, from field experience in which many false positive multiple puncture tests were noted when persons were retested with the more definitive PPD (Mantoux) test. A relatively large number of false positive tests are observed because the multiple puncture test is properly designed to be very sensitive and also because these tests are usually performed on school populations with a very low prevalence of tuberculosis infection.

In screening programs conducted

in populations with a low prevalence of infection, a relatively high proportion of false positive tests are inevitably found among the screening positives. Such a result is to be expected and does not negate the value of the screening test, as experience from a countywide skin testing program in North Carolina demonstrates. Screening school children with a tuberculin tine test and then following up those children whose tests are positive with an intradermal PPD test was found to be an approach well accepted by public health professionals and the community. The cost was approximately 50 cents per child tested, or about 8 cents per year per child in school.

**CHERRY, WILLIAM B.** (Public Health Service), and **THOMASON, BERENICE M.**: *Fluorescent antibody techniques for Salmonella and other enteric pathogens. A status report. Public Health Reports, Vol. 84, October 1969, pp. 887-898.*

Industrial and public health laboratories are seeking to develop a reliable fluorescent antibody (FA) test for the detection of salmonellae in foods, feeds, and raw materials. Results indicate that conjugates prepared from OH serums may be useful in screening selective enrichment media for salmonellae. More information is needed, however, before

specific recommendations can be made. However, a reliable FA test has been developed for detecting *Salmonella typhi* in fecal specimens from chronic carriers and from persons with acute typhoid fever.

Several groups have evaluated conjugates for *Shigella flexneri* and *Shigella sonnei*. One difficulty in using *Shigella* conjugates is the in-

ability to isolate *S. flexneri* from many of the FA positive specimens. Whether this difficulty is due to false positive FA reactions or to failure of isolation procedures is not clear. The *S. sonnei* reagent has proved both sensitive and specific.

FA tests for enteropathogenic *Escherichia coli* are well adapted to the diagnosis and surveillance of infant diarrhea. The tests have proved to be 10 to 100 times more sensitive than cultural procedures. FA examinations, however, should be restricted to specimens from children up to 2 years of age.

**HEALY, GEORGE R.** (National Communicable Disease Center, Public Health Service), **GLEASON, NEVA N., BOKAT, ROBERT, POND, HARRY, and ROPER, MARGARET:** *Prevalence of ascariasis and amebiasis in Cherokee Indian school children. Public Health Reports, Vol. 84, October 1969, pp. 907-914.*

Single stool specimens, collected from each of 631 children at the Cherokee Indian Elementary School, Cherokee, N.C., were examined for intestinal parasites. The organisms identified and their prevalence were as follows: *Ascaris lumbricoides*, 49 percent; *Trichuris trichiura*, 38 percent; hookworm, 3 percent; *Entamoeba histolytica*, 11 percent; *Entamoeba hartmanni*, 35 percent; *Entamoeba coli*, 40 percent; *Endolimax nana*, 46 percent; *Iodamoeba bütschlii*, 5 percent; *Giardia lamblia*, 9 percent; *Dientamoeba fragilis*, 11

percent; *Chilomastix mesnili*, 3 percent; and *Trichomonas hominis*, 11 percent.

Evidence of infection with one or more parasites was found in 92 percent of the children. The amebic prevalence rate, which can be used to measure the extent of ingestion of organisms through fecal contamination, was 74 percent. There was no difference in the prevalence of *A. lumbricoides* or *T. trichiura* between Indian boys and girls. Although there was a slight reduction in the prevalence of some parasites

(*A. lumbricoides*, *T. trichiura*, and *G. lamblia*) in children of the higher elementary grades as compared with the lower ones, in many cases an equal or greater number of children in the higher grades were parasitized with *E. histolytica* and *E. hartmanni* as compared with children in the lower grades. In general, the survey revealed a high prevalence of intestinal parasites in children throughout the eight grades of the school.

An indirect hemagglutination test for amebiasis was used to detect antibody in the serums of 617 of the children. The results revealed no cross reactions with any other intestinal parasites. They also indicated that this test was of little value in asymptomatic intestinal amebiasis.

**MACKEY, RICHARD A.** (Boston College Graduate School of Social Work), **TASCHMAN, HARVEY A., and KISIELEWSKI, JULIE:** *An analysis of requests for help to a mental health study center. Public Health Reports, Vol. 84, October 1969, pp. 923-928.*

An analysis was made of 365 inquiries for help from persons who telephoned or came to a mental health study center on their own initiative between October 1, 1961, and December 31, 1963. Most were seeking help for themselves or for family members.

A one-page schedule, containing a condensed version of what the person had told the social worker who talked with him, was the source of the data. Each author coded one primary problem in each case, although there could be multiple secondary problems and symptoms. If judgments were not unanimous, a two-thirds majority of the authors determined the coding category of the problem.

The authors classified problems as (a) intrapersonal conflict—specific somatic complaints such as headaches, irrational or bizarre thoughts, nervous habits (such as hair pulling), and negative or hostile feelings, (b) intrafamilial conflicts—marital tension, parent-child conflict, and conflicts with other relatives such as aunts and uncles, (c) extrafamilial conflicts—underachievement at school, inability to work adequately, and delinquent behavior in the community, and (d) other—requests for technical and financial information and requests for information on community resources and on the hospitalization of persons with psychiatric problems.

In analyzing the difficulties as per-

ceived by the callers, the following differences were statistically significant.

Mothers who called about problems of a child were more likely to describe the problems in extrafamilial terms than were other callers.

The problems of persons under 20 years of age were more likely to be described in extrafamilial terms, while those of persons more than 20 years of age were more likely to be described in intrapersonal terms.

Among referral sources the only significant differences were for professional persons in schools. Callers who were referred by school personnel tended to express the difficulties in extrafamilial terms.

Because of the special needs of the callers and the need for immediate diagnostic understanding and intervention, the analysis suggests that skilled professionals should answer incoming calls for help.



*Public Health Reports*, published since 1878 under authority of an act of Congress of April 29 of that year, is issued monthly by the Public Health Service pursuant to the following authority of law: United States Code, title 42, sections 241, 245, 247; title 44, section 220. Use of funds for printing this publication has been approved by the Director of the Bureau of the Budget, August 26, 1963.

ORDER BLANK FOR PHR

To: Superintendent of Documents  
Government Printing Office  
Washington, D.C. 20402

Please enter my Subscription for Public Health Reports. I am enclosing Money Order ☐ Check ☐ for this subscription.  
\$6.50 a year; \$1.75 additional for foreign mailing. A discount of 25 percent is allowed for orders of 100 or more  
subscriptions. Subscriptions are accepted also for 3-year periods, for the convenience of subscribers, at the estab-  
lished annual rate.)

Please address the PHR as follows: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON, D.C. 20402. 1969

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Subscription price \$6.50 a year, \$1.75 additional for foreign mailing.

Price for a single copy of this issue is 55 cents.

U. S. DEPARTMENT OF  
HEALTH, EDUCATION AND WELFARE  
PUBLIC HEALTH SERVICE  
BETHESDA, MD. 20014

OFFICIAL BUSINESS



POSTAGE AND FEES PAID  
U. S. DEPARTMENT OF H.E.W.

If you do not desire to continue receiving this publication, please **CHECK HERE** ☐;  
cut off this label and return it to the above address. Your name will then be  
promptly removed from the appropriate mailing list.

Public Health Reports

ph  
r



52.7184/11

Kdv.

NOVEMBER 1969 Volume 84 Number 11



# PUBLIC HEALTH REPORTS

## *In this issue*

**U.S. and Swedish Perinatal Mortality**

**Awareness of Sickle Cell Anemia**

**Birth Defects After A2 Flu Epidemics**

**Tribal Health Representatives**

**Two Therapies for Gonorrhea**

**Health and Morale of the Elderly**

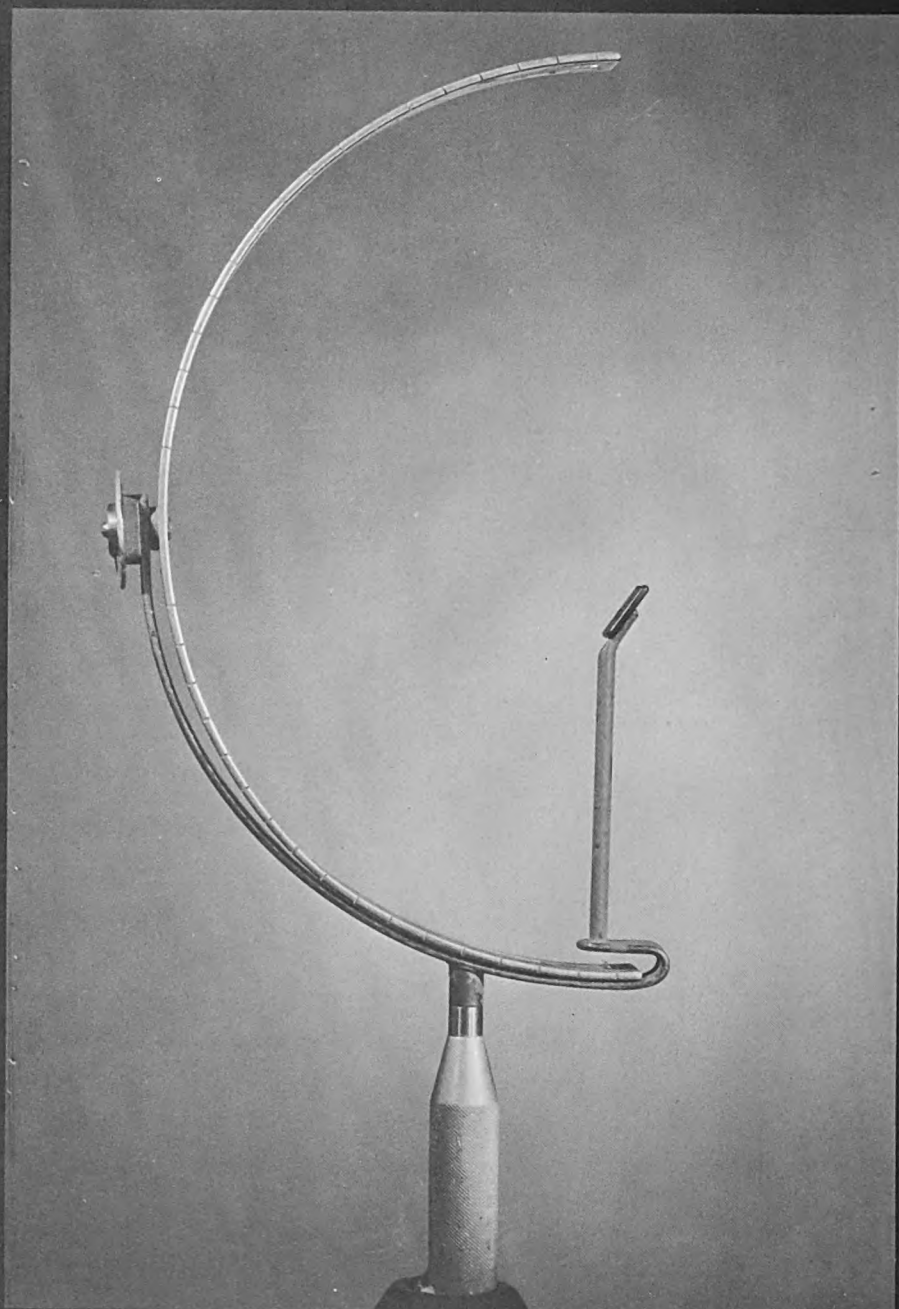


U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Public Health Service

Digitized by Google

14.0973  
u5p



# Public Health Reports

Published since 1878

CONTENTS	PAGE
A proposal for revision of curriculums of schools of public health..... <i>William C. Thomas, Jr., and Herman E. Hilleboe</i>	933
Low birth weight and perinatal mortality..... <i>Gunnar af Geijerstam</i>	939
Awareness of sickle cell anemia among Negroes of Richmond, Va..... <i>John C. Lane and Robert B. Scott</i>	949
Visual acuity and field of vision of urban and rural Egyptians..... <i>Mohyi-Eldin Said, Hyman Goldstein, Ahmad Korra, and Khalil El-Kashlan</i>	955
Tribal community health representatives of the Indian Health Service..... <i>Richard B. Uhrich</i>	965
Malformations recorded on birth certificates following A2 influenza epidemics..... <i>Ian Leck, Sylvia Hay, John J. Witte, and John C. Greene</i>	971
Comparative study of two therapies for gonorrhea..... <i>Morton Nelson</i>	980
Preliminary report of a recall program for persons with inactive tuberculosis..... <i>John A. Sbarbaro and G. David Onstad</i>	985

continued

## frontispiece

Side view of Schweigger hand perimeter used to test the vision of rural and urban Egyptians. Results of field of vision and visual acuity tests on a random sample of 10,000 persons are reported in the paper appearing on pp. 955-964.



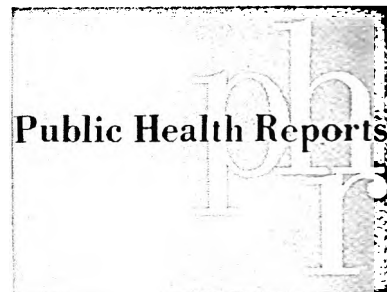
Social status and subjective perceptions of 250 men after myocardial infarction . . . . .	989
<i>Sydney H. Croog and Sol Levine</i>	
Role of the community health aide in public health programs . . . . .	998
<i>Wilbur Hoff</i>	
The control of schistosomiasis in Patillas, Puerto Rico . . . . .	1003
<i>Juan R. Palmer, Aida Z. Colón, Frederick F. Ferguson, and William R. Jobin</i>	
The participation of optometrists in New York City's Medicaid program . . . . .	1008
<i>Raymond S. Alexander, Lowell E. Bellin, Florence Kavalier, Harold Najac, and Jesse Rosenthal</i>	
Relating health and social contacts to the morale of elderly persons . . . . .	1013
<i>Ilse J. Volinn and Jess B. Spielholz</i>	
A study of the application of laminar flow ventilation to operating rooms . . . . .	1021
Short reports and announcements:	
Education note . . . . .	948
Dietetics and computers . . . . .	953
Rats . . . . .	954
Rubella vaccine licensed . . . . .	964
Reflectorized materials for children's clothing . . . . .	970
Films . . . . .	979
Computers in medical education . . . . .	984
Physician augmentation program . . . . .	988
Foundation of Thanatology established . . . . .	1012
The elderly and Model Cities programs . . . . .	1022
Publication announcements . . . . .	1023
Synopsis . . . . .	1024

*Published concurrently with this issue:*

Public Health Monograph No. 78 . . . A Study of the Application of Laminar Flow Ventilation to Operating Rooms.

*By Donald G. Fox.*

*Summary and information on availability appear on page 1021.*



## MANAGING DIRECTOR

EDWARD J. McVEIGH

*Assistant Administrator for Information,  
Office of Information, Health Services  
and Mental Health Administration.*



## STAFF

Keith Kost, M.P.H.	<i>Editor</i>
Marian K. Priest	<i>Managing Editor</i>
Esther C. Gould	<i>Asst. Managing Editor</i>
Eugene Fite	<i>Art Editor</i>

*Address correspondence to Editor, Public Health Reports, Public Health Service, Department of Health, Education, and Welfare, Lee Building, 6935 Wisconsin Avenue, Chevy Chase, Md. 20015.*

Opinions expressed are the authors' and do not necessarily reflect the views of *Public Health Reports* or the Public Health Service. Trade names are used for identification only and do not represent an endorsement by the Public Health Service.

**For subscriptions to *Public Health Reports*, please use the order form on the inside back cover.**

## U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

ROBERT H. FINCH, *Secretary*

ROGER O. EGEBERG, *Assistant Secretary for Health and Scientific Affairs*

### PUBLIC HEALTH SERVICE

### HEALTH SERVICES AND MENTAL HEALTH ADMINISTRATION

JOSEPH T. ENGLISH, *Administrator*

# A Proposal for Revision of Curriculums of Schools of Public Health

WILLIAM C. THOMAS, Jr., Ph.D., and HERMAN E. HILLEBOE, M.D., M.P.H.

THE TRADITIONAL curriculums of many schools of public health throughout the world do not reflect the modern precepts of rational decision making and planning. Courses in planning are given in such schools—indeed, students may be exposed to highly sophisticated techniques of cost-benefit analysis, of information gathering and retrieval systems, and of decision-making theory. However, curriculum structure itself usually does not include the fundamental concepts that lead to building a health services system.

Curriculum structure too often does not include systematic and comprehensive consideration of health needs, demands, or problems. The usual disciplinary approach does not induce the student to think about the relative significances of these health factors or of their interrelationships in an organized manner. Instead, the approach sets forth primarily instruments or tools from disciplines such as epidemiology, biostatistics, social science, public health, and hospital administration. In proceeding with means without considering ends, the disciplinary approach also creates an atmosphere of fragmentation.

Schools of public health were created specifi-

cally to bring various disciplines together for a combined approach to community service (1). Yet the departments or divisions which teach these disciplines often are relatively isolated from each other. A biostatistician may consider teachers of administration to be working in the realm of magic because so much is uncertain about administration. Similarly, a teacher of administration may say that biostatisticians are in retreat from the most important challenges of today. The traditional system does little to help each specialist understand the other's work or to involve all concerned in the joint efforts needed to do a job well.

## Medical Care—an Inadequate Framework

Many schools of public health tend to accord independent organizational status to medical care—a tendency encouraged by the weight given to hospital administration, a specialty within medical care. This is an inadequate perspective from which to regard many of the health challenges extant in any community. Other factors besides medical care are of obvious relevance to patients who may receive such care.

For example, effective education about smoking is certainly a better way to deal with lung cancer than palliative surgery, and the extent of injury to automobile accident victims can be more effectively reduced outside rather than inside the hospital. Furthermore, many persons would not become patients if they had adequate housing and nutrition. Thus, in a limited sense,

---

*Dr. Thomas is assistant professor of public health practice and Dr. Hilleboe is DeLamar professor of public health practice at the Columbia University School of Public Health and Administrative Medicine, New York City.*

the acute-care hospital treats, except for women with normal deliveries, persons whom society has failed to handle effectively through primary means. The hospital is often a last-chance facility—its work being determined by the extent to which other social institutions fail to function properly.

In addition to the traditional proposition that public health emphasizes prevention, there is the consideration that various tasks should be divided appropriately among various health agencies and organizations according to their capabilities. The recent trend to designate the hospital as the nucleus of all health care should be critically scrutinized. No medical care institution can assume the responsibility for improving highway safety, for air and water pollution control, and for broad-scale health education. Furthermore, hospitals usually are not equipped or located well enough to provide total neighborhood services, especially the larger ones built decades ago.

Today most health services can be performed more effectively in an organized setting. Even a private practitioner finds virtually indispensable such supporting resources as laboratories, specialized diagnostic facilities, standardized and regulated sources of drugs, and a variety of specialized institutions where he can send patients when indicated. All such resources must function in organized settings.

One underlying principle of organization is that interrelated parts move concordantly. Because all health-related factors are in turn related to each other, they need a common framework. Emphasis on medical care as the base of this framework stresses cure rather than prevention and tends to neglect the social factors in health and illness—such as family and community structure—and broad environmental health problems.

Not only are the relationships between medical care problems and other health problems complex and infinite, but there is also the ultimate consideration—the necessity to make decisions about how best to allocate resources among various programs, activities, or techniques in order to advance health purposes. These decisions can be made properly only in terms of the relative productivity and cost of each means proposed. Thus, one cannot fully

consider which resources should be committed to medical care without comparing their value for health purposes to those of all other areas of health activity that, with similar effort, could be brought forward.

In considering this matter, Roemer (2) has noted the traditional value of the public health movement, with its emphasis on prevention. Sensitive to the need for community support, however, he observed that the permanent structure necessary to carry out health programs effectively "cannot be built with a mission of preventive services alone." He argued that such a structure "must meet the needs of the people, as they are felt by the people, and this requires that the pain and distress of sickness which has not been prevented must be confronted." As a second major consideration for advancing the status of medical care Roemer rejected, "on the grounds that specialization is called for," the idea that "the whole field of administration of all types of health service should be coalesced under the umbrella of 'health service administration'."

Undeniably, specialization is needed, acute care is more dramatic than preventive care, and public support is crucial to the long-term success of any health mission. But we cannot concur with Roemer's premise.

It is a self-fulfilling prophecy that so long as health professionals are guided solely by what the public wants rather than by what, in their informed and specialized judgment the professionals recommend for the benefit of the public, popular feelings will be the catalyst for health actions. One might ask what the public would want if it fully understood the benefits of the community health approach. Schools of public health have a particular responsibility in this regard, and their leadership and community education ought to be based on considerations of the total health of the total community, not upon a special field of interest.

### **Mission-Oriented Teaching**

Conditions within many schools of public health mirror the fragmentation and lack of rationalism found in health services outside. They are not only a reflection, however, they are also a cause. Such schools have a rather well-defined mission, one that is not confined to im-



parting knowledge and skills to students. Uniquely, their aim is to have the most beneficial effect possible upon the health and functioning of the people in the community. Thus, schools of public health should organize their curriculums accordingly. Moreover, organization of the curriculum that takes into account the community mission will provide the most meaningful learning experience for students. Curriculums should be modeled on the decision-making designs students are expected to follow in their postacademic careers.

Specialists in curriculum construction distinguish between content (information to be learned) and process (the learning act); they also emphasize the importance of process for the impact that it has upon the learner. Crucial to the learning process is the experience that the student has as he progresses through the curriculum rather than the material that he is supposed to assimilate. Although curriculum content may make assertions as to validity of certain principles, their impact is largely undone if the activity through which the student is led belies those assertions (3).

It is unreasonable to expect a graduate to take a broad view of the health field if his experience in school has been narrowly contained within a single area such as maternal and child health, sanitary science, or hospital administration. It is unreasonable to expect a graduate to consider in a balanced perspective the many competing claims on limited health resources if in school he has seen isolation and competition among divisions and disciplines.

We recognize that the radical change we propose is not easy to bring about and that the requisite motivation is difficult to generate. The sheer magnitude of the work of recasting the teaching modes and materials and of coordinating the efforts of various specialist teachers make the outcome of such a venture somewhat uncertain. Yet we make the plea that the time is overdue to begin a widescale—worldwide—dialog concerning the rationalization of curriculums of schools of public health.

#### **A Proposal for Curriculum Design**

*Integration and specialization.* A school of public health curriculum should simultaneously fulfill the conflicting needs for comprehensive-

ness and integration and for specialization. This, we suggest, might be best accomplished by establishing a broad picture of the health field as firmly as possible in the mind of the student and then following up with specialized education and experience. The intent is to build a base sufficiently strong to contain the counter-currents of fragmentation and conflict that stem from the demands of modern organization. The organization called for involves a core course followed by elective courses and fieldwork. The proper distribution of time for each depends on student characteristics and other conditions that vary from school to school, which cannot be detailed here. Suffice it to say, the core material required for most master's degrees in public health or hospital administration probably should represent no more than half the time invested in the first 12 months for either a 1- or 2-year curriculum. The major innovations that we propose are in the core course.

*Phase one: definition of the problem.* The most significant feature of the core course is that it starts with a comprehensive examination of health problems in the particular geographic area or areas with which the school is concerned. Before the means of conducting attacks on targets are considered, it is necessary to define the targets. A presentation of the extent and characteristics of diseases, disorders, and defects and of environmental hazards and the social components of illness and of other health problems will establish priorities. The usefulness of an activity depends at the onset on whether it is directed toward a proper purpose. Early in the teaching year the question, "Why are we here?" can be answered in terms of community needs and goals. At this time, the student's requirements for a sense of mission can be best satisfied. Rather than beginning the program with tool courses, the value of which may appear quite obscure to students, this approach focuses upon purposes first; later, when tools are presented their relevance will become clear.

The survey of problems should encompass varieties of health challenges for all people—"total health for the total community." Rather than consist of simply an enumeration, the survey should consider the relative importance of different health problems and establish priorities. Obviously, the combined efforts of various

departments of the school are required to paint this broad panorama, but epidemiologists, biostatisticians, and social scientists should probably predominate. The primary focus at this curriculum stage is on health problems—personal or environmental—as distinguished from those of organizational structure, management functions, financing, methodology developments, or other administrative factors.

Obviously, there are limitations as to what can be taught within a reasonable time about the extent and characteristics of all human ailments and environmental hazards in a community. Similarly, it is often not possible to establish health priorities with mathematical precision. However, the intent is to follow rational decision-making procedures to the extent that is reasonably possible. It is not justifiable to follow established procedures without question or to make decisions, or guesses, without examining as many relevant factors as possible. Moreover, the approach is important, because concepts, outlooks, and thought habits are being acquired by students; the fact that the ideal is unattainable does not justify the abandonment of all rationality. Again, differences of opinion as to priorities may be expected, but at least priorities will be intentionally considered. An expected dividend of this process should be periodic reexamination by faculty members of their ideas about the relative importance of various health needs and demands. Assumptions about needs must be challenged regularly because they are the starting point from which all else proceeds. Also, they change, often insidiously and without warning.

The logical next step from the comprehensive overview of community health problems would be the introduction of methods and techniques by which health needs are determined. Epidemiologists, biostatisticians, and survey methodologists could pointedly demonstrate the significance of systematically gathering and analyzing data in relation to health needs. The emphasis would be best placed on "problem definition," rather than creation of professional images in particular disciplines such as epidemiology or biostatistics. If the sense of mission is firmly established, the students will come to view the work of the professionals not as abstract subjects to be learned for passing ex-

aminations, but as essential tools for the proper accomplishment of community health goals.

From the introduction to methods of data gathering on health needs, the epidemiologists, biostatisticians, and social scientists could then turn to the application of their disciplines to an inventory of health resources and activities. The main purpose at this point is the consolidation of epidemiologic and biostatistical skills through their application to somewhat different areas. But this teaching activity also can serve as a step to the next major curriculum section, which deals with resources.

*Phase two: resources and activities.* Phase two of the proposed curriculum is a comprehensive and descriptive presentation of all the community resources which deal with health. It calls for information about the various kinds and numbers of health personnel, institutions, and agencies and their organization and financing. Laws and regulations should be presented. Again, comprehensiveness and balance are sought—an overview to provide students with a sense of fitting into a complicated network of interdependent resources. This effort would be largely descriptive, but interpretation and analysis are inherent parts of it. A general idea of administrative problems encountered in the health field would emerge from examination of the administration of specific services.

Student understanding of this phase would be enhanced if it is accompanied by historical explanations of how present conditions developed. Effects of social, political, and economic factors that have influenced health efforts should also be discussed. Faculty members should again be drawn upon in appropriate combination of their special knowledge, skills, and experience. The concepts of an economist would be important in depicting the insurance and social security structures and other financial aspects of health services. Hospital administrators could describe the organization and management of their institutions. Special activities such as nutrition, maternal and child health, mental health, dentistry, and the broad field of environmental hazards should be included. Clearly, the challenge to the faculty to organize and integrate diverse subject matter into a smooth, meaningful presentation would be substantial. However, the accomplishment of this task is a step toward

overcoming the fragmentation of health services.

*Phase three: administration and application.*

We propose that the teaching of ideas, concepts, and techniques of administration follow the concrete and factual presentations of phases one and two. Administration is construed broadly to include descriptions of decision-making processes at both the community and the health agency levels. A survey of organizational theory is needed in phase three, supplemented by an introduction to quantitative techniques such as systems analysis and automated information systems.

In addition to the theoretical aspects of administration, the students will need to acquire practical skills. They should be exposed to modern budgeting and personnel administration. Moreover, a relatively thorough grounding in the planning process is important, since the aim of this process is essentially the rationalization of health services—the fundamental purpose in health administration.

In phase three, case studies and seminars would bring together all material presented in the core course. The aspects of administration taught in the initial part of phase three should relate to the health problems identified in phase one and to the resource and administrative problems identified in phase two. A cross-application by the student of the knowledge and skills drawn from all three phases—a process of intellectual discovery—would be most rewarding to health administrators. Equipped with factual, practical, and theoretical information, the student would eventually strengthen his ability to devise solutions to problems in health administration. The faculty would stimulate and challenge rationality of approaches rather than feed information and patterns of past action.

During the cross-application stage, the skills of a variety of faculty members would again be needed because the experience of the three phases would be repeated in miniature but with initiative largely left to the students. The students would begin with identification of problems, using newly acquired techniques, and progress to assessment of present services and resources. There should be exercises in which students design programs, projects, or subsystems for health services. Design of services

should take into account social, economic, and political factors and result in comprehensive plans that include the details of implementation.

### **Elaboration of Core Course Rationale**

Schools of public health are organized for the promotion of the health of the community as a whole, whereas other professional educational institutions generally are organized for a discipline such as medicine, engineering, or law. To advance their purpose, schools of public health employ specialist physicians, economists, business administrators, chemists, engineers, statisticians, nurses, health educators, sociologists, and even political scientists. A great number of persons with different skills and experience are thus available to undertake the complicated tasks necessary in providing health care services. This variety of specialists is at once the strength of, and the challenge to, such schools. Unless the activities of the many specialists and generalists are united for the accomplishment of the mission, their individual values are diminished. The traditional curriculum approach tends to emphasize disciplines as disciplines rather than as bodies of information and skills that can be advantageously addressed to the mission.

Many different professional groups and other social organizations in the community contribute to the fragmentation of health services. The effects of uncoordinated forces on health services are found in both the community and the school of public health. The school should be in an advantageous position to overcome the difficulty within itself, however. Although the school is divided as to disciplines, it is united as to mission. This cannot be said of community health groups or professional organizations.

A school of public health is an extraordinary example of an institution that deals with administration. The essence of administration is coordination of numerous diverse talents so that they work in harmony and therefore produce optimally. In our curriculum proposals we seek not merely addition of a few courses or course titles, but rather a weaving together of teaching material on community health in a rational manner. This gives significance and rationality to the contributed parts as they unfold in the

learning experience of the student. Disciplines are brought into teaching and learning as they are needed. Tools or instruments are introduced only after the student is thoroughly immersed in problems, goals, and priorities. This is a deliberate attempt to schedule teaching material and student activity so as to build highly sought perspectives of breadth, interrelatedness, and balance.

Grounded in the core course material, students would move on to elective courses. They could elect to specialize in a relatively confined area such as epidemiology, maternal and child health, or hospital administration, or they could select a variety of options in different specialties. Similarly, fieldwork could offer opportunities to acquire fuller knowledge in a limited area or a diversity of experience. The problems of educating specialists are not nearly so great as those of coping with the separatist tendencies generated by unbridled specialism, a difficulty to which the core course is addressed.

It may be argued that what we propose is idealistic and unattainable. Thus, some clarification is in order. We seek neither a set of precious distinctions between means and ends nor three watertight compartments in phases one, two, and three. To insist that no action can be taken unless it follows precisely the dictates of rational decision making is unrealistic. To insist that administrative problems or techniques could never be discussed during phase one—the presentation of health problems—would probably result in stilted and artificial rigidity. However, these facts do not invalidate the adoption of the rational decision-making model as a guide for the main outlines of a core course and to provide a means for breaking out of traditional patterns of thought and teaching.

It might also be argued that our proposal would lead to narrow vocationalism of schools of public health by emphasizing problem solving and the application of knowledge and skills. But there is enormous intellectual challenge and complexity encountered in the provision of

health services. Our approach would focus the wide range of competence found among the faculty in the schools of public health specifically and effectively on this challenge and complexity. It stresses purposefulness and application, but that is entirely consistent with the concept of the role of a school of public health. It also stresses, on a grand communitywide scale, the search for better ways to do things and for better things to do—this is hardly narrow vocationalism.

Multitudes of factors in the community and in medical societies and health financing institutions have created the “non-system” characteristics of health services. It may seem unduly ambitious to expect schools of public health to influence patterns of health services toward greater rationality. The schools generally are not large institutions and not numerous. Yet they do have the responsibility to educate future health administrators. Since they have a diversity of professions working together for improvement of health and social functioning, these schools are potentially equipped to succeed in their mission. The outcome is more likely to be successful if schools of public health rationalize their approaches to their teaching of community health concepts.

#### REFERENCES

- (1) Winslow, C.: *The accreditation of North American schools of public health*. American Public Health Association, New York, 1953.
- (2) Roemer, M. I., and Gomez, H. A.: *Instruction on medical care organization in the basic curriculum of Latin American schools of public health*. Paper presented at the Fifth Conference of the Schools of Public Health of Latin America, Buenos Aires, Argentina, November 26–December 1, 1967, pp. 2 and 3.
- (3) Parker, J. L., and Rubin, L. J.: *Process as content: curriculum design and application of knowledge*. Rand McNally & Company, New York, 1966.

#### Tearesheet Requests

William C. Thomas, Jr., Ph.D., Research Building, Columbia University School of Public Health and Administrative Medicine, 630 West 168th St., New York, N.Y. 10032.

# Low Birth Weight and Perinatal Mortality

GUNNAR af GEIJERSTAM, M.D.

A RECENT STUDY by the National Center for Health Statistics, Public Health Service, was concerned with the higher and more slowly decreasing perinatal and infant mortality in the United States compared to six West European countries, one of which was Sweden (1). In 1964 the U.S. infant mortality rate was highest among the seven countries and 75 percent higher than the lowest rate, that for Sweden. Even when the comparison was limited to white infants in the United States, the rate was 52 percent higher than in Sweden.

In each of the countries studied, the decline of both infant and perinatal mortality was retarded after 1950, but the slowing down was more evident in the U.S. rate than in all but one of the others. According to the Public Health Service study, the differences cannot be explained by factors such as age of the mother or birth order of the child. The data show that the incidence of low-birth-weight infants is higher in the United States and that it has been slowly increasing. The data also suggest that differences in birth weight distribution could account for as much as 85 to 90 percent of the differences in neonatal mortality between the United States and Sweden. The comparison is hampered, however, by insufficient data on birth

weight from the European countries and by lack of U.S. data on weight-specific mortality rates later than 1950.

## Swedish Data

Swedish data on the proportion of low-weight births are available in the statistical reports of the National Board of Health which are published yearly, with a delay in time of 1½ to 2 years so that the latest report contains the statistics for 1965. For birth statistics, the following recommendations of the World Health Organization have been adopted: (a) the dividing line for prematurity is set at 2,500 grams, (b) "live birth" includes all infants who are breathing or show any other sign of life independent of the gestational age, and (c) "late fetal death" or "stillbirth" includes fetuses born without any evidence of life at 28 or more weeks of gestation.

Since 1965, data have been collected from all of Sweden on birth weights, in 500-gram groups, 2,500 grams or less and the late fetal and early neonatal mortality in those groups. These data were published for the first time in the 1967 report of the National Board of Health (2).

The primary source for the statistics of the National Board of Health is the yearly reports from hospitals, which cover more than 99.8 percent of all childbirths in Sweden. The remaining 0.2 percent represents domiciliary deliveries attended by district midwives, whose birth reports also reach the Board through the provincial health officers. The birth and death data of the National Board of Health correspond well with the official vital statistics which are collected in

---

*Dr. Geijerstam, an associate professor at the department of obstetrics and gynecology, Karolinska Hospital, Stockholm, Sweden, wrote this paper when he was a visiting professor of population planning at the University of Michigan. He presented a preliminary version at the First International Conference on Prematurity, January 11-13, 1968, at Fort Lauderdale, Fla.*

the parish registries and computed by the Central Bureau of Statistics.

By using the statistics of the National Board of Health it is possible to make international comparisons on prematurity which go beyond those in the 1967 study (1). As background to my subsequent discussion on the maternal health programs in Sweden, such information should be of interest.

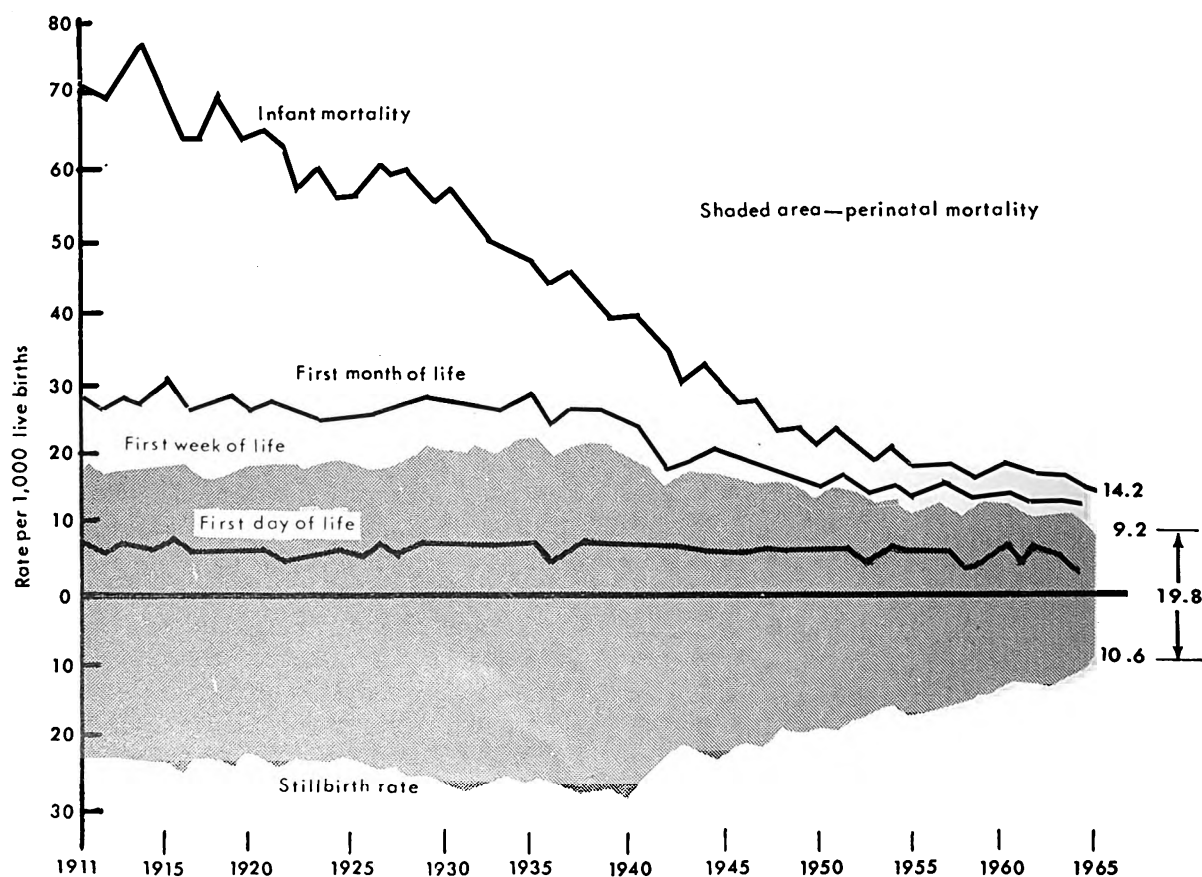
The mortality within the first day, week, month, and year of life, as well as late fetal deaths per 1,000 live births in Sweden, from 1911 to 1965, illustrate the dynamic changes which have occurred and are still in process (fig. 1). Since 1943, the early neonatal mortality has dominated the losses during the first year of life, and it accounted for almost two-thirds of such losses in 1965.

Figure 2 shows that for perinatal mortality there has been a gradually increasing relative dominance of low-weight infants from 1955 to

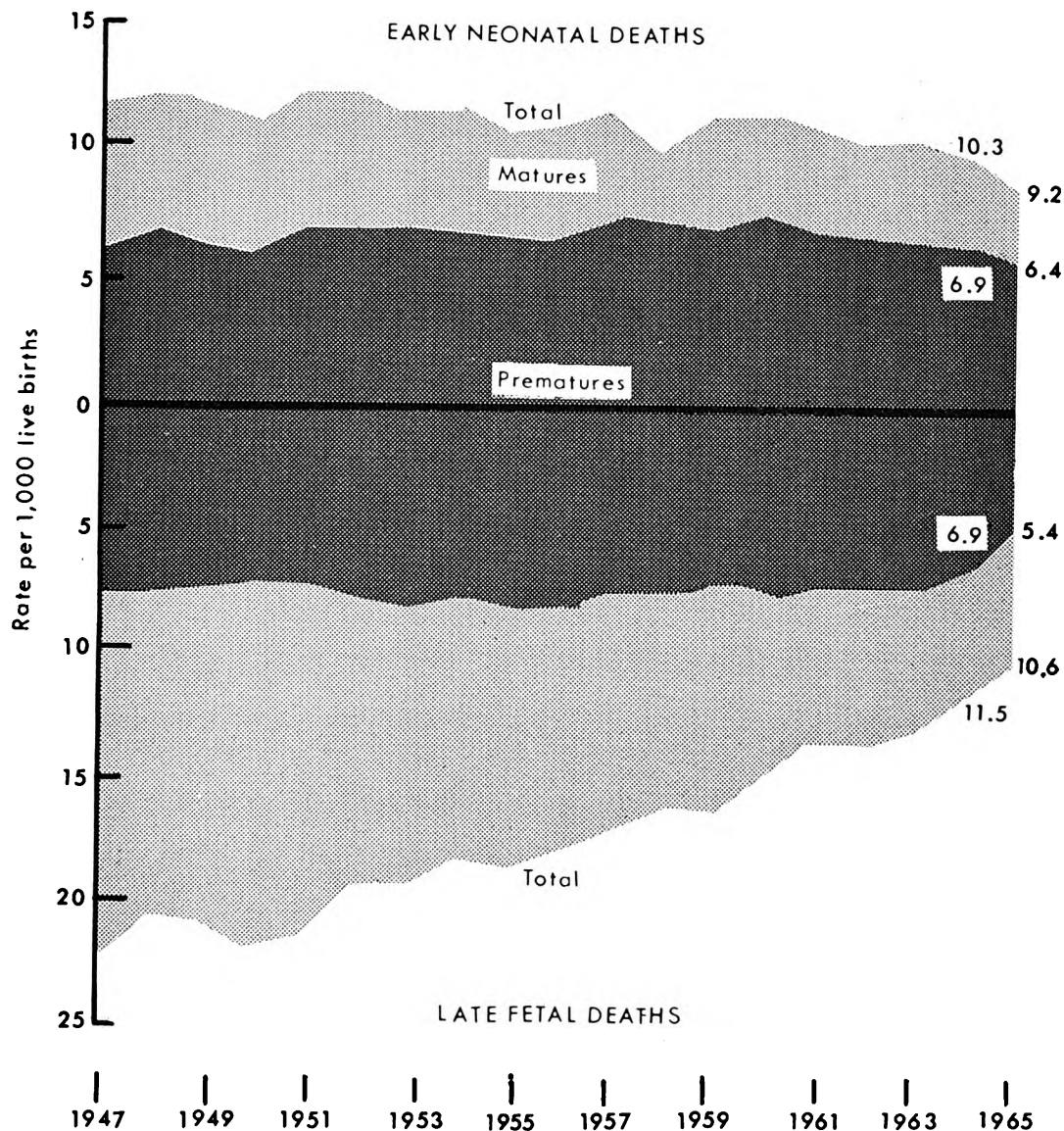
1965. In 1965 the "prematures" accounted for about three-fifths of the total perinatal mortality. This proportion is related particularly to a continuous decrease in the fetal death rate of the "matures." In the early neonatal deaths, the prematures dominated throughout this 10-year period. A small increase in the proportion of premature births was also seen at the beginning of the period (fig. 3); however, this increase can be related mainly to a change in definition of premature.

Although low-weight infants constitute less than 5 percent of the total number, their high early neonatal death rate causes their dominance in the perinatal mortality. To be able to show in the same graph (fig. 4) the death rates of the prematures and the matures, the scale of the latter must be made 10 times larger. In 1965, the Swedish perinatal mortality of the prematures was 28.4 times that of the matures. From figures 2-4, it is evident that little change has occurred

**Figure 1. Infant, neonatal, and perinatal mortality per 1,000 live births, Sweden, 1911-65**



**Figure 2. Perinatal mortality per 1,000 live births, Sweden, 1947-65**



in the outcome of low-weight births in Sweden. The progress made in lowering the perinatal mortality was due mainly to the considerable drop in the late fetal death rate together with some decrease in the early neonatal mortality, both with respect mainly to infants weighing more than 2,500 grams.

Thus it is probable that Sweden's fortunate position in infant and perinatal mortality is caused to a high degree by a comparatively low rate of low-weight births. Another factor of possible importance is the weight distribution of live births in the United States and Sweden

(table 1). The only recognizable difference in the distribution under 2,500 grams is in the lowest weight group where the U.S. figure is relatively higher—about 7 percent of the live-born prematures as against 4 percent in Sweden. However, this difference is of considerable importance as the lowest weight group has a high early neonatal mortality; in Sweden one of four early neonatal deaths among the low-birth-weight infants occurred in this weight group. The early neonatal mortality and the perinatal mortality by weight are shown in table 2.

Table 3 demonstrates the significance of the



rate of low-weight births for the national differences. The 1964 data show how the Swedish early neonatal mortality would have been affected if only the prematurity rate had been increased to the U.S. level the same year. For the 1959 data the reverse experiment is done, using the latest available figures for weight-specific neonatal mortality in the United States (3). It is evident that the national differences decrease or disappear through such manipulations.

For the purposes of table 3, only the weight was considered as a criterion for the maturity of the child at birth. It has been suggested that newborn children from certain minority groups in the United States, especially from the Negro population, show a comparatively higher maturation at lower birth weight. If this observation is correct, it should increase the difference in the total perinatal mortality between the two nations. The fact that the United States and Sweden show a significant difference in prematurity rates, despite their similar levels of general development, motivates a search for possible determinants of that difference.

#### Socioeconomic Factors

Studies in the United States and in Sweden demonstrate that women of the least favored social groups, unmarried women, and women in less-skilled occupations have an increased tendency to give birth to low-weight infants.

**Table 1. Percentage distribution of live births by birth weight, United States and Sweden**

Birth weight (grams)	United States 1964	Sweden 1965
1,000 or less.....	0.6	0.2
1,001-1,500.....	.7	.4
1,501-2,000.....	1.5	1.0
2,001-2,500.....	5.4	2.9
2,501 or more.....	91.8	95.6

However, no study seems to have been made in the two countries or elsewhere which can serve as a basis for an evaluation of the impact such socioeconomic factors may have on the national statistics, and thus enable international comparison.

General demographic data indicate important sociologic and economic differences between Sweden and the United States, which may have consequences in infant mortality. Sweden has a small population of about 8 million, which is slowly increasing with a growth rate of 0.6 percent per year. The birth rate is one of the lowest in the world, in 1966 close to 16 per 1,000, and the death rate is around 10 per 1,000. The growth rate of the U.S. population is a third larger. The Swedish population is also rather homogeneous; there are no minority groups with significant fertility differences, as in the United States.

**Figure 3. Percent of total births 2,500 grams or less, Sweden, 1947-65**

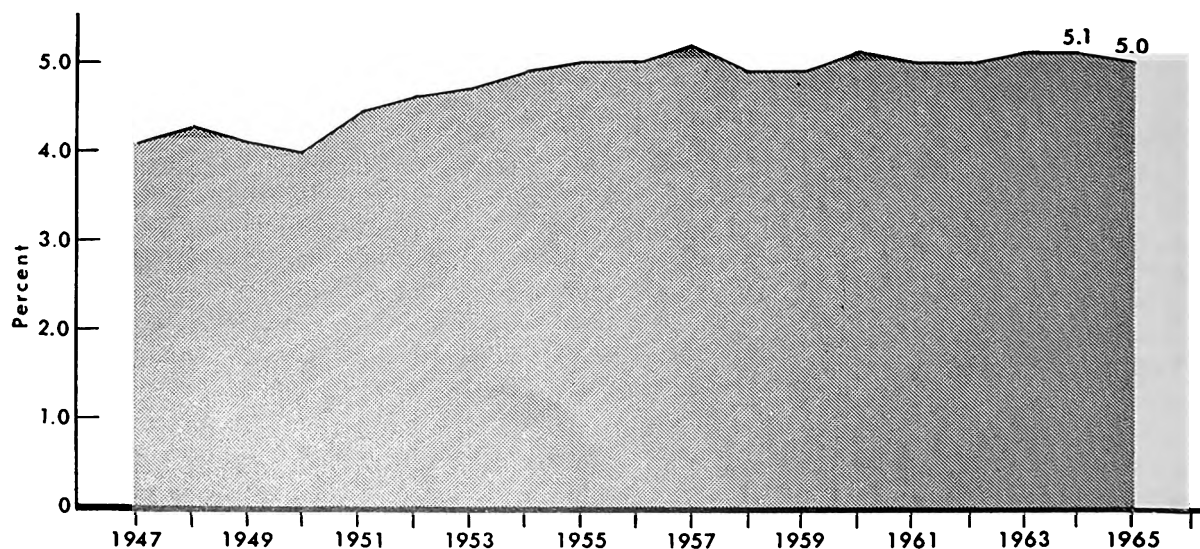
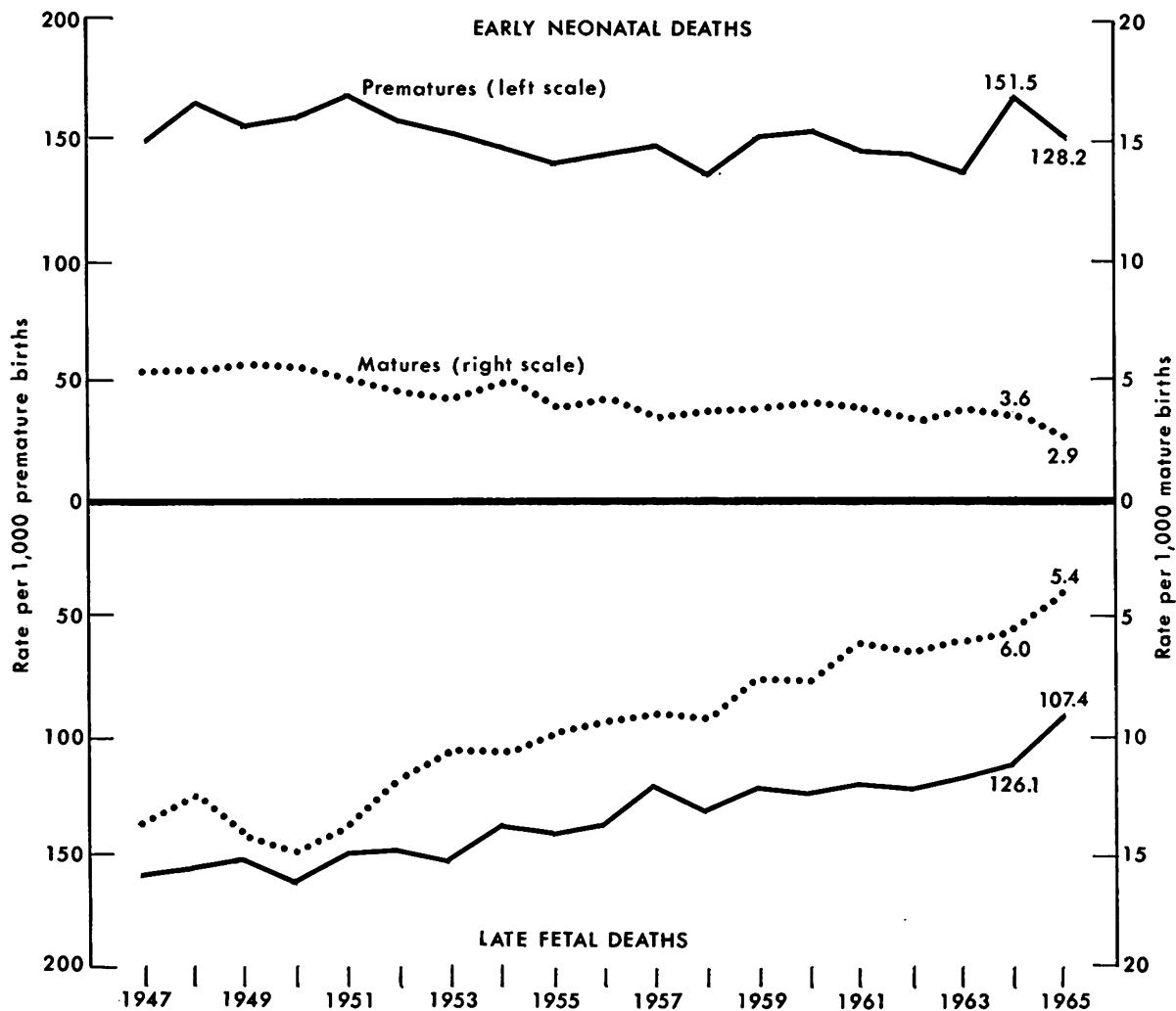




Figure 4. Late fetal deaths and early neonatal deaths, Sweden, 1947-65



Sweden is a highly developed and industrialized country with the highest per capita income in Europe, along with Switzerland. Although the gross national product of \$2,400 per capita in 1964 was only about half the U.S. figure, Swedish standards of living are high, and, more important for health standards, the prosperity is far more equally distributed than in the United States; there are few very rich people but also few really poor ones. With some exaggeration, Sweden has been described as approaching the stage of having only one solid middle-class population. Even though there is a considerable housing shortage caused by pronounced urbanization, especially in the major cities, city slums are virtually non-existent.

Much of what is included in the social reforms of a welfare state like Sweden should be of considerable importance for health in general and for maternal and child health in particular, although it is impossible to prove in figures if and to what extent such reforms should be given credit for the progress made.

Since 1962, Sweden has had compulsory health insurance for all residents. Most of the cost is paid by the insured together with his income tax, with a premium according to his income; part is paid by the employer and part by the Government. The insured gets hospital care without charge, both for illness and for childbirth. For outpatient care there is a 75 percent refund of fees to the physician, to the hospital, or to the laboratory, according to a

schedule of the services provided, and also of travel costs of the patient to the physician or of the physician to the patient. Half the cost of medicine over a low basic price is paid by the insurance, and more expensive medicines as well as some medicines for chronic diseases and during pregnancy are free of charge. There is a cash sickness benefit with a supplement to gainfully employed persons according to income. Similarly, a cash maternity grant of about \$215 is available to everyone and can be supplemented for a maximum of 180 days by an additional cash benefit according to income, if the mother was employed 270 days before confinement.

Apart from the benefits under health insurance, the social security of mothers is further enhanced by yearly family allowances of \$100–\$120 per child until the age of 16, or 18 for students. All these benefits are provided independently of the marital status of the woman.

The term “illegitimate” for many years has been canceled from all law texts and replaced by the term “out-of-wedlock.” Unmarried motherhood carries much less social stigma in Swedish society than in North America, and certain social services are offered specifically to unmarried mothers. A guardian is always appointed by the Child Welfare Board of the home community. One duty of the guardian is to try to find the father of the child and make him admit his social and economic responsibilities, if necessary by bringing the case to court, and to help the mother in representing the child in all legal and economic matters. If no father can be found, the Government provides a special cash allowance to support the child so long as the mother needs it.

Out-of-wedlock births are almost twice as

**Table 2. Early neonatal and perinatal mortality,<sup>1</sup> by birth weight, Sweden, 1965**

Birth weight (grams)	Early neonatal mortality	Perinatal mortality
1,000 or less.....	881. 3	1, 255. 7
1,001–1,500.....	475. 9	857. 4
1,501–2,000.....	153. 7	304. 9
2,001–2,500.....	47. 5	104. 0
2,501 or more.....	2. 8	8. 2
Total.....	9. 2	19. 7

<sup>1</sup> Per 1,000 live births.

**Table 3. Incidence and mortality of prematurity infants, Sweden and the United States**

Year and location	Percent live births 2,500 grams and under <sup>1</sup>	2,500 grams and under	More than 2,500 grams	Total
<b>First week mortality <sup>2</sup></b>				
<i>1964</i>				
Sweden <sup>3</sup> .....	4. 6	151. 5	3. 6	10. 3
United States <sup>3</sup> .....	8. 2	-----	-----	17. 9
Sweden <sup>4</sup> .....	-----	-----	-----	15. 7
<b>First month mortality <sup>2</sup></b>				
<i>1969</i>				
California <sup>3</sup> .....	7. 2	172. 9	4. 8	17. 3
Sweden <sup>3</sup> .....	4. 5	-----	-----	12. 8
California <sup>5</sup> .....	-----	-----	-----	12. 4

<sup>1</sup> Incidence of prematurity.

<sup>2</sup> Per 1,000 live births.

<sup>3</sup> Actual.

<sup>4</sup> Calculated with U.S. incidence and Swedish weight-specific mortality.

<sup>5</sup> Calculated with Swedish incidence and California weight-specific mortality.

SOURCES: references 1, 2, 4, and 5.

common in Sweden (13.1 percent) as in the total U.S. population (6.8 percent), but only about half as frequent as among U.S. nonwhites (24.5 percent). Several studies indicate that the prematurity rate is higher in unmarried than in similar control groups of married women. However, the studies do not allow statistical international comparisons. Such comparisons may also be difficult because the basic data can be misleading, as the traditional attitudes and behavior with respect to marriage and childbearing vary in different countries and in different socioeconomic and cultural groups in the same society. For instance, a great number of so-called out-of-wedlock children in Sweden are born to parents who marry after the first childbirth, an accepted custom since old times when proved fertility could be a prerequisite for marriage.

### Maternal Health Services

Swedish pregnant women are prohibited from taking or continuing heavy manual labor. Every employer is required to allow an employee leave during the last 6 weeks of her pregnancy and up to half a year after the child-

birth and also to grant her necessary time off if she is breast feeding her child. He must re-employ her after the childbirth if she has expressed beforehand that she wishes to return to the job.

Organized care for pregnant women was not introduced in Sweden until early in this century. Originally, private physicians provided such care, and their aim was primarily directed toward early discovery of albuminuria in pregnant women and prevention of eclampsia. Their initiative was eventually followed by the establishment of outpatient clinics with similar aims in a few hospitals in the country. A Government pilot project was started in 1931 in several urban and rural areas. Some years later, the National Board of Health published a report and a plan for the organization of a general maternal and child health (MCH) service in the country (6). A 1938 statute established the rules for state grants to the local governments for this service. The statute has since been revised and updated several times.

A condition for the grant is that the care is given free to the patients. The maternal health part of the activities is mainly preventive prenatal care but also provides for postnatal examination and advice on family planning. Free testing for pregnancy is included to stimulate first visits as early as possible in pregnancy. Education for childbirth classes are arranged and conducted by the midwife in charge. In addition to preventive care, there is also provision for treatment of diseases during pregnancy and up to 12 weeks after the delivery, if the diseases are caused by the pregnancy or delivery and when inpatient care is not necessary. This provision is in addition to the general sickness insurance. Other free services included are a serologic test for syphilis, chest X-ray screening, blood-typing, at least for Rh factor, and often vaginal cytology and bacteriological culture for gonococcal infection. The examination of every pregnant woman with respect to asymptomatic bacteriuria, either by quantitative bacteriological culture or by a chemical screening test, is being carried out in some centers as a pilot study.

As mentioned earlier, certain medicines are given free of charge to pregnant women. These include both prophylactic and therapeutic

drugs; for example, vitamins, iron, and calcium. More recently, immune or gamma globulin has been added to the free medicines to be given for protection to women exposed to rubella in early pregnancy.

The MCH services are administered by medical committees of the governments of the 25 Swedish Provinces and three separate cities. Each committee plans for its own area in consultation with the National Board of Health. The Board issues instructions for the MCH services, stating the aims of the care and the organization of the activities.

Where there is a hospital with a separate department of obstetrics and gynecology, the maternal health service is provided by a center staffed by specialists and usually directed by the head physician of the department. In some of the larger cities, centers of the same highly qualified type are also located outside of the hospitals. In this type of center, only midwives with special training in preventive obstetrics may be employed. In other urban areas, the care is given by less specialized personnel, often the medical and midwifery staff of the general hospital which is providing the delivery services, or the city medical officer and district midwives.

In rural areas, preventive maternity care is provided by the district medical officer, and the district midwife is responsible for midwifery duties. If the district covers a large area, branch centers may be arranged to avoid long trips for the pregnant women. The centers are usually used for combined MCH services, and the midwife is replaced by the district public health nurse for the well-baby clinics.

After their introduction in 1938, the Swedish maternal health services expanded rather rapidly, and during the past 10 years the country has been fairly sufficiently covered, although the rural areas with sparse population and lower fertility are not as well supplied as the cities. Another determinant of the rural backwardness in this respect has been a shortage of district midwives.

Since there are no domiciliary deliveries, the midwifery districts have been expanded in order to fill the time of the midwives with maternal health work. The young, newly graduated midwives prefer to take positions in the maternity wards of the hospitals where they can

practice the delivery care for which they have received their principal training and which they feel is more rewarding. In sparsely populated northern Sweden, some communities have solved this problem by appointing district nurses with full training in both public health and midwifery, which, however, requires a long and expensive education.

Because education in obstetrical practice at delivery is not really necessary, a different way of midwifery training for nurses was tried. Public health nurses were given a 5-month training course in the theoretical and practical aspects of prenatal care and also in handling some obstetrical emergency situations which they might encounter. After this course, the nurses took over the maternal health work in their own and sometimes a neighboring district, where home delivery no longer can be the choice of pregnant women. The results of this experiment were favorable; they indicate that the advantages of effectiveness and continuity in care outweigh the disadvantages of incomplete midwifery training of the nurse. No serious complications have been recorded that can be charged to the experiment.

The instructions for MCH services recommend at least three consultations with a physician during a normal pregnancy—one visit in the beginning, one in the middle, and one about 4 weeks before the expected date of delivery. Whenever needed, the number of visits can be increased. Another visit to the physician is to be made 6 to 8 weeks after the childbirth. The main burden of regular care during pregnancy is assumed by the midwife, who makes monthly checkups in the early stages of the pregnancy, fortnightly between the second and last regular visits to the physician, and then weekly until the delivery. If possible, the midwife makes a home visit to every pregnant woman in her care. These aims correspond reasonably well to reality. The 1965 statistics show that women in the general maternal health service made an average of 3.4 visits to a physician and 6.3 visits to the midwife, and that the midwives made 0.5 home visit per patient. Naturally, more visits to midwives and home visits are made in rural areas, and more consultations with physicians take place in urban centers.

No statistics are available on the distribution of pregnant women by the different types of clinics, but the number of specialized centers has increased steadily, from 30 in 1945 to 75 in 1965, whereas the number of less-qualified centers has decreased. Between 80 and 90 percent of all the childbearing women receive prenatal care through the public services; the others prefer care by private physicians at their own expense. In recent years, rarely has a woman been admitted for delivery who has had no prenatal care.

As transportation facilities have improved, particularly in recent years when private automobiles have become generally available, prenatal care has become increasingly centralized. Also, the aim has been to have every pregnant woman examined at least once during pregnancy, by a specialist if possible, at the maternal health center of the hospital where she plans to deliver. In most accessible areas this aim seems to have been reached; in some places by having a member of the obstetrical staff of the hospital conduct the clinics of small and distant centers once or twice monthly.

Furthermore, the National Board of Health strongly recommends a consultation with a specialist for all high-risk pregnant women so that a joint decision can be reached on necessary precautions and on special care that may be needed. A major portion of the special care is directed to the prevention of prematurity. This system is also rewarding for the consulted specialist because the insight of the local physician into the personal and social circumstances of a patient may be extremely helpful for the specialist in making his evaluation. The system also seems to diminish substantially the incidence of late admittance to the maternity hospitals of patients in critical condition.

Especially since World War II, maternity care in Sweden has become increasingly specialized and largely concentrated in departments headed by physicians well qualified in obstetrics and gynecology. Presently, throughout the country there are more than 50 such departments which have about 70 percent of the total 3,600 maternity beds. In 1920 only 9 percent of all deliveries took place in a hospital; the statistics were more than reversed in 1965 when 0.1

percent of the deliveries were at home, 0.5 percent took place in small maternity homes without a resident physician, and three of four of the remaining 99.4 percent of the deliveries were in departments staffed with obstetrical specialists.

Most hospitals with a separate department of obstetrics and gynecology also have a pediatric department, and for several years it has been the policy of the National Board of Health never to sanction the building of such hospitals without pediatric departments. For other general hospitals, the Board recommends that a pediatric consultant be assigned to the maternity department at all times.

The influence on the incidence of prematurity and on the fate of the low-birth-weight infants of these efforts to centralize and specialize the

obstetrical care is difficult to evaluate. Some possibly favorable effects may be deduced from tables 4 and 5. Table 4 shows that the specialized hospitals had a comparatively higher proportion of low-weight births, mainly live births. To some extent, this may be influenced by a higher general incidence of prematurity in the usually highly industrialized communities which they serve in addition to prenatal screening and admission of high-risk patients.

Table 5 indicates that the slightly higher perinatal mortality for the low-weight births in the specialized hospitals makes their total perinatal mortality rate significantly higher, even though it is lower for the matures. However, the gradual increase in total perinatal mortality, combined with the gradual decrease in perinatal mortality for mature births, progressing from

**Table 4. Proportion of premature births, by type of place of delivery, Sweden, 1965**

Place	Percent of all live births	Live births 2,500 grams or less		Stillbirths 2,500 grams or less	
		Percent of all	Percent in each place	Percent of all	Percent in each place
Maternity hospital or hospital department with obstetrical specialists.....	75.0	80.0	4.8	79.6	53.1
Maternity department in general or cottage hospital without specialized staff.....	24.4	19.3	3.6	19.8	45.3
Maternity home without a resident physician..	.5	.4	3.0	0	0
Home.....	.1	.3	10.3	.6	( <sup>1</sup> )
Total.....	100.0	100.0	4.5	100.0	51.1

<sup>1</sup> Too few for calculation of rate.

**Table 5. Perinatal mortality, by type of place of delivery, Sweden, 1965**

Place	Number of live births	Live births 2,500 grams or less		Perinatal mortality rate		
		Number	Percent	2,500 grams or less	More than 2,500 grams	Total
Maternity hospital or hospital department with obstetrical specialists.....	91,837	4,393	4.8	264.7	8.1	20.4
Maternity department in general or cottage hospital without specialized staff.....	29,822	1,062	3.6	261.8	8.7	17.7
Maternity home without a resident physician..	636	19	3.0	( <sup>1</sup> )	13.0	15.7
Home.....	175	18	10.3	( <sup>1</sup> )	19.1	57.1
Total.....	122,470	5,492	4.5	264.0	8.3	19.8

<sup>1</sup> Too few for calculation of rate.

the least to the most highly specialized hospitals, is a result of successful screening of the high-risk patients for specialized care.

### Summary

An analysis of Swedish data on incidence and mortality of low-birth-weight infants and a comparison with available U.S. statistics indicates that the higher U.S. infant and perinatal mortality is caused mainly by a higher proportion of low-weight births. Possible reasons for Sweden's more favorable position in this regard may be found in its lower birth rate, its homogeneous population which has no underprivileged minority groups, its social welfare system and compulsory health and sickness insurance, and its well-developed and highly specialized prenatal and maternity care.

All prenatal, delivery, and postnatal services are provided free of charge to everyone as a part of the general health insurance. A screening system is used to detect women at risk for premature birth or other obstetrical complications so that they may be given specialized prenatal and delivery care. As a probable result, 75 percent

of all Swedish children—but 80 percent of the prematures—are born in maternity hospitals or hospital departments which have obstetrical specialists. The resources of a modern hospital are not immediately available for less than 1 percent of all pregnant women.

### REFERENCES

- (1) U.S. National Center for Health Statistics: International comparison of perinatal and infant mortality. PHS Publication No. 1000, Series 3, No. 6. U.S. Government Printing Office, Washington, D.C., March 1967.
- (2) National Board of Health: Public health in Sweden, 1965. Stockholm, 1967.
- (3) California Department of Public Health: Perinatal mortality and survival, California 1949-59. Berkeley, 1963.
- (4) National Board of Health: Public health in Sweden, 1964. Stockholm, 1966.
- (5) National Board of Health: Public health in Sweden, 1959. Stockholm, 1961.
- (6) National Board of Health: Report on maternal and child health. Swedish Government Report Series (S.O.U.) 1935, No. 19. Stockholm, 1935.

### Tearsheet Requests

Dr. Gunnar af Geijerstam, Karolinska Hospital, S-10401 Stockholm 60, Sweden

## Education Note

**Dissertation Research Grants in Medical and Pharmaceutical Economics.** The Pharmaceutical Manufacturers Association (PMA) is offering dissertation research grants to doctoral candidates in economics and related disciplines at universities in the United States. The association's objective is to interest scholars in medical and pharmaceutical economics. It is hoped that independent dissertations will help to build a body of knowledge valuable to Government, medicine, and industry.

Each grant for calendar year 1970 will carry a stipend of \$2,000, and additional funds may be made available for certain travel expenses for visits and interviews with pharmaceutical manufacturers' executives and certain other expenses. The PMA

program does not preclude the student from receiving financial assistance from other sources.

Successful candidates will be chosen from schools which offer degrees in various economic and administrative science disciplines. Each candidate must have a letter of recommendation from his major adviser. Universities will soon receive complete information on the procedure to be followed by graduate students applying for grants. However, the association will award the grants directly to the recipients.

Applications should be submitted as soon as possible before November 15 for the year beginning January 1 or by May 15 for the 12 months beginning July 1.

Additional information is available from Howard L. Binkley, Pharmaceutical Manufacturers Association, 1155 Fifteenth St. NW., Washington, D.C. 20005.

# Awareness of Sickle Cell Anemia Among Negroes of Richmond, Va.

JOHN C. LANE, B.S., and ROBERT B. SCOTT, M.D.

**S**ICKLE CELL ANEMIA is one of the most common chronic illnesses of Negro children (1). It occurs in approximately 1 of 500 Negro births. (This estimate is based on homozygotes being  $\frac{1}{40}$ th of trait frequency; 8.0 percent  $\times \frac{1}{40}$ th = 0.2 percent, or  $\frac{1}{500}$ th.) Sickle cell anemia is about six times more common than the next most common long-term illness of Negro children—diabetes mellitus (1). A number of serious childhood illnesses are well known to the general public because of massive publicity and public education campaigns sponsored by health agencies and organizations providing support for the prevention, control, or amelioration of the specific illness. The following list shows how the incidence of some widely known childhood illnesses compares with the incidence of sickle cell anemia. All these other conditions occur less commonly in Negroes than in the white population.

Sickle cell anemia.....	1:500 Negro births
Thalassemia major.....	1:2,400 Italian-American births (2)
Acute leukemia.....	1:2,900 children under 15 years (3)
Cystic fibrosis.....	1:3,000 births—98 percent white (4)
Phenylketonuria.....	1:10,000 births—virtually all white (5)

There have been few organized efforts to support programs of research and public information on sickle cell anemia or programs to provide care for patients with this condition. One possible explanation for this lack is that the

public is unaware of the extent of the disease or even of its existence.

To determine the level of awareness of sickle cell anemia in one community, adult Negroes in Richmond, Va., were surveyed. The results demonstrate an appalling lack of awareness of the extent of this condition and of its great effect on a large segment of the U.S. population.

## Methods

The survey form consisted of four questions:

1. Have you ever heard of sickle cell anemia?

If the answer is "yes":

2. What sort of sickness is it?

3. Have you ever known anyone with the disease?

If the answer is "yes":

4. What relation to you was the patient?

The addresses, race, age, sex, and years of schooling of the respondents were also tabulated. Brief statements were taken for the answer to question 2 in an effort to determine

---

*Mr. Lane teaches in the science department at Armstrong High School, Richmond, Va. Dr. Scott is associate professor of medicine and director of the Laboratory for Hematological Research at the Medical College of Virginia, Health Sciences Center, Virginia Commonwealth University, Richmond. This paper, submitted by Mr. Lane in partial fulfillment of the master of science degree at the College of William and Mary, was presented in part by Dr. Scott before the Virginia Society of Hematology at Virginia Beach, June 14, 1969.*

whether an affirmative answer to question 1 indicated an understanding of the disease process.

The survey was conducted during November 1968, and the majority of the respondents were interviewed during 1 week. The survey was limited to adult Negroes, with the exception of some teenage college students. The survey was conducted in all the predominantly Negro neighborhoods of Richmond. In a given neighborhood, alternate blocks were chosen, and each home on the block was visited. A small number of persons from adjacent areas of two counties were also surveyed. The majority of the interviews were conducted by a group of 11th grade students from Armstrong High School in Richmond and the remainder by volunteers from Club Dejours, a Richmond social organization. All of the interviewers were Negroes.

### Results

A total of 1,457 interviews were conducted. This number represents about 2 percent of the adult Negro population. The geographic distribution of the persons surveyed corresponded closely with the distribution of the Negro popu-

**Table 1. Age distribution of 1,366 persons<sup>1</sup> and distribution expected based on 1960 census data**

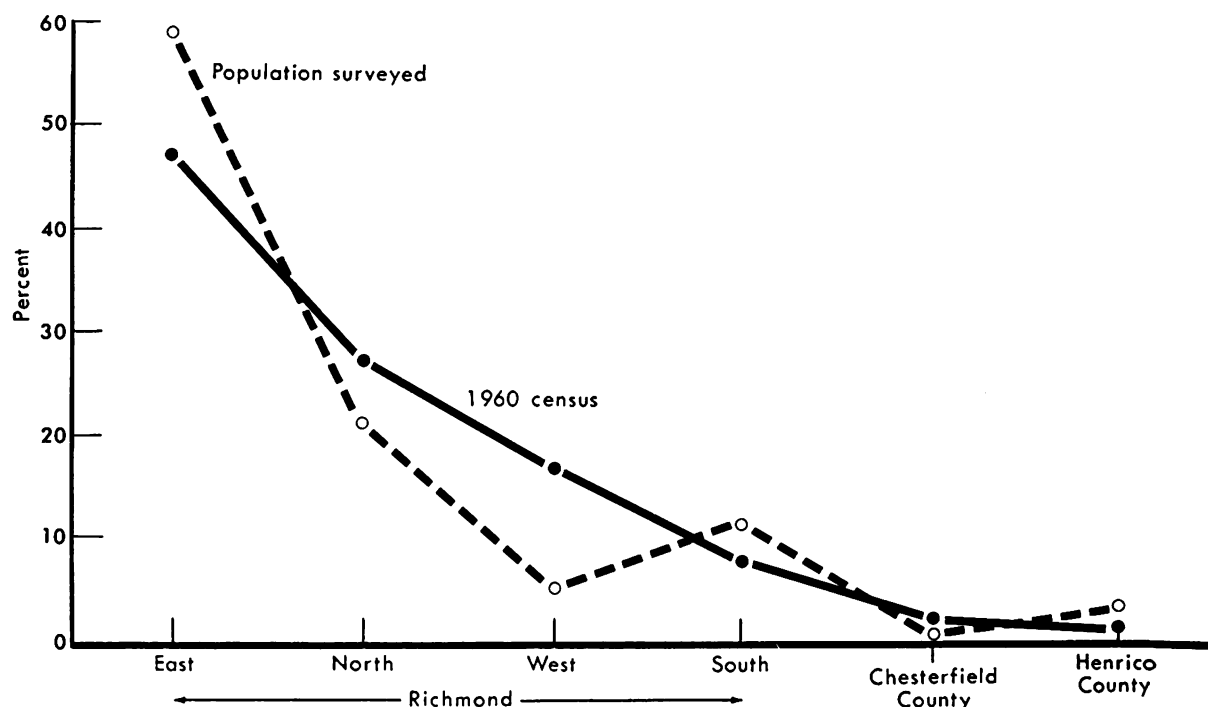
Age group (years)	Number surveyed	Percent of total	Percent distribution expected
15-19-----	150	11.0	10.3
20-29-----	327	23.9	19.8
30-39-----	321	23.5	21.7
40-49-----	267	19.6	19.5
50 and over-----	301	22.0	23.7

<sup>1</sup> 91 of the 1,457 persons surveyed did not state their age.

lation in the survey area (fig. 1). The expected distribution is based on 1960 U.S. census data (6). The age distribution of the persons surveyed is shown in table 1. Their distribution in the various age groups corresponded closely to the distribution shown in the 1960 census data except that somewhat fewer persons in the survey were in the age group over 50 years and there was a slight excess of persons in the 20- to 29-year-old age brackets.

Table 2 shows the distribution of the surveyed

**Figure 1. Percentage distribution of Negroes surveyed, by residence in Richmond, Va., or in surrounding counties of Chesterfield and Henrico**





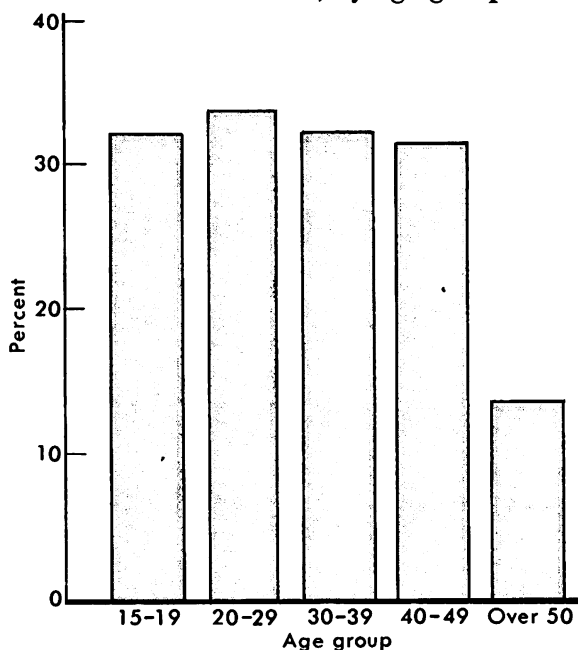
population according to educational level. This table indicates that the population sample that we surveyed in November 1968 contained many more well-educated persons than would be expected on the basis of the 1960 census data. The educational level was higher than would be expected probably in part because a portion of the survey was carried out at Virginia Union University. Also, the level of education of the Negro population had increased since the 1960 census data were compiled. In 1960, the median number of years of schooling completed by Negroes was 8, whereas in the survey sample, the median number was 11.9 years.

Of the 1,457 persons questioned, 441 or 30.3 percent answered "yes" to question 1. Only an estimated 20 percent of this number knew that sickle cell anemia is a blood disease predominantly affecting Negroes. Of the 88 who gave "good" definitions of sickle cell anemia, 30 were nurses, five were physicians, 25 were teachers, 15 were medical technicians, eight were practical nurses, and five persons knew of the disease because members of their families were afflicted with it.

The awareness of sickle cell anemia at varying age levels is shown in figure 2. At all age levels from 15 to 49 years, slightly more than 30 percent had heard of the disease. Only in persons 50 years and over, was there a difference in awareness. In this group, slightly less than 15 percent knew of the disease.

Awareness of sickle cell anemia is strikingly related to educational level (fig. 3). Of the 217 adults who had completed no more than 8 years of school, only 10.6 percent had ever heard of sickle cell anemia. Of the 505 who had attended

**Figure 2. Percent of Negroes who knew of sickle cell anemia, by age group**



high school but did not graduate, 17 percent had heard of it. Among the 344 who had completed high school but had not attended college, 29.4 percent knew of the disease. A total of 342 college students, college graduates, and persons who had attended college were questioned. Of these, 65.5 percent responded that they knew about the disease.

### Discussion

The results of our survey reveal that the lack of awareness about this serious and common disorder is grossly out of proportion to its importance in the community.

The population surveyed included more highly educated persons than the population as a whole. Thus, since the results demonstrated that knowledge of the disease was closely related to educational level, the 30.3 percent in the survey who knew of the disease was a higher proportion than would be expected in the population as a whole. Using data from the 1960 census and the levels of knowledge of sickle cell anemia that we observed at different educational levels, we arrived at a more accurate estimate of the general population's knowledge of this condition. In 1960, 59.4 percent of the adult Negro population in the survey area had not advanced

**Table 2. Distribution of 1,408 persons,<sup>1</sup> by educational level, and level expected based on 1960 census data**

Highest educational level	Number	Percent of total	Percent distribution expected
Grade 8.....	217	15. 4	59. 4
Grade 11.....	505	35. 9	19. 7
High school.....	344	24. 4	13. 2
Attended college....	342	24. 3	7. 7

<sup>1</sup> 49 of the 1,457 persons surveyed did not state their educational level.

beyond 8 years of schooling; only 7.7 percent had attended or completed college (table 2). From these data we calculated that at the time of our survey 17.6 percent of the adult Negroes in the population knew about sickle cell anemia. Because educational levels may have increased significantly since the 1960 census, this figure may be considered the minimum. Nevertheless, whether two of 10 or three of 10 knew about this illness, the level of knowledge was low in proportion to the effect of the illness.

The level of awareness of sickle cell anemia in other communities cannot be deduced from these data. Public knowledge of the condition, however, is probably low throughout the nation. Since such awareness is closely related to education, a program of public information seems indicated. Only when people are informed, will public support be generated. And only with the broad support of the Negro community will programs of research, public information, prevention, and patient care be possible.

The most immediate need is for public information about sickle cell anemia. Moreover, a program of public information is feasible in view of the success of present-day communications and educational media. A more serious

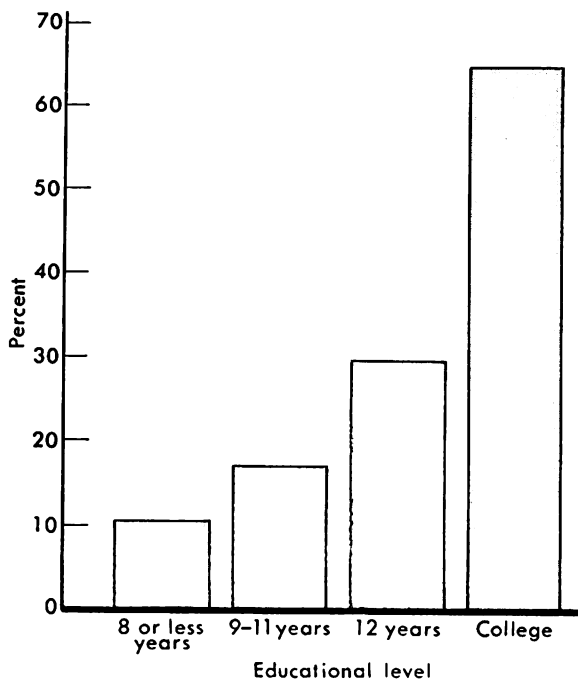
difficulty is that few young Negroes know whether they are at risk of having children with this disease. Sickle cell anemia is not curable, and treatment is unsatisfactory. While patients with the disease are living longer, they still have a shortened life expectancy, require repeated hospitalizations, and suffer chronic disability. Even now, Negroes are not routinely tested for the trait and do not have the opportunity to approach parenthood knowing whether or not they risk having children with sickle cell anemia. The proportion of Negroes with the sickle trait is about 8 percent, or about one in 12. The chance, then, of two trait-carriers marrying is about one in 144. Thus, one family in 144 is at risk of having children with severe illness. These young people deserve to know of this risk before they begin their families. But providing them with adequate knowledge of the disease and setting up the requisite programs for mass screening will require a significant increase in the public's awareness of the extent of sickle cell anemia.

### Summary

A survey of the adult Negro population of Richmond, Va., was conducted to determine the level of awareness of sickle cell anemia. Only 30 percent of those questioned had heard of this disease. Of those who had heard of it, many apparently did not understand the nature of the illness.

Awareness of sickle cell anemia was closely related to the educational level of the persons surveyed. Although the condition is one of the most common chronic illnesses among Negro children, the survey showed that the level of public knowledge of the condition is grossly disproportionate to its importance to the Negro community.

**Figure 3. Percent of Negroes who knew of sickle cell anemia, by educational level**



### REFERENCES

- (1) Sultz, H. A., Schlesinger, E. R., and Mosher, W. E.: The Erie County survey of long-term childhood illness. II. Incidence and prevalence. *Amer J Public Health* 58: 491-498, March 1968.
- (2) Neel, J. V., and Valentine, W. N.: The frequency of thalassemia. *Amer J Med Sci* 209: 568-572, May 1945.
- (3) Miller, R. W.: Persons with exceptionally high risk of leukemia. *Cancer Res* 27: 2420-2423, December 1967.

- (4) diSant' Agnese, P. A., and Talamo, R. C.: Pathogenesis and physiopathology of cystic fibrosis of the pancreas. *New Eng J Med* 277: 1287-1294, Dec. 14, 1967.
- (5) Hsia, D. Y.: Inborn errors of metabolism. Ed. 2. Yearbook, Chicago, 1966, pt. 1, p. 136.

- (6) U.S. Bureau of the Census: County and city data book. U.S. Government Printing Office, Washington, D.C., 1962.

#### Tearsheet Requests

Dr. Robert B. Scott, Medical College of Virginia, Health Sciences Center, Virginia Commonwealth University, Richmond, Va. 23219

## Dietetics and Computers

A series of 12 videotape programs, covering the application of computers to everyday dietary practices, has been designed as a basic resource for hospitals with dietetic internship programs, State and local professional meetings, colleges, and universities. It can be helpful to hospital dietitians currently working with or planning to work with computers.

The videotapes, consisting of lectures, demonstrations, and discussions, were taped during a 4-day workshop co-sponsored by the Health Facilities Planning and Construction Service, Public Health Service, and the Ohio State University. In addition to helping viewers to understand the broad applications of electronic data processing to dietetics and some basic planning requirements for use in a dietary system, the programs are aimed at fundamentals which include menu planning, computing nutrient intake, forecasting cost and nutrient levels, and identifying, organizing, collecting, evaluating, and recording required data for a dietary information system.

Following are the titles, faculty, and descriptions for each videotape.

1. Introduction and Orientation to the Conference and Evolution of Electronic Data Processing, 14 minutes—John P. Casbergue. Orients participants to the need and use of the computer.

2. Dietetics and Computers, Their Role in Community Health, 17 minutes—George Christakis, M.D. Illustrates how computers may initiate a new era in medical dietetics.

3. Basic Computer Concepts in Review, 10 minutes—John P. Casbergue and James Griesen. Relates electronic data processing and systems design to dietary concepts.

4. Medical Information Systems and Their Implications for Patient Medical and Dietetic Care, 15

minutes—Jordan Baruch. Reviews and compares systems connected with patient care.

5. Systems Analysis and the Role of the Dietitian in Planning the Use of Electronic Data Processing, 13 minutes—James Griesen. Designs a data processing system in relation to hospital dietary functions.

6. Planning a Dietary Information System: Goals and Data Requirements, 12 minutes—John P. Casbergue. Identifies the kinds of information necessary to meet established goals.

7. Demonstration of a Model Dietary Information System, 16 minutes—John P. Casbergue. Computer prints out total nutrient components of a day's menu.

8. Planning and Implementing an Inventory and Cost Control System, 12 minutes—Janet Andrews. Explains the use of electronic data processing in intradepartmental food cost accounting at the University of Missouri Medical Center.

9. Planning Considerations in the Use of Electronic Data Processing Systems, 15 minutes—Paul Konnersman. Assists planners in computerizing menus through use of mathematical formulas.

10. The Role of Education for the Professional and Nonprofessional in Planning the Use of Electronic Data Processing, 16 minutes—John P. Casbergue. Emphasizes the importance of inservice training programs.

11. A Demonstration and Discussion of Computer-Assisted Menu Planning, 19 minutes—Joseph L. Balintfy. Simplifies menu planning in patient dietary care.

12. Final Discussion and Summary, 35 minutes—John P. Casbergue. Stresses and summarizes needs of conference participants.

These programs may be rented for \$12 each for a 2-week period, excluding shipping time. They may be obtained from the Network for Continuing Medical Education Library, 342 Madison Avenue, New York, N.Y. 10017.

# WHEN THE RATS MOVE IN... YOU MIGHT HAVE TO *MOVE OUT!*



## GET SMART! *CLEAN UP!* MAKE THE FIRST MOVE

THE POSTERS, placed in schools, stores, and other public buildings, were developed by the Bureau of Rodent and Insect Control to promote the rat eradication program of the Baltimore City Health Department. The department's war on rats is a block-by-block effort in central city areas, which have approximately 116,500 dwell-

ing units. A staff of 50 health aides, chiefly inner city residents, is directing the program which involves cleaning up trash, debris, and food, exterminating rats, correcting housing conditions so that rats have no harborage, and maintaining the corrections achieved.



# Visual Acuity and Field of Vision of Urban and Rural Egyptians

MOHYI-ELDIN SAID, M.B., B.Ch., HYMAN GOLDSTEIN, Ph.D., AHMAD KORRA, M.Ch.,  
and KHALIL EL-KASHLAN, Dr.P.H.

**T**HE PERCENTAGE of persons with visual defects in a community is an indication of the health awareness of its population. Care of the eye is the responsibility of the person, his family, and the community.

Education, habits, beliefs, and socioeconomic standards are all factors which influence the importance that a given person places on his vision, and hence the degree of care that he will seek to protect it. The community's responsibility is to provide facilities to insure healthful surroundings, adequate health education to inculcate good habits of living, and opportunities to improve socioeconomic conditions. Adequate medical care should be provided where necessary to meet the health needs of the population.

Because vision is so important in life, it is of the utmost concern that distribution of visual acuity and field of vision among persons in the

community be studied. Such a study was made possible in Egypt through the cooperation of the National Institutes of Health, Public Health Service, and the University of Alexandria.

## Review of the Literature

A thorough review of the literature failed to reveal any study in which scientific sampling methodology and standardized equipment had been employed to measure the distribution of visual acuity and field of vision in an Egyptian community. Some studies may have been made of school children or of institutionalized populations in Egypt. No information, however, is usually available regarding the nature of the populations from which the subjects of such studies are drawn. Furthermore, the persons studied do not comprise a scientifically selected sample from which generalizations may be made. Therefore, it is impossible and improper to compare the results of such studies with those using scientific methodology.

## Objectives and Methodology

This study was undertaken with the following objectives in mind:

1. To determine the distribution of acuity of vision in the population residing in the urban and rural areas selected for the study.
2. To determine the distribution of the field of vision in such urban and rural populations.
3. To determine whether differences, if any,

---

*Dr. Said is professor of ophthalmology and principal investigator of the blindness register survey; Dr. Korra is assistant professor of ophthalmology and project control officer; Dr. El-Kashlan is assistant professor of hygiene and public health at Tanta; all three are members of the Faculty of Medicine, University of Alexandria, Egypt. Dr. Goldstein is associate director, Division of Research, Children's Bureau, Department of Health, Education, and Welfare. This paper is based on data from the Blindness Register Demonstration Project in Egypt supported by Agreement No. 522518, National Institutes of Health Special Foreign Currency Program.*

in acuity of vision and field of vision are associated with sex, age, or urban-rural environment.

*Urban sample.* In planning the study, we decided to choose two administrative districts in Alexandria to represent the urban sample. The two districts were Mansheya (1960 population 42,494) and Attarine (1960 census population 71,148). In 1965 their combined populations were estimated to be 125,000. The two districts were contiguous and included a cross section of all socioeconomic strata. These areas represented a convenient population size from which to draw a 4 percent sample of households.

This size sample was determined by estimating five persons on the average to a household. We hoped to have an urban sample of approximately 5,000 persons for the study. Households, rather than persons, were used as sampling units because it was impossible to secure listings for persons in the general population for any locality. Household is defined as those persons sharing one dwelling.

*Rural sample.* A rural sample was chosen from 23 villages of the Beheira Governorate. In 1965 the population of these villages, as determined by survey books of the local health authority, totaled 126,938. These survey books had up-to-date population counts; therefore, we did not need to estimate the rural population as we had done for the urban population.

The 23 villages selected also represented a convenient population size of approximately 125,000 from which to draw a 4 percent random sample of households. The same criteria regarding the size of the sample as in the urban area were applied. Furthermore, the 23 villages were within a perimeter of about 20 miles (35 kilometers) from Alexandria, and most of them were relatively easy to reach.

We planned to examine 10,000 persons—5,000 in urban areas and 5,000 in rural areas. Selection, however, was on a household sampling basis. For both theoretical and practical reasons random sampling, though more difficult to apply than other types of scientific sampling, was most suited to our study. It was fortunate that the Alexandria Department of Social Affairs had available complete listings of households in Alexandria by administrative districts and subdistricts.

A 4 percent random sample of households in each subdistrict was taken and, if the number of persons to be examined in each subdistrict was not reached, an additional sample of households was taken to reach the desired number of persons. This procedure was observed in each subdistrict in the urban areas and in each subvillage unit in rural areas.

It was presumed that the two districts selected from the urban sample did not represent Alexandria, nor did the 23 villages selected represent the rural communities in Egypt.

## Equipment

*Vision tester.* The tester made by the Titmus Optical Co. (A) was used to measure visual acuity by means of a tumbling-E slide (figs. 1 and 2). This handy portable instrument weighs approximately 18 pounds (8 kilograms) and is simple to operate. It affords complete privacy, complete occlusion, and standardized lighting and distance, which may not be possible with Snellen type tumbling-E, or Landolt ring test charts. The tester operated on a 110-volt power supply, dry cell batteries, or car batteries. A transformer was needed if the supply was 220 volts.

The conversion table used for distance visual acuity tests follows:

English	Snellen	Metric
20/20	-----	6/6
20/30	-----	6/9
20/40	-----	6/12
20/50	-----	6/15
20/64	-----	6/20
20/100	-----	6/30
20/200	-----	6/60

*Perimeter.* The Schweigger hand perimeter (B) was used to measure the field of vision. It is a simple instrument that consists of an aluminum arc with a radius of 22 cm., which rotates around a fixed fulcrum, to which is attached a 1 cm. radius plane mirror, used for fixation. A square white target, 3 by 3 mm., is attached to a handle 40 cm. in length. The arc is graduated in degrees from 0° to 90° (figs. 3 and 4).

*Trial lenses.* A box of trial lenses containing a set of concave lenses from -0.50 to -10.00 D (diopters) and a set of convex lenses from +0.50 to +10.00 D was provided each team. With these lenses the acuity of vision could be

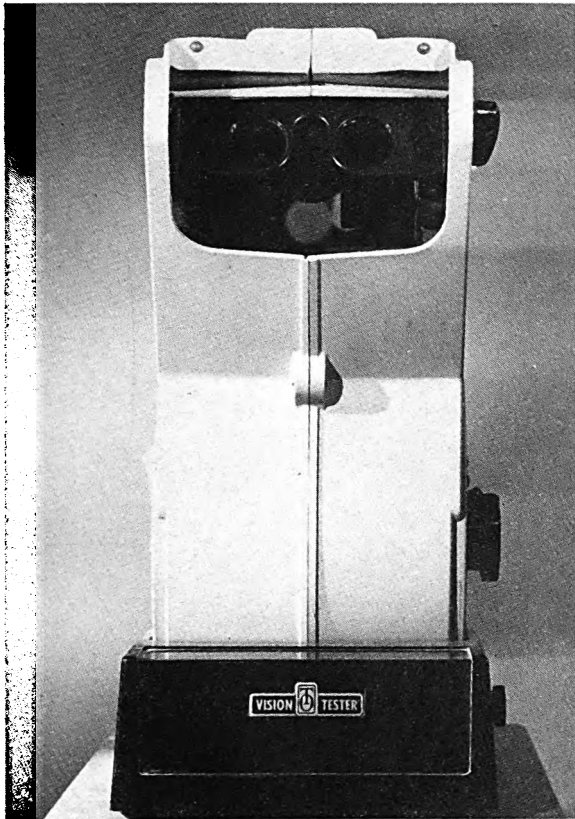


Figure 1. Titmus vision tester, front view

corrected to at least 6/30. No lenses to correct astigmatism were provided.

*Ophthalmoscope-retinoscope unit.* To examine the fundus oculi, a battery-operated ophthalmoscope (*C*) was used; it had an attachment for attaching a retinoscope to the battery handle. The optical system of the ophthalmoscope with the lenses ranging from +20 to -20 D is similar to that of the May model ophthalmoscope. The retinoscope was used to estimate the power of the correcting lens and to determine the axes of the cylindrical correction, if any.

Each of the six teams doing fieldwork had this equipment. A team consisted of a physician (a junior ophthalmologist if available) to operate the optical screener, perimeter, ophthalmoscope, and retinoscope; a social worker to orient persons in the household beforehand concerning the purpose of the study and the examinations to be carried out and to record the necessary data on the form; and a porter to carry the equipment from house to house. In addition, an

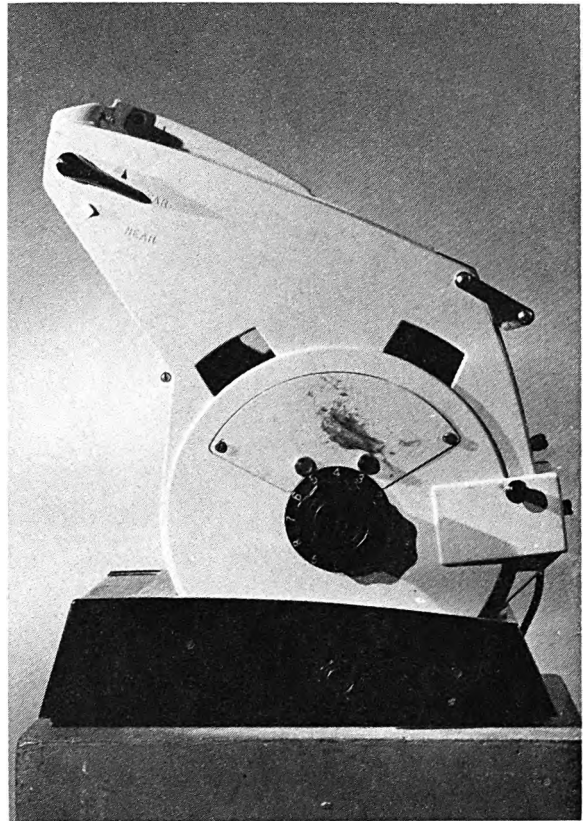


Figure 2. Titmus vision tester, side view

ophthalmologist was available for consultation, for confirmation of blindness of persons referred by the vision screeners as blind, and to perform other necessary duties.

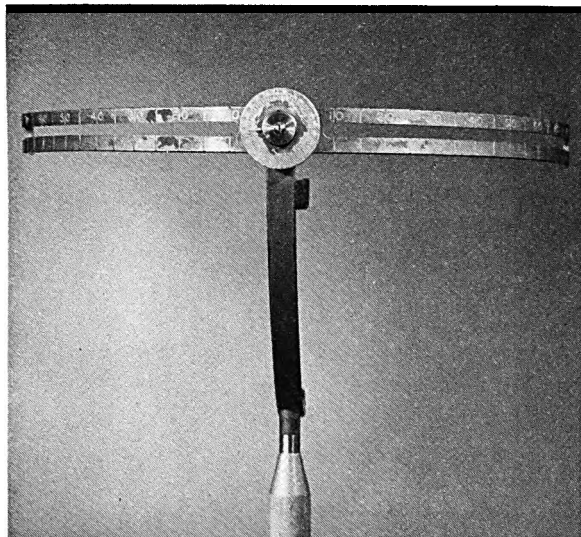
#### Methods of Testing

*Visual acuity.* The vision tester was placed on a table, connected to the power supply or to a battery by a cable, and the height of the instrument was adjusted so that the person could sit or stand comfortably during the test. The instrument was placed so that glaring or excessive light from a window did not shine in the subject's eyes or directly on the lens.

The tumbling-E is seldom used in visual acuity examinations in Egypt. Therefore, before the examination, big tumbling-E charts or a large wooden E were shown to the persons to be examined, and the test was demonstrated.

Each eye was examined separately, starting with the right eye. The person was examined with his eyeglasses on if he had any. The best



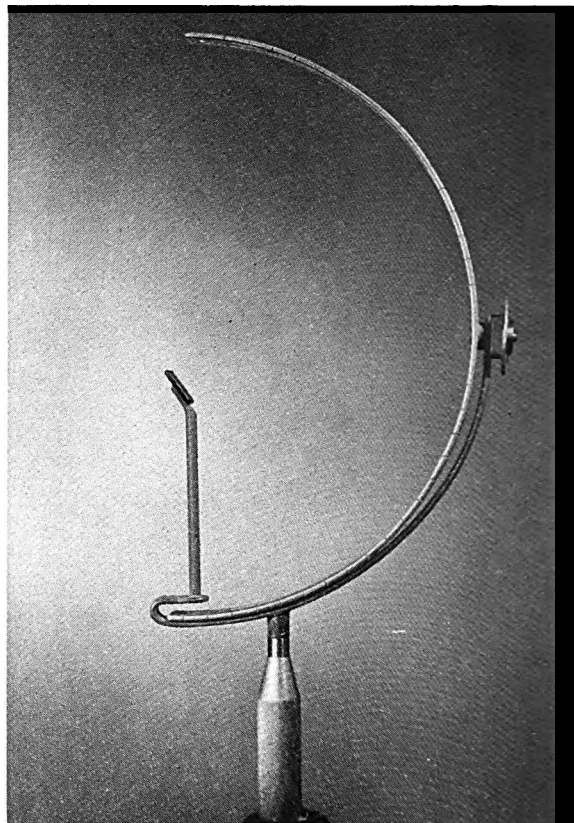


**Figure 3. Schweigger hand perimeter, front view**

visual acuity of each eye was determined by starting with a visual acuity of 6/60 (20/200) and by successive steps to determine the best visual acuity. If the better eye had a visual acuity of 6/60 or less, correcting lenses were added after retinoscopy to improve the visual acuity to at least 6/30. If the person's visual acuity was 6/60 or less in the better eye with best correction, he was referred to the ophthalmologist as blind for confirmation of the findings and, if confirmed as blind, for possible determination of the cause. It was impossible to use the vision tester with children under 5 years of age, and they were excluded from the test. Other persons who had difficulty in understanding what was expected of them were examined clinically by an ophthalmologist, and visual acuity was measured by use of wall charts.

*Field of vision.* The field of vision was determined for those persons whose vision was better than 6/60 in the better eye. The procedure of the test was explained to the person beforehand. For each eye a determination was made of the angle subtended by the widest diameter of the field of vision. If each eye subtended an angle no greater than  $20^\circ$  or if one eye subtended such an angle and the other eye had a visual acuity of 6/60 or less, such persons were referred to the ophthalmologist as blind.

In this paper data are presented for field of vision for each eye separately; therefore, no



**Figure 4. Schweigger hand perimeter, side view**

inferences can be drawn concerning the overall binocular field of vision.

*Reliability tests.* During most of the survey six teams were in the field, and it was obvious that some provision had to be made to determine variability among the testers as it was related to vision screening. Attempts were made before and during the project as personnel changed to provide the necessary training in use of equipment so that standardized methodology would result. It was evident that such attempts could not completely eliminate variability. We decided before starting the study that the degree of agreement should be not less than 80 percent among vision testers testing the same set of persons. If there were indications that screeners were tending to approach this limit, immediate steps were taken to ascertain the reason and to give additional training if necessary.

In order to implement the reliability tests, which were conducted monthly, 10 nonblind persons were selected and examined independently



by the vision screeners. The percentage of agreement was computed for each individual screener, and an average of such percentages was obtained. The reliability tests obtained each month resulted in a degree of agreement above the minimum and were regarded as satisfactory.

When tests of significance were applied to the results in this study, significance was tested at the 5 percent level.

## Results

### *Urban and rural samples by age and sex.*

Table 1 shows the distribution of persons screened visually in urban and rural areas by age and sex. In practically every age group the number of females greatly exceeded the number of males. Females traditionally are more home-bound than males, and in the age group 20 to 39, the disparity between the number of males and females examined was even greater. In the older age groups, the difference in numbers examined between the two sexes may be due in part to the known difference in expectation of life, but the main reason is probably that men are less likely to be at home during the daytime in urban areas.

The differences in the numbers of males and females in urban areas were not found in the rural areas, because in the rural areas more men were available for examination.

*Visual acuity.* The percentage distribution of visual acuity in the right and left eyes of all males and females, aged 5 years or older, examined in urban areas is shown in table 2. Up to the age of 45 years, urban males with 6/6 acuity of vision predominated, with percentages ranging from 36.2 to 56.2 in the right eye and from 32.8 to 53.7 in the left eye. After the age of 45 years the percentage dropped rapidly to 7.0 in the right eye and 6.1 in the left eye in the age group 60 years and older. For each eye more than 75 percent of the sample had an acuity of vision of 6/12 or more. Employers in Egypt accept 6/12 as the average level of vision needed for employment in most jobs.

Among the urban females a marked decrease occurred in visual acuity starting with 45 years. In general, the percentage of urban females with an acuity of 6/6 was less than the corresponding percentage of urban males for all age groups. The difference between males and fe-

**Table 1. Distribution of persons screened visually in urban and rural areas, by age and sex**

Age group (years)	Males		Females		Total	
	Number	Percent	Number	Percent	Number	Percent
Urban.....	2, 082	100. 0	3, 057	100. 0	5, 139	100. 0
5-9.....	343	16. 5	376	12. 3	719	14. 0
10-14.....	422	20. 3	515	16. 8	937	18. 2
15-19.....	276	13. 3	479	15. 7	755	14. 7
20-24.....	147	7. 0	268	8. 8	415	8. 1
25-29.....	112	5. 4	271	8. 9	383	7. 5
30-34.....	132	6. 3	252	8. 2	384	7. 5
35-39.....	128	6. 1	239	7. 8	367	7. 1
40-44.....	116	5. 6	167	5. 5	283	5. 5
45-49.....	124	6. 0	133	4. 4	257	5. 0
50-54.....	87	4. 2	127	4. 1	214	4. 2
55-59.....	80	3. 8	76	2. 5	156	3. 0
60 and older.....	115	5. 5	154	5. 0	269	5. 2
Rural.....	2, 879	100. 0	2, 950	100. 0	5, 829	100. 0
5-9.....	369	12. 7	303	10. 3	667	11. 4
10-14.....	577	20. 0	500	16. 9	1, 077	18. 5
15-19.....	322	11. 2	327	11. 1	649	11. 1
20-24.....	159	5. 5	231	7. 8	390	6. 7
25-29.....	194	6. 7	297	10. 1	491	8. 4
30-34.....	216	7. 5	333	11. 3	549	9. 4
35-39.....	242	8. 4	301	10. 2	543	9. 3
40-44.....	230	8. 0	203	6. 9	433	7. 4
45-49.....	166	5. 8	125	4. 2	291	5. 0
50-54.....	142	4. 9	133	4. 5	275	4. 7
55-59.....	106	3. 7	73	2. 5	179	3. 1
60 and older.....	161	5. 6	124	4. 2	285	4. 9

males in the percentage with 6/6 visual acuity in urban areas was statistically significant for each eye.

Table 3 shows the percentage distribution of acuity of vision in the right and left eyes of all males and females, aged 5 years or older, examined in rural areas. There was a statistically significant decrease in the percentage of rural males with acuity of vision of 6/6 compared with males of urban areas (from 43.5 percent in the urban sample to 22.0 in the rural sample for the right eye, and from 39.9 in the urban sample to 18.6 in the rural sample for the left eye). There was a decrease with age of those males with 6/6 visual acuity, reaching 2.5 percent for the right eye, and 3.1 percent for the left eye for those aged 60 years or over.

Only 58.1 percent of the rural males had an acuity of vision of 6/12 or more in the right eye (as compared with 76.7 percent in urban areas) and 56.6 percent in the left eye (as compared with 76.3 percent in urban areas). The difference in percentages with 6/12 visual acuity between persons in urban and rural areas was statistically

significant. We believe this diminution of visual acuity is caused by greater exposure to eye infections of rural residents who have fewer facilities for proper treatment and medical care. This decreased visual acuity is probably aggravated by less education in the proper care of the eyes as well as by the relatively lower socioeconomic standard.

Among females in the rural area, there was also a marked decrease in visual acuity starting with age 45 years (table 3). In general, for all age groups, the percentage of those with acuity of 6/6 was less than the corresponding percentage of rural males. This loss of vision may be explained by the fact that females receive relatively less medical care in both urban and rural areas. For each eye, the difference between males and females in rural areas was also statistically significant.

Among females in urban areas, however, 69 percent had an acuity of vision of 6/12 or more in the right eye and 69.5 percent in the left eye compared with 43.6 percent for the right eye and 40.7 percent for the left eye for females in

**Table 2. Percentage distribution of acuity of vision of males and females in urban areas**

Age group (years)	Acuity of vision, right eye							Acuity of vision, left eye						
	6/6	6/9	6/12	6/15	6/20	6/30	6/60 or less	6/6	6/9	6/12	6/15	6/20	6/30	6/60 or less
<b>Males</b> .....	43.5	21.0	12.2	6.1	4.9	3.5	8.8	39.9	24.0	12.4	4.7	5.9	4.2	8.9
5-9.....	43.5	28.9	11.6	4.1	4.4	1.4	6.1	39.0	28.6	12.2	3.5	6.7	5.0	5.0
10-14.....	54.0	23.5	7.8	4.7	3.8	1.2	5.0	49.5	28.7	7.8	4.3	2.4	2.4	4.9
15-19.....	56.2	19.2	8.3	5.1	3.2	2.2	5.8	52.2	23.2	10.5	2.5	4.4	2.5	4.7
20-24.....	55.8	20.4	12.9	2.7	2.0	1.4	4.8	53.7	21.8	11.6	2.7	2.0	0.0	8.2
25-29.....	49.1	12.1	8.0	8.9	4.5	4.5	8.9	47.3	13.4	13.4	9.8	7.1	1.8	7.1
30-34.....	51.5	18.2	9.1	4.6	3.0	3.0	10.6	44.7	24.2	12.9	1.5	6.8	2.3	7.6
35-39.....	44.5	15.6	16.4	5.5	4.7	4.7	8.6	41.4	21.9	14.0	4.7	5.5	3.1	9.4
40-44.....	36.2	15.5	20.7	6.9	6.0	2.6	12.1	32.8	19.8	12.1	9.5	6.1	9.5	10.3
45-49.....	21.8	24.2	16.9	9.7	8.1	5.6	13.7	18.6	24.2	20.2	5.6	12.0	6.4	12.9
50-54.....	26.4	19.5	23.0	10.3	4.6	8.1	8.1	21.8	28.7	14.9	8.1	9.2	3.4	13.8
55-59.....	15.0	16.3	18.8	17.5	10.0	3.7	18.7	15.0	22.5	18.7	11.2	10.0	3.8	18.8
60 and older..	7.0	13.9	14.8	8.7	13.0	16.5	26.1	6.1	11.3	18.3	3.5	11.3	16.5	33.0
<b>Females</b> .....	32.7	23.5	12.8	6.9	8.2	4.7	11.2	29.8	26.8	12.9	6.4	6.5	5.9	11.7
5-9.....	38.0	29.0	13.5	3.7	6.3	4.2	5.3	34.8	30.6	12.8	6.1	4.5	5.9	5.3
10-14.....	46.8	27.8	10.1	6.2	2.9	1.4	4.8	45.4	29.5	8.4	4.5	4.1	2.9	5.2
15-19.....	41.3	24.8	13.2	4.2	3.8	3.1	9.6	35.7	31.9	12.9	4.0	5.0	3.6	6.9
20-24.....	41.4	22.4	10.5	6.3	6.3	3.8	9.3	38.4	29.5	10.5	4.8	7.1	4.1	5.6
25-29.....	33.2	23.6	11.4	8.5	8.5	4.1	10.7	30.3	23.2	17.0	8.8	5.9	5.9	8.9
30-34.....	27.9	22.2	11.9	9.5	11.5	3.2	13.9	26.2	28.6	14.7	7.1	4.8	5.1	13.5
35-39.....	24.7	24.3	13.8	8.9	12.1	5.4	11.3	21.3	29.7	4.2	7.5	8.4	4.6	14.2
40-44.....	23.3	17.4	19.1	9.0	9.6	7.2	14.4	19.7	23.9	15.6	6.6	9.6	10.2	14.4
45-49.....	15.8	27.8	13.5	6.0	12.0	8.3	16.5	12.0	27.1	13.5	12.0	7.5	10.5	17.3
50-54.....	9.5	16.5	18.1	13.4	13.4	6.3	22.8	7.1	5.0	16.5	8.6	12.6	13.4	26.8
55-59.....	11.8	15.8	15.8	7.9	26.3	5.3	17.1	15.8	13.2	11.8	11.8	10.5	9.2	27.6
60 and older..	30.7	6.5	13.6	9.7	16.9	18.2	31.8	2.0	.5	13.6	7.1	13.0	13.0	44.8

**Table 3. Percentage distribution of acuity of vision of males and females in rural areas**

Age group (years)	Acuity of vision, right eye							Acuity of vision, left eye						
	6/6	6/9	6/12	6/15	6/20	6/30	6/60 or less	6/6	6/9	6/12	6/15	6/20	6/30	6/60 or less
<b>Males</b> -----	22.0	19.3	16.8	11.4	10.9	8.2	11.4	18.6	21.3	16.7	9.3	11.7	8.6	13.8
5-9-----	15.7	21.4	19.5	10.7	14.0	13.2	5.5	16.5	21.7	16.8	9.0	14.3	15.4	6.3
10-14-----	27.2	21.5	17.2	11.6	10.1	6.2	6.2	20.5	25.0	16.8	10.0	10.4	9.0	8.3
15-19-----	52.6	18.9	19.3	10.9	6.5	6.5	5.3	29.5	25.8	14.9	8.4	8.1	4.6	8.7
20-24-----	28.3	20.7	11.9	14.5	10.7	3.8	10.1	27.7	18.9	16.3	5.0	14.5	8.2	9.4
25-29-----	33.7	17.5	18.6	15.5	11.9	4.1	8.7	20.1	21.1	21.1	9.3	9.8	7.2	11.3
30-34-----	24.5	23.2	18.5	10.2	5.6	6.9	11.1	18.1	19.0	19.4	6.0	11.6	8.8	17.1
35-39-----	26.4	19.8	16.1	8.7	9.9	7.4	11.6	22.3	22.3	19.4	9.1	9.9	5.4	11.6
40-44-----	20.9	20.0	13.5	11.3	13.0	9.1	12.2	16.5	18.7	15.2	15.6	12.2	7.4	14.4
45-49-----	19.3	19.9	15.7	11.4	9.6	7.8	16.3	15.1	24.1	16.9	7.8	15.7	5.4	15.0
50-54-----	10.5	18.7	19.0	14.1	14.1	11.3	18.3	7.7	13.4	18.3	9.9	14.1	12.0	24.6
55-59-----	6.6	17.9	14.1	12.3	17.9	12.3	18.9	7.5	17.0	12.3	11.3	13.2	12.3	26.4
60 and older--	2.5	6.8	12.4	8.1	14.3	13.0	42.9	3.1	13.0	10.6	8.7	11.2	6.2	47.2
<b>Females</b> -----	11.2	16.4	16.0	13.0	14.8	12.4	15.6	9.2	15.4	16.1	11.6	16.8	13.5	17.4
5-9-----	9.9	21.8	13.2	10.2	14.9	19.1	6.9	10.2	19.1	16.8	9.2	17.5	19.5	7.6
10-14-----	13.8	21.0	17.6	13.4	15.4	11.6	7.2	11.8	20.4	19.8	10.8	17.2	10.8	9.2
15-19-----	17.1	19.9	17.4	14.1	11.3	8.9	11.3	14.7	18.7	16.8	12.8	15.9	7.3	13.8
20-24-----	14.7	17.3	17.8	19.9	11.3	9.5	9.5	10.8	18.6	13.0	19.5	15.2	12.5	10.4
25-29-----	14.1	17.9	18.9	15.5	12.1	11.4	10.1	10.4	23.2	19.5	12.1	14.1	8.8	11.8
30-34-----	8.7	20.7	19.2	13.5	15.0	10.5	12.3	8.1	12.6	20.4	11.4	18.6	14.1	14.7
35-39-----	11.3	17.6	16.9	15.6	16.3	9.6	12.6	10.0	12.3	17.3	12.9	16.9	13.0	17.6
40-44-----	11.8	8.4	10.3	14.8	15.8	18.7	20.2	6.4	10.3	13.8	11.3	20.2	19.7	18.2
45-49-----	3.2	6.4	17.6	16.8	23.2	13.6	19.2	1.6	6.4	14.4	12.0	20.0	18.4	27.2
50-54-----	4.5	3.8	9.8	10.5	23.3	13.5	34.6	4.5	6.8	6.0	10.5	17.3	17.3	37.6
55-59-----	1.4	2.7	6.9	5.5	15.1	16.4	52.0	1.4	2.7	6.8	4.1	19.2	15.1	50.7
60 and older--	1.6	1.6	4.0	10.5	13.7	68.6	-----	.8	3.2	4.0	8.9	17.7	65.3	-----

rural areas. Both differences for right and left eyes between urban and rural females were statistically significant.

*Field of vision.* Tables 4 and 5 show field of vision data by age and sex for the right and left eyes of urban and rural dwellers. Only persons who were not binocularly blind received field of vision examinations. Included in the tables are data on examinations of eyes of nonblind persons as well as the better eye of monocularly blind persons. The total number of eyes examined, therefore, cannot be compared with the total number of people in table 1.

Most urban males under age 45 had a 90° field of vision, except for right eye results of the 5- to 9-year age group (table 4). In the urban areas the age group 45 years and older showed some restriction in visual field and most of them had an 80° field of vision. At about this age, the percentage of the group with field of vision between 20° and 70° started to increase and rose sharply in the oldest age group, 60 years and older. Among all males, 92.4 percent had a field of vision of 70° or more in the right eye, and 91.5 percent had a field of vision of 70°

or more in the left eye. The difference between the right and left eyes was not statistically significant.

Among urban females, the highest percentage had a field of vision of 90° for almost all groups through age 34 years (table 4). In general the trend is more or less like that in the males, with a slightly lower percentage of those having a field of vision of 90°. The difference, however, between the percentages of males and females with a field of vision of 70° or more in either eye was statistically significant. The percentage of those with field of vision between 20° and 70° increased at age 40 and rose sharply in the oldest age group as was the case with urban males. In the right eye, 90.2 percent had a field of vision of 70° or more, and in the left eye, 89.4 percent. The difference between the right and left eyes was not statistically significant.

The percentage distribution of field of vision for the right and left eyes of males and females in rural areas is shown in table 5. In no age group for either sex and either eye did those with a 90° field of vision have the highest percentage. In fact, the percentages of those males

with a 90° field of vision for each eye were less in the rural than the urban areas for the corresponding age groups indicating, in general, greater field of vision restriction in the rural group. The difference between the percentage of urban and rural males with fields of vision of 70° or more is statistically significant. There was a marked increase in the oldest age group in percentage of rural males with field of vision between 20° and 70°. Of the males examined in the rural areas, 87.1 percent had a field of vision of 70° or more for the right eye and 85.9 percent for the left eye. The difference between the right and left eyes was not statistically significant.

As with rural males, the percentage of rural females with a field of vision of 90° was no longer the highest in either eye (table 5). The field of vision restriction was greater in the rural female than in the rural male when measured by the percentage having a field of vision of 70° or more. There was a statistically significant difference between the field of vision of males and females in either eye in rural areas. In all age groups of rural females, percentages

decrease markedly for those having a field of vision of 90° for either eye compared with females in urban areas. The difference between the percentage of urban and rural females with a vision of 70° or more was statistically significant. In the right eye, 81.8 percent of the rural females had a field of 70° or more; in the left eye 81.1 percent had a field of vision of 70° or more. This difference between the right and left eye was not statistically significant.

There are fewer medical facilities in the rural areas; therefore, a larger percentage of persons with incipient visual disorders, including those affecting field of vision, go without treatment.

### Discussion

No data were available on acuity of vision on a communitywide basis in developing countries including Egypt. Hence, information obtained in this study—in which all groups of the population were represented and where standard techniques and equipment were used—was of special significance.

The study showed that for both right and

**Table 4. Percentage distribution of field of vision of males and females in urban areas**

Age group (years)	Field of vision, right eye				Number of persons	Field of vision, left eye				Number of persons
	90 °	80°—	70°—	Less than 70° but more than 20°		90°	80°—	70°—	Less than 70° but more than 20°	
<b>Males</b> -----	41.0	36.0	15.4	7.6	1,899	41.8	32.8	16.9	8.5	1,896
5-9-----	32.0	43.8	19.6	4.6	322	34.7	33.7	25.2	6.4	326
10-14-----	42.9	36.6	13.0	7.5	401	39.9	37.9	12.0	10.2	401
15-19-----	51.5	32.7	10.8	5.0	250	50.9	29.3	14.1	5.7	263
20-24-----	45.7	37.2	15.0	2.1	140	53.3	28.2	13.3	5.2	135
25-29-----	53.9	22.6	18.6	4.9	102	62.5	21.2	11.5	4.8	104
30-34-----	53.4	29.6	8.5	8.5	118	50.0	30.3	11.5	8.2	122
35-39-----	42.7	33.3	17.1	6.8	117	46.6	31.0	15.5	6.9	116
40-44-----	40.2	37.3	12.7	9.8	102	38.5	36.5	19.2	5.8	104
45-49-----	33.6	40.2	13.1	13.1	107	34.2	38.0	17.6	10.2	108
50-54-----	33.7	35.0	20.0	11.3	80	29.3	34.7	25.3	10.7	75
55-59-----	27.7	36.9	18.5	16.9	65	30.8	33.8	21.5	13.9	65
60 and older..	18.8	30.6	29.4	21.2	85	16.9	29.9	26.0	27.2	77
<b>Females</b> -----	38.0	35.0	17.2	9.8	2,713	36.4	34.9	18.1	10.6	2,699
5-9-----	37.9	34.8	15.5	11.8	356	35.1	37.1	16.8	11.0	356
10-14-----	41.2	34.7	16.1	8.0	490	39.4	33.4	17.6	9.6	488
15-19-----	44.3	37.4	10.4	7.9	433	41.5	34.5	15.7	8.3	446
20-24-----	46.1	32.9	14.0	7.0	243	46.3	30.8	18.6	4.3	253
25-29-----	40.5	36.0	13.6	9.9	242	37.6	39.7	15.0	7.7	247
30-34-----	43.3	36.4	13.8	6.5	217	43.1	36.2	12.4	8.3	218
35-39-----	36.3	38.7	17.9	7.1	212	34.6	41.5	15.1	8.8	205
40-44-----	28.0	33.5	23.1	15.4	143	24.5	30.8	25.9	18.8	143
45-49-----	22.5	35.1	31.6	10.8	111	27.2	31.9	28.2	12.7	110
50-54-----	23.5	39.8	25.5	11.2	98	19.3	38.7	28.0	14.0	93
55-59-----	25.4	19.1	36.4	19.1	63	23.6	36.4	16.4	23.6	55
60 and older..	15.2	24.8	35.2	24.8	105	11.8	20.0	30.6	37.6	85

**Table 5. Percentage distribution of field of vision of males and females in rural areas**

Age group (years)	Field of vision, right eye				Number of persons	Field of vision, left eye				Number of persons
	90°	80°—	70°—	Less than 70° but more than 20°		90°	80°—	70°—	Less than 70° but more than 20°	
<b>Males</b> -----	17.9	37.6	31.6	12.8	2,551	19.4	39.6	26.9	14.1	2,481
5-9-----	13.4	40.4	23.0	23.2	344	11.7	37.0	29.3	22.0	341
10-14-----	16.8	38.1	32.4	12.7	541	27.4	41.2	16.5	14.9	529
15-19-----	23.9	40.0	29.8	6.2	305	22.4	46.3	23.8	7.5	294
20-24-----	16.1	43.4	32.8	7.7	143	18.8	41.7	33.3	6.2	144
25-29-----	22.6	37.8	31.1	8.5	177	19.2	39.0	29.6	12.2	172
30-34-----	18.2	28.7	43.2	9.9	192	18.4	35.2	33.5	12.9	179
35-39-----	19.2	38.3	31.8	10.7	214	16.8	41.6	26.6	15.0	214
40-44-----	22.3	39.6	28.2	9.9	202	18.8	39.6	30.5	11.1	197
45-49-----	22.3	34.5	30.2	12.9	139	22.0	36.2	31.2	10.6	141
50-54-----	14.6	34.5	41.4	9.5	116	14.0	34.6	37.4	14.0	107
55-59-----	12.8	36.0	37.2	14.0	86	14.1	37.2	35.9	12.8	78
60 and older	4.4	30.4	32.6	32.6	92	8.2	32.9	27.1	31.8	85
<b>Females</b> -----	12.5	36.9	32.4	18.2	2,489	11.8	34.5	34.8	18.9	2,434
5-9-----	12.4	37.6	27.7	22.3	282	11.8	34.3	33.9	20.0	280
10-14-----	13.2	36.2	32.3	18.3	464	14.8	38.1	33.9	13.2	454
15-19-----	16.2	36.9	34.8	12.1	290	14.2	36.9	35.8	13.1	282
20-24-----	13.4	35.4	31.1	20.1	209	12.1	36.7	30.4	20.8	207
25-29-----	11.6	37.8	37.5	13.1	267	13.7	31.7	35.1	19.5	262
30-34-----	13.7	33.2	30.8	22.3	292	10.9	32.8	35.9	20.4	284
35-39-----	14.1	38.8	36.5	10.6	263	11.7	36.7	35.5	16.1	248
40-44-----	6.8	41.4	25.3	26.5	162	4.2	30.7	36.1	29.0	166
45-49-----	6.9	42.6	35.6	14.9	101	5.6	36.2	37.4	19.8	91
50-54-----	9.2	28.7	32.2	29.9	87	8.4	25.3	33.8	32.5	83
55-59-----	5.7	51.4	34.3	8.6	35	16.7	27.8	33.3	22.2	36
60 and older	7.7	28.2	25.6	38.5	39	4.6	18.6	41.9	34.9	43

left eyes, males of urban areas had significantly better visual acuity than males of rural areas. The main cause for such difference is due to the greater exposure to eye infections in the rural areas and to the scarcity of services—preventive or curative—available in rural areas. This difference could also be explained partly by the fact that people in rural areas are less educated than those in urban areas and, as a result, often fail to take proper care of their eyes. In general the lower socioeconomic and educational levels of people of rural areas, together with difficult transportation from village to city, contribute to delays in seeking medical advice and care.

Results also indicated that females in urban areas had significantly better visual acuity than females in rural areas. The reasons applying to males also applied to females.

Males had significantly better visual acuity than females in both urban and rural areas. Since men are the breadwinners of the family in Egypt, they are more likely to seek medical advice. Because their jobs may require a certain

degree of visual acuity, they are more likely to have their vision corrected by glasses.

Field of vision data showed a marked decrease in the percentage of females in rural areas having a field of vision of 90°. The drop was from 38.0 percent to 12.5 percent in the right eye, and from 36.4 percent to 11.8 percent in the left eye. A similar, but somewhat smaller, decrease was also observed in males in rural areas—from 41.0 percent to 17.9 percent in the right eye, and from 41.8 percent to 19.4 percent in the left eye.

The fewer medical facilities available and inadequate care of eyes are believed to account for the poorer field of vision in both males and females in the rural areas. As a result, visual disorders of people in rural areas generally are not detected or treated early.

### Summary

A survey of the visual acuity and field of vision of the population was conducted in selected urban and rural areas in Egypt. The objectives were to determine the distributions of

measurements of these two factors and to determine whether differences, if any, were associated with sex, age, or an urban-rural environment.

Two contiguous urban districts in Alexandria with an estimated population of about 125,000 and 23 villages located within a radius of some 20 miles of Alexandria that had a combined population of about 125,000 were selected as the urban and rural frames from which to sample.

Complete household listings were available and, estimating that there were five persons in the average household, 4 percent random samples of households were drawn to yield about 5,000 persons for examination in the urban areas and a similar number in the rural areas. Because of difficulty in testing the visual acuity in the young, all children under 5 years of age were excluded from study. Standardized portable equipment was used to measure visual acuity and field of vision in the home.

The results of the study showed that visual acuity and field of vision decreased markedly in males and females in urban and rural areas starting at about 45 years of age. For both males and females the visual acuity and field of vision of persons in urban areas were significantly better than those of persons in rural areas. Both of these visual measurements in males were significantly better than in females.

#### EQUIPMENT REFERENCES

- (A) Titmus vision tester. Titmus Optical Co., Inc., Petersburg, Va.
- (B) The Schweigger hand perimeter. Matelene Co., New York, N.Y.
- (C) Ophthalmoscope-retinoscope unit. National Electric Instrument Division, Engelhard Hanovia, Inc., Elmhurst, N.Y.

#### Tearsheet Requests

Dr. Hyman Goldstein, Division of Research, Children's Bureau, Washington, D.C. 20201

## Rubella Vaccine Licensed

The first license in the United States to produce a live attenuated German measles (rubella) virus vaccine has been approved by Secretary of Health, Education, and Welfare Robert H. Finch. The license was given to Merck Sharp & Dohme, West Point, Pa.

Scientists of the National Institutes of Health developed the HPV-77 rubella virus used in the vaccine. It was grown in a duck embryo cell culture system evolved by Merck virologists.

The vaccine has been administered to more than 18,000 children and adults in community testing in this country and abroad. Additional vaccines are expected to be licensed as testing and evaluation programs are completed.

"This initial licensing," Secretary Finch said, "brings to fruition a 7-year Government and industry effort to develop and make avail-

able a vaccine against German measles before 1970."

Reflecting recent recommendations of the Public Health Service Advisory Committee on Immunization Practices, primary emphasis will be placed on immunizing school-age children, who account for approximately 75 percent of rubella cases. These children, in turn, expose women of childbearing age to the virus. The vaccine is not recommended for routine use in women of childbearing age because its safety has not been established for use in pregnant women.

Because major outbreaks of the disease tend to occur in 7- to 10-year cycles, medical scientists believe a significant upswing in German measles cases will occur late in 1970 or early in 1971.

# Tribal Community Health Representatives of the Indian Health Service

RICHARD B. UHRICH, M.D., M.P.H.

**F**OR the first time a health aide exists in Indian communities who is not an employee of the local, State, or Federal Government or the representative of an outside agency. The community health representative represents the Indian community rather than a single profession. He is an employee of the tribal group who he represents and to whom he is responsible. He is a tribal member who resides within his community, and his training and orientation, though identified with health, are much broader in scope.

The health representative functions as a liaison person who identifies with his tribe and interprets to them and to the outside world their needs for the purpose of bringing existing health resources to bear upon their health difficulties. He also translates the advice of the health professional to Indian people in such a way that it is more clearly understood and a greater impact is realized from the health professional's efforts.

The use of various types of community workers has become commonplace in many Indian communities. These programs have been stimulated by the Office of Economic Opportunity or by the growing interest of many Indians in pursuing their own community development. Experience with OEO-funded

health aide programs has been especially encouraging. The success of health aide programs and the expressed interest on the part of many Indian leaders in having more of these auxiliary health workers have resulted in the development of the Community Health Representative Program of the Indian Health Service.

To many health professionals the word "aide" means a person trained as a technician assisting and working under the direction of a health professional. The words "community health representative" carry a broader meaning. As a health worker he is trained in a broad understanding of health skills and practice. He is selected and supervised as an employee of the community. His ability to speak the tribal language as well as the language of the professional health workers helps to make him a more effective representative of his community. The expected result has been to bring into sharper focus the health difficulties and priorities which face the Indians. Demands have been created for more health services, and the delivery of such services has taken place.

## The Tribal Program in 1969

Congress has appropriated funds for the Community Health Representative Program and authorized the Indian Health Service to contract with Indian tribes for the services of these health representatives and to provide suitable training for the tribal employees selected.

During fiscal year 1969 the Indian Health

---

*Dr. Uhrich is chief, Office of Special Services, Indian Health Service, Health Services and Mental Health Administration, Public Health Service.*

Service has trained and employed through contracts with Indian communities some 185 community health representatives. This program required negotiating contracts with some 37 Indian contractors who represented from one to several principal Indian tribes in 14 States. In addition, 185 Native village health aides were employed in Alaska for part of fiscal year 1969 and completed phase 1 of a four-phase training program that will extend for more than 3 years.

The function of the Alaska Native community health aide is substantially the same as that of the community health representative; however, the extreme isolation of Alaskan communities requires additional training to prepare the aide to provide a wider range of medical services under professional supervision received via shortwave radio or telephone.

Funds requested for fiscal year 1970 under mandatory increases will provide the additional amount needed to negotiate full-year contracts for the services of the 185 community health representatives and the 185 Alaska Native community health aides that were employed for part of fiscal year 1969. A requested increase in appropriations will permit the training and employment of 100 to 200 new community health representatives for part of fiscal year 1970.

### **Tribal Responsibilities**

The tribal group which negotiates the contract must develop the proposal defining the types of services which will be provided. The group is also responsible for the recruitment and selection of Indians who are to serve as community health representatives. The tribal group has the additional responsibility, once the health representative has received formal training, to see that he receives adequate administrative supervision and to show that the services for which the Indian Health Service contracted are being provided. Thus, in these respects, the Community Health Representative Program is a new and unique concept for the provision of health services.

### **Characteristics and Qualifications**

Beyond the essential qualifications of an ability to speak his tribal dialect and to speak and write effectively in English, no specific re-

quirements or restrictions have been established for the age or educational level of the trainee. The important factor is that the tribal groups select persons who they feel will best serve the needs of their tribe.

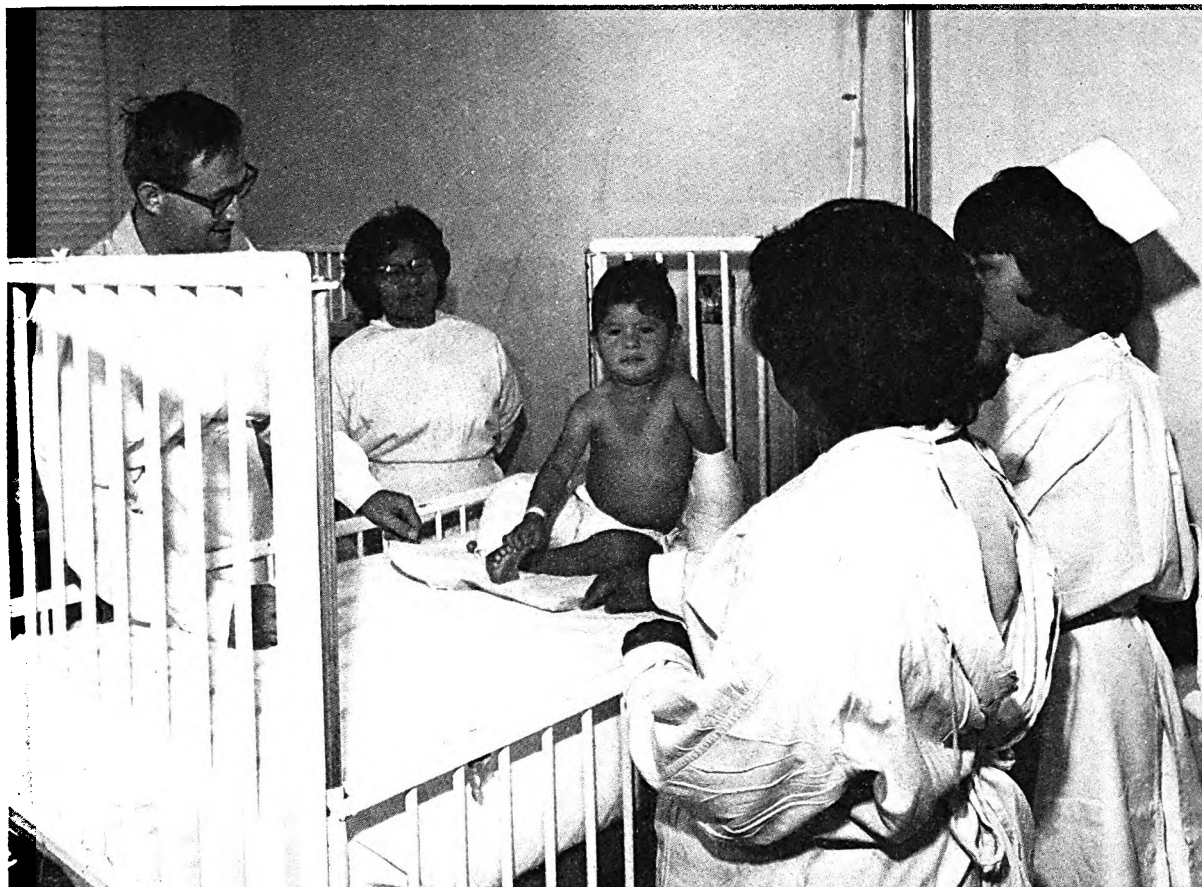
The community health representative is selected for those traits and characteristics which the tribe feels he must possess to function effectively, within both the Indian and the non-Indian community, although he remains essentially a member of his tribe. Trainees selected for the program have run the spectrum of age and education. The tribes have chosen both men and women in their 20's to 50's, some with less than high school education and some with college training. The average salary is \$4,200 a year. The personal characteristics that the tribes emphasize are a sensitivity and ability to recognize the needs of the community; an awareness of prevailing attitudes, beliefs, and practices related to health; and the ability to communicate information both to the Indian and non-Indian community.

The 4 weeks of intensive training at the Indian Health Service Training Center in Tucson, Ariz., followed by periods of varying lengths of training in the field at Indian Health Service units or other health resource locations at the State, county, city, and private levels, are not intended to turn out a health specialist. The training is designed to educate the trainees to



**Community health representative learns to take blood pressure under direction of public health nurse at the Pima Reservation near Phoenix, Ariz.**





**Community health representatives help out in pediatric ward of Public Health Service Indian Hospital, Sacaton, Ariz.**

sense the health needs and to bridge communication gaps between the Indian and the non-Indian world. In addition, the health representative is expected to identify health problems when they occur and know where, when, why, how, and to whom to go for help either in the medical community or in a related agency.

#### **Training Protocol**

Training protocol for the health representatives has been developed in the following four basic study areas.

***Socioculture.*** This training is designed to give the individual trainee sociocultural insights which will enable him to examine and constructively review both the Indian and the non-Indian value systems. Similarities and differences which exist between the two systems are emphasized and included in the training area concerning concepts of health and diseases.

The trainee, therefore, realizes how an understanding of both these systems is crucial to the formation of attitudes—especially attitudes relating to health and disease.

***Communications skills.*** The health representative is trained as a two-way communicator. Learning how to do this effectively is the core of all training. The teaching of communication skills is not confined solely to conventional approaches, but also includes innovative approaches to develop the trainee's confidence in situations requiring such basic skills as telephone usage, interviewing techniques, conducting meetings and conferences, public speaking, making reports and referrals, and collecting and interpreting health data. Program planning, role playing, skits, group discussions, panel and group presentations, and group dynamics are used in the training course. In addition, case histories are studied to develop pro-

iciency in problem solving and competency in techniques necessary to bring about changes in the community and in personal attitudes regarding health matters. Such training gives the trainee confidence in approaching the other members of the health team in a positive and constructive way.

*Concepts of health and disease.* The approach to imparting technical knowledge and skills in the area of health and disease is carried out in several ways. Didactic teaching in the conventional manner, such as studying body systems, anatomy, physiology, and the germ theory, is kept to a bare minimum. The training begins with the broad concepts of health and disease and how cultural background and value systems strongly influence both the person's and the community's attitudes toward health and disease. Training is related to the trainee's own perception of the well and the ill, and both Indian and non-Indian concepts are explored.

The trainee progresses from a simple understanding of causal relationships and body systems and processes to a working understanding of disease cause-and-effect relationships; including the roles that social, cultural, economic, and environmental conditions play in the prevention and control of disease.

Treatment followup procedures, family relationships, and community involvement are taught in terms acceptable and understandable to the people who will be served by the community health representative. Information on environmental health is not limited to sanitation but deals with the total environment as it relates to health and disease. Topics such as transmission of disease and concepts of prevention and control of disease are covered, as well as home safety, accident and fire prevention, and defensive driving.

*Technical skills.* Technical skills such as taking temperatures, pulse, respiration, and blood pressure are taught in small groups to stimulate confidence and to insure that proficiency is developed. Specialized training is provided in home nursing, environmental health, advanced first aid, and other fields of public health as they are requested by the tribes.

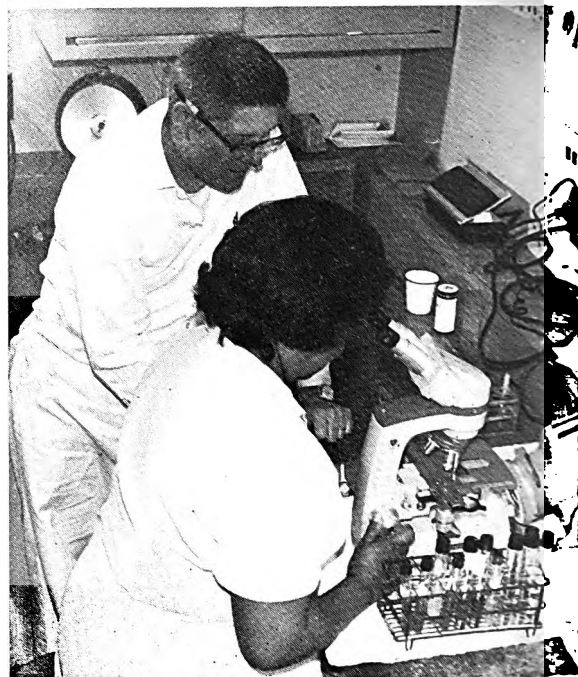
Although the core training program provides uniform basic knowledge in public health, individual classes are tailored to the needs and

requests of specific tribal groups. To prepare for such classes, the community health representative training staff visit the home communities of the trainees and meet with the tribal leaders and health officials in that community. Classes are limited to 10 to 12 trainees with an individual training officer for each class.

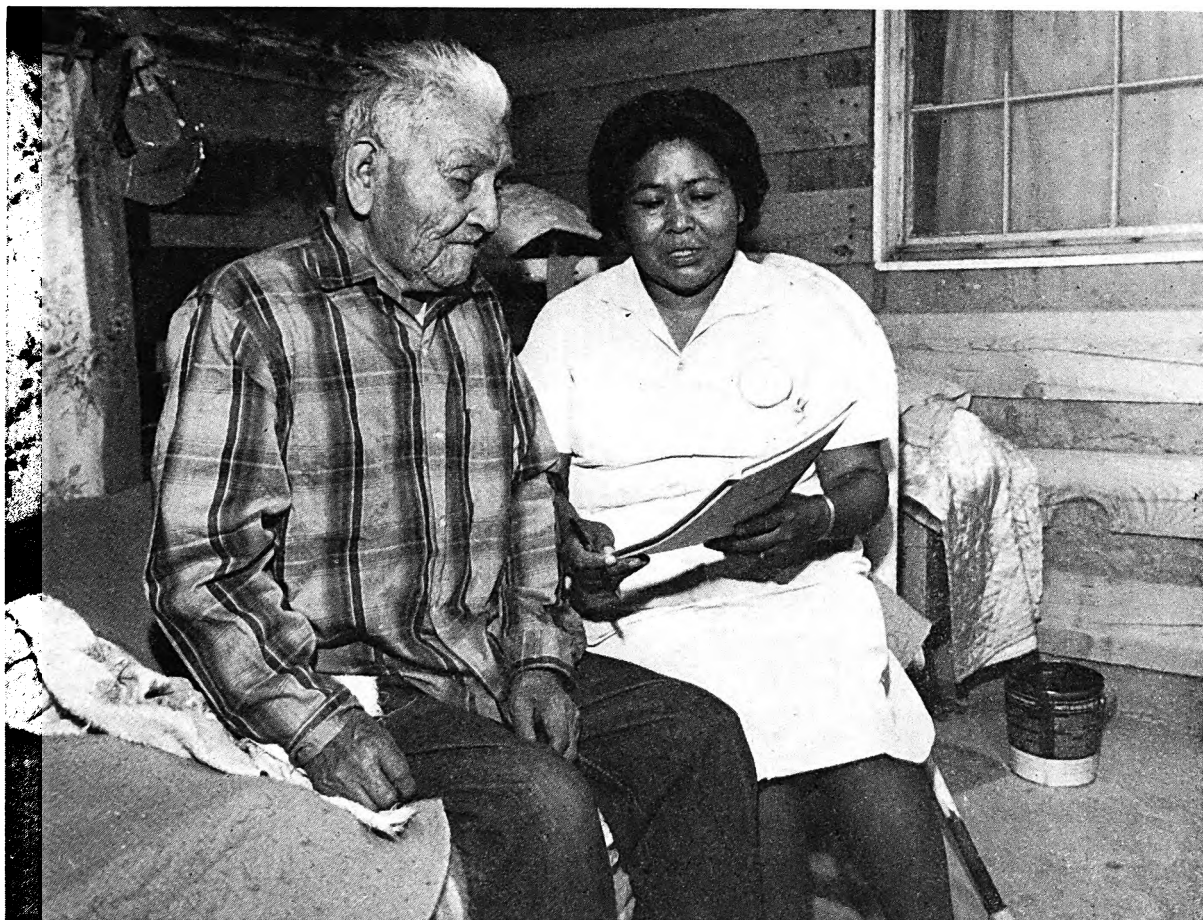
## Discussion

Although it is too early to make an indepth evaluation of the impact of these workers in the communities where they are now employed, preliminary reports are optimistic. The unique position of this worker as a tribal employee rather than an employee of a government agency has enhanced the effectiveness of the health representative in carrying out his or her responsibilities. Early reports indicate that the presence of these representatives in the community, visiting individual homes and conducting group meetings, has generated an increased demand for health services.

In many locations where well child, chest, influenza, poliomyelitis, diabetes, and various physical screening clinics were held, attendance



**Community health representative looks through a microscope in the Sacaton (Ariz.) Indian hospital laboratory**



**Home visit on the Pima Reservation near Phoenix, Ariz.**

rose considerably at each successive clinic after community health representatives began to work. On one northwestern reservation, an unprecedented 85 percent of the village population turned out for examinations and immunizations at a general clinic. On a southwestern reservation, the community health representatives succeeded in getting 350 Indians to a conference on the problems of alcoholism.

They have effectively helped Indians reach sources of health services that were heretofore unknown to them. As a liaison between the tribe and health agencies they have stimulated the health agencies to take a greater interest in the Indian citizens of the communities for which they have responsibility.

The health representatives are channeling information to the Indian Health Service staff about how Indians perceive health and illness and what they think is good or bad about the

health programs provided. This information should enable health programmers to devise approaches that will be more readily accepted by the Indian people and thus be more effective in improving and maintaining their health status. Members of the Indian community have been helped to better understand why it is important to seek treatment or to participate in preventive health activities and thus improve their own health. In many instances community health representatives have brought patients in for treatment who had needed but had resisted care, either for themselves or for their children, for days, weeks, or months.

Community health representatives also show evidence of being viable change agents in the communities where they work because they stimulate both Indian and professional health staff to be concerned with the total community and to develop the human resources that exist

within it. This concern has resulted in health being viewed as only one input in community development and not an end all, be all unto itself. As a result, resource agencies across the board are being stimulated to cooperate and work together more effectively than they have in the past.

Because the health representative is a tribal employee and not a member of any one of these several agencies, he has been singularly effective in catalyzing this type of cooperative effort on behalf of the total development of the community in which he works. Thus far experience shows that this program will more than achieve its goal and that it has already become a vital and effective component of the total system delivering health services to Indian people.

### Summary

The community health representative is the first health aide in an Indian community who is not an employee of the local, State, or Federal Government or the representative of an outside agency. He is an employee of the tribal group who he represents and to whom he is responsible.

For fiscal year 1969, Congress appropriated funds for the Community Health Representative Program and authorized the Indian Health

Service to contract with Indian tribes for services of these health representatives. The service was also authorized to provide suitable training for the 185 tribal members selected.

Community health representatives receive 4 weeks of intensive training at the Indian Health Service Training Center in Tucson, Ariz., followed by field training of varying lengths. The intention of the training is not to turn out a health specialist, but to educate the trainee to sense the health needs and bridge communication gaps between the Indian and the non-Indian world. Emphasis is placed on identification of health difficulties and use of resources available to serve them.

Although it is too early to make an indepth evaluation of the impact of these workers, preliminary reports are optimistic. Their presence in the community, visiting individual homes and conducting group meetings, has generated an increased demand for health services and brought many patients into health facilities who had previously accepted services infrequently.

On the basis of experience thus far, there is substantial evidence that the program will more than achieve its goal.

### Tearsheet Requests

Mrs. Jean M. Nowak, Indian Health Service, Room 822, Willste Bldg., 7915 Eastern Ave., Silver Spring, Md. 20910

## Reflectorized Materials for Children's Clothing

The American Academy of Pediatrics strongly recommends that retroreflective materials, such as reflectorized tags attached to a child's coat zipper, be worn by children at night. This, the Academy emphasizes, will help to reduce significantly the more than 1,000 childhood deaths each year attributed to poor visibility during evening hours.

The Academy's Committee on Accident Prevention encourages the development of various commercial reflectorized materials to make pedestrians readily visible to drivers at night. Retroreflectorized materials can be affixed to clothing or incorporated in the design of a garment.

The Academy further recommends that more information concerning traffic safety be given to children.

# Malformations Recorded on Birth Certificates Following A2 Influenza Epidemics

IAN LECK, M.B., Ph.D., SYLVIA HAY, B.A., JOHN J. WITTE, M.D.,  
and JOHN C. GREENE, D.M.D., M.P.H.

**I**NTEREST in the relationship of viral infections to malformations was first aroused by the discovery that the human embryo could be damaged by rubella (1), and several attempts were made in studies following the appearance and worldwide spread of Asian influenza (type A2) in 1957-58 to determine whether this disease also might be teratogenic.

A review (2) of most of these studies suggested that their results were inconclusive. The reported malformations in children whose

mothers might have had influenza in early pregnancy were much less homogeneous than those observed in children following exposure to known teratogens such as rubella and thalidomide. Although statistically significant increases in the incidence of particular types of defects in such children were reported from Dublin, Ireland (3), and Birmingham, England (2, 4), the types of defects were different in the two cities. Anencephalus, meningocele, encephalocele, and spina bifida were especially common among the children of Dublin women who reported an attack of influenza during pregnancy. In Birmingham the incidence of cleft lip, esophageal atresia, anal atresia, and exomphalos, and especially of cases exhibiting combinations of these malformations with each other or with other defects, was significantly increased among children who had been in the early stages of intrauterine life when influenza was epidemic.

Data from other sources apparently have not been examined for consistency with either set of findings. In this study we examined U.S. birth records for evidence of increases in the incidence of defects following influenza epidemics.

## Material Used

At the National Communicable Disease Center (NCDC), Public Health Service, weekly returns of the number of deaths ascribed to in-

---

*Dr. Leck, senior lecturer of community medicine, University College Hospital Medical School, London, has been a special consultant to the Public Health Service. Miss Hay is acting chief of the Congenital Anomalies Section, Epidemiology Branch, Dental Health Center, National Institutes of Health, Public Health Service, San Francisco, Calif. Dr. Witte is chief of the Field Services Branch, Epidemiology Program, and assistant chief of the Immunization Branch, National Communicable Disease Center, Public Health Service, Atlanta, Ga. Dr. Greene is deputy director of the Division of Dental Health, National Institutes of Health, Public Health Service.*

*Mrs. Carol Bender, Miss Mary Hernandez, and William Wada, of the Epidemiology Branch, Dental Health Center, and Mrs. Juliet Bebbington, University College Hospital Medical School, assisted in various phases of the report.*



fluenza and pneumonia are received from 122 cities of the United States. For the analysis of these figures the country is divided into nine regions, and the number of deaths reported from the cities of each region is compared with the number to be expected if the normal secular trend and seasonal fluctuation in mortality were to continue undistorted by epidemics. Influenza is assumed to be epidemic if two or more consecutive weekly totals exceed the expected figures by at least 1.64 standard deviations (5).

At the Dental Health Center of the Public Health Service, San Francisco, live-birth certificates selected from the 1956-61 files of four States and from the 1962-65 files of up to 29 States and two other reporting areas, including 63 of the 122 cities surveyed by NCDC, were abstracted and coded on punchcards or magnetic tape (6, 7). The selected certificates comprised (a) all those on which clefts of the lip and palate were recorded, (b) those for 1961-65 on which malformations of any kind were noted, and (c) a control sample consisting of the certificates of 0.5 percent of the related births in 1956-60 and 1 percent of those in 1961-65. Whenever a certificate in group (a) or (b) was selected for group (c), the next certificate filed was substituted for it in this sample. The data abstracted from each selected certificate included month, county of mother's residence, and any malformations that were reported. For births in 1961-65, the day was also recorded.

The times and places at which A2 influenza was epidemic during the period when the children represented by these certificates were at risk of malformation were estimated from NCDC's influenza and pneumonia mortality statistics, checked against records of the strain of virus most prevalent when mortality was high. By far the most severe epidemic that occurred when any of the children born in 1962-65 were at risk was in early 1963. Substantial increases in influenza and pneumonia mortalities for 2 or more consecutive weeks of this period occurred in 17 of the 63 cities for which data on malformed births as well as influenza deaths were available. At approximately the same time that each of these increases occurred, influenza was epidemic (according to NCDC's formal criteria) in the NCDC region containing the city concerned. The 1962-65 birth

records of children whose mothers resided in the Standard Metropolitan Statistical Areas (SMSA's) containing these 17 cities were divided into high and low risk groups. The high risk group comprised cases in which, according to the birth dates recorded, the period of high mortality in the city concerned might well have coincided with early pregnancy.

Complete mortality data for the 122 cities surveyed by NCDC were not available for all years when the children born in 1956-61 were at risk. The dates when A2 influenza was epidemic during this period were estimated for each State by reviewing the mortality and absenteeism statistics and reports of epidemics received by NCDC from State health departments. The 1956-61 birth records were divided accordingly into high and low risk groups.

### Statistical Methods

The incidence of various types of malformations in the 1956-61 and 1962-65 series was examined for possible post epidemic increases by computing two ratios for each epidemic and type of defect:

1. *Crude incidence ratio.* Ratio between the malformation incidence rates observed among high risk births after the epidemic concerned and among low risk births in the same population.

2. *Standardized incidence ratio.* Ratio of the incidence rate observed in the high risk group ( $i_1$ ) to an estimate of the incidence rate to be expected during the season and year when these children were born ( $i_0$ ). Use of such a ratio is desirable because seasonal and secular variations in incidence unrelated to influenza are known to occur (8, 9) and would tend to distort the crude ratio if the timing of an influenza epidemic were such that the high risk group were born during a season or year of high or low incidence.

Even under these conditions, it might be expected that, if influenza had no effect, the ratio of incidence when the high risk group was born ( $i_1$ ) to incidence during the remainder of the post epidemic year ( $i_2$ ) would be of the same order as the equivalent ratio for low risk years ( $\frac{I_1}{I_2}$  where  $I_1$  is the incidence rate in the

months corresponding to those in the post epidemic year when the high risk births occurred, and  $I_2$  is the rate during the other months of the low risk years). The value of  $i_1$  to be expected in these circumstances (denoted  $i_0$  before) can therefore be estimated from the equation ( $\frac{i_0}{i_2} = \frac{I_1}{I_2}$ ), provided that  $i_2$ ,  $I_1$ , and  $I_2$  are calculated first. The estimates of  $i_0$  that were used in calculating the standardized incidence ratios were obtained in this way. The division of time into post epidemic and low risk years that this method requires was carried out by reference to the midpoint of each period when high risk children were born. The time from 6 months before to 6 months after each of these midpoints was defined as a post epidemic year.

For each crude or standardized ratio above unity, indicating a post epidemic excess of malformed births, the significance of the excess was evaluated by computing  $\chi^2$  with Yates' correction from the relevant basic data and halving the statistical probability ascribed to it in the standard tables. Increases and decreases in incidence after epidemics each account for half of this probability, and one is not concerned with the decreases, since the hypothesis under test is that incidence rises after epidemics.

For each crude ratio,  $\chi^2$  was computed from

the numbers of malformed and other children in the high risk group and those born at other times. For each standardized ratio,  $\chi^2$  was computed for a contingency table containing in the following sequence the numbers of malformed births ( $n_1, n_2, N_1, N_2$ ) from which the incidence rates  $i_1, i_2, I_1$ , and  $I_2$  were derived:

Period	Post epidemic years	Low risk years
High risk months-----	$n_1$	$N_1$
Low risk months-----	$n_2$	$N_2$

This method of testing significance is not entirely valid except in the absence of interaction between season and year of birth in the related population. The number of malformed births in the high risk group ( $n_1$ ) would, for example, tend to be higher than expected if during the high risk year a greater proportion of all births than in other years occurred in high risk months.

There was some evidence of interaction of this kind in 1962-65, when the number of control births to be expected in the high risk period (given the numbers of controls actually born in low risk months or years) was only 95.6 percent of the number observed. To offset the effects of this excess of all high risk births on the numbers of malformed births, each  $\chi^2$  test that suggested a significant increase in one of the standardized ratios for 1962-65 was repeated after

**Table 1. Live-born children classified according to likelihood of exposure to A2 influenza in early intrauterine life, 1956-61**

Reported dates of epidemics	Months with midpoints 26-40 weeks after epidemics (high risk)	Live births <sup>1</sup>	
		A In high risk months listed	B In low risk months of 1956-61
California-----			1, 980, 752
Jan 10-Feb. 13, 1960-----	July-November 1960-----	162, 838	
Pennsylvania-----			1, 216, 584
Oct. 6-Dec. 21, 1957-----	April-September 1958-----	190, 678	
Feb. 2-Mar. 22, 1958-----	August-December 1958-----		
Mar. 22-May 2, 1959-----	October 1959-January 1960-----	80, 882	
Wisconsin-----			466, 024
Oct. 6-Dec. 21, 1957-----	April-September 1958-----	72, 824	
Jan. 26-Mar. 29, 1958-----	August-December 1958-----		
Dec. 27, 1959-Mar. 5, 1960-----	July-November 1960-----	43, 520	
Total-----		550, 742	3, 663, 360

<sup>1</sup> Figures derived from "Vital Statistics of the United States," 1956 through 1961.

**Table 2. Number of clefts reported among live births in high and low risk months,**

State	Cleft palate alone				Cleft lip alone			
	a High risk births	b Low risk births	Crude incidence ratio <sup>1</sup>	Standard- ized incidence ratio <sup>2</sup>	a High risk births	b Low risk births	Crude incidence ratio <sup>1</sup>	Standard- ized incidence ratio <sup>2</sup>
California.....	64	703	1. 11	0. 97	59	695	1. 03	0. 94
Pennsylvania:								
First high risk period..	72	391	1. 17	1. 33	52	395	. 84	. 71
Second high risk period.....	22		. 85	. 96	28		1. 07	1. 37
Wisconsin:								
First high risk period..	25	205	. 78	. 87	19	151	. 81	. 76
Second high risk period.....	14		. 73	. 80	19		1. 35	1. 44
All three States:								
With exomphalos, esophageal, or ano- rectal defect.....	2	19	. 70	3. 00	1	5	1. 33	-----
With other defects only.....	42	314	. 89	1. 26	16	72	1. 48	2. 80
Without other defects.....	153	966	1. 05	. 83	160	1, 164	. 91	1. 00
Total.....	197	1, 299	1. 01	. 94	177	1, 241	. 95	1. 08

<sup>1</sup> Crude incidence ratio equals  $\frac{a}{b} \div \frac{A}{B}$ . For explanation of A and B, see table 1.

<sup>2</sup> For explanation of standardized incidence ratio, see text, p. 972. Standardized incidence ratios for the 3 States combined cover 1959-61 only.

replacing  $n_1$  by  $0.956n_1$ . All estimates of statistical significance given for these ratios in the results were obtained in this way. The 1956-61 data did not require any such correction.

## Results

As the data for births in 1956-61 are considerably less extensive than those for 1962-65, the findings for the two periods are presented separately.

*Births in three States in 1956-61.* Data on births in 1956-61 were available for California, Hawaii, Pennsylvania, and Wisconsin. In Hawaii, no epidemic was observed during the years when the children born in 1956-61 were passing through early intrauterine life. One outbreak of A2 influenza was defined in California and two each—the first occurring in two waves—in Pennsylvania and Wisconsin. The distribution of births in relation to these epidemics is shown in table 1. Separate figures are given for the months with midpoints 26 to 40 weeks after epidemics, since the children who were born then are considered to have been at high risk of exposure to maternal influenza during the

teratogenic period. The assumption that this period might be at any time between 26 and 40 weeks before birth was also made in earlier papers (2, 4), to allow for variations in length of gestation and in the age at which teratogenesis occurs.

The frequency of clefts occurring in each of the five high risk groups and in other children is compared in table 2. Because of the report that influenza epidemics may be followed by a particularly marked increase in the incidence of clefts associated with other defects, especially esophageal atresia, anal atresia, and exomphalos, separate figures are given for such cases. The standardized ratios for the three States combined were computed only for 1959-61 because the method used is not suitable for analyzing data in which any community is represented by more than one high risk group of births unless these births occurred in the same year or in the same months of different years. The basic data used in computing the expected values for the standardized ratios are not given since this material would occupy more space than its importance warrants.



as defined in table 1, 1956-61

Cleft palate with cleft lip			
a High risk births	b Low risk births	Crude incidence ratio <sup>1</sup>	Standard- ized incidence ratio <sup>2</sup>
80	1, 065	0. 91	0. 96
95	} 631 {	. 96	. 84
40		. 95	. 88
51	} 303 {	1. 08	1. 48
33		1. 17	1. 57
2	29	. 46	. 40
28	253	. 74	. 56
269	1, 717	1. 04	1. 11
299	1, 999	. 99	1. 01

No ratio listed in table 2 is significantly in excess of unity. The only malformation with any evidence of a consistent pattern is cleft lip, the incidence of which was relatively high after the second epidemics in both Pennsylvania and Wisconsin but not after the first widespread outbreaks in any of the three States.

*Births in 17 SMSA's in 1962-65.* Figures for the 17 areas yielding data on the frequency of malformations and the duration of the influenza epidemic in 1963 are shown in table 3. Birth statistics from all 17 areas were available for 1963-65, and from 13 for 1962. Because of a misunderstanding, the high risk periods for these births were defined as starting 188 days after the onset of the epidemic, whereas the interval allowed in the other studies was 182 days. This discrepancy is not likely to have appreciably biased our findings.

The original material included details of all malformations reported on birth certificates, coded according to the Dental Health Center

**Table 3. Children born alive in 1962-65, classified according to likelihood of exposure to 1963 influenza epidemic in early intrauterine life**

Standard Metropolitan Statistical Area	Reported dates of 1963 epidemic	Live births 188-280 days after epidemic (high risk)		Other live births (low risk)		Crude inci- dence ratio $\frac{a}{A} \div \frac{b}{B}$	Stand- ardized incidence ratio (see text)
		a Affected <sup>1</sup>	A Total <sup>2</sup>	b Affected <sup>1</sup>	B Total <sup>2</sup>		
Baltimore, Md. (part).....	Jan. 27-Feb. 23.....	61	11, 900	714	129, 700	0. 93	0. 73
Birmingham, Ala.....	Mar. 3-16.....	3	4, 200	87	45, 900	. 38	. 51
Chattanooga, Tenn.....	Mar. 10-30.....	8	1, 700	65	19, 200	1. 39	1. 43
Detroit, Mich.....	Feb. 24-Mar. 16.....	145	26, 500	1, 528	303, 600	1. 09	1. 18
Grand Rapids, Mich.....	Mar. 10-Apr. 6.....	13	3, 200	165	31, 000	. 76	1. 13
Little Rock, Ark.....	Feb. 10-Mar. 16.....	8	2, 600	114	22, 100	. 60	. 58
Louisville, Ky., and Indiana (part).....	Mar. 3-30.....	9	4, 600	101	53, 900	1. 04	1. 13
Memphis, Tenn.....	Mar. 3-16.....	3	5, 100	25	57, 400	1. 35	1. 40
Milwaukee, Wis.....	Feb. 17-Mar. 23.....	58	9, 000	674	98, 000	. 94	1. 30
Montgomery, Ala. <sup>3</sup> .....	Feb. 24-Mar. 16.....	4	1, 000	40	10, 000	1. 00	1. 35
New Orleans, La.....	Mar. 3-16.....	24	7, 500	229	81, 800	1. 14	1. 08
New York, N.Y. (part) <sup>2</sup> .....	Jan. 27-Mar. 2.....	292	58, 300	2, 170	428, 700	. 99	1. 12
Norfolk-Portsmouth, Va.....	Feb. 17-Mar. 9.....	19	5, 100	220	54, 200	. 92	. 87
Philadelphia, Pa., and New Jersey (part).....	Feb. 17-Mar. 23.....	164	27, 000	1, 451	275, 000	1. 15	1. 02
Pittsburgh, Pa.....	Mar. 3-23.....	94	16, 700	859	155, 400	1. 02	1. 06
Richmond, Va. <sup>3</sup> .....	Feb. 3-23.....	11	3, 400	116	23, 600	. 66	. 82
St. Louis, Mo. <sup>3</sup> , and Illinois (part).....	Mar. 3-30.....	54	12, 200	452	94, 600	. 93	1. 06
Total.....		970	200, 000	9, 010	1, 884, 100	1. 01	1. 05

<sup>1</sup> Exhibiting 1 or more of the malformations listed in table 4.

<sup>2</sup> Estimated from 1 percent sample of controls.

<sup>3</sup> 1963-65 births only.

classification (10). Categories in this classification that comprise miscellaneous or ill-defined defects grouped according to site were not included in the present inquiry, except for two groups (esophageal and rectal) in which a single type of malformation (atresia, sometimes combined with fistula) was apparently predominant. Minor defects and those reported in less than 0.05 per 1,000 live births were also excluded. The remaining conditions are listed in table 4, and the affected children enumerated in table 3 are those for whom these defects were described. The incidence of affected children did not increase significantly following the epidemic in any of the 17 areas.

Findings for specific types of defects are summarized in table 4. The standardized ratio for cleft lip and both ratios for defects of the upper limbs are significantly in excess of unity. More than half of the reduction deformities of upper limbs apparently involved digits only (table 5). Most of the increase in reduction deformities observed among the high risk births was in de-

fects of this type. The slight excess exhibited by supposedly more extensive deformities may only indicate that some digital defects were inadvertently allocated to this group—a likely occurrence in view of the incompleteness of information on many birth certificates.

Defects limited to the thumbs and radii are enumerated separately in table 5 because they showed an increase, although not a statistically significant one, after epidemics in Birmingham, England (2). In the present series, they showed less increase than reduction deformities involving other parts of the upper limbs.

The high risk births included no children with cleft lip combined with reduction deformities of the limbs, such as might have been expected if the increases shown by these two types of defects had a common cause.

The 1962-65 data are used in table 6 to explore the suggestion (2, 4) that influenza epidemics may be followed by a particularly marked increase in the proportion of births in which cleft palate with cleft lip, cleft lip alone,

**Table 4. Numbers of selected malformations reported among live births in 17 Standard Metropolitan Statistical Areas, 1962-65**

Type of malformation	a High risk births	b Low risk births	Crude incidence ratio ( $\frac{a}{200,000} \div \frac{b}{1,884,100}$ )	Standardized incidence ratio (see text)
<b>Anomalies of nervous system:</b>				
Anencephalus.....	52	466	1.05	1.32
Spina bifida, encephalocele.....	126	1,097	1.08	1.13
Hydrocephalus.....	57	579	.93	.93
Microcephalus.....	2	105	.18	.24
<b>Anomalies of digestive system:</b>				
Cleft palate.....	55	556	.93	.93
Cleft lip.....	62	464	1.26	<sup>1</sup> 1.47
Cleft palate with cleft lip.....	74	779	.89	1.10
Esophageal defects.....	11	135	.77	1.12
Anorectal defects.....	39	378	.97	.80
Hypospadias.....	123	1,218	.95	.93
<b>Anomalies of musculoskeletal system:</b>				
Clubfoot.....	232	2,247	.97	.89
<b>Reduction deformities:</b>				
Upper limbs only.....	51	320	<sup>2</sup> 1.50	<sup>2</sup> 1.91
Lower limbs only.....	13	129	.95	1.23
Upper and lower limbs.....	6	45	1.26	1.32
Limbs unspecified.....	2	22	.86	.75
Congenital dislocation of hip.....	14	150	.88	.77
Diaphragmatic hernia.....	10	114	.83	1.01
Down's disease.....	92	810	1.07	1.16
Exomphalos.....	26	272	.90	1.16

<sup>1</sup>  $0.05 > \frac{P}{2} > 0.01$ .

<sup>2</sup>  $0.01 > \frac{P}{2} > 0.001$ .

**Table 5. Extent of reduction deformities of upper limbs**

Extent of deformity	Number of children at high risk			Number of children at low risk			Incidence ratios	
	Legs also affected	Legs not affected	Total	Legs also affected	Legs not affected	Total	Crude	Standardized
Limited to digits:								
Thumbs only-----	0	4	4	3	26	29	1.30	1.70
Other-----	4	30	34	21	160	181	1.77	2.54
Not limited to digits:								
Radial sides of limbs only-----	0	0	0	0	6	6	0	0
Other-----	2	17	19	21	128	149	1.20	1.39

**Table 6. Frequency of single and multiple defects among children listed in table 5**

Defects of special interest in each child	Children with multiple defects <sup>1</sup>				Children with single defects			
	Number at high risk	Number at low risk	Crude incidence ratio	Standardized incidence ratio	Number at high risk	Number at low risk	Crude incidence ratio	Standardized incidence ratio
2 or more special-interest defects-----	5	38	1.24	1.67	-----	-----	-----	-----
Only 1 special-interest defect-----	32	347	.87	.95	170	1,605	1.00	1.14
Cleft lip alone-----	1	40	.24	.62	61	421	<sup>2</sup> 1.36	<sup>2</sup> 1.51
Cleft palate with cleft lip-----	14	87	1.52	<sup>2</sup> 2.92	57	682	.78	.94
Esophageal defects--	3	21	1.35	2.46	6	92	.61	.80
Anorectal defects-----	8	124	.61	.42	27	225	1.13	.96
Exomphalos-----	6	75	.75	.69	19	185	.97	1.50
No special-interest defects-----	110	1,105	.94	1.09	653	5,915	1.04	1.03
Total-----	147	1,490	.93	1.07	823	7,520	1.03	1.05

<sup>1</sup> Multiple defects are defined as combinations of malformations from 2 or more of the 62 categories of the Dental Health Center classification. Source, reference 10.

<sup>2</sup>  $0.05 > \frac{P}{2} > 0.01$ .

esophageal atresia, anal atresia, and exomphalos are associated with each other or with other defects. In the present series, the influenza epidemic was followed by increases in the incidence of combinations of these five defects and of cases in which esophageal defects or cleft palate with cleft lip were associated with other malformations. None of these increases was significant, however, except for the high standardized ratio for children exhibiting both cleft palate with cleft lip and other defects. The increase in incidence of cleft lip without cleft palate (table 4) was limited to children with no other defects.

## Discussion

The study results raised two methodological problems that must be noted before any biological implications can be discussed. The first prob-

lem, since the reporting of malformations on birth certificates was incomplete (11), is that differences may have existed between the proportions reported 26 to 40 weeks after epidemics and at other times. If true, the cited incidence ratios would have been biased. The fact that influenza is not reputed to be a potent teratogen makes it unlikely that an epidemic itself would have such delayed effects on the quality of reporting, but regular seasonal or more prolonged changes in reporting habits not resulting from epidemics may very possibly have occurred. However, although changes of this kind may have biased the crude incidence ratios, any such bias would have tended to be eliminated when the standardized ratios were calculated.

The second problem is whether it is right even

to consider biological explanations when the number of statistically significant results observed (six, with a probability below 5 percent, among the 161 crude and standardized ratios shown in tables 2-4 and 6) is no greater than the number that might be expected to occur by chance. Certainly, it would be unwise to attach much importance to findings of this kind unless they confirmed trends observed in other data.

Unfortunately, we have no data with which to compare the excess of finger defects following the influenza epidemic of 1963 (table 5). The increase at this time in the incidence of cleft lip without cleft palate (table 4), however, can be compared with observations made on four other occasions when a population previously affected by the 1957-58 pandemic of A2 influenza was reexposed—Pennsylvania in 1959 and Wisconsin in 1959-60 (table 2) and Birmingham, England, in 1959 and 1960-61 (2). Data covering the 1957-58 epidemic in these three communities and the first widespread outbreak in California (in 1960) are available from the same sources. All five reexposures were followed by increases in the incidence of either cleft lip alone (in the American series) or cleft lip with or without cleft palate (treated as a single entity in the Birmingham series), but no increase occurred after the first major exposure in any of the four communities from which data for this period were analyzed. If these observations are meaningful, they may indicate that cleft lip can be caused by something that happens when pregnant women who already have some immunity to the A2 virus are reexposed.

The U.S. data provide little support for the view that influenza was responsible for the excessive number of certain other defects, notably esophageal atresia, anal atresia, and exomphalos, observed in children following the epidemics in Birmingham, or for the high incidence of neural tube defects among the children of mothers with a history of influenza in Dublin, Ireland (3). With one exception (anorectal defects) the standardized incidence ratios for all the corresponding categories in the U.S. data for 1962-65 exceeded unity, but no excess was significant (table 4). In contrast to the Birmingham data on cleft lip, esophageal atresia, anal atresia, and exomphalos, no significant increase occurred in the incidence of children with two

or more of these defects following the 1963 epidemic in the present series, and no increase was noted in the overall incidence of combinations involving only one of these defects (table 6). The proportion of children with multiple defects increased among those with cleft lip and palate and decreased among those with cleft lip alone following the 1963 epidemic (table 6), but the reverse was true following the epidemics to which the 1956-61 series of births was exposed (table 2).

There is little in this report to suggest that A2 influenza causes a syndrome of defects. The only malformation that showed a significant association with more than one outbreak was cleft lip.

### Summary

Records of the National Communicable Disease Center, Public Health Service, were used to identify periods when A2 influenza was widespread in California, Pennsylvania, and Wisconsin in 1955-61 and in 17 Standard Metropolitan Statistical Areas in the eastern United States that were affected by the epidemic of early 1963. Encoded abstracts of the birth certificates of children born in the three States in 1956-61 and in the 17 metropolitan areas in 1962-65 were subdivided according to whether or not birth occurred approximately 26 to 40 weeks after the epidemics. The incidence of clefts of the lip and palate in these subdivisions of the 1956-61 data was compared, and the 1962-65 data were used for similar comparisons of all the common major malformations that were distinguished in the records used.

Reduction deformities of the fingers were especially common among births following the 1963 epidemic. As in a previous series from Birmingham, England, the incidence of cleft lip did not increase after the first widespread epidemic of A2 influenza but was higher after subsequent outbreaks. The other defects examined showed no significant increase in incidence after epidemics.

### REFERENCES

- (1) Gregg, N. M.: Congenital cataract following German measles in the mother. *Trans Ophthal Soc Aust* 3: 35-46 (1941).
- (2) Leck, I.: Incidence of malformations following

- influence epidemics. *Brit J Prev Soc Med* 17: 70-80 (1963).
- (3) Coffey, V. P., and Jessop, W. J. E.: Maternal influenza and congenital deformities. A follow-up study. *Lancet* No. 7284: 748-751 (1963).
  - (4) Leck, I.: Examination of the incidence of malformations for evidence of drug teratogenesis. *Brit J Prev Soc Med* 18: 196-201 (1964).
  - (5) Serfling, R. E.: Methods for current statistical analysis of excess pneumonia-influenza deaths. *Public Health Rep* 78: 494-506 (1963).
  - (6) Greene, J. C., et al.: Epidemiologic study of cleft lip and cleft palate in four States. *J Amer Dent Assoc* 68: 387-404 (1964).
  - (7) Greene, J. C., Vermillion, J. R., and Hay, S.: Utilization of birth certificates in epidemiologic studies of cleft lip and palate. *Cleft Palate J* 2: 141-156 (1965).
  - (8) Edwards, J. H.: Seasonal incidence of congenital disease in Birmingham. *Ann Hum Genet* 25: 89-93 (1961).
  - (9) Leck I.: Changes in the incidence of neural-tube defects. *Lancet* No. 7467: 791-793 (1966).
  - (10) Hay, S., and Tonascia, S.: A classification of congenital malformations for use in coding birth certificates in the National Cleft Lip and Palate Intelligence Service. Dental Health Center, U.S. Public Health Service, San Francisco, 1968.
  - (11) Leck, I., and Record, R. G.: Sources of variation in the reporting of malformations. *Develop Med Child Neurol* 5: 364-370 (1963).

#### Tearsheet Requests

Miss Sylvia Hay, Division of Dental Health, Dental Health Center, Public Health Service, San Francisco, Calif. 94118



**Blood Pressure Readings.** *Motion picture, 16 mm., color, sound, 18 minutes, 1968. Order No. M-1582.* Produced for the Heart Disease and Stroke Control Program, National Center for Chronic Disease Control, by the National Medical Audiovisual Center.

**AUDIENCE:** Field investigators employed in studies involving the measurement of blood pressure, medical and nursing students, and paramedical personnel.

**SUMMARY:** Developed to provide a test of the reliability of blood pressure readings by one observer or a group of observers. Presents a series of clinical blood pressure measurements using a mercury sphygmoma-

nometer and stethoscope. Each scene shows a column of mercury descending on a sphygmomanometer scale with accompanying stethoscopic sounds. Following a practice reading, 14 separate readings are presented as test segments. Viewers record their observations during the pause between segments. The film was made during actual measurement of blood pressure on persons selected to provide a variety of responses.

**AVAILABLE:** Free short-term loan from the National Medical Audiovisual Center (Annex), Chamblee, Ga. 30005, Attention: Film Distribution. Purchase from DuArt Film Laboratories, Inc., 245 West 55th Street, New York, N.Y. 10019.

**Intensive Respiratory Care.** *Motion picture, 16 mm., color, sound, 30 minutes, 1968. Cleared for television. Produced by John Sutherland Productions, Inc., for the Chronic Respiratory Diseases Control Program,*

*Health Service and Mental Health Administration.*

**AUDIENCE:** Restricted to physicians, nurses, medical and nursing students, and paramedical personnel to acquaint them with techniques for diagnosing and treating acute respiratory failure.

**SUMMARY:** Presents an overview of an intensive respiratory care unit, with emphasis on the roles of doctor, nurse, and laboratory technician in diagnosis and treatment. The story is presented in dramatic form through short sequences showing various treatments of actual patients, with a 2-minute animated segment showing lung pathology and physiology.

**AVAILABLE:** Free short-term loan from the National Medical Audiovisual Center (Annex), Atlanta, Ga. 30341, Attention: Distribution. Purchase from DuArt Film Laboratories, Inc., 245 West 55th Street, New York, N.Y. 10019.

Results indicated that gonorrhea can still be effectively treated by a single intramuscular injection of a sufficiently large dose of fast-acting penicillin.

## Comparative Study of Two Therapies for Gonorrhea

MORTON NELSON, M.D.

PENICILLIN has lost some of its once devastating effectiveness against *Neisseria gonorrhoeae*: more and more strains have become relatively resistant during the past decade (1). Gonorrhea now contracted by U.S. servicemen in the Far East, particularly in Vietnam, is reported as often resisting treatment (2-4).

Such resistant organisms spread rapidly among the civilian population, and the Alameda County Health Department venereal disease clinic in Oakland, a port of debarkation from Vietnam, inevitably acquired an influx of patients who failed to respond to the standard therapeutic regimen. The standard regimen was 1.2 million units of aqueous procaine penicillin G (APP) plus 1.2 million units of the more slowly released and longer acting aqueous procaine penicillin G with 2 percent aluminum monostearate (PAM).

To counter the threat of penicillin resistant gonococci, clinicians began to omit the PAM and to increase the dose of APP to the level recommended since 1965 by the Food and Drug Administration and the Public Health Service and subsequently adopted by the joint U.S. military forces. This schedule consists of a single intramuscular injection of 2.4 million units of APP in men and 4.8 million units in women (5,6).

---

Dr. Nelson is assistant health officer in charge of the Central District, Alameda County Health Department, Oakland, Calif.

Broad-spectrum antibiotics were rejected for our purpose, since none are suitable for use in public health venereal disease clinics, where a single visit from the patient is generally the most that can be expected. Some broad-spectrum antibiotics are otherwise acceptable alternatives to penicillin for therapy of gonorrhea (3,7,8). All broad-spectrum drugs so far developed generally are more toxic than penicillin, and most require oral administration. The patient is responsible for continued medication when orally administered drugs are prescribed, and the patient is often undependable.

Tetracycline, an excellent antigonococcal agent, is especially effective in treatment of post-gonococcal urethritis (9). Nevertheless, laboratory studies indicate a growing resistance of *N. gonorrhoeae* to tetracycline (1, 10, 11). Therefore, tetracycline should be reserved for treating the penicillin-hypersensitive patient and for combating gonococci known to be resistant to penicillin.

This study was undertaken to determine if penicillin can still be given in a single intramuscular dose large enough to produce serum levels adequately bactericidal for all *N. gonorrhoeae*, including strains passed along from servicemen returning from Vietnam. The dosage levels recommended by the Food and Drug Administration and the Public Health Service were adopted. Rigid criteria were imposed to distinguish reinfections from treatment fail-

ures. The results indicated that the Food and Drug Administration and the Public Health Service regimen is adequate in women but that the dose for men may have to be increased.

### Methods and Materials

Group A patients were treated according to the old dosage schedule of APP and PAM, the same dose being given to both men and women. Group B patients received the increased dosage recommended by the Food and Drug Administration and the Public Health Service (2.4 million units of APP in men and 4.8 million units in women). The APP was administered with a 4-cc., 2,400,000-unit, single-dose, disposable syringe (A). All doses were administered intramuscularly in one session.

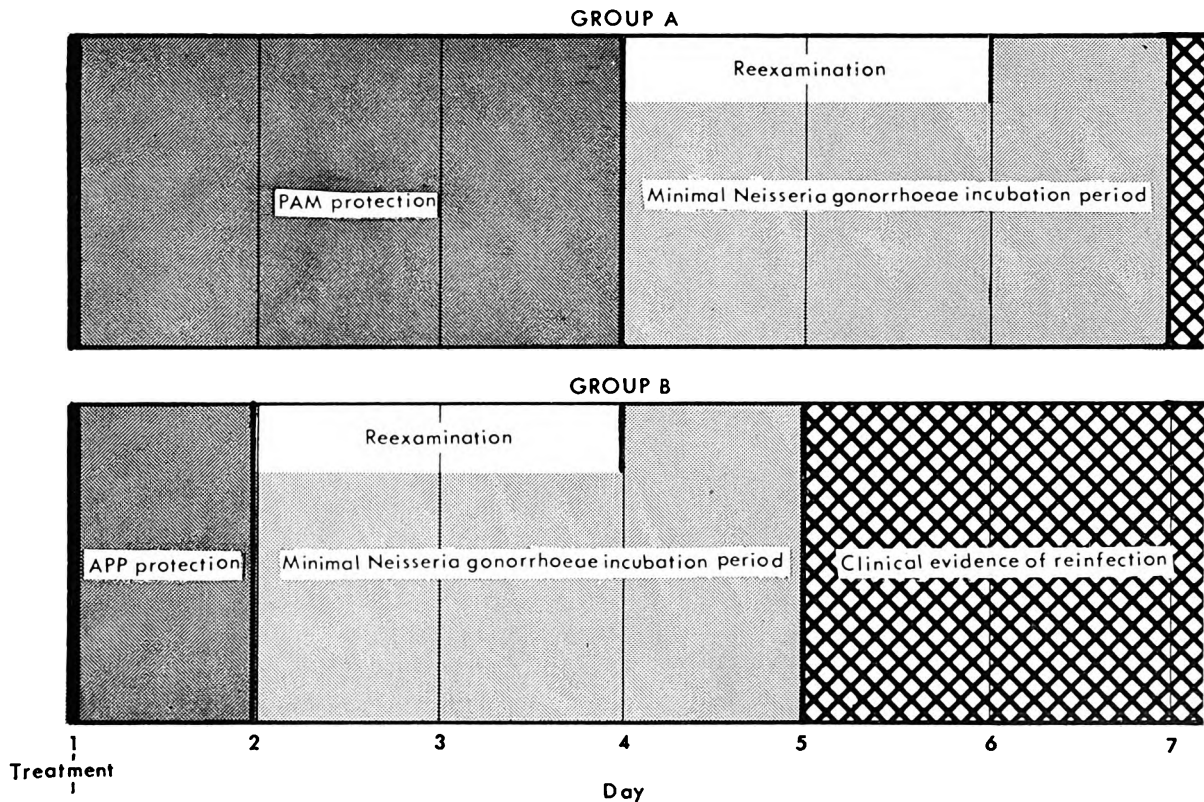
Gonorrhea was diagnosed positively by laboratory methods. The presence of *N. gonorrhoeae* was objectively demonstrated in all patients by a smear of exudate from men and by culture of the vaginal discharge (specimen from cervix and urethra) from women. Women named as

contacts were included in the study only if they came voluntarily to the clinic.

Patients were assigned randomly to the two treatment groups. A total of 251 patients was treated in group A, but only 106 (83 men and 23 women) returned for followup and could thus be evaluated. Similarly, 232 patients started in group B, but only 119 (98 men and 21 women) remained in the study. The difference of 19 patients between group A and B (251 and 232) was attributed to penicillin allergy and, therefore, these 19 were deleted from the study. The study period was from October 20, 1967, through February 2, 1968. The tight reexamination schedule necessitated exclusion of all patients who missed appointments.

At the reexamination, specimens for culture were obtained from both women and men. Groups A and B were reexamined at different intervals: group B between the second and fourth days after treatment, and group A between the fourth and sixth. As shown in the chart, all APP is eliminated from the body in about 24 hours, while PAM may be retained for

**Chronology of gonorrhea infection and treatment rationale**



up to 72 hours. (This permits PAM to maintain a low blood level concentration, which may permit a degree of protection from reinfection in some persons).

The incubation period for *N. gonorrhoeae* usually ranges from 3 to 4 days. Reinfections occurring after the period of penicillin protection (1 to 3 days) would not become clinically evident until 5 days after treatment of patients in group B and 7 days after treatment of patients in group A.

Treatment was considered a failure if, when the patient was reexamined, there was laboratory evidence of persisting *N. gonorrhoeae*. These patients were retreated in accordance with the higher dosage of the group B regimen.

## Results

As shown in table 1, 4.8 million units of APP were curative in all women, but 2.4 million units were inadequate in some of the men. Specifically, the fast-acting APP produced a

distinctly higher cure rate in both sexes: 92 percent compared with 77 percent for APP plus PAM, a difference that is statistically significant at the  $P < 0.01$  level by chi-square tests (table 2). The difference in men in group A and men in group B, while considerable, was not large enough to be statistically significant (tables 1 and 2). (Yates' factor was used in the computations. This procedure prevented false rejections of the valid hypothesis by changing the frequency in each cell by 0.5 without changing marginal totals). No hypersensitivity or other adverse reaction was noted.

## Discussion

It is difficult to evaluate agents for use in a public health venereal disease clinic. Drugs that require oral administration are apt to be poorly absorbed.

Although erratic absorption can be overcome by giving larger and more frequent doses, few patients can be relied on to take all the tablets

**Table 1. Comparison of 2 single-dose penicillin regimens for treatment of gonorrhea**

Regimen and sex	Entered study	Completed study <sup>1</sup>	Cured		Treatment failures	
			Number	Percent	Number	Percent
APP and PAM <sup>2</sup> (both sexes)-----	251	106	82	77	24	23
Men-----	212	83	68	82	15	18
Women-----	39	23	14	61	9	39
APP <sup>3</sup> (both sexes)-----	232	119	110	92	9	8
Men-----	198	98	89	91	9	9
Women-----	34	21	21	100	0	0

<sup>1</sup> Patients who did not keep appointments for reexamination were lost to followup.

<sup>2</sup> 1.2 million units of aqueous procaine penicillin G plus 1.2 million units of aqueous procaine penicillin G with 2 percent aluminum monostearate. The same dose was given to men and women.

<sup>3</sup> 2.4 million units of sterile procaine penicillin G suspension for men and 4.8 million units for women.

**Table 2. Results of chi-square tests applied to cure rates (table 1 data) with 2 treatment regimens**

Compared groups	Uncorrected value	Corrected value <sup>1</sup>	Probability value (P)	
			Lower limit	Upper limit
Men receiving APP and PAM with those receiving APP-----	3. 09	-----	0. 25	<sup>2</sup> 0. 10
Women receiving APP and PAM with those receiving APP-----		5. 21	. 01	. 05
Patients (both sexes) receiving APP and PAM with those receiving APP-----	10. 18	-----	. 001	. 01

<sup>1</sup> Using Yates' factor because 1 of the expected frequencies was less than 5.

<sup>2</sup> Not significant.



or capsules prescribed. Once the more distressing aspects of gonorrhea have disappeared, there is a strong temptation to neglect further medication.

Many patients do not return to the clinic unless symptoms persist or recur. One might assume that not returning to the clinic implies cure, since the symptoms of full-blown gonorrhea are tolerated poorly by the average male. Yet gonococci may survive without producing symptoms, or the disease may become chronic and produce milder, less distressing symptoms, or the patient, even if not cured, may go elsewhere for treatment.

Evaluating treatment without due regard for the incubation period of *N. gonorrhoeae* and the period of protection afforded by penicillin may cause investigators to fail to distinguish clearly between ongoing infections and reinfections. In this study, an attempt was made to surmount the difficulties of evaluation by employing a single intramuscular injection and by judging the results strictly on the basis of bacterial culture.

The results indicate that gonorrhea is still adequately responsive to sufficiently high levels of penicillin, but that the dosage may have to be increased even beyond the presently recommended level in men, or that probenecid may have to be given adjunctively to maintain the serum peaks for a longer period. Antimicrobial agents other than penicillin have given cure rates not substantially different from those reported in this paper. Seldom do investigators obtain more than 92 percent cures, and rare indeed has it been to achieve the 100 percent success as obtained in the women of this study.

The search for suitable substitutes for penicillin must certainly continue, particularly in view of the constantly changing patterns of microbial resistance (12-15). Until good substitutes are found, it is comforting to realize that penicillin has not lost its efficacy in such basic, straightforward applications as gonorrhea. Available evidence suggests that increased dosage of procaine penicillin G suspension should suffice to eradicate gonococci now encountered (4, 10). However, this proposition should be continuously retested, if possible, using much larger groups of patients than could be assembled for this study.

## Summary

The aqueous procaine penicillin G (APP) regimen recommended for treatment of gonorrhea by the Food and Drug Administration and the Public Health Service was compared with a lower dose regimen of APP plus PAM (penicillin with aluminum monostearate) in 225 patients at the Alameda County Health Department venereal disease clinic in Oakland, Calif., a port of debarkation from Vietnam.

The cure rates, as determined by culture, were 77 percent for the 106 patients in group A (all of whom were given 1.2 million units of aqueous procaine penicillin G plus 1.2 million units of aqueous procaine penicillin G with 2 percent aluminum monostearate) and 92 percent for the 119 in group B (the Food and Drug Administration and the Public Health Service regimen); the difference was statistically significant at the  $P < 0.01$  level by chi-square test.

The 21 women of group B, who received 4.8 million units of procaine penicillin G suspension instead of the 2.4 million units given the men, were all cured. The men of this group had a higher cure rate than the men of group A, but the difference was not statistically significant. No adverse reactions were noted. Results indicated that gonorrhea can still be effectively treated by a single intramuscular injection of a sufficiently large dose of fast-acting penicillin.

## REFERENCES

- (1) Thayer, J. D., Samuels, S. B., Martin, J. E., Jr., and Lucas, J. B.: Comparative antibiotic susceptibility of *Neisseria gonorrhoeae* from 1955 to 1964. In *Antimicrobial agents and chemotherapy, 1964*, edited by J. C. Sylvester. American Society for Microbiology, Ann Arbor, Mich., 1965, pp. 433-436.
- (2) Editorial: Penicillin-resistant gonorrhea and post-gonococcal urethritis. *Med J Aust* 1: 275-276, Feb. 17, 1968.
- (3) Holmes, K. K., Johnson, D. W., Stewart, S., and Kvale, P. A.: Treatment of "penicillin-resistant" gonorrhea in military personnel in Southeast Asia: A cooperative evaluation of tetracycline and of penicillin plus probenecid in 1,263 men. *Milit Med* 133: 642-646, August 1968.
- (4) Minkin, W.: Treatment of gonorrhea by penicillin in a single large dose. *Milit Med* 133: 382-386, May 1968.
- (5) U.S. Public Health Service: Notes on modern management of VD. PHS Publication No. 859. U.S. Government Printing Office, Washington,

- D.C. 1964. Gonorrhea: Interim recommended treatment schedules, July 1965.
- (6) Department of Defense: Treatment and management of venereal disease. (Army TB Med 230; Navy Med P-5052-11A; Air Force AFP 161-1-12.) U.S. Government Printing Office, Washington, D.C., July 9, 1965, pp. 6-7.
  - (7) Fischnaller, J. E., et al.: Kanamycin sulfate in the treatment of acute gonorrheal urethritis in men. *JAMA* 203: 909-912, Mar. 11, 1968.
  - (8) Shapiro, L. H., and Lentz, J. W.: Final report on the effectiveness of oxytetracycline in the treatment of gonorrhea in females. *Amer J Obstet Gynec* 94: 536-538, February 1966.
  - (9) Holmes, K. K., Johnson, D. W., Floyd, T. M., and Kvale, P. A.: Studies of venereal disease. II. Observations on the incidence, etiology, and treatment of the postgonococcal urethritis syndrome. *JAMA* 202: 467-473, Nov. 6, 1967.
  - (10) Amies, C. R.: Development of resistance of gonococci to penicillin: An eight-year study. *Canad Med Assoc J* 96: 33-35, Jan. 7, 1967.
  - (11) Editorial: Treatment of gonorrhea today. *Brit Med J* 5625: 391-392, Aug. 17, 1968.
  - (12) Sparling, P. F., Yobs, F. R., Billings, T. E., and Hackney, J. F.: Spectinomycin sulfate and aqueous procaine penicillin G in treatment of female gonorrhea. *In* Antimicrobial agents and chemotherapy, 1965, edited by Gladys L. Hobby. American Society for Microbiology, Ann Arbor, Mich., 1966, pp. 689-692.
  - (13) Lucas, J. B., et al.: Treatment of gonorrhea in males with cephaloridine. *JAMA* 195: 919-921, Mar. 14, 1966.
  - (14) Smith, E. B.: Ampicillin in the treatment of "penicillin-resistant" gonorrhea. *Milit Med* 131: 345-347, April 1966.
  - (15) McLone, D. G., Billings, T. E., Hardegree, W. E., and Hackney, J. F.: Gonorrheal urethritis in males treated with one oral dose of ampicillin. *Southern Med J* 61: 278-280, March 1968.
- SUPPLY REFERENCE**
- (A) Wycillin®, Wyeth Laboratories, P.O. Box 8299, Philadelphia, Pa. 19101.
- Tearsheet Requests**
- Dr. Morton Nelson, Alameda County Health Department, 499 5th St., Oakland, Calif. 94607

## Computers in Medical Education

A self-instruction program using computers that will allow the student to study at his own pace is being developed through the award of a \$1,400,000, 3-year grant from the Division of Physician Manpower, National Institutes of Health, to the Ohio State University College of Medicine.

Under the direction of three medical educators and a systems analyst at the College of Medicine, the theory that independent study can improve the efficiency of medical education will be tested. Findings of the experiment such as newly developed teaching concepts, techniques, and materials will be released for use by other medical schools.

A key aim of this project is to overcome a major weakness of the present lockstep method of instruction which compels students to advance at the same pace. All students do not arrive at medical schools with the same degree of preparation for various medical subjects. Moreover, they vary as to their intellectual capability, interest, study habits, personalities, and backgrounds.

The major advantage of the self-instruction project is that it recognizes these differences among students and attempts to tailor the teaching schedule to the individual student rather than fit all students to a common program. Because this demonstration may help minimize student dropouts, it is significant implications for this country's future supply of physicians.

# Preliminary Report of a Recall Program for Persons with Inactive Tuberculosis

JOHN A. SBARBARO, M.D., M.P.H., and G. DAVID ONSTAD, M.D.

**I**NCREASING RECOGNITION is being given to the fact that persons with abnormal chest roentgenograms resulting from previous tuberculosis infection should have lifelong followup. Studies in Denmark (1) and Muskogee County, Ga. (2), document that persons infected with tubercle bacilli, as indicated by a positive purified protein derivative intermediate skin test, and also showing definite fibrotic lesions on chest roentgenogram, have reactivated dormant infection at a rate of 0.5 to 2 percent per year. Stead (3) has written extensively on this reactivation phenomenon.

In her epidemiologic model, Ferebee (4) suggested that as many as 75 percent of new cases of active tuberculosis result from reactivated cases in the infected population of the United States. Logistically, it is impossible for the staffs of existing U.S. health facilities to treat preventively the entire reactor pool with 1 year of isoniazid (INH). Ferebee, therefore, suggested that higher risk groups receive first attention.

---

*Dr. Sbarbaro is director and Dr. Onstad is tuberculosis control officer, Disease Control Service, Denver (Colo.) Department of Health and Hospitals. Dr. Onstad is a Public Health Service assignee from the Tuberculosis Branch, National Communicable Disease Center, Health Services and Mental Health Administration. This research was supported in part by tuberculosis project grant No. 65-8813, Public Health Service.*

Patients whose chest roentgenograms show definite fibrotic lesions diagnosed as minimal, moderate, or far-advanced inactive tuberculosis deserve just such attention.

Many U.S. health departments know of a large number of such persons. Because of the lack of personnel, as well as the justifiable emphasis on controlling new active cases and accomplishing adequate followup of case contacts, persons in whom the disease has been inactive for a long time have been given little attention after their disease was ascertained to be inactive. In terms of yield per dollar spent on tuberculosis control, however, it seems reasonable that supervision of these persons would pay dividends.

During 1961 to 1963, the Long Beach (Calif.) Department of Public Health conducted a recall program for persons with apparently inactive disease (5). Health department personnel reviewed their records from 1935 to 1960 and selected 2,536 persons with evidence of inactive pulmonary disease as defined in the National Tuberculosis Association Standards of 1961. In an effort to locate these persons, telephone and city directories, together with death certificates, were reviewed, and relatives and physicians mentioned in the patients' records were contacted. Valid addresses could not be obtained for 1,028 persons.

The remaining 1,508 persons were sent letters inviting them to return for examination. Only

399 persons responded; 383 (15 percent) agreed to participate. Of these 383 participants, 161 (42 percent) had received chemotherapy previously. Thirty-one persons (8.1 percent) were found to have reactivated disease, and 20 of these had not received chemotherapy previously.

The rationale for such a recall program would also extend to persons who have had known active tuberculosis in the past and who received less than 6 months of chemotherapy. A report in 1964 revealed that 47 percent of 282 male patients who had received less than 6 months of treatment had relapsed within a 10-year period (6).

### Denver Program

The Disease Control Service of the Denver Department of Health and Hospitals recently initiated a program to recall persons whose names were on a register of persons with inactive tuberculosis during a 10-year period. These persons were to be reevaluated by use of chest roentgenograms and multiple sputum examinations. The rationale for the program was twofold: (a) that the yield of active cases of tuberculosis would be high and further infection of the population from this source eliminated and (b) potential reactivated tuberculosis would be prevented by offering each recall patient with bacteriologically negative results a course of prophylactic isoniazid. The initial experience of this program follows.

*Method.* The register of the disease control service was reviewed for persons whose last diagnosis was far-advanced, inactive pulmonary tuberculosis. The register contained names of some 10,000 persons with diagnoses of tuberculosis of varying degrees. Persons were excluded from further followup efforts if the record showed they had moved out of the county, were dead, or older than 90 years.

A letter of inquiry was sent to the Veterans' Administration, Army, or other hospital outpatient clinics, or to a physician in private practice if the last notation on the person's record indicated that he was receiving his medical care from one of these sources. A form letter was sent to the remaining persons with an appointment date at the disease control clinic. The letter explained the need for a followup interval

history and examination and included information about preventive isoniazid medication. Consultation with physicians in private practice was obtained whenever desired by persons in this category. A cost-time study was performed to ascertain the number of clinic personnel and time needed for this project.

*Results.* For this preliminary study, 1,404 names were pulled from the register for persons with inactive tuberculosis. Of these, 866 persons had moved or died. Listed as receiving their medical care from established outpatient clinics or physicians in private practice were 369 (26 percent). No source of medical care was listed by 169 persons, and they were sent routine appointment letters. Of the 169 letters sent, 82 were returned because the patient had moved or his address was unknown. Four persons had died. Therefore, of the original 1,404 persons whose disease was known to be inactive, only 83 (6 percent) were actually contacted. Of these, 69 failed to keep their appointment and did not request another one; 14 appointments were kept.

Chest roentgenograms and sputum cultures obtained for all 14 persons revealed that one had relapsed to active disease. The remaining 13 were offered preventive isoniazid chemotherapy, but only five accepted the medication. Eight persons refused prophylactic therapy.

*Discussion.* Since the Arden House Conference on Tuberculosis in 1959, most experts in public health have strongly supported the selective use of INH prophylaxis to reduce the incidence of active pulmonary tuberculosis. Because the capability of health departments to competently distribute preventive INH is limited, a series of priorities have been introduced. Both the American Thoracic Society Committee on Therapy (7) and the Ad Hoc Committee on Chemoprophylaxis (8) strongly recommended the prophylactic treatment of persons with inactive tuberculosis.

The Tuberculosis Branch, National Communicable Disease Center, Public Health Service, and others, have urged health departments to initiate programs of recalling persons with inactive tuberculosis, especially those treated before antituberculosis medication was available. Recall programs would both identify those with interim relapses and offer chemoprophylaxis to those whose tuberculosis has been proved inac-

tive. Other workers have stated that the active casefinding productivity of such an effort will not be worth the cost. Moreover, many workers in the field question whether persons contacted under these circumstances would actually accept a year of chemoprophylaxis.

In this preliminary effort, the department of health and hospitals found only one person with active tuberculosis of an original 1,404 persons surveyed, for an overall casefinding rate of 0.7 per 1,000. However, 866 persons were immediately eliminated and only 169 persons were sent clinic appointment letters—an actual casefinding rate of 6 per 1,000. Most impressive, however, is that one of 14 patients had active tuberculosis for a casefinding rate of 71.4 per 1,000. The initial survey took approximately 3 months and cost \$1,074.

One mistake that should not be repeated is the policy of sending routine query forms to the physicians in private practice who were last documented as caring for the person. Although answers to our queries were received from approximately 90 percent of those physicians, the responses were generally inadequate in factual content, such as to the date of the last chest roentgenogram or sputum examination. Responding physicians were then sent a personal letter, explaining the need for a further followup of their patients, as well as the rationale for instituting a course of preventive INH therapy. Further, examinations and drugs were offered free of charge through the department of health and hospitals. Few physicians indicated a desire to pursue either a course of further examinations or chemoprophylaxis.

This experience suggests that, in the future, persons initiating such programs should directly contact the person involved, whether or not he had listed a personal physician, and then, following adequate workup, involve the physician in the chemoprophylactic treatment of his patient. The patient's interest should be sufficient stimulus to assure his physician's participation.

Compared with current X-ray casefinding practices, this type of program is financially reasonable. During the past 3 years, the Denver and Tri-County Tuberculosis and Respiratory Disease Association has spent approximately \$25,000 per year to find an average of two previously unknown active pulmonary tuberculosis

cases per year—a yield of 0.12 new active cases per 1,000 X-rays and an average casefinding cost of \$12,500 per new case.

Furthermore, when considering chemoprophylaxis effects, it should be noted that while this inactive recall program began with persons known to have far-advanced tuberculosis (inactive), the mobile X-ray unit program identified only 123 persons with inactive tuberculosis in 3 years at a cost of \$610 per case. This casefinding cost must be added to any prophylactic isoniazid tuberculosis control program initiated in a general population. This cost is eliminated by focusing on a select known population.

### Conclusions

As indicated previously, this preliminary inactive recall program, as originally designed, should be modified. The stated source of primary medical care should be bypassed when designing a chemoprophylaxis program based on the recall of persons with inactive pulmonary tuberculosis. Further, more efforts should be directed at those persons failing to respond to the first contact and a public health worker should be used to recontact persons not responding to the initial recall effort. Such changes will enhance the program's casefinding value, and the overall tuberculosis control program will benefit from the selective use of INH prophylaxis among these high-priority candidates.

### Summary

The Disease Control Service of the Denver Department of Health and Hospitals recently initiated a program to recall persons whose tuberculosis had been diagnosed as inactive during a 10-year period. The purpose of the survey was (a) to discover active cases of tuberculosis and to eliminate further infection of the population from this source and (b) to prevent potential reactivation of tuberculosis by offering each person who had bacteriologically negative results a course of prophylactic isoniazid.

From the 1,404 names selected from a register of persons with inactive tuberculosis, only 83 (6 percent) were actually contacted. Of these persons, 69 failed to keep their appointment and did not request a reappointment. Fourteen persons kept their appointments.

Chest roentgenograms and sputum cultures

were obtained on all 14 persons. One of the 14 had relapsed to active disease. Five of the remaining 13 accepted preventive isoniazid chemotherapy; eight patients refused. The case-finding rate for the 14 persons was 71.4 per 1,000.

#### REFERENCES

- (1) Groth-Petersen, E., Knudsen, J., and Wilbek, E.: Epidemiological basis of tuberculosis eradication in an advanced country. *Bull WHO* 21: 5-49 (1959).
- (2) Comstock, G. W.: Untreated inactive pulmonary tuberculosis. Risk of reactivation. *Public Health Rep* 77: 461-470, June 1962.
- (3) Stead, W. W.: Pathogenesis of a first episode of chronic pulmonary tuberculosis in man: recrudescence of residuals of the primary infection or exogenous reinfection. *Amer Rev Resp Dis* 95: 729-745 (1967).
- (4) Ferebee, S. H.: An epidemiological model of tuberculosis in the United States. *NTA Bull* 53: 4-7, January 1967.
- (5) Litwack, I. D., and Gardner, J.: Reactivation of apparently inactive cases of pulmonary tuberculosis. *Public Health Rep* 79: 823-828, September 1964.
- (6) Campbell, A. H.: Relapse in pulmonary tuberculosis. *Med J Aust* 2: 448-457 (1967).
- (7) American Thoracic Society Committee on Therapy: The use of chemotherapy as a public health measure in tuberculosis. *Amer Rev Resp Dis* 84: 609-611 (1961).
- (8) American Thoracic Society: Chemoprophylaxis for the prevention of tuberculosis: A statement by an ad hoc committee. *Amer Rev Resp Dis* 96: 558-560, September 1967.

#### Tearsheet Requests

Dr. John A. Sbarbaro, Department of Health and Hospitals, West Sixth Avenue & Cherokee Street, Denver, Colo. 80204

## Physician Augmentation Program

The Physician Augmentation Program, authorized under the Health Manpower Act of 1968, supports the addition of 1,000 first-year places in schools of medicine and osteopathic medicine beginning in fall 1970. These newly created places must be an increase over that to which the schools are already committed. Total enrollment through this program is expected to be about 4,000 in the fourth year of operation.

Grants will be awarded on a national competitive basis to schools of medicine and osteopathic medicine that document their intention to institute a major increase in the first-year enrollment and that appear to have the greatest potential for achieving major increases with their resources as supplemented by funds allocated by the program.

Special attention will be given to applications for the program from schools of medicine

that make provisions for the following factors as they increase their first year enrollment:

1. Clinical training that provides extensive experiences in patient care in outpatient and ambulatory facilities.
2. Provisions for experiences that will encourage students when they graduate to enter the practice of family medicine.
3. Provisions that will lead to improvement in the distribution, both geographic and among various socioeconomic groups, of medical and other health services.

A clear intent for increasing the output of physicians has been expressed recently by the Association of American Medical Colleges and the American Medical Association. Both organizations have endorsed the proposition that all medical schools should aim to expand their collective enrollment to a level that permits all qualified students to be admitted.

# Social Status and Subjective Perceptions of 250 Men After Myocardial Infarction

SYDNEY H. CROOG, Ph.D., and SOL LEVINE, Ph.D.

**R**ECOVERY from the serious illness of myocardial infarction, as physicians have long recognized, involves not only physiological adaptation but also numerous complex psychological and social adjustments. Among the many significant elements influencing the nature of the recovery process is the "perceptual screen" through which the patient experiences the disease. Subjective experience and interpretation of symptoms contribute to the patient's fundamental decision as to whether or not he will seek a physician and at what stage of the disease he will do so. Perception of symptoms influences the reporting of ailments that a patient will describe to the physician, and this reporting, in turn, influences the physician in framing the medical therapy and psychological support that he will provide (1-4).

In addition, the subjective appraisal by the patient of the physician-patient relationship has implications for the course of recovery and rehabilitation. For example, the patient's per-

ception of the physician helps to determine the level of faith he has in him and whether he wishes to continue receiving care. It may influence the degree to which the patient accepts and is willing to follow the advice of his physician concerning medication, physical exertion, work, family life, sexual performance, and recreational activities, among other things (5-8).

In research on illness behavior, much suggestive evidence has been collected on the nature of the relationship of social and psychological variables to patterns of development of illness, perception of symptoms, seeking of medical care, and the course of recovery. One key variable that appears to be associated with both the nature of objective reality and the character of subjective experience in illness is the patient's social status. In many recent studies, position in the social structure has been found to be related to such phenomena as the patterning of ailments, the nature of therapy, the use of outpatient services, and the character of communication with medical and psychiatric personnel (9-14).

This paper reports findings that point up possible relationships between social status variables and subjective perceptions during illness in a population of men who have suffered a first myocardial infarction. The report is based on an exploratory review of ways in which social status variables may be related to such elements as perception of symptoms, conception of the

---

*Dr. Croog is associate professor of sociology, department of behavioral sciences, Harvard University School of Public Health, Boston, Mass. Dr. Levine is professor and director of the department of behavioral sciences, Johns Hopkins University School of Hygiene and Public Health, Baltimore, Md.*

*Data for this paper were collected in connection with the study, "Social Factors in the Recovery of Heart Patients," supported by Public Health Service grant HS-00268.*

etiology of the disease, assessment of the adequacy of communication with physicians, and concerns about the meaning of the disease in future planning.

The data were collected during an extensive study of social and psychological factors in the process of recovery from serious illness. In the larger study, we are attempting to discover the elements that might be related to differential levels of adaptation to cardiac disease. In the early phases of the research it became apparent that the meaning of the disease varied among the population of patients. The larger study is still in process. This preliminary report is on one subsegment of the data and deals with the first 250 patients in the series.

Because our information was drawn solely from perceptions reported by patients in a hospital interview, it cannot be viewed automatically as an accurate assessment of reality. However, interview responses tap a crucial dimension of the experience of patients—the ways in which they interpret stimuli and define their situation. Insofar as a patient perceives events as having occurred, for example, they contribute to the content of his world, furnishing cues to which he may respond and serving as important determinants of subsequent interpretations and actions.

## Methods

Data were obtained from a population of 250 men between the ages of 30 and 60 who had no previous major ailment and who therefore suffered the myocardial infarction as a first crisis of serious illness. Extensive efforts were made to insure that the health criteria be met. We specifically excluded men from the study who had been diagnosed as having conditions such as hypertension requiring treatment, diabetes, coronary insufficiency, and gout, among many others.

Cases were obtained from a group of 26 hospitals in the areas of Greater Boston and Worcester, Mass. In each of the cooperating hospitals, cases were first screened by a casefinder physician employed for the project. If a case fitted the strict criteria of selection for the study population, permission to invite the patient's participation was obtained from the physician responsible for his care. The casefinder physi-

cian then sent a report to the medical director of the project, a board-certified specialist in internal medicine, who decided whether the case fitted the criteria of no major previous illness and a diagnosis of unequivocal myocardial infarction.

Specially trained interviewers, each of whom held a master's degree in social work, carried out the interviews in three stages. The first interview usually took place in the hospital shortly before the patient was discharged, approximately 18 days post infarct. Two subsequent interviews were carried out 1 month post discharge and 1 year post infarct. The survey-research-type interviews contained a mixture of fixed alternative and open end questions. The data reported here were derived from the hospital interview, conducted when the experience of the infarct was still relatively fresh in the mind of the patient.

We employed two commonly used indicators as measures of social status: education and occupational level. For brevity, tabular materials relating to social status are presented in terms of the educational variable, and information on occupation is included in the text. Scales were derived from the Hollingshead index of social position (15).

In line with common practice, we employed the 0.05 level as the criterion for statistical significance. Because of the exploratory nature of this effort, we also included two findings below that level—insofar as the direction may be useful for generating hypotheses.

## Findings

*Recall of premonitory symptoms.* From the medical standpoint, the distribution of reported symptoms in the premonitory phase of disease is often of vital importance for diagnosis, treatment, and rehabilitation. In past studies a large volume of findings has emerged on the association of social status variables with perception of pain and symptoms of illness. While these reports have introduced new insights, some have also led to controversy about methods and interpretations (3, 4, 14, 16-18). In this study we made an effort to explore the ways, if any, in which perception of symptoms might be related to that complex of elements commonly measured as social status. While the findings are mixed



and largely negative, they deserve scrutiny because they may cast light on aspects of the perception of the disease.

Patients were asked whether they experienced, before the acute onset of the illness, warning signs or symptoms that they perceived as being associated with the development of their heart condition. Fifty-eight percent of the patients reported symptoms that they believed were related to the illness. The reported experience of one or more of the symptoms was differentially distributed by educational level, with college-educated men being most likely to recall symptoms (table 1). While the relationship is not statistically significant, the trend suggests possible association ( $P<0.20$ ). No association between the symptom variable and the occupational level was found. In a study of heart patients closely comparable to our own in design, Johnson found no association between social variables and presence of reported symptoms during the premonitory phase (5).

To determine the distribution pattern of specific symptoms recalled as occurring during the premonitory phase, all patients were asked a series of questions concerning their experience. They reported the following individual occurrences:

Symptoms	Percent
Chest pain.....	36
Tightness in chest.....	18
Gastrointestinal (indigestion, nausea, vomiting, abdominal pain).....	15
Pain in shoulders, arms, or neck.....	14
Tiredness or fatigue.....	14
Sweating or feeling cold or faint.....	13
Shortness of breath on exertion.....	6
Palpitations.....	0
Edema or swelling.....	0

From the clinical standpoint these recollected symptoms may or may not have been directly related to the development of the myocardial infarction. They have meaning here insofar as they were remembered by the patient as significant during the period preceding the heart attack.

As the percentages indicate, substantial proportions of patients did not mention individual premonitory symptoms. In the interpretation of these data, an approach that excludes patients who reported no symptoms permits the elimination of three types of respondents: (a) those who actually experienced none, (b) those em-

ploying the "denial" defense mechanism, and (c) those who were unwilling reporters (19, 20). Hence, analysis of the reported distribution of symptoms was carried out by examining the responses of the "perceivers," or those men who during the interview stated they had one or more symptoms (58 percent).

The following proportions of perceivers recalled one or more premonitory symptoms: one, 41 percent; two, 38 percent; three, 13 percent; and four or more, 8 percent. However, no association existed between either education or occupation and the number of symptoms recalled during the premonitory phase.

The date when symptoms were first noted was also explored. Among the perceivers, 30 percent recalled one or more symptoms 1 year or more before the infarction that led to hospitalization and 34 percent reported first symptoms as occurring from 1 month to less than 1 year before the attack. The remaining 36 percent first noted symptoms 1 month or less before hospitalization. Sometimes it is assumed that the better educated in the general population are more likely than others to note the onset of changes in their physical status. However, in this study, the time when one or more symptoms was first noted, as recalled by the patient, was not found to be associated with the variables of social status.

Further, within the perceiver group, the reporting of individual premonitory symptoms showed little or no statistical relationship to social status. Two exceptions, however, may deserve further exploration. One of the most com-

**Table 1. Percentage of men with myocardial infarction, at each educational level, reporting one or more symptoms during premonitory phase**

Educational level	Percent citing 1 or more symptoms <sup>1</sup>	Total number
Total.....	58.0	250
1 year or more of college.....	68.2	63
4 years of high school.....	60.3	78
10 or 11 years of school.....	52.2	46
Grades 7-9.....	53.1	49
6 grades or less.....	35.7	14

<sup>1</sup> Chi-square=6.86, degrees of freedom=4. Not significant,  $P<0.20$ .

mon indicators of cardiac disease, chest pain, was reported in a way which indicated that social status was related to its perception. Similarly, experiencing indigestion, nausea, and vomiting (also common symptoms) seemed to be related to status indicators as well. The findings on these variables formed an unusual pattern. As table 2 indicates, a positive association was obtained between the reporting of chest pain and educational status ( $P < 0.10$ ), but a negative association for gastrointestinal symptoms ( $P < 0.01$ ). Stronger results were obtained when these symptom patterns were examined in relation to occupational level. The positive association between occupational level and reported chest pain was at the 0.01 level. Negative association with gastrointestinal symptoms was also at the 0.01 level.

A related issue is whether patients who reported both chest pain and gastrointestinal symptoms in the premonitory phase differ from those who reported only one symptom. Of the 91 patients who reported chest pain, 22 indicated that they also experienced gastrointestinal symptoms during the premonitory phase. In the group reporting the two symptoms, we found the pattern of negative association mirroring earlier findings when gastrointestinal pain was considered alone. Thus, of the total college-educated group with chest pain, only 10 percent reported gastrointestinal symptoms as well. On the other hand, 22.6 percent of all the high school graduates reported a combination of symptoms, as did 35.7 percent of the patients who completed 10 to 11 years of school. Of those who completed nine grades or less, 43.8 percent reported experiencing the two symptoms. Although chest pain alone apparently was associated in a positive way with the social status measures we employed, the fact of gastrointestinal pain in combination apparently weighted the association to a negative one.

*Perception of etiology of the heart attack.* The ways patients perceive the nature of their illness and its origins constitute important elements that physicians may take into account in the management of treatment. When interviewed, 30 percent of the patients reported that they had no opinion on the cause of the attack. An additional 35 percent cited one factor only as being the cause.

The patients in the study population exhibited a variety of views on the causes of their illness. When queried about responsible factors, the item most frequently mentioned as leading to the onset of the heart attack was mental or emotional distress—defined as continuing worry or tension rather than a specific traumatic emotional experience. The variable is one that some social scientists might generally characterize as “stress.” It was cited by 34 percent of the patients. No other factor was mentioned as frequently. The following items were mentioned in order of descending frequency: overindulgence in eating and smoking, 21 percent; overwork, 18 percent; physical exertion, 16 percent; and specific emotional or physical trauma, 9 percent. Less frequently mentioned were heredity, age, or general fatigue. In view of the relatively high number of times emotional stress was cited as the precipitating factor, it is interesting that of all the variables mentioned it was the only one showing a positive relationship to such social status indicators as occupation and education (table 3).

*Physician-patient communication.* One common complaint of patients is their difficulty in communicating fully with their physicians. They say, for example, that physicians are

**Table 2. Percentage of men with premonitory symptoms, at each educational level, reporting chest pain and gastrointestinal symptoms during premonitory phase**

Educational level	Percent citing chest pain <sup>1</sup>	Percent citing gastrointestinal symptoms <sup>2</sup>	Total number with premonitory symptoms
Total.....	60. 6	25. 3	150
1 year or more of college.....	73. 8	14. 2	42
4 years of high school.....	63. 8	17. 0	47
10 or 11 years of school.....	53. 8	46. 2	26
Grades 7-9 <sup>3</sup> .....	46. 7	33. 3	30
6 grades or less <sup>3</sup> ..	40. 0	40. 0	5

<sup>1</sup> Chi-square=7.03, degrees of freedom=3. Not significant,  $P < 0.10$ .

<sup>2</sup> Chi-square=11.86, degrees of freedom=3,  $P < 0.01$ .

<sup>3</sup> The last 2 levels were combined for computation of chi-squares.

**Table 3. Percentage of men with myocardial infarction, at each educational level, citing mental or emotional stress as a factor in the etiology of their heart attack**

Educational level	Percent citing "stress", <sup>1</sup>	Total number
Total.....	34.0	250
1 year or more of college.....	47.6	63
4 years of high school.....	37.2	78
10 or 11 years of school.....	28.3	46
Grades 7-9.....	24.5	49
6 grades or less.....	7.1	14

<sup>1</sup> Chi-square=12.71, degrees of freedom=4,  $P < 0.02$ .

too busy, too unapproachable, or too unconcerned—or at least they appear so to complaining patients. In our hospital interview the patients were asked, "Has your doctor discussed your illness with you?" Seventy-one percent stated that he had. An important feature however, is the obverse side. Nearly 30 percent of the patients maintained that their physician had not discussed their illness with them. Further, the patterning in perception of communication with the physician varied by social status level. As table 4 indicates, the lower the status level of the patient, as measured by educational category, the less likely was he to report that the physician had discussed his case with him ( $P < 0.001$ ). In considering these findings, it is important to note that at the interview virtually all the patients had been in treatment for at least 2.5 weeks. Hence, ample time had elapsed for discussion of the case between physician and patient.

Further investigation suggests that these findings do not simply reflect the treatment of service, or ward, patients as compared with private patients. Within the group of 85 service patients, 43 percent reported no discussion of their illness with the physician, but 27 percent of the 165 private patients responded in the same way.

Controlling for educational level within the service and private groups separately revealed the same pattern of association between education and communication. Obviously, since poor or less educated persons are most likely to be

service patients, some statistical association between being a staff patient and reported non-discussion with the physician might be expected. However, among private patients as well, the association between reported communication and educational level was clear. A chi-square test revealed that to a significant extent the less educated of the private patients were more likely than the higher educated to report that their physicians had not discussed the illness with them (chi-square=15.18, degrees of freedom=2,  $P < 0.001$ ).

To some extent, the reporting of no discussion may have been due to lack of effort on the part of the patient in pressing the physician for discussion. Of the 109 patients who reported no discussion, 68 percent stated in the interview that they would have liked to ask the physician about such matters as prognosis, future work plans, activities that would be allowed after discharge, diet, and other topics related to the illness.

It was not feasible in this study to monitor communications between physicians and patients. Possibly all the physicians of the study population communicated fully with their patients before the first interview and the patients' impressions were inaccurate. However, evidence from other data suggests that negative perceptions by the patient shortly before discharge reflected reality rather than biased reporting or misimpressions.

In the second series of interviews, patients were seen approximately 1 month after dis-

**Table 4. Percentage of men with myocardial infarction, at each educational level, reporting no discussion of illness with their physician**

Educational level	Percent reporting no discussion <sup>1</sup>	Total number
Total.....	29.0	250
1 year or more of college.....	14.2	63
4 years of high school.....	20.5	78
10 or 11 years of school.....	39.1	46
Grades 7-9.....	47.0	49
6 grades or less.....	43.0	14

<sup>1</sup> Chi-square=20.69, degrees of freedom=4,  $P < 0.001$ .

charge from the hospital. At that time, 99 percent of the patients reported that they had discussed aspects of the illness with their physician. No differential perception existed then by social status level in regard to whether communication had taken place. Since all patients were able to perceive communication by the time of the second interview, it is unlikely that some element associated with social status prevented them from perceiving it accurately approximately 1 month earlier.

*Physician-patient communication and occupational plans.* Among the most critical concerns of male heart patients are the implications of their illness for employment. The social and emotional importance of employment for men has often been reviewed, and there is little need to emphasize its meaning for masculine self-image, family roles, social participation patterns, social identity, and a host of other areas (21, 22). The issue of future work potential is likely to be an important area of anxiety even though the concerns may not be consciously recognized or expressed by the patient.

In the hospital interview held shortly before their discharge, 60 percent of the patients reported that the physicians had discussed returning to work. Perhaps equally important is the fact that at the time of the interview 40 percent apparently did not perceive that such communication had taken place. Possibly the physicians gave advice about returning to work, but the patients did not perceive it as having been given. Perhaps the physicians preferred to discuss work issues closer to the time of discharge from the hospital. However, the finding is meaningful to us insofar as it helps to indicate the degree to which possible anxieties and concerns of patients about aspects of their future employment had been dealt with by the time of the hospital interview.

Whether they will be able to fulfill the usual requirements of their job is a practical question of central importance to male patients, particularly those engaged in blue collar occupations requiring physical exertion. For obvious reasons, physicians are more likely to advise restrictions on exertion for patients doing heavy labor than they are to give such recommendations to patients in sedentary occupations. When asked about the matter in the hospital

interview, patients with blue collar occupations, as expected, responded more frequently than white collar workers that their physicians had indeed advised them to reduce physical exertion on the job. However, only 15 percent of all patients in blue collar occupations reported receiving such advice by the time of the first interview.

Approximately 6 percent of the reporting population indicated that their physicians had advised them of the desirability of a change in occupation. All these patients were in the blue collar category. Minor variation existed in the frequency of reporting advice. The proportions were as follows: skilled workers, 11 percent; semiskilled workers, 10 percent; and unskilled workers, 17 percent.

Perhaps one basis for suggesting job changes was the physicians' concern that patients should avoid the physical exertion of blue collar employment. Why the advice was not reported by white collar, business, or professional workers is an item of interest for potential inquiry. Although many high-status patients reported that a great deal of emotional stress existed in their work and they considered stress to be a cause of their heart attack, physicians possibly took physical rather than emotional stress more seriously as a basis for recommending a job change.

Regardless of whether the physician had given advice on a job change, at the time of the first interview a relatively substantial proportion of patients in blue collar occupations had either decided not to return to their former jobs or were in the process of deciding. No patient reported his intention to retire. Among 73 semiskilled and unskilled laborers, 18 percent said that they did not plan to return to the same job and 21 percent stated that they did not know if they would return. Among 46 skilled workers, 9 percent stated that they would not return and 13 percent indicated uncertainty through the "don't know" response. The proportions were substantially lower among 128 white collar workers. Only 2 percent reported that they would not go back to the jobs they held before the illness and 4 percent were in the "don't know" category.

Up to the first interview, many blue collar workers apparently had been coping with a

major decision concerning their employment. Although some patients had received assistance through discussion with their physicians, among those who were highly concerned about job change it was generally the semiskilled and unskilled men who had not yet had advice on the matter by the time of the interview.

### Comments

We have presented a set of empirical findings based on an exploratory study of the reported perceptions of heart patients and of some associations with social status. The results raise at least two major types of questions: First, how can the findings be explained? Second, regardless of their ultimate source, what are the implications of such findings for the treatment or management of the hospitalized cardiac patient?

While it is not feasible to review all possible hypotheses that might explain these data, several examples pertaining to status can be offered as ways of framing future analyses. For instance, in regard to the differential perception of two of the most prominent diagnostic clues, chest pain and gastrointestinal pain, some interesting possibilities emerge. One medically oriented explanation is that these perceptions are based on reality and that location of the pain is associated with location of the infarct. Thus, posterior infarcts have been observed as associated with gastrointestinal symptoms or intense vagotonia, according to some clinical reports (23, 24). These clinical reports have been disputed by some cardiologists. However, if they are valid they lead to still more problematic questions for investigation. If gastrointestinal symptoms are associated with location of the infarct, it may be desirable to explain why association exists between location of infarct and social status in our study population.

As indicated earlier, the role of social and cultural factors in affecting perception has been documented by other authors in a series of experimental and clinical investigations. One explanation of our findings might be that men of different educational levels tend to perceive differently the presence of pain in the body cavity. One may hypothesize that the better educated men, by virtue of their greater sophistication about illness, were more readily able to identify chest pain accurately, whereas the

less educated were able to interpret mainly in terms of previous experience with a common ailment of man, gastrointestinal distress.

At another level one may conjecture that the differential perception of symptoms was related to culturally linked patterns of defense mechanisms. For example, lower status men, coming primarily from working and lower class backgrounds and having fewer resources, might feel more threatened by the meaning of chest pain and its implications of financial cost, family disruption, and work disability. Thus they might tend to interpret objective pain in the way that is least threatening and most culturally acceptable, perceiving it as minor gastric distress (12, 14).

An alternative explanation, which may deserve further investigation, is that the results were due to differential correction of perception on the basis of reality testing. According to this thesis, the better educated men, though they originally may have experienced gastrointestinal symptoms, may have reinterpreted this symptom while in the hospital as having been chest pain.

The finding concerning the association of social status with beliefs about stress as a contributing factor in etiology may be interpreted in several ways. Given the common cultural assumptions concerning stress and heart disease, one may hypothesize that the data in table 3 are the product of the tendency of more highly educated people to be better informed about common theories concerning illness. However, because the popular media and common folk belief often emphasize that tension and anxiety can lead to heart attacks, it is surprising that there should be such marked differential acceptance of this information according to educational level or social status.

It is also possible that, although all social groups share the information, members of each group actually differ in their perception of the determining role of emotional stress. Two factors may account for the patterns of distribution. First, people of high social status, or at least those in this study, may actually experience more emotional stress and tension than those of lower social status. This thesis has been the subject of a large volume of recent research, producing conflicting conclusions. As one re-

view of the pertinent literature recently showed, evidence on the relationship between social class and stressors of all types is "equivocal" (18).

A second possibility is that the cultural definition of stress varies among status groups. Although the actual amount of life stress may be theoretically the same at all social levels, according to this explanation persons of higher social status may be more likely to label and report life conditions as stressful, while persons of lower status may accept analogous conditions as normal contingencies of life.

The data on patient perception of communication with physicians bears particular problems of interpretation, some of which arise from whether or not the perceptions were correct and were accurately reported. One possibility is that the level of communication actually varied by status level of the patient and that the perceptions recorded were correct. Or perhaps the physicians did in fact communicate fully with patients and the variation was solely in the accuracy of perception by patients of differing social status levels. A third possibility is that the patients were subsequently incorrect in reporting their original perceptions. Hence, the real variation in communication may have occurred along lines other than those of status level, but it was differentially perceived by patients of varying status levels.

Regardless of which of the three possibilities correspond to reality, these data point to the presence of communication problems between patients in the study population and the physicians treating them. If the perceptions were accurate, they point to a gap in communication between physician and patient at a point relatively far along in the program of therapy. At the very least, they provide clues to the nature of the psychological state of these patients, reflecting anxieties and confusion in their interaction with the physicians.

Perception of communication with the physician regarding work plans also raises several points regarding policy in treatment and its consequences. The date when advice on work plans should be given to patients by physicians is a matter of individual clinical judgment. Our purpose has been to report on the patterning of such advice at a particular point in time. The data imply that when the patients were about to be

discharged from the hospital, significant proportions of the men had not yet received guidance concerning their work. One can hypothesize that a delay in discussing work plans may have positive and therapeutic benefits for patients. The topic has so great an emotional overlay that postponement could be fortuitous, avoiding the stirring up of anxieties and tensions that may interfere with physical progress toward recovery. On the other hand, delay in handling the issue may exacerbate anxieties about life changes at a critical time and may hamper the adjustment of the patients as well as their families.

Our findings on perception of symptoms, etiology, and communication are tentative, and further investigation with other and large study populations may reveal that variables other than social status are associated with the differential reporting by patients. The results may also underline a principle familiar to practicing physicians; namely, that information presented by the patient is mediated not simply by what has been occurring at the physiological level but by social and psychological influences. The results imply that diagnosis and the framing of programs of therapy might be rendered more effective if physicians consider how social status may be associated with the perception of particular symptoms by the patient and with interpretation of the content and character of communication.

Moreover, recognizing these phenomena of differential perception may help provide criteria useful in mapping health education programs for differing target populations. It may be desirable, for example, to frame differing educational programs for particular status groups. If lower status groups are not likely to perceive chest symptoms as readily as other groups, then efforts directed toward informing this population may succeed in producing earlier identification of symptoms and may evenuate in bringing them to medical attention at a time when possible preventive measures or early treatment may be undertaken.

### Summary

Two hundred and fifty men in Boston and Worcester, Mass., who had recently experienced a first myocardial infarction were interviewed in

connection with a study of social and psychological factors in recovery from heart disease. The patients were between the ages of 30 and 60 and had no previous major ailments. In interviews conducted shortly before they were discharged from the hospital, they responded to a series of questions designed to elicit their perceptions of aspects of the development of their illness and of the degree and content of communication with their physicians.

An exploratory examination of possible relationships between the perceptions and social status of the patients revealed that reported chest pain during the premonitory phase varied positively with status, while reported gastrointestinal symptoms varied inversely. A positive association was found between status and perception of emotional stress as an etiological factor. Patients from the lower status levels reported significantly less discussion with their physicians concerning the illness, and their perception of advice received indicated possible communication gaps concerning plans for work after convalescence.

#### REFERENCES

- (1) King, S. H.: Perceptions of illness and medical practice. Russell Sage Foundation, New York, 1962.
- (2) Mechanic, D.: Medical sociology: A selective view. Free Press of Glencoe, New York, 1963, pp. 115-157.
- (3) Stoeckle, J. D., Zola, I. K., and Davidson, G. E.: On going to see the doctor: The contributions of the patient to the decision to seek medical aid. *J Chronic Dis* 16: 975-989, September 1963.
- (4) Zola, I. K.: Culture and symptoms: An analysis of patients' presenting complaints. *Amer Sociol Rev* 31: 615-630, October 1966.
- (5) Johnson, W. L.: A study of family adjustment to the crisis of cardiac disease. American Nurses Foundation, Inc., New York, 1966. Mimeographed.
- (6) Parsons, T.: The social system. Free Press, Glencoe, Ill., 1951, pp. 428-473.
- (7) White, P. D.: Rehabilitation of the cardiac patient. McGraw-Hill Book Co., New York, 1958.
- (8) Wilson, R. N.: Patient-practitioner relationships: In *Handbook of medical sociology*, edited by H. E. Freeman, S. Levine, and L. G. Reeder.

- Prentice-Hall, Inc., Englewood Cliffs, N.J., 1963, pp. 273-295.
- (9) Badgley, R. F., and Heterington, R. W.: Medical care and social class in Wheatville. *Canad J Public Health* 53: 425-431, October 1962.
- (10) Duff, R. S., and Hollingshead, A. B.: *Sickness and society*. Harper & Row Publishers, New York, 1968.
- (11) Kadushin, C.: Social distance between client and professional. *Amer J Sociol* 67: 517-531, March 1962.
- (12) Koos, E. L.: *The health of Regionsville*. Columbia University Press, New York, 1954.
- (13) Myers, J. K., and Bean, L. L.: A decade later: A follow-up of social class and mental illness. John Wiley & Sons, Inc., New York, 1967.
- (14) Rosenblatt, D., and Suchman, E. A.: Blue collar attitudes and information toward health and illness. In *Blue collar world*, edited by A. B. Shostak and W. Gomberg. Prentice-Hall, Inc., Englewood Cliffs, N.J., 1964, pp. 324-333.
- (15) Hollingshead, A. B.: Two-factor index of social position. Yale University, New Haven, Conn. Mimeographed.
- (16) Croog, S. H.: Ethnic origins, educational level, and response to a health questionnaire, *Hum Organization* 20: 65-69, summer 1961.
- (17) Zborowski, M.: Cultural components in response to pain. *J Sociol Issues* 8: 16-30, fall 1952.
- (18) Dohrenwend, Bruce, and Dohrenwend, Barbara: Social class and stress. In *Social stress*, edited by S. Levine and N. A. Scotch. Aldine Publishing Co., Chicago. In press.
- (19) Olin, H. S., and Hackett, T. P.: The denial of chest pain in 32 patients with acute myocardial infarction. *JAMA* 190: 977-981, December 1964.
- (20) Rosen, J. L., and Bibring, G. L.: Psychological reactions of hospitalized male patients to a heart attack. *Psychosom Med* 28: 808-821, November 1966.
- (21) Simmons, O.: Implications of social class for public health. *Hum Organization* 16: 7-10, fall 1957.
- (22) Friedman, E. A., and Havighurst, R. J.: *The meaning of work and retirement*. University of Chicago Press, Chicago, 1954.
- (23) James, T. N.: Coronary anatomy for the practicing internist. *Minn Med* 43: 847-849, December 1960.
- (24) James, T. N.: Posterior myocardial infarction. *J Mich Med Soc* 60: 1409-1412, November 1961.

#### Tearsheet Requests

Dr. Sydney H. Croog, Harvard School of Public Health, 55 Shattuck St., Boston, Mass. 02115.

# Role of the Community Health Aide in Public Health Programs

WILBUR HOFF, Dr.P.H.

**E**VENTS during the past 2 years have strikingly pointed out many problems that exist among large segments of our communities. The National Advisory Commission on Civil Disorders, chaired by Otto Kerner, has discerningly described the effects of deprivation on persons who lack opportunities for a decent education and meaningful jobs and who grow up and live within a social climate of rejection and hostility (1). Perhaps of more importance are the findings of the President's National Advisory Commission on Rural Poverty (2) that describe the physical and emotional health problems of some 14 million Americans "who live in a state of poverty so acute and so widespread that it is a national disgrace—and its consequences have swept into our cities violently."

Health planners and administrators are under increasing pressures to devise new ways and systems for delivering more effective and more efficient health services to our nation's people. With the passage of Public Law 89-749 by Congress, the concept of comprehensive health planning became national health policy. The law states that "... the fulfillment of our national purpose depends on promoting and assuring the highest level of health attainable for every person, in an environment which con-

tributes positively to healthful individual and family living . . ." (3).

As our society begins to recognize that preventive and medical health care is a right not only for those who can afford it but for every citizen, we are faced with providing quality health services at the most economical cost. Obtaining the manpower to carry out this mandate is now of the highest priority. Unless we examine our current systems and practices for carrying out health programs and consider new ways of delivering adequate health services to the people, the impasse we are encountering will worsen. New approaches to the improved use of health manpower are being considered.

Ginzberg (4) and Kissick (5) discussed several approaches, such as the downward transfer of functions establishing new staffing patterns in health agencies, massive development of sub-professional aides and assistants with new positions and titles, the use of new technologies and mechanisms for recruitment and training, and the development of career systems that enable aides and assistants to move upward in a permanent health career.

## Varied Uses of Aides

Many health agencies employ health aides and similar auxiliary workers. Although the concept of community aides in health programs is not new, their use in the United States has increased only within the past few years. The developing countries of the world have used aides

---

*Dr. Hoff is health education specialist, Institute for Health Research, Oakland, Calif., and health education consultant, California State Department of Public Health, Berkeley.*



as an integral part of community development programs for nearly two decades.

In the 1950's, two programs in North America piloted the use of health aides. In one, educational aides were introduced into the Navaho Indian Reservation at Window Rock, Ariz., in a project developed by the University of California School of Public Health, Berkeley, for the Division of Indian Health, Public Health Service (6). These aides bridged the wide gap that existed between the Indians and the health and medical services that were available to them.

Another program, sponsored in 1958 by the Department of National Health and Welfare of Canada, offered community health for the Indians and Eskimos living north of the 60th parallel (7). The health educator in this program recognized one of the soundest approaches, "... the long-talked-of idea of training native people as assistants to field staff. The natives had cherished the idea for some time of having their own people trained to work in their own communities."

Also in 1958, Florida's Palm Beach County Health Department employed a health aide to help nurses work with migrants in a community health program. The staff recognized the need to employ a person of the same ethnic background to work more effectively with the farmworkers in a migrant health program. In 1961 the Kern County Health Department in California employed a small number of community health aides in a pilot project to extend the services of the health department to the farmworker and his family (8). This project was based on the belief that persons with leadership qualities might be effectively recruited from the farmworker community and employed to help their neighbors accept good health practices—and thereby bring about a better understanding and improved use of existing health services.

When the Federal Migrant Health Act passed in 1962 and funds became available for services to migrants, larger numbers of health aides were used for such programs. In the next few years the use of persons from target population groups to dispense services within these groups increased by leaps and bounds. For example, during the first year of operation only two or three local projects included health

aides. Four years later, 42 projects listed approximately 160 aides under titles of liaison worker, health aide, homemaker, and sanitation aide.

Heath (9) described the use of community health aides in a migrant health program of the Santa Barbara County Health Department in California. The community health aide, she said, "is a person with a professionalism based on his grasp of the culture and feelings of a group rather than on specific academic preparation. Training, of course, is essential, but it is his unique capacity to communicate with a specific group of persons that makes the aide a member of the health department team."

Within the past 5 years, aides and indigenous workers have been used successfully in a variety of health programs. Stimulated by funds from the National Antipoverty Program, the Community Mental Health Program, and other special Federal legislation, health agencies began to experiment with the use of auxiliary personnel in a variety of ways.

In Pittsburgh, the Allegheny County Health Department piloted a successful project by using neighborhood-based workers as new and important members of the public health team (10). These nonprofessional workers made door-to-door surveys to encourage residents in one of the worst slum areas in Pittsburgh to get tuberculin tests or chest X-rays. The project was highly successful; 86 percent of all residents participated.

In another poverty area, neighborhood workers were used somewhat differently. In a maternity and infant care project the Denver Department of Health and Hospitals hired residents to interpret to their disadvantaged neighbors the nature and extent of health services that were available to them (11). The department found that the culturally and socially disadvantaged patient is not "hard to reach" when health programs are planned around the needs and wishes of the clients. The authors reported that while the workers were in the neighborhoods, the use of clinic services increased by 42 percent. In one neighborhood, more than 60 percent of the patients referred to a maternal and infant care clinic had been referred by the neighborhood worker. The clinics served by these neighborhood representatives treated an

average of 20 percent more unwed mothers than the clinics in comparable neighborhoods not served by representatives.

Stewart (12) stated that seven indigenous nonprofessionals were selected from lower socioeconomic groups to recruit patients from neighborhood areas for immunization clinics. The experimental areas assigned to these workers had been the responsibility of public health nurses, who had averaged 200 immunizations per month in the year before the aides were employed. After the aides began working, the immunization rates increased to more than 2,000 per month. When the project was discontinued the rate dropped significantly and within 3 months approached pre-experimental levels.

Reiff and Reissman described the unique characteristics of the indigenous nonprofessional in community action and community mental health programs (13). They thought the essential value of the indigenous nonprofessional was "his capability for acting as a bridge between the middle class oriented professional and the client from the lower socioeconomic groups. Implicit in the bridge concept is the notion that people drawn from lower socioeconomic strata may have special skills for establishing communication across class lines. This ability is rooted in their background. It is not based on things they have been taught, but on what they are."

Health workers from poverty areas were recruited and employed in two other projects to extend health services. One work-study project prepared public health subprofessionals for health services that traditionally were provided by professionals. In Massachusetts the Springfield Health Department, in cooperation with Holyoke Community College, recruited high school graduates from poverty areas and trained them as public health assistants in various health programs (14).

The other project was carried out by the Environmental Sanitation Program of the National Center for Urban and Industrial Health, Cincinnati (15). Persons from the Chicago ghettos were recruited and trained as health educator aides to function as environmental sanitation communicators and educators. They bettered the environmental health conditions of the city by improving the attitude of residents

and by strengthening their motivation to achieve and maintain a healthier way of living.

Two local health departments in California experimented with health aides in programs. In 1965, the Alameda County Health Department in Oakland started using 10 part-time demonstration aides in a poverty health program (16). The aides' ability to extend health services to the poor became so apparent to the staff that in 2½ years the department employed more than 150 full-time aides to work in a variety of health programs; home care, sanitation, maternal and child health, family planning, dental health, communicable disease control, and alcoholism.

The Contra Costa County Health Department in Martinez piloted a project in a neighborhood multiservice center (17). Multipurpose workers, or primary counselors, demonstrated their ability to deliver services for health and well-being from three county departments (health, welfare, and probation) to assigned families in a disadvantaged neighborhood. The agency strongly emphasized the importance of training and employing even one multipurpose worker to give broad services to clients within communities.

The California Division of the American Cancer Society and the University of California School of Public Health are experimenting in a project (18) with the use of health education aides in local chapters of the cancer society agencies. This 2-year project aims to (a) delineate the role of the paid aide from that of the volunteer and the paid professional staff workers in the agency, (b) provide operational guides for the use of paid aides in public educational programs for the American Cancer Society, (c) develop suitable training guides for use in several voluntary health agency settings, and (d) demonstrate the possible areas of career development for indigenous persons in such agencies.

Hoff and Dunbar completed the most recent and comprehensive study on the use of auxiliary health workers in migrant health programs (19). The purpose of this study was to determine the nature, use, and effectiveness of aides in migrant health programs. Data on 12 sample projects selected throughout the United States were collected through interviews, activity studies, and performance assessments of 66 nurs-

ing, sanitation, and community health education aides, their supervisors, and 31 other professional staff. Findings included characteristics, recruitment and selection, nature and extent of training and supervision, administrative practices, and evaluation of the aides.

Significantly, the professional staff perceived the overall impact of the aides as a positive one on the health agency and the migrants. The professionals thought that the aides not only lightened the workload of the staff but also helped to create better relationships between the staff and the migrants and to bridge the cultural gap that existed. The main result of this study was a set of guidelines (20) for the recruitment, training, employment, supervision, and evaluation of auxiliary workers in health programs. A system model diagramed a series of progressive steps to implement these guidelines.

#### Future Usefulness of Aides

The health industry is now the second largest industry in the country, and by 1975 it probably will be the largest. Within this vast complex lies a tremendous number of health jobs. The potential exists for developing these jobs, and new ones yet to be created, into challenging health careers for people at all levels of education and experience.

The Governing Council of the American Public Health Association recently adopted a policy statement on health and poverty (21). This statement grew out of the members' concerns over our nation's failure to adapt its health system to the needs of large segments of its population. It states that the immediate problem of the poor is employment and recommends "a massive public employment program to complement an accelerated private industry employment program, including necessary training, to help make possible the provision of critically needed health and other community services, especially in poverty areas. The now unemployed can become a significant productive force."

Each agency has a professional, social, and moral responsibility to open its health programs to the citizens who live in the ghettos and slums and to create a place in the health system for them. We must do this immediately. We can

provide meaningful health careers for the poor and the disadvantaged by first developing entry-level jobs for aides and then creating further opportunities for upward mobility. By recruiting and training aides and auxiliaries and making them full-fledged members of the health team, they not only can help in delivering more effective health services to poverty groups but can add new dimensions to the planning and organization of the health delivery system.

#### Summary

During the past decade the use of auxiliary personnel in public health programs has increased rapidly. Community health aides have been employed to perform a wide range of duties in health programs such as health education, communicable disease control, maternal and child health, dental health, family planning, and environmental health. Evidence from a variety of health programs and projects has demonstrated the value of using community aides. Increasing communications, bridging the cultural gap, and improving the delivery of health services to poverty, ethnic, and other neighborhood groups are values that have been demonstrated.

As the nation demands comprehensive health care for all its citizens, the need for more and new types of health personnel will increase. The creation of entry-level jobs for persons with low levels of education and experience and the development of meaningful health career opportunities for the poor are ways to meet these demands. To insure effective functioning of the new health manpower systems, adequate education and training programs for both health aides and professional workers are needed.

#### REFERENCES

- (1) U.S. National Advisory Committee on Civil Disorders (Otto Kerner, chairman): Report. U.S. Government Printing Office, Washington, D.C., 1968.
- (2) President's National Advisory Commission on Rural Poverty. The people left behind. U.S. Government Printing Office, Washington, D.C., September 1967.
- (3) U.S. Senate: Comprehensive health planning and public health service amendments of 1966. Public Law 89-749, 89th Cong., U.S. Government Printing Office, Washington, D.C., Nov. 3, 1966.
- (4) Ginzberg, E.: New dimensions of public health:

Their impact on the evaluation section of health personnel. II. A manpower strategy for public health. *Amer J Public Health* 57: 588-592, April 1967.

- (5) Kissick, W. L.: Effective utilization. The critical factor in health manpower. *Amer J Public Health* 58: 23-29, January 1969.
- (6) Roberts, B. J., Mico, P. R., and Clark, E. W.: An experimental study of two approaches to communication. *Amer J Public Health* 53: 1361-1381, September 1963.
- (7) Martens, E. G., and Ryoner, S. N.: Health education for 200,000 Canadians. In *Health educators at work*. Vol. 15, edited by E. S. Tyler and L. S. Morgan. University of North Carolina School of Public Health, Chapel Hill, June 1964.
- (8) Potts, D., and Miller, C. W.: The community health aide. *Nurs Outlook* 12: 33-35, December 1964.
- (9) Heath, A. M.: Health aides in health departments. *Public Health Rep* 82: 608-614, July 1967.
- (10) Domke, H. R., and Coffey, G.: Project planning and development by official health agencies. III. The neighborhood-based public health worker: Additional manpower for community health services. *Amer J Public Health* 56: 603-608, April 1966.
- (11) Kent, J. A., and Smith, C. H.: Involving the urban poor in health services through accommodation: The employment of neighborhood representatives. *Amer J Public Health* 57: 997-1003, June 1967.
- (12) Stewart, J. C.: Employment of indigenous personnel as a strategy for increasing immunization rates in hard core areas. Doctoral dissertation. University of Oklahoma, Oklahoma City, 1967.
- (13) Reiff, R., and Reissman, F.: The indigenous non-professional: A strategy of change in community action and community mental health programs. *Community Ment Health J Monograph Series*, No. 1, Lexington, Mass., 1965.
- (14) Bellin, L. E., et al.: Preparing public health sub-professionals recruited from the poverty groups: Lessons from an OEO work-study program. *Amer J Public Health* 57: 242-252, February 1967.
- (15) U.S. Public Health Service: Health educator aides: A method for improving the urban environment tested in Chicago, Illinois. National Center for Urban and Industrial Health, Cincinnati, Ohio, February 1968.
- (16) California State Department of Public Health: Alameda County Health Department is sold on health aides. *Calif Health* 25: 8-12, April-May 1968.
- (17) Blum, H. L., et al.: The multipurpose worker and the neighborhood multiservice center. Initial experiences and implications of the Rodeo Community Service Center. *Amer J Public Health* 58: 458-468, March 1968.
- (18) Callan, L. B.: Health education aide trainee project. *Public Health Rep* 84: 459-464, May 1969.
- (19) Hoff, W., and Dunbar, R.: The use of auxiliary health personnel in migrant health programs. Migrant Health Program, U.S. Public Health Service, July 1968.
- (20) Hoff, W.: Guidelines for the use of health aides in migrant health projects: Migrant health program. U.S. Public Health Service, Washington, D.C., January 1969. Mimeographed.
- (21) American Public Health Association: Health and poverty: A policy statement. *Amer J Public Health* 59: 158-159, January 1969.

#### Tearsheet Requests

Dr. Wilbur Hoff, Farm Workers Health Service, California State Department of Public Health, Berkeley, Calif. 94704

# The Control of Schistosomiasis in Patillas, Puerto Rico

JUAN R. PALMER, S.B., AIDA Z. COLÓN, S.B., FREDERICK F. FERGUSON, Ph.D.,  
and WILLIAM R. JOBIN, Sc.D.

ONE of public health's most complex challenges to physicians, biologists, and sanitary engineers is the control of parasitic diseases in the tropics. Two classic examples are the campaigns against yellow fever and malaria in the Caribbean during the first half of the 20th century. More recently, the battle in the Americas has turned to the persistent debilitating disease, schistosomiasis *mansoni*, spread by the aquatic snail *Biomphalaria glabrata* in Brazil and Venezuela as well as in Saint Lucia, Puerto Rico, and other Caribbean islands. To learn whether *B. glabrata* could be controlled to halt the transmission of schistosomiasis and

---

*Mr. Palmer is chief, vector control section, division of environmental health, Puerto Rico Department of Health, San Juan. Mrs. Colón (now retired) was the laboratory technician, and Dr. Ferguson is chief of the San Juan Laboratories, Ecological Investigations Program, National Communicable Disease Center, Public Health Service. Dr. Jobin is research associate, Hydrodynamics Laboratory, Department of Civil Engineering, Massachusetts Institute of Technology, Cambridge. He formerly was assistant chief of the San Juan Laboratories.*

*This paper is based on one presented by Dr. Ferguson at the meeting of the American Society of Tropical Medicine and Hygiene in Atlanta, Ga., October 1968.*

to determine the cost of such a project, the Puerto Rico Department of Health and the San Juan Laboratories of the Public Health Service instituted a control program in Patillas, P.R.

The history of the project can be divided into three phases. The exploratory phase, 1952 through 1953, included the initial prevalence surveys and attempts at chemical control of the snail. From the experience gained in that period the control phase, 1954 to 1960, was organized. By the end of 1960, the efforts in Patillas were reduced to the third or maintenance phase because of the scarcity of snail populations.

Manuel Pérez Torres and Félix García, of the Puerto Rico Department of Health, developed much of the original planning and organization of this project. Emilio Avila, of the same department, directed the daily field operations in Patillas.

## Materials and Methods

The political boundaries of the municipality of Patillas coincide with the watersheds of the Patillas River and two small rivers to the east (figs. 1 and 2). The Patillas River starts at 700 meters above sea level in the central hills of Puerto Rico and runs south into an irrigation reservoir at an elevation of 67 meters. Average discharge into the reservoir is about 2 cubic meters per second. The initial reach of the river

is steep, but after leaving the reservoir the river flattens out considerably in the sugarcane area along the coast, continuing past the town of Patillas and then to the Caribbean. There are 200 kilometers of streams and 21,000 square meters of still-water habitats in addition to the reservoir, which has an area of 1.3 million square meters. An irrigation canal from the reservoir supplies water to the canefields west of Patillas.

Following the classic approach of centralized administration for control of vectorborne diseases, the field crews in Patillas as well as those in five nearby municipalities were directed by a project chief with his technical advisory group of biologists, sanitary engineers, and physicians. During the control phase of the project, a supervisor and five laborers with a vehicle worked full time in Patillas on the control of schistosomiasis. Sodium pentachlorophenate (NaPCP) at 6 milligrams per liter of water was applied to flowing streams for 24 hours; a V-notch weir was used for streamflow measurements. The chemical dose was regulated by a constant-head tank connected to drums containing 200 liters of NaPCP solution (fig. 3). In 1958 an automatic dispenser was introduced to decrease the amount of labor required for treatment of streams (1). Still water was treated with hand sprayers and briquets at a concentration of 10 milligrams of NaPCP per liter of water. Small seepage areas and swamps were drained by constructing ditches. Biological control was used also by planting *Marisa cornuarietis*, a predatory ampullarid snail, in the reservoir, which was too large for chemical control.

Although snail control was the major method employed during the control phase, routine but unevaluated treatment with stibophen (Fuadin) was given to more than 1,500 persons by the medical staff at the Patillas Health Unit of the Puerto Rico Department of Public Health. Health education was offered in the primary schools and rural communities. Drainage work was continued during the maintenance phase after 1960, but very little molluscicide was needed. Fuadin therapy was discontinued during this period because of poor results, and health education efforts were gradually reduced.

Prevalence of the disease and the effect of the program were evaluated from the annual survey

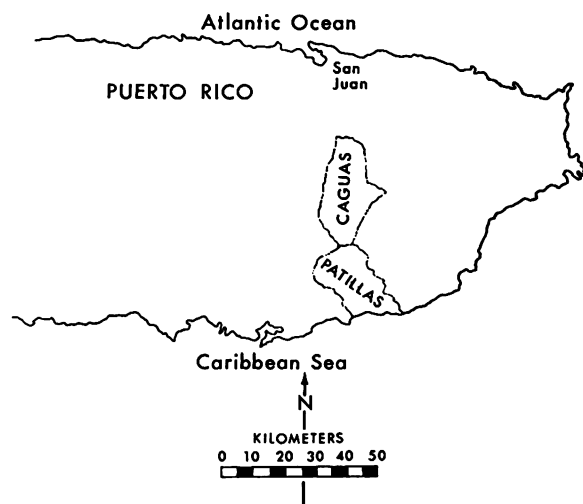
in November of each year. Single stool specimens were collected from all first-graders; prevalence of *Schistosoma mansoni* eggs was determined by using a formalin-ether concentration technique (2). In addition to the annual survey in Patillas, a similar survey was conducted in the adjacent municipality of Caguas, where no control work had been done (fig. 1).

## Results

Although populations of *B. glabrata* existed in 1952 throughout Patillas, by 1960 these snails were eliminated except for occasional colonies slightly upstream of the Patillas reservoir in the borough of Mulas (fig. 2). About every 2 years after 1960, snails appeared upstream of the reservoir and were killed with molluscicides during the dry spells when the river discharge dropped below 100 liters per second. *M. cornuarietis* became well established in the reservoir, and *B. glabrata* subsequently disappeared.

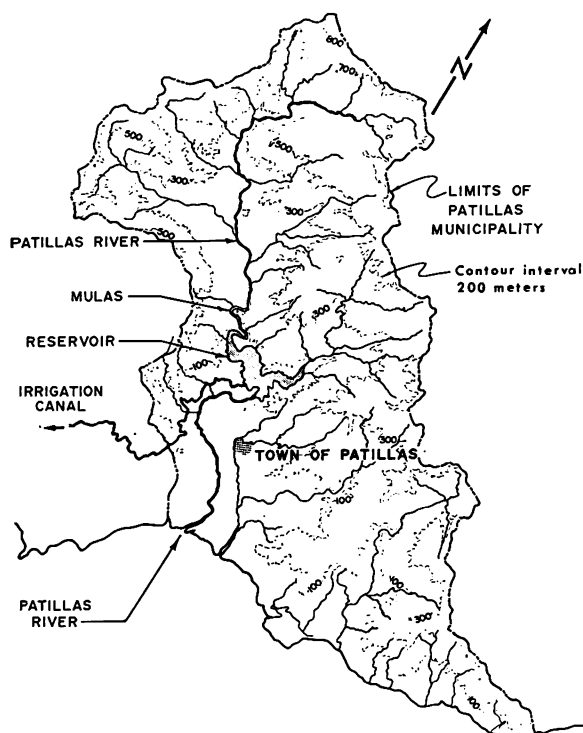
The prevalence rates used to evaluate progress in controlling transmission of the disease are presented in tables 1 and 2. Prevalence among 6-year-old children was originally slightly higher in Caguas (9.6 percent) than in

**Figure 1. Location of municipalities of Patillas and Caguas in Puerto Rico**



Location	1960 population	Annual rainfall (cm.)	Area (km. <sup>2</sup> )
Puerto Rico.....	2, 349, 544	175	8, 900
Patillas.....	17, 106	179	122
Caguas.....	65, 098	178	150

**Figure 2. Major water bodies and topography of Patillas, P.R.**



Patillas (7.7 percent), but the prevalence in 7-year-old children was greater in Caguas (13.8 percent) than in Patillas (11.5 percent). By 1960, when full-scale control efforts ceased and maintenance crews continued searching for snails, prevalence rates were still slightly higher in Caguas (3.2 percent in 6-year-olds and 4.4 percent in 7-year-olds) than in Patillas (0.4 percent in 6-year-olds and 1.4 percent in 7-year-olds). Moreover, the few cases of schistosomiasis detected in Patillas after 1960 were all from the single problem area of Mulas, where sporadic reappearance of *B. glabrata* occurred for several years. Despite rapid socioeconomic progress in Caguas, an increased prevalence was observed in 1966 as compared with the initial downward trend after 1953. Zero prevalence continued in Patillas among 7-year-olds.

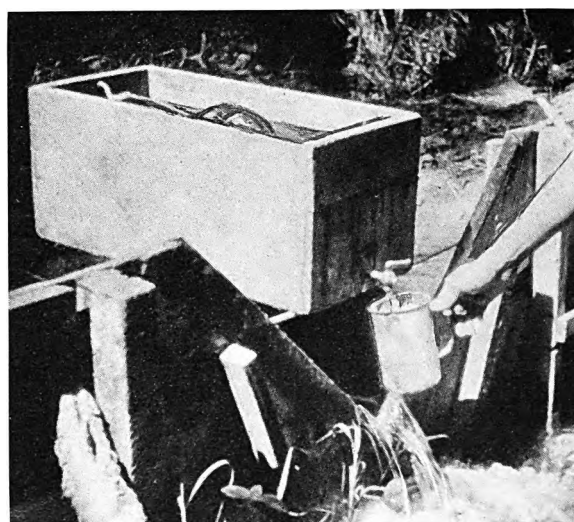
During the control phase, the cost for snail control averaged \$8,600 annually (table 3). In 1958, a typical year, the major expenses included 61 percent for wages; chemical costs were only 6 percent of the total. In the maintenance phase, about \$4,000 was spent annually on inspections for the reappearance of snails and on

the annual prevalence survey among first-grade school children. Maintenance costs also reflected the effect of a general salary raise among project personnel in the early 1960's.

### Discussion

The successful measures for snail control strongly supported the long-awaited campaign to eliminate schistosomiasis from all of Puerto Rico. The drop of prevalence to near zero among the children was very gratifying. Clearly, schistosomiasis was no longer a public health problem in Patillas. However, the scientific value of the work was obscured by the parallel decline of schistosomiasis in Caguas, the untreated area. Many unexpected factors apparently were operating in Caguas that were not present in Patillas, such as rapid urbanization and economic improvement (3).

The first successful control of schistosomiasis in Puerto Rico was carried out on Vieques in a shorter period and at a lower cost than for the Patillas project (4). The principal method in both projects was control of the snails with NaPCP, and the comparative suitability of the two areas for snail habitats probably accounts for the differences in response to control. Vieques is relatively dry, with only 115 centimeters of annual rainfall, or about 64 percent of the



**Figure 3. Inspector calibrating discharge of sodium pentachlorophenate from constant head dispenser into flowing water at V-notch weir on a small stream in Patillas, P.R.**

annual rainfall in Patillas; also the topography of Patillas is flatter and provides more habitats for snails.

When the molluscicide treatment costs were calculated on the basis of cubic meters of water treated, the difference between those for Vieques and those for Patillas was very slight. No measurements of the volume of water treated were

recorded, but costs were estimated from the amount of chemical used. Most applications involved standing water, which was treated at 10 milligrams of active ingredient per liter of water. About 89,000 cubic meters of water were treated each year in Patillas during the control phase at a cost of \$9.70 per 100 cubic meters. These costs were slightly higher than those for

**Table 1. Prevalence of schistosomiasis mansoni in first-grade school children in Patillas, P.R., 1952-66**

Year	6-year-olds <sup>1</sup>			7-year-olds <sup>1</sup>		
	Total sampled	Total positive	Percent positive	Total sampled	Total positive	Percent positive
1952.....	122	9	7.4	219	47	21.5
1953.....	182	14	7.7	192	22	11.5
1954.....	203	13	6.4	186	17	9.1
1955.....	105	4	3.8	133	10	7.5
1956.....	222	8	3.6	106	4	3.8
1957.....	155	3	1.9	146	2	1.4
1958.....	209	4	1.9	210	6	2.9
1959.....	194	3	1.5	172	6	3.5
1960.....	227	1	.4	212	3	1.4
1961.....	233	1	.4	217	4	1.8
1962.....	249	1	.4	194	0	0
1963.....	262	1	.4	162	2	1.2
1964.....	285	3	1.1	137	1	.7
1965.....	302	0	0	144	0	0
1966.....	340	2	.6	149	0	0

<sup>1</sup> The 6-year-old population in 1960 was 574 and the 7-year-old population was 589. Source, reference 3.

NOTE: All results are from single stool samples.

**Table 2. Prevalence of schistosomiasis mansoni in first-grade school children in Caguas, P.R., 1953-66**

Year	6-year-olds <sup>1</sup>			7-year-olds <sup>1</sup>		
	Total sampled	Total positive	Percent positive	Total sampled	Total positive	Percent positive
1953.....	94	9	9.6	145	20	13.8
1954.....	274	31	11.3	246	25	10.2
1955.....	288	19	6.6	444	52	11.7
1956.....	504	31	6.2	791	78	9.9
1957.....	590	32	5.4	372	20	5.4
1958.....	525	26	5.0	354	23	6.5
1959.....	246	10	4.1	269	7	2.6
1960 <sup>2</sup> .....	663	21	3.2	497	22	4.4
1961.....	727	16	2.2	563	15	2.7
1962.....	831	13	1.6	381	14	3.7
1963.....	1,079	14	1.3	444	19	4.3
1964.....	1,147	6	.5	245	3	1.2
1965.....	1,302	7	.5	396	5	1.3
1966.....	1,425	17	1.2	406	9	2.2

<sup>1</sup> The 6-year-old population in 1960 was 1,728 and the 7-year-old population was 1,795. Source, reference 3.

<sup>2</sup> Figures corrected from data in reference 4.

NOTE: All results are from single stool samples.



**Table 3. Total costs during the control phase of the schistosomiasis program in Patillas, P.R., 1954-60**

Year	Project expenses <sup>1</sup>	Cost of NaPCP <sup>2</sup>
Total cost.....	\$60, 383	\$6, 199
1954.....	5, 643	979
1955.....	8, 760	1, 558
1956.....	9, 404	1, 058
1957.....	9, 026	913
1958.....	10, 500	613
1959.....	8, 803	725
1960.....	8, 247	353
Average annual cost.....	\$8, 626	\$886

<sup>1</sup> Project expenses included all costs for the full-time supervisor and laborers working in Patillas, as well as vehicle, equipment, chemical, maintenance, and travel costs.

<sup>2</sup> 83 cents per kilogram.

Vieques (\$8.50) and much higher than the costs (\$1.22 per 100 cubic meters) for NaPCP application for schistosomiasis control in Egypt (4, 5). Treatment costs in Puerto Rico were higher than those in Egypt primarily because of higher labor costs.

Since Patillas has the same average rainfall as all of Puerto Rico, the cost figures should be more reliable than those from Vieques for projecting the cost of an islandwide program for snail control. By comparing the ratio of land mass of Patillas to that of Puerto Rico (fig. 1) and multiplying this factor by the total cost of the control effort (table 3), the estimated cost for the control phase of an islandwide program totals \$4.5 million—assuming that the characteristics of Patillas are representative of Puerto Rico and that the control methods are similar to those used in Patillas. Adjustments to this factor should be made for the use of better molluscicides and for the higher costs of wages and materials. With this consideration in mind, the experience in Patillas offers a useful cost estimate for controlling schistosomiasis in Puerto

Rico in the near future and marks an important step in progress against schistosomiasis in the Caribbean.

### Summary

A joint effort of the Puerto Rico Department of Health and the San Juan Laboratories of the Public Health Service to control schistosomiasis in Patillas, P.R., was started in 1952 as an interdisciplinary effort involving biologists, engineers, and physicians. Snails were controlled with a molluscicide, sodium pentachlorophenate, or by drainage of snail habitats. Fuadin chemotherapy was given to children.

By 1962 the prevalence of schistosomiasis among 7-year-old children in Patillas decreased to zero from the original 21.5 percent in 1952, and the snail population was virtually exterminated. The successful program in Patillas, at an average yearly cost of \$8,600, provided an estimate of less than \$5 million for the snail control phase of an islandwide program in Puerto Rico.

### REFERENCES

- (1) Klock, J. W.: An automatic molluscicide dispenser for use in flowing water. *Bull WHO* 14:639-646 (1956).
- (2) Ritchie, L. S., et al.: The possible effects of pH and specific gravity on the ether sedimentation procedure in concentrating eggs and cysts. *Amer J Trop Med Hyg* 9:444-449 (1960).
- (3) Department of Commerce: United States census of population: Puerto Rico PC(1)-53A through D-P.R., HC(1)-53-P.R. U.S. Government Printing Office, Washington, D.C., 1960.
- (4) Ferguson, F. F., Palmer, J. R., and Jobin, W. R.: The control of schistosomiasis on Vieques Island, P. R. *Amer J Trop Med Hyg* 17: 858-863 (1968).
- (5) Dawood, I. K., Dazo, B. C., and Farooq, M.: Large scale application of Bayluscide and sodium pentachlorophenate in the Egypt-49 project area. *Bull WHO* 35:357-367 (1966).

### Tearsheet Requests

Dr. F. F. Ferguson, U.S. Public Health Service, Box 52, San Juan, Puerto Rico 00902

# The Participation of Optometrists in New York City's Medicaid Program

RAYMOND S. ALEXANDER, M.B.A., M.S., LOWELL E. BELLIN, M.D., M.P.H., FLORENCE KAVALER, M.D., M.P.H., HAROLD NAJAC, M.D., and JESSE ROSENTHAL, M.S., O.D.

THE Medical Assistance Program of New York City is the largest publicly funded program for the provision of personal health care in any urban jurisdiction in the United States. During the fiscal year ending June 1, 1968, more than \$750 million were expended for services by physicians, dentists, pharmacists, optometrists, podiatrists, and chiropractors in private offices, hospitals, outpatient clinics, and nursing homes. In relation to the U.S. Medicaid program, the Medicaid program in New York City accounts for about \$1 of every \$4 spent for Medicaid and one of every five Medicaid patients enrolled.

Medicaid administrators elsewhere have consulted those in New York City for help with problems within smaller and less complex programs. To assess its present status and to predict the future of optometry in New York City's Medicaid program, it is helpful to be familiar with the history of optometry and welfare clients' health care in the city.

## Pre-Medicaid Provisions

The New York City Medicaid program came into being April 30, 1966, when the New York State Legislature passed title XI of the State Social Welfare Law implementing title XIX of the 1965 Federal Social Security Amendments. Previously, publicly funded health care was administered by the city's department of welfare, subsequently renamed the department of social services. A panel of physicians pro-

vided care at their private offices and on house calls, but ambulatory welfare patients received most of their care at the outpatient departments of municipal and voluntary hospitals. The clients received dental care at welfare department dental clinics. The city's health department provided care for children at well-baby clinics and at pediatric clinics. Optometrists were not on the public payroll under the system.

In 1963 the New York State Optometric Association initiated a lawsuit against the city, which resulted, for the first time, in the hiring of approximately 10 optometrists in health department clinics in 1965. These optometrists were supervised by ophthalmologists. The city's only other publicly funded optometric clinic, at the then experimental Gouverneur Ambulatory Care Unit, was staffed and supervised by the Optometric Center of New York (1).

Clients on public assistance received their

---

*Mr. Alexander, formerly assistant commissioner, Health and Medical Insurance Programs, New York City Health Department, is deputy administrator, Montefiore Hospital and Medical Center, Bronx, N.Y. The other authors are with the city's Medical Assistance Program. Dr. Bellin is executive medical director, Dr. Kavalier is deputy executive director, Dr. Najac is director of optical services, and Dr. Rosenthal is director of optometry. This paper is based on one presented by Dr. Rosenthal at the annual meeting of the American Academy of Optometry, Beverly Hills, Calif., December 9, 1968.*

glasses from the welfare department. After being examined, the patients went to a welfare center for measurements. A single optical company, holding a low bid contract with the department of welfare, dispensed glasses.

The costs were low, and quality control was seriously limited (2). Standards and tolerances of materials, although officially established, were virtually ignored. The average welfare patient had scant choice of frames. The waiting period for prescribed glasses was usually more than 1 month, with 2- or 3-month delays quite common. The vendors did not always adjust the glasses but merely handed them to the patient. Whether the patient could muster or maintain any dignity under such a system was conjectural.

Optometrists, among others in New York City, were dissatisfied with this system. In their view, the virtual exclusion of optometrists promoted poor quality vision care for welfare clients and cast an aura of doubt upon the legitimacy of optometry as a profession.

#### **The New York City Medicaid Plan**

In a statement on Medicaid to the New York City commissioners of health and social services, Alexander and Bellin delineated the changed concepts and policy concerning delivery of the city's publicly funded health care services (3).

The philosophy underlying the Medicaid program in New York City is that publicly funded health care can be comprehensive in nature. "Comprehensive" means the vigorous participation of all relevant professional disciplines: medicine, dentistry, pharmacy, optometry, podiatry, clinical psychology, etc., and all relevant health care institutions: hospitals, hospital outpatient departments, extended care facilities, homes for aged, half-way houses, etc.

"Comprehensive" means a blending of preventive, therapeutic and rehabilitative care. Explicitly, the Medicaid program must act to facilitate the patient's entry into the complex health care system of professionals and institutions, and to assist the passage of the patient from professional to professional, and from institution to institution according to his needs.

Inherent in this system is an insistence on high quality of service rendered in a fashion to insure the dignity of the individual. Interposed in the process is the Health Department's development of realistic standards of care and evaluation of the quality of services delivered.

\* \* \* \* \*

Unless the New York City Medical Plan encompasses a realistic methodology of health care standard setting, surveillance, and enforcement, the Medicaid Program must deteriorate to the level of traditional welfare medical care, which historically provided mediocre care to optionless poor. Indeed, the chief reason for the Health Department's participation in administering the Medicaid Program is to prevent such a development.

The mere fact of Health Department participation is clearly no automatic surety that future care for the poor will be to any significant extent better than what was provided in the past under the Welfare Department auspices.

Without the operative features of standard setting, surveillance, and enforcement of these standards built into the Medical Plan, one must predict that the overriding preoccupation of Medicaid will be determining client eligibility and making payments through professional and institutional providers of care, with the attendant "Poor Law" approach that such a policy had historically implied.

The optometrists in the city were encouraged by the change in the official attitude toward their profession reflected in this policy statement. Now, after 3 years of operation, the policies can be assessed in relation to the actual delivery of health services in the city. Has the pledge of "comprehensive care" been fulfilled with respect to optometric services?

#### **Optometrists' Participation**

To judge the quality of optometrists' participation, we shall invoke the principle of peer review. Dr. Henry B. Peters, a faculty member of the School of Optometry and the School of Public Health, University of California, has listed eight provisos as standards for participation by optometrists in comprehensive community health programs (4). How congruent are the realities of New York City Medicaid to these provisos?

CONDITION 1. *That optometrists be allowed to join with others to serve the health needs of all our people.*

New York City Medicaid provides compensation for every kind of licensed health care professional, including optometrists. The patient is free to choose the practitioner. The patient determines who will examine his eyes—the ophthalmologist or the optometrist. Preliminary statistical data suggest that more than 75 percent of the private vision services under New York City's Medicaid program are provided by optometrists.

New York City restricts remuneration to self-employed optometrists, eliminating payment of certain fees to corporations. Of the 979 registered optometrists in the city, 625 (63.8 percent) participated in Medicaid as of December 31, 1968. Many of those not participating are either retired or not in private practice. Others have refused to join the program, do not comply with the 25 hours per year postgraduate education

requirement, or have been suspended from the program for not adhering to established standards of practice. In comparison, participation by physicians is 44 percent, by dentists 66 percent, by podiatrists 67.2 percent.

CONDITION 2. *The optometrist be permitted to provide the highest quality and broadest scope of vision services to all people.*

The city's Medicaid administrators' attitude on this subject is promulgated in the standards of care set forth in the Health Department Bulletin effective June 1, 1968 (5), and is summarized as follows: not only is the optometrist permitted to provide the highest quality of vision services, but it is demanded of him. The Health Department Bulletin specifies minimum standards for test procedures, test time, instrumentation, and appliances (5). For example, no less than 30 minutes are to be applied to the average routine optometric examination, and the examination must include patient's history, external examination, ophthalmoscopy, uncorrected visual acuity, retinoscopy, subjective refraction (distance and near), quantitative muscle balance and fusion evaluation, gross visual fields, completion of forms (for school or drivers), and optometric diagnosis. As an example of instrument requirements, a slit lamp must be employed in the fitting of contact lenses.

For the standards and tolerances of spectacles, the Medicaid program has adopted the specifications of the United States of America Standards Institute. The individual optometrist may exceed any of the minimum standards of practice.

Regarding the scope of vision services, the program encompasses all aspects of optometric practice. There are codes for paying optometrists for examination, perimetry, orthoptic evaluation, orthoptic treatment, tonometry, contact lens fitting, fitting and dispensing prosthetics, subnormal vision examination, subnormal vision fitting and rehabilitation, frame repair, and adjustment. Thus, the New York City Medicaid program is using the full scope of optometric services.

CONDITION 3. *The optometrist's dignity and code of ethics be respected.*

The New York City Medicaid program respects the dignity and code of ethics of optome-

trists. However, auditing of services conducted under the auspices of the city health department may include reexamination of patients and office visits. Some practitioners resent any administrative control and might construe this aspect of the program as an affront to their professional dignity. As a purchaser of services, however, government is obligated to ascertain whether services provided are in accord with stipulated standards.

Auditing of services is necessary for the protection of the taxpayer who is financing the program and the patient-consumer who is receiving its benefits. Optometry is not singled out in this respect. It is subject to the same scrutiny as all other services for which Medicaid compensates the vendors.

CONDITION 4. *The optometrist be subject only to the judgment of his peers in his professional activities.*

Peer judgment is a concept the New York City Medicaid has accepted. Services requiring prior authorization are reviewed by the director of optometry. Visits to optometric offices are made by optometrists. The Optometric Center of New York supervises reexamination of samples of patients who have received services from optometrists under Medicaid.

Optometrists who allegedly abuse or do not conform to the standards of the program have the option of reviews before committees of their local society. In matters of fraud, investigative authorities are notified. In matters of quality, optometric authorities make determinations.

CONDITION 5. *The optometrist have freedom of professional judgment within his field of competence.*

In New York City Medicaid, freedom of judgment generally is respected, but there are a few exceptions. Although the minimum test procedures for some services have been specified, the right to render and be paid for certain services, such as orthoptics, is contingent upon review and prior authorization. Similar restrictions exist for the other health care disciplines. These restrictions reflect the acceptance of responsibility by the department of health rather than governmental interference.

Other limitations are not so general. For example, patients with aphakia or keratoconus

must have consent of an ophthalmologist before being fitted with contact lenses. Optometrists might interpret this requirement as an infringement on professional judgment. The point is debatable. The regulation represents an extra measure of caution in regard to these special patients. There are a few other comparable regulations. However, these regulations are minuscule when considered in the context of the overall optometry program.

CONDITION 6. *The optometrist have reasonable remuneration commensurate with his education and professional service.*

The schedule of fees in the Health Department Bulletin (5) is generally reasonable as evidenced by the participation of optometrists in the program.

CONDITION 7. *The optometrist have opportunity to enhance his knowledge and skills through continuing education.*

New York State and New York City Medicaid programs require optometrists who wish to participate in the program to attend approved courses an average of 25 hours per year. The New York State Optometric Association has cooperated with government in developing certified courses and in enforcing this provision.

On the other hand, the professional societies of medicine and dentistry have objected publicly to a compulsory continuing education provision for their respective members. These associations have characterized the compulsory feature of continuing education (50 hours per year for general medical practitioners and 25 hours per year for dentists) as "secondary licensure" and unwarranted encroachment into the legal prerogatives and obligations of the originally designated licensing authority. Indeed, two local dental societies in New York City have brought an injunction against the health department to block the enforcement of the provision pertaining to dentists.

CONDITION 8. *The optometrist participate in the planning process for his own and his colleagues' services.*

The basic standards of practice for all vision care professionals in New York City were drafted jointly by the director of optical services, an ophthalmologist, and by the director of optometry, an optometrist. These standards were further refined after a series of 12 meetings

with practicing optometrists, ophthalmologists, ophthalmic dispensers, lens and frame manufacturers, wholesale optical laboratories, and practitioners specializing in the fitting of low-vision aids and prosthetics. Before their publication, the standards were reviewed and revised by the permanent Medicaid Advisory Committee on Quality Vision Care. Four of the 10 members of this committee are optometrists. Thus, optometrists clearly are major participants in the basic planning process for optometric services.

In addition to establishing a committee on quality vision care, the city Medicaid administration has developed liaison with local professional societies to promote cooperation. The relationships have been particularly useful in auditing services and enforcing standards. Whenever possible, the Medicaid administration delays punitive action against a professional to enable his peer group to try to influence the practitioner to take corrective measures.

## Conclusions

The optometric component of the Medical Assistance Program of New York City correlates with the eight standards suggested by Dr. Henry B. Peters of the University of California to serve as guidelines for participation of optometrists in a comprehensive community health program. Practicing optometrists in New York City appear reasonably satisfied with the operative provisions of Medicaid, as evidenced by their percentage of participation.

Optometry has achieved prominence in municipal health care with the advent of Medicaid. New York City Medicaid, the largest Medicaid program in the country with an annual expenditure of more than \$750 million in the fiscal year ending June 1, 1968, and close to 1,800,000 enrollees, may be a useful prototype of how the professional optometrist can contribute to publicly funded comprehensive health care programs. The New York City Medicaid program has demonstrated that ophthalmologists and optometrists can work together productively.

## REFERENCES

- (1) Brown, H. J., and Alexander, R. S.: The Gouverneur Ambulatory Care Unit: A new approach to ambulatory care. *Amer J Public Health* 54: 1661-1665, October 1964.

- (2) Light, H. L., and Rosenthal, J.: Pilot study of quality and standards in filling spectacle prescriptions. *Public Health Rep* 80:401-404, May 1965.
- (3) Alexander, R. S., and Bellin, L. E.: Local medical plan. Medical assistance program. Department of Health, New York City, June 1968, pp. 1, 2.
- (4) Peters, H. B.: Optometric service in a comprehensive health program. *Amer J Optom* 45: 605-612, September 1968.
- (5) New York City Health Department: Instructions to participating ophthalmologists, optometrists, opticians and approved wholesale prescription laboratories. *Health Department Medicaid Bull* No. 5, 1967-68.

#### Tearsheet Requests

Florence Kavalier, M.D., Deputy Director of Medicaid, Room 326, 330 West 34th St., New York, N.Y. 10001

## Foundation of Thanatology Established

The Foundation of Thanatology, devoted to scientific and humanistic inquiries into and the promotion of the application of knowledge to the subjects of dying, reactions to death, loss and grief, and recovery from bereavement has been established.

The foundation will function as a nonprofit, charitable organization to service the fields of psychiatry, medicine, religion, psychology, the paramedical disciplines, social sciences, nursing, social welfare, philosophy, and theology, as well as to assist directly the bereaved.

The Foundation of Thanatology derived initial impetus from a group of more than 100 author-contributors to a series of books written for lay persons who deal with recovery from bereavement and a medical text for the health professions, entitled "Loss and Grief: Psychological management in medical practice," to be published by the Columbia University Press. Its board of professional advisers originally consisted of a group of contributors and creative consultants who were responsible for these books. It now includes persons in many professions and disciplines who have become interested in the foundation and have offered their services to carry forward the organizational, publications, and research activities.

The purposes of the foundation are as follows:

1. As a multidisciplinary organization, the foundation solicits the interest of all persons, who are concerned with the subjects set forth, and attempts to be of service to them.

2. Development of a publications program including "The Archives of the Foundation of Thanatology" (started in April 1969), to be sent to members and academic libraries; publication of a scientific-professional-pastoral journal, *The Journal of Thanatology*, beginning next year; publication of worthy manuscripts submitted to the foundation for this purpose; inauguration of an annual review volume; selected collected readings compiled as books; and the foundation transactions.

3. Sponsorship of an annual symposium with subsequent publication of papers and workshop proceedings as multidisciplinary books. The first of these, "Psychosocial Aspects of Terminal Care," will take place next year. The second is entitled "Psychopharmacologic Agents in the Care of the Terminally Ill and the Bereaved."

4. Sponsorship and direct initiation of an extensive retrospective and prospective research program in medicine, education, use of pharmacological agents, and nursing and divinity schools, in areas of the foundation's concern.

Associate membership in the Foundation of Thanatology or participation in its general efforts or any specific activity is open to all. Additional information can be obtained by writing to the foundation's president, Dr. Austin H. Kutscher, Columbia-Presbyterian Medical Center, 630 West 168th Street, New York, N.Y. 10032.

# Relating Health and Social Contacts to the Morale of Elderly Persons

ILSE J. VOLINN, Ph.D., and JESS B. SPIELHOLZ, M.D., M.P.H.

**I**N 1963 a group of public-spirited citizens in a metropolitan area of the Pacific Northwest discussed their concern about the well-being of elderly persons in their community. Together with board, committee, and staff members of voluntary and public agencies, they personally observed services provided in clinics, housing projects, and public recreation facilities. Plans for a household survey became formalized by 1965 when the division of health services, State department of health, and the planning division of United Good Neighbors offered to participate in further efforts to search for objective information on the subject.

Statistical data from the 1960 census were first examined for information relevant to local population trends. The demographic data helped to interpret the subjective concern expressed by citizens at large and by professional staff. Neither informal observations nor secondary data served to assess satisfactorily a possible gap between demand and supply of health and welfare services available in the community.

The decision was made at this point to con-

duct the survey, applying scientific principles of data collection and data analysis. Coupled with the survey was a built-in procedure for future action. An additional goal was to contribute to knowledge in the field of gerontology.

An overall ad hoc committee and five sub-committees representing specific areas of interest were selected. Consultants from a university and community representatives with wide experience in public health and social welfare were chosen for the study areas of health, personal and social adjustment, economics, housing, and recreation. After these groups defined several objectives to be accomplished by the survey, they assigned priority ratings to each informational item to decide whether to include it in the questionnaire.

## Methodology

The sample was a stratified cluster sample, and the primary sampling unit was the census tract. From the 1960 census figures, the 15 census tracts with the largest number of persons 55 years and older were determined. Because the census data were based on 1960 information and the survey was conducted in 1965, the lower age limit of 55 was used for survey sampling procedures. A purposive sample to include non-whites was added to the general sample.

Within each of the 15 census tracts, seven blocks were selected at random by using a map indicating block numbers. A table of random

---

*Dr. Volinn is research project director, health manpower project, and Dr. Spielholz is deputy director, Washington State Department of Health, Seattle. Mrs. Jane Dawson, an economist in the planning division of the Seattle United Good Neighbors, assisted in all phases of data gathering and analysis.*

numbers was used for the procedure. Households with persons in the desired age range were located by interviewers through door-to-door canvassing. One interview per dwelling unit was conducted. All institutions, retirement homes, nursing homes, and transient hotels were excluded from the sample.

The total return rate was 92 percent. The rejection rate was 8 percent; 4 percent consisted of persons who were unable to become respondents, and the rest refused to be interviewed because of their physical condition.

Table 1 shows that the sample of respondents drawn for the study is comparable in demographic characteristics to the noninstitutionalized aged population of the city as a whole.

Several city blocks were assigned to each interviewer as his work territory. The number and location of assigned sampling areas depended on population density, difficulty of terrain (the city is hilly), and an effort to put interviewers outside their own home territory. Each interviewer was given a map of his work area.

The intent to recruit interviewers within the same age range as the prospective respondents had been conceived during the early planning stages of the survey. Not known to the research staff at the time was that aged persons had been put in charge of data gathering in a survey conducted by the Newton (Mass.) Department of Health and the Medical Foundation, Inc. (1). Elderly male interviewers were employed to test the feasibility of using the skills of older people to gather quantifiable data.

In our study, like that in Massachusetts, elderly persons were used both to perform a specified task and to test the effectiveness of such an endeavor. Interviewers were recruited from several clubs of retired employees of local companies and through a golden age club of a low-income housing project. Of the initial 28 recruits, only 15 men and women from 55 to 77 years (median age 69) remained after three rigorous training sessions.

Interviewers' training consisted of discussion of general principles of survey interviewing, the sample design, and the survey instrument. Their assignments were explained at length, and difficult interviewing situations were anticipated through role playing. After the last training session, each trainee conducted a minimum of

three trial interviews. All completed questionnaires were evaluated for completeness, discrepancy of information, or other detectable errors of the interviewer. Weekly training and work evaluation sessions were held during the entire survey.

*The study instrument.* The questionnaire consisted of structured and open-ended questions which were categorized before coding. It was divided into the five topical areas (health, personal and social adjustment, economics, housing, and recreation) represented by the committees. This report pertains to physical and mental health items. The interrelationship of three variables—changes in health, changes in social relationships, and an expression of contentment—will be discussed. To determine the degree of contentment, a quantitative measure was selected, Kutner's (2) seven-item Guttman-type scale. That measure expresses the respondent's general outlook on life within a range of extreme pessimism to extreme optimism. It expresses a person's perception of his own contentment or well-being. This point is made because we considered using an anomie scale constructed by Srole (3) which expresses the respondent's perception of his social environment.

Limitations of the Kutner scale were discussed by Neugarten and co-workers (4). Two major shortcomings of the Kutner scale are its lack of validation against outside criteria and its assumption that psychological well-being is a unidimensional phenomenon. These shortcomings, however, do not invalidate the survey findings. In addition to the Kutner scale, measures of satisfaction related to each context area were applied.

*Pretest.* Six volunteers pretested the questionnaire with 25 respondents. Some of them had been assigned, others were self-chosen. Modifications of the questionnaire followed the pretest.

*Statistical analysis.* Trivariate and bivariate analyses were undertaken, and the degree of association between ordered variables was determined by the gamma measure, which was translated into a z score. Association between variables was considered significant if the z score was 1.96 or higher. The higher the z score, the greater was the confidence in the association between the variables.

The chi-square was used for significance tests



**Table 1. Demographic characteristics of the 1965 sample population (60 years and older) compared with those of the census population (55 years and older)**

Characteristics of sample population	Number	Percent	Characteristics of city's population	Number	Percent
Age:			Age (1960 census): <sup>1</sup>		
60-64-----	94	17.8	55-59-----	30,447	24.6
65-74-----	259	49.0	60-69-----	49,620	40.2
75 and older-----	176	33.2	70 and older-----	43,411	35.2
Sex:			Sex (1960 census): <sup>1</sup>		
Male-----	195	36.7	Male-----	56,993	46.2
Female-----	336	63.3	Female-----	66,485	53.8
Marital status:			Marital status (SMSA): <sup>2</sup>		
Single-----	61	11.5	Single-----	16,285	11.9
Married, living with spouse-----	194	36.6	Married, living with spouse-----	60,945	44.4
All other-----	276	51.9	All other-----	59,844	43.7

<sup>1</sup> U.S. Bureau of the Census: Census of population and housing: 1960. Census tracts, Final Report PHC (1)-142, U.S. Government Printing Office, Washington, D.C., 1962.

<sup>2</sup> Standard Metropolitan Statistical Area. U.S. Bureau of the Census: Detailed characteristics, Washington, 1960. Final Report PC (1)-49D, U.S. Government Printing Office, Washington, D.C., 1962.

when one or both of the variables tested was not ordered. All statistical data were based on actual responses. Nonresponses on specific questionnaire items were omitted to fulfill all requirements for use of the gamma measure. Magnitude of nonresponses can be detected by examining the totals of the statistical tables.

*Health and deteriorating health defined.* The concern of this study is to define health as perceived by the respondents and not clinical morbidity. Limitations of such research tools have been elaborated at length at the occasion of the National Health Survey (5). Correlation of self-perceived health and clinical health has been reported (6).

Lawton and co-workers (7) reported that self-perceived health and physician-rated health both provided meaningful indices of health. They concluded that there was no single factor of health which could be reduced to an operational definition. With increased generalization of the concept, the chances of inclusion of non-physical elements increased, and the authors concluded that it was possible to obtain an internally consistent measure of health from the older person himself (7). Sullivan (8) stated, "The health of individuals is classified by very different procedures in different situations; however, possibly the simplest procedure is to accept the individual's judgment of his own state of health, as is frequently done in everyday life." He further pointed out that most

morbidity concepts consisted of a combination of (a) clinical evidence, (b) subjective evidence, and (c) behavioral evidence. Our study deals only with subjective evidence.

Health attitudes were studied in a time perspective. The specific question asked was "Do you think your health is currently better, the same, or worse than 10 years ago?"

Sorokin and Merton (9) formulated the dual aspect of time. They juxtaposed quantitative astronomical time to qualitative social time. Social time was based on the premise that "Notions form eras in terms of some remarkable event which has social implication." They explained that in the field of psychology time is influenced by the number and importance of concrete events occurring in the particular period under observation.

The health related question in our study reflects qualitative social time which might have been shaped through the impact of a particularly traumatic morbidity event.

DiCicco and Apple (10) made the point that health became important to persons in their study only when it interfered with their daily activities or threatened their independence. Health self-evaluation does not necessarily depend on the factor emphasized by DiCicco and Apple. Baumgarten (11) distinguished three categories of health-illness orientation: (a) a general feeling of well-being, (b) absence of general or specific symptoms of illness, and (c)

measures of ability to perform. She reported that her second category, symptoms orientation, decreased with age. Persons affected with chronic illnesses probably learn to accept persistent physical shortcomings.

## Health

*Health studies.* To validate the self-reported changes in health conditions, additional health related questionnaire replies were considered. To assess a general satisfaction with their current health status, respondents were asked, "Do you consider your health as very good, good, average, poor, or very poor?" More than half of the respondents, 282 (53 percent) thought their health was very good or good, 157 (30 percent) thought it was average, and 92 (17 percent) stated it was very poor or poor.

When queried about current conditions of morbidity, 122 (23 percent) of the respondents denied having any such conditions, 230 (43 percent) identified one or more of the diagnostic categories, and the remaining 179 (34 percent) were noncommittal.

A question to determine conditions that were incapacitating followed. The exact wording was "Are your everyday activities limited?" Ninety-seven (18.3 percent) replied "yes," 160 (30.1 percent) "somewhat," and 274 (51.6 percent) said "no activity limitations." The following table summarizes the preceding data on the self-evaluation of 531 respondents.

<i>Self-evaluation</i>	<i>Number</i>	<i>Percent</i>
Health good or average.....	439	83
Health poor.....	92	17
No morbidity.....	122	23
Morbidity.....	230	43
Noncommittal.....	179	34
No activity limitations.....	274	52
Activity limitations.....	257	48

Temporal changes in self-perceived health will be discussed next. When asked how their health compared with their condition 10 years ago, slightly more than one-third reported it had deteriorated. The replies were categorized as follows.

<i>Health status</i>	<i>Number</i>	<i>Percent</i>
Remained the same.....	268	52.3
Improved.....	62	12.1
Became worse.....	182	35.5

Self-reported health has been discussed from different viewpoints of the respondents. Morale was determined by a quantitative measure. The

next step was to assess the relationship between the two variables.

*Health and morale.* In this study, morale was considered the dependent variable and health perception the independent variable. This relationship had been tested empirically. Lowenthal (12) reported that two-thirds of the mental patients participating in her survey stated that physical ill health was their main problem in life. Youmans (13) noted that the degree of perception of ill health was closely related to a high degree of pessimism, probably because the ill person is denied access to means of goal achievement.

*Survey results.* High morale was observed in 56 percent of the respondents who reported "improved health," in 50 percent reporting "unchanged health," but in only 19 percent reporting "deteriorating health" (table 2).

The z score (5.216) indicated that the distribution could not have occurred by chance. The gamma value (0.459) expressed the degree of association.

Based on the data in table 2, it can be concluded that respondents who thought that their health had not deteriorated were the most likely to have a rather optimistic view about themselves and life in general. But when health had declined during the past 10 years, the chances of such a point of view became unlikely.

## Friendships

*Social contact studies.* One of the many misconceptions about the aged is the assumption that involuntary isolation always brings about emotional suffering. Although such cases do occur, several studies reveal a reversed trend. Rose and Peterson (14) described the formation of subcultures composed of older people. This social phenomenon is explained by modern med-

**Table 2. Morale and perceived changes in health, in percent**

Morale	Better health (N=62)	Same (N=268)	Worse (N=182)
High.....	56.5	50.0	19.2
Average.....	27.4	33.2	40.1
Low.....	16.1	16.8	40.7

NOTE: Gamma, 0.459; z, 5.216.

ical advances which lead to an increased number of elderly persons within the population which, in turn, leads to various forms of self-segregation in social activities, in housing, and in independent economic and welfare arrangements. Rose and Peterson described the opportunities for new social roles for those who became conscious of their subgroup.

Cumming and Henry (15) challenged the assumption that stabilization of social contacts is important to the morale of the elderly. They noted that although morale was significantly related to social contacts, increasing age brought decreasing desire for interpersonal relationships. Maddox (16) observed a relationship between activities and morale only under certain conditions. Morale could be maintained in the absence of interpersonal activities if the subjects believed themselves to be in good health. In other words, respondents who considered themselves healthy had high morale even if they were socially isolated.

Quality of friendship ties as a dimension and their decrease in depth during later years is discussed by Rosow (17). Blau (18) reported that friendship ties among aged persons were greatly limited by socioeconomic differences as well as by differences in marital status.

The assumption that the quantity of social activities depends on the health status has been questioned by Rosow (17). On the basis of empirical studies he observed that "health is a substantially weak variable, much weaker than expected. . . . Contact differences are strictly a function of density (of living arrangements) with poor health contributing nothing to the pattern." He further asserts, "While poor health may restrict social life, this apparently applies mainly to outside activity. . . . The significance of the health factor remains ambiguous."

Sorokin and Merton (9) discussed the fact that reports of contracting social circles either reflect the loss of a particular close friend, marking qualitative social time, or an overall decrease of the social circle forming the quantitative time element. Rosow (17) referred to a study conducted in England in 1957 in which it was noted that the loneliest people were not those with fewest contacts but those who had had the greatest relative decline of contacts.

*Survey findings.* In our study, friendship

was defined as the respondent's perception of his social ties. No attempt was made to define the degree of closeness achieved in these social ties. Friendship, like health, was considered in a social time perspective.

Some general findings related to the subject will be discussed before considering changes in friendships. A crude composite score of social contacts was established on the basis of replies to the following three questions, "How many times during the past 7 days have you seen each of the following members of your family?" (The list included immediate family as well as members of an extended family group.) "How often during the past week have you heard by telephone or mail from some member of your family?" "How often during the past week did you get together with one of your friends?" Frequency of contacts was translated into scores. A zero score representing no contacts was reported by 6.2 percent of the total sample, or 33 respondents. Respondents with a range of contact scores of one to three were noted in 25.6 percent of the group. The majority, 68.2 percent, fell into the highest category of four or more social contacts. Two-thirds of the whole sample reported several social contacts during a week.

We can now proceed to consider friendships in the time perspective. The question asked was "Compared to 10 years ago, do you have now: more friends, fewer friends, about the same?" About one-fourth of the respondents felt their friendship circle was contracting; three-fourths reported unchanged or increasing social contacts. Table 3 shows the relationship of perceived changes in social contacts to morale.

Fifty percent of those whose friendships were increasing had high morale; those whose pattern of friendships was unchanged were some-

**Table 3. Morale by perceived changes in friendships, in percent**

Morale	More friends (N=83)	Same number (N=299)	Fewer friends (N=131)
High.....	50.6	43.1	25.2
Average.....	33.7	34.1	37.4
Low.....	15.7	22.7	37.4

NOTE: Gamma, 0.294; z, 3.030.

what less likely to express such feelings of general optimism. Only one-fourth of the respondents whose score showed high morale reported decreasing numbers of friends.

The z score (3.030) signified that the distribution could not have occurred by chance, but the gamma value (0.294) showed that statistically the degree of association between the two variables was relatively weak. By comparing the gamma values in table 2 (0.459) and table 3 (0.294), it becomes apparent that the relationship of friendships to morale was weaker than that of health to morale. About 40.7 percent of the respondents with deteriorating health had low morale, and 37.4 percent of those whose friendships were diminishing had low morale.

#### Morale, Health, and Friendships

The following discussion deals with three subsamples separately: respondents who thought their friendships had been diminishing, those who felt they had the same number of friends 10 years ago, and those who considered that their circle of friends had increased. A general comparison of the three subgroups precedes the detailed discussion.

<i>Friendships</i>	<i>Number</i>	<i>Percent of total</i>
Diminishing-----	136	25.7
Unchanged-----	307	58.0
Increased-----	86	16.3

It should be noted that the number of respondents in each of the three subgroups varied slightly from that reported in the following cross-tabulations, because respondents who did not reply to items of the morale scale were omitted from the computation.

*Diminishing friendships.* A strong relationship between perception of health changes and morale was observed in this group. Only 8 per-

**Table 4. Diminishing friendships by health and morale, in percent**

Morale	Better health (N=14)	Same (N=52)	Worse (N=64)
High-----	50.0	40.4	7.8
Average-----	35.7	36.5	39.1
Low-----	14.3	23.1	53.1

NOTE: Gamma, 0.582; z, 3.699.

**Table 5. Unchanged friendships by health and morale, in percent**

Morale	Better health (N=34)	Same (N=171)	Worse (N=93)
High-----	58.8	50.9	23.7
Average-----	20.6	33.9	39.8
Low-----	20.6	15.2	36.6

NOTE: Gamma, 0.400; z, 3.264.

**Table 6. Increased friendships by health and morale, in percent**

Morale	Better health (N=14)	Same (N=44)	Worse (N=24)
High-----	57.1	59.1	33.3
Average-----	35.7	27.3	41.7
Low-----	7.1	13.6	25.0

NOTE: Gamma, 0.312; z, 1.282.

cent of the respondents thought their health as well as their social contacts had been deteriorating. The morale of the majority, 53 percent of those who considered themselves thus doubly disadvantaged, was low (table 4).

*Number of friends unchanged.* The relationship between health perception and morale was weaker in the group with stable friendships than when friendships seemed to be diminishing (table 5). Statistically, this was measured through gamma. When friendships remained stable, 24 percent of those with deteriorating health had high morale, which is 16 percentage points more than in table 4. In the stable friendship subgroup, only 37 percent of those with deteriorating health had low morale compared with 53 percent in the preceding subsample.

*Increased friendships.* In this group of 82 respondents the relationship between morale and health had further decreased compared with the two subgroups discussed in the preceding paragraph (table 6). With a z value of 1.282, the null hypothesis could not be rejected.

The percentage of respondents with high morale whose health was deteriorating had increased to 33 percent from the preceding 24 percent and 8 percent in the respective subsamples. Only one-fourth of the respondents with de-

teriorating health had low morale compared with 53 percent of the group who reported that their friendships were diminishing.

## Discussion

It was shown that deteriorating health was significantly associated with morale when friendships were diminishing or remained stable. Of the respondents with deteriorating health and stable friendships, 36.6 percent had low morale, as did 53.1 percent of the respondents with deteriorating health and diminishing friendships. Only 25.0 percent of those with deteriorating health and increased friendships had low morale. Low morale was related to positive and negative changes in health and friendship status as shown in the following table.

Friendships	Health deteriorating		Same or improved	
	Number	Percent	Number	Percent
Diminishing-----	34	53	14	21
Same or improved..	40	34	40	15

Low morale was noted in 53 percent of the respondents with adverse changes in health as well as in friendships and in 34 percent of the respondents with adverse changes in health only. When changes were in friendships only and not in health, only 21 percent had low morale. As can be expected if neither friendships nor health was perceived as deteriorating, a relatively small percentage, 15 percent, were not optimistic toward life.

## Conclusion

Several possible applications of the findings to the practice of public health can be considered. Some applications would strengthen already existing programs, others could add renovative aspects. These observations could supply some guidelines in the setting of priorities in community services for the aged.

Because perception of changes in health status has great impact, the following procedures could be considered in working with elderly persons.

1. When treating elderly people with chronic illnesses, detailed explanations of the nature of the disease would be useful.

2. Physical rehabilitation should be related to emotional rehabilitation and morale.

These facts certainly are not new but only a confirmation of existing knowledge. The data further show how closely the social environment of the aged person is linked to his physical health.

The procedure followed in this study reinforced close cooperation between a statewide public health agency and the private sector of community welfare services. The goal of both agencies was to improve the physical and emotional welfare and the environment of elderly persons in general.

## Summary

A public agency and a private agency in a large city cooperated in a survey of the opinions of aged persons about their health and welfare. The ultimate goal was to develop community services based on personal expression of these needs.

A random sample of seven city blocks was drawn from the 15 metropolitan census tracts containing the largest number of residents 60 years old and older. Fifteen interviewers, similar in age to the study population, made personal calls and collected data, using a pre-tested questionnaire.

Data were quantified from a total of 531 respondents, and the following statistical measures were applied. Gamma was used as a measure of association among the three ordered variables. A z score tested the degree of certainty with which the null hypothesis could be rejected.

Relationships between health self-evaluation, perception of social ties, and personal morale are the only aspects of the survey discussed in this paper. The emotional impact of changes in health and changes in friendships was assessed. A higher association between health and morale than between social contacts and morale was discovered. An exception to this trend were those persons who believed that their circle of friends had been widening. When friendships were increasing, deteriorating health was not related to low morale. In contrast, when number of friends remained relatively stable or even decreased, deteriorating health could be expected to bring about low morale.

The findings of the study can be applied to the planning of community services for the

aged. Priorities should be assigned to preventive, curative, and physical rehabilitative services. Psychological rehabilitation, frequently linked to social activities, nevertheless warrants serious consideration.

#### REFERENCES

- (1) Kravitz, S., and Lambert, C., Jr.: Volunteer interviewers among the elderly. *Gerontologist* 3: 55-60, March 1963.
- (2) Kutner, B., Fanshel, D., Togo, A. M., and Langer, F. S.: *Five hundred over sixty*. Russell Sage Foundation, New York, 1956.
- (3) Srole, L.: Social integration and certain corollaries. *Amer Sociol Rev* 21: 709-721, December 1956.
- (4) Neugarten, B. L., Havighurst, R. J., and Tobin, S. S.: The measurement of life satisfaction. *J Geront* 16: 134-143, April 1961.
- (5) U.S. National Center for Health Statistics: Health interview responses compared with medical records. PHS Publication No. 1,000, Ser. 2., No. 7. U. S. Government Printing Office, Washington, D.C., July 1965.
- (6) U.S. National Center for Health Statistics: Interview data on chronic conditions compared with information derived from medical records. PHS Publication No. 1,000, Ser. 2, No. 23. U.S. Government Printing Office, Washington, D.C., May 1967.
- (7) Lawton, M. P., Ward M., and Yaffe S.: Indices of health in an aging population. *J Geront* 22: 334-342, July 1967.
- (8) Sullivan, D. F.: Conceptual problems in developing an index of health. *Vital Health Statist* 2: 1-18, May 1966.
- (9) Sorokin, P. A., and Merton, R.: Social time, a methodological and functional analysis. *Amer J Sociol* 42: 615-629, March 1937.
- (10) DiCicco, I., and Apple, D.: Health needs and opinions of older adults. In *Social studies of health and sickness*. McGraw-Hill Book Co., New York, 1960, pp. 26-39.
- (11) Baumgarten, B.: Diversities in conception of health and physical fitness. *J Health Hum Behav* 2: 39-49, spring 1961.
- (12) Lowenthal, M. F.: *Lives in distress, the paths of the elderly to the psychiatric ward*. Basic Books, Inc., New York, 1964.
- (13) Youmans, E. G.: Pessimism among older rural and urban persons. *J Health Hum Behav* 2: 132-137, summer 1961.
- (14) Rose, A. M., and Peterson, W. A.: *Older people and their social world, the sub-culture of the aging*. F. A. Davis, Co., Philadelphia, 1965.
- (15) Cumming, E., and Henry, W. E.: *Growing old. The process of disengagement*. Basic Books, Inc., New York, 1961.
- (16) Maddox, G. L.: Activity and morale. A longitudinal study of selected elderly subjects. *Social Force* 42: 195-204, December 1963.
- (17) Rosow, I.: *Social integration of the aged*. Free Press, New York, 1967.
- (18) Blau, Z.: Structural constraints of friendships in old age. *Amer Sociol Rev* 26: 429-439, June 1961.

#### Tearsheet Requests

Dr. Ilse J. Volinn, Washington State Department of Health, Room 815, Smith Tower, Seattle, Wash. 98104

# A Study of the Application of Laminar Flow Ventilation to Operating Rooms

A study of airflow patterns and levels of airborne contamination at various critical sites in a simulated operating room equipped with a horizontal unidirectional airflow system revealed a dependence upon the location of personnel and equipment in the airstream. Conventional air sampling techniques were used to recover the chemical and biological contaminants. The study was conducted in three stages to determine (a) the effect of static manikins on the distribution of uranine dye aerosols during simulated surgical procedures, (b) the effect of human volunteers on the distribution of viable micro-organisms during simulated surgical procedures, and (c) the distribution of viable micro-organisms by a normal surgical team during actual surgical procedures on normal animals. Two configurations of people and equipment, one typical of routine neurosurgery and one typical of routine cardiac surgery, were established and orientated both perpendicular and parallel to the direction of the airflow.

These techniques showed that laminar airflow used in an operating room can yield mean levels of viable airborne contamination at critical sites as low as 0.05 organisms per cubic foot of air. This level compares with five or more organisms per cubic foot of air for operating rooms ventilated by more conventional means. This low level of 0.05 organisms per cubic foot of air was reached without altering any of the normal techniques of the surgical team.

---

## Public Health Monograph No. 78

A Study of the Application of Laminar Flow Ventilation to Operating Rooms. *By Donald G. Fox, Ph.D.* Public Health Monograph No. 78 (PHS Publication No. 1894), 58 pages. U.S. Government Printing Office, Washington, D.C., 1969, 70 cents.

The accompanying article summarizes the contents of Public Health Monograph No. 78. Dr. Fox is currently on detail to the Planetary Quarantine Program, Bioscience Programs, Office of Space Science and Applications, National Aeronautics and Space Administration. At the time this study was prepared, he was chief, Hospital Unit, Environmental Services Branch, Division of Research Services, National Institutes of Health.

Readers wishing to read the full monograph may purchase copies from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Official agencies and others directly concerned may obtain single copies from the Public Inquiries Branch, Office of Information and Publications, Public Health Service, Washington, D.C. 20201. Copies also will be found in the libraries of professional schools and major universities and in selected libraries.

---

Results of these studies revealed that in the neurosurgery configuration the minimum airborne contamination was recovered in the sterile field when the long axis of the operating table was positioned perpendicular to the direction of the airflow with the air passing between the surgeon and the wound. The instrument nurse was positioned upstream of the patient. The minimum airborne contamination was recovered in the cardiac surgery configuration when the long axis of the operating table was also positioned perpendicular to the direction of the airflow. In this case, however, the surgeon was downstream of the patient while the instrument nurse was on the opposite side of the table and upstream of the patient.

Airflow studies indicated the position of equipment in the operating room and the extent to which it is draped can significantly alter

the airflow patterns and the levels of airborne contamination at critical work sites. No evidence was found to indicate that the use of a ceiling return air grille at the downstream end of the room adversely influenced the level of airborne contamination at critical worksites.

The capacity of this mechanical air-handling system to remove high levels of airborne contamination in short periods of time and to maintain this low level under repeated severe challenge indicated that this system would have broad application in the hospital environment. Among the most notable applications, besides the neurosurgery and cardiac surgery situations, would be in postoperative intensive care rooms and in the care of leukemic patients with low resistance and patients with organ transplants whose therapy had suppressed the natural immune defense mechanism.

## **The Elderly and Model Cities Programs**

Robert H. Finch, Secretary of Health, Education, and Welfare, and George W. Romney, Secretary of Housing and Urban Development, have announced a joint campaign to provide older people with increased services in the Model Cities program and to encourage them to take a greater role in planning and developing these services.

The campaign is carried on jointly by the Administration on Aging of HEW and the Model Cities Administration of HUD. John B. Martin, Commissioner of the Administration on Aging and President Nixon's Special Assistant for the Aging, and Floyd H. Hyde, Assistant Secretary (for Model Cities and Governmental Relations) of Housing and Urban Development share administrative responsibility.

Under the HEW-HUD agreement, every community participating in the Model Cities program is encouraged to assure representation of the elderly on each model city board or planning body. In Washington, the Model Cities Administration program development staff has hired a special consultant to review

projects for their content on aging and to assist local boards and planning bodies in involving older citizens.

The Administration on Aging has urged all State agencies on aging to offer their communities technical and financial assistance for model city developments and to designate a State agency staff member to be responsible for model city activities. In addition, AoA is directly funding research and demonstration projects in model city neighborhoods to provide information on services which can be adapted to needs in many communities. MCA will work with AoA in preparation and distribution of program models and guidance materials to community development agencies.

During August, September, and October, AoA and MCA jointly sponsored a series of meetings in various parts of the nation to stimulate greater involvement of older people in the program. Older people make up a significant percentage of the population of many model city neighborhoods, usually out of proportion to their numbers in the general population.



## PUBLICATION ANNOUNCEMENTS

*Address inquiries to publisher or sponsoring agency.*

*The Institute for Cancer Research. Fourteenth Scientific Report, 1966-1968.* 1969; 175 pages. Fox Chase, Philadelphia, Pa. 19111.

*Salaries and Related Personnel Practices of Voluntary Social and Health Agencies in New York City: September 1968.* By Janice Clinthorne. June 1969; 60 pages; \$2.50. Research Department, Community Council of Greater New York, 225 Park Ave. South, New York, N.Y. 10003.

*Twelfth Annual Institute of the Council of Physical Therapy School Directors on Community Health Aspects of Physical Therapy Education, October 28-November 1, 1968.* Edited by Nancy W. Lazlo, Lydia S. Holley, and Barbara White. February 1969. Department of Health Administration, School of Public Health, University of North Carolina, Chapel Hill, N.C.

*Internal Control and Internal Auditing for Hospitals.* Financial Management Series. 1969; 66 pages; \$4.25. American Hospital Association, 840 North Lake Shore Drive, Chicago, Ill. 60611.

*Comprehensive Health Planning in the States: A current status report.* Health Services Research Center Publication No. 2. July 1969; 24 pages; \$1.50. Health Services Research Center, Institute for Interdisciplinary Studies, American Rehabilitation Foundation, 1800 Chicago Ave., Minneapolis, Minn. 55404.

*The Science of Social Medicine.* By Alwyn Smith, Ph.D., M.B. 1968; 221 pages; 63s (\$7.56). Staples Press, 3 Upper James St., Golden Square, London W 1.

*The Organization and Continuing Education.* By Raymond W. Carlaw, M.P.H., Sandra Hellman, M.P.H., and Nicholas Parlette, M.P.H. May 1969; 29 pages. Program of Continu-

ing Education in Public Health, 655 Sutter St., San Francisco, Calif. 94102.

*The Utilization of the Medical Services and Its Relationship to Morbidity, Health Resources and Social Factors.* A survey report of the population of Finland prior to the National Sickness Insurance Scheme. By Tapani Puroila, Kai Sievers, Esko Kalimo, and Kauko Nyman. 1968; 243 pages. Publications of the National Pensions Institute of Finland, Series A: 3. Research Institute for Social Security, Helsinki 25, Finland.

*An Annotated Bibliography of Induced Abortion.* Edited by Gunnar K. af Geijerstam, M.D. 1969; 359 pages. Center for Population Planning, 1225 South University Ave., University of Michigan, Ann Arbor, Mich. 48104.

*The Virus Diseases of the Rice Plant. Proceedings of a symposium at the International Rice Research Institute, April 1967.* 1969; 354 pages; \$15. The Johns Hopkins Press, Baltimore, Md. 21218.

*The Content of Medical Practice. A research bibliography.* By James B. Tenney, M.D. 1969; 69 pages; \$1. Johns Hopkins University School of Hygiene and Public Health, Department of Medical Care and Hospitals, 615 North Wolfe St., Baltimore, Md. 21205.

*The Organisation of Medical Care Under Social Security. A study based on the experience of eight countries.* International Labour Office Studies and Reports, new series, No. 73. By Milton I. Roemer, M.D. 1969; 241 pages; \$2.75; Geneva. International Labor Office, Washington Branch, 917 15th St. NW., Washington, D.C. 20005.

**SOCIOECONOMIC CHARACTERISTICS OF DECEASED PERSONS, United States, 1962-1963 deaths.** *PHS Publication No. 1000, Series 22, No. 9; February 1969; 38 pages; 50 cents.*

### World Health Organization

*WHO publications may be obtained from the Columbia University Press, International Documents Service, 2960 Broadway, New York, N.Y. 10027.*

*The Medical Research Programme of the World Health Organization, 1964-1968. Report by the Director-General.* 1969; 350 pages; \$9; Geneva.

*WHO Expert Committee on Medical Rehabilitation. Second report.* WHO Technical Report Series No. 419. 1969; 23 pages; 60 cents; Geneva.

*Amoebiasis. Report of a WHO Expert Committee.* WHO Technical Report Series No. 421. 1969; 52 pages; \$1; Geneva.

*Developments in Fertility Control. Report of a WHO Scientific Group.* WHO Technical Report Series No. 424. 1969; 36 pages; \$1; Geneva.

*International Drug Monitoring. The role of the hospital. Report of a WHO meeting.* WHO Technical Report Series No. 425. 1969; 24 pages; 60 cents; Geneva.

*Principles for the Testing and Evaluation of Drugs for Carcinogenicity. Report of a WHO Scientific Group.* WHO Technical Report Series No. 426. 1969; 26 pages; 60 cents; Geneva.

*Biochemistry of Mental Disorders. Report of a WHO Scientific Group.* WHO Technical Report Series No. 427. 1969; 40 pages; \$1; Geneva.

*The Organization and Administration of Maternal and Child Health Services. Fifth report of the WHO Expert Committee on Maternal and Child Health.* WHO Technical Report Series No. 428. 1969; 34 pages; \$1; Geneva.

*Smallpox Eradication. Report of a WHO Scientific Group.* WHO Technical Report Series No. 393; 1968; 52 pages; \$1; Geneva.

**GEIJERSTAM, GUNNAR** af (Karolinska Hospital, Stockholm, Sweden): *Low birth weight and perinatal mortality, An attempt to define and explain differences between the United States and Sweden. Public Health Reports, Vol. 84, November 1969, pp. 939-948.*

An analysis of Swedish data on incidence and mortality of low-birth-weight infants and a comparison with available U.S. statistics indicates that the higher U.S. infant and perinatal mortality is caused mainly by a higher proportion of low-weight births. Possible reasons for Sweden's more favorable position in this regard may be found in

its lower birth rate, its homogeneous population which has no underprivileged minority groups, its social welfare system and compulsory health and sickness insurance, and its well-developed and highly specialized prenatal and maternity care.

All prenatal, delivery, and postnatal services are provided free of charge to everyone as a part of the

general health insurance. A screening system is used to detect women at risk for premature birth or other obstetrical complications so that they may be given specialized prenatal and delivery care. As a probable result, 75 percent of all Swedish children—but 80 percent of the pre-matures—are born in maternity hospitals or hospital departments which have obstetrical specialists. The resources of a modern hospital are not immediately available for less than 1 percent of all pregnant women.

**LANE, JOHN C.** (Armstrong High School, Richmond, Va.), and **SCOTT, ROBERT B.**: *Awareness of sickle cell anemia among Negroes of Richmond, Va. Public Health Reports, Vol. 84, November 1969, pp. 949-953.*

A survey of the adult Negro population of Richmond, Va., was conducted to determine the level of awareness of sickle cell anemia. Only 30 percent of those questioned had

heard of this disease. Of those who had heard of it, many apparently did not understand the nature of the illness.

Awareness of sickle cell anemia

was closely related to the educational level of the persons surveyed. Although the condition is one of the most common chronic illnesses among Negro children, the survey showed that the level of public knowledge of the condition is grossly disproportionate to its importance to the Negro community.

**NELSON, MORTON** (Alameda County Health Department, Oakland, Calif.): *Comparative study of two therapies for gonorrhea. Public Health Reports, Vol. 84, November 1969, pp. 980-984.*

The aqueous procaine penicillin G (APP) regimen recommended for treatment of gonorrhea by the Food and Drug Administration and the Public Health Service was compared with a lower dose regimen of APP plus PAM (penicillin with aluminum monostearate) in 225 patients at the Alameda County Health Department venereal disease clinic in Oakland, Calif., a port of debarkation from Vietnam.

The cure rates, as determined by culture, were 77 percent for the 106 patients in group A (all of whom were given 1.2 million units of aqueous procaine penicillin G plus 1.2 million units of aqueous procaine penicillin G with 2 percent aluminum monostearate) and 92 percent for the 119 in group B (the Food and Drug Administration and the Public Health Service regimen); the difference was statistically significant

at the  $P < 0.01$  level by chi-square test.

The 21 women of group B, who received 4.8 million units of procaine penicillin G suspension instead of the 2.4 million units given the men, were all cured. The men of this group had a higher cure rate than the men of group A, but the difference was not statistically significant. No adverse reactions were noted. Results indicated that gonorrhea can still be effectively treated by a single intramuscular injection of a sufficiently large dose of fast-acting penicillin.

**PALMER, JUAN R.** (Puerto Rico Department of Health), Colón, Aida Z., Ferguson, Frederick F., and Jobin, William R.: *The control of schistosomiasis in Patillas, Puerto Rico. Public Health Reports, Vol. 84, November 1969, pp. 1003-1007.*

A joint effort of the Puerto Rico Department of Health and the San Juan Laboratories of the Public Health Service to control schistosomiasis in Patillas, P.R., was started in 1952 as an interdis-

iplinary effort involving biologists, engineers, and physicians. Snails were controlled with a molluscicide, sodium pentachlorophenate, or by drainage of snail habitats. Fuadin chemotherapy was given to children.

By 1962 the prevalence of schistosomiasis among 7-year-old children in Patillas decreased to zero from the original 21.5 percent in 1952, and the snail population was virtually exterminated. The successful program in Patillas, at an average yearly cost of \$8,600, provided an estimate of less than \$5 million for the snail control phase of an island-wide program in Puerto Rico.

**SAID, MOHYI-ELDIN** (University of Alexandria, Egypt), **GOLDSTEIN, HYMAN, KORRA, AHMAD, and EL-KASHLAN, KHALIL**: *Visual acuity and field of vision of urban and rural Egyptians. Public Health Reports, Vol. 84, November 1969, pp. 955-964.*

A survey of the visual acuity and field of vision of the population was conducted in selected urban and rural areas in Egypt. The objectives were to determine the distributions of measurements of these two factors and to determine whether differences, if any, were associated with sex, age, or an urban-rural environment.

Two contiguous urban districts in Alexandria with an estimated population of about 125,000 and 23 vil-

lages located within a radius of 20 miles of Alexandria that had a combined population of about 125,000 were selected as the urban and rural frames from which to sample.

Complete household listings were available and, estimating that there were five persons in the average household, 4 percent random samples of households were drawn to yield about 5,000 persons for examination in the urban areas and a similar number in the rural areas. Because

of the difficulty in testing the visual acuity in the young, all children under 5 years of age were excluded from study. Standardized portable equipment was used to measure visual acuity and field of vision in the home.

The results of the study showed that visual acuity and field of vision decreased markedly in males and females in urban and rural areas starting at about 45 years of age. For both males and females, the visual acuity and field of vision of persons in urban areas were significantly better than those of persons in rural areas. Both of these visual measurements in males were significantly better than in females.

**UHRICH, RICHARD B.** (Public Health Service): *Tribal community health representatives of the Indian Health Service. Public Health Reports, Vol. 84, November 1969, pp. 965-970.*

The community health representative is the first health aide in an Indian community who is not an employee of the local, State, or Federal Government or the representative of an outside agency. He is an employee of the tribal group who he represents and to whom he is responsible.

For fiscal year 1969, Congress appropriated funds for the Community Health Representative Program and authorized the Indian Health Service to contract with Indian tribes for services of these health representa-

tives. The service was also authorized to provide suitable training for the 185 tribal members selected.

Community health representatives receive 4 weeks of intensive training at the Indian Health Service Training Center in Tucson, Ariz., followed by field training of varying lengths. The intention of the training is not to turn out a health specialist, but to educate the trainee to sense the health needs and bridge communication gaps between the Indian and non-Indian world.

Emphasis is placed on identification of health difficulties and use of resources available to serve them.

Although it is too early to provide an indepth evaluation of the impact of these workers, preliminary reports are optimistic. Their presence in the community where they visit individual homes and conduct group meetings has generated an increased demand for health services and brought many patients into health facilities who had previously accepted services infrequently.

On the basis of experience thus far, there is substantial evidence that the program will more than achieve its goal.

**LECK, IAN** (University College Hospital Medical School, London), **HAY, SYLVIA, WITTE, JOHN J., and GREENE, JOHN C.**: *Malformations recorded on birth certificates following A2 influenza epidemics. Public Health Reports, Vol. 84, November 1969, pp. 971-979.*

Records of the National Communicable Disease Center, Public Health Service, were used to identify periods when A2 influenza was widespread in California, Pennsylvania, and Wisconsin in 1955-61 and in 17 Standard Metropolitan Statistical Areas in the eastern United States that were affected by the epidemic of early 1963. Encoded abstracts of the

birth certificates of children born in the three States in 1956-61 and in the 17 metropolitan areas in 1962-65 were subdivided according to whether or not birth occurred approximately 26 to 40 weeks after the epidemics. The incidence of clefts of the lip and palate in these subdivisions of the 1956-61 data was compared, and the 1962-65 data were

used for similar comparisons of all the common major malformations that were distinguished in the records used.

Reduction deformities of the fingers were especially common among births following the 1963 epidemic. As in a previous series from Birmingham, England, the incidence of cleft lip did not increase after the first widespread epidemic of A2 influenza but was higher after subsequent outbreaks. The other defects examined showed no significant increase in incidence after epidemics.

**SBARBARO, JOHN A.** (Denver Department of Health and Hospitals), and **ONSTAD, G. DAVID:** *Preliminary report of a recall program for persons with inactive tuberculosis. Public Health Reports, Vol. 84, November 1969, pp. 985-988.*

The Disease Control Service of the Denver Department of Health and Hospitals recently initiated a program to recall persons whose tuberculosis had been diagnosed as inactive during a 10-year period. The purpose of the survey was (a) to discover active cases of tuberculosis and to eliminate further infection of the

population from this source and (b) to prevent potential reactivation of tuberculosis by offering each person who had bacteriologically negative results a course of prophylactic isoniazid.

From the 1,404 names selected from a register of persons with inactive tuberculosis, only 83 (6 per-

cent) were actually contacted. Of these persons, 69 failed to keep their appointment and did not request a re-appointment. Fourteen persons kept their appointments.

Chest roentgenograms and sputum cultures were obtained on all 14 persons. One of the 14 had relapsed to active disease. Five of the remaining 13 accepted preventive isoniazid chemotherapy; eight patients refused. The casefinding rate for the 14 persons was 71.4 per 1,000.

**CROOG, SYDNEY H.** (Harvard University School of Public Health), and **LEVINE, SOL:** *Social status and subjective perceptions of 250 men after myocardial infarctions. Public Health Reports, Vol. 84, November 1969, pp. 989-997.*

Two hundred and fifty men in Boston and Worcester, Mass., who had recently experienced a first myocardial infarction were interviewed in connection with a study of social and psychological factors in recovery from heart disease. The patients were between the ages of 30 and 60 and had no previous major ailments. In interviews conducted shortly be-

fore they were discharged from the hospital, they responded to a series of questions designed to elicit their perceptions of aspects of the development of their illness and of the degree and content of communication with their physicians.

An exploratory examination of possible relationships between the perceptions and social status of the

patients revealed that reported chest pain during the premonitory phase varied positively with status, while reported gastrointestinal symptoms varied inversely. A positive association was found between status and perception of emotional stress as an etiological factor. Patients from the lower status levels reported significantly less discussion with their physicians concerning the illness, and their perception of advice received indicated possible communication gaps concerning plans for work after convalescence.

**VOLINN, ILSE J.** (Washington State Department of Health), and **SPIELHOLZ, JESS B.:** *Relating health and social contacts to the morale of elderly persons. Public Health Reports, Vol. 84, November 1969, pp. 1013-1020.*

A public agency and a private agency in a large city cooperated in a survey of the opinions of aged persons about their health and welfare. The ultimate goal was to develop community services based on their needs as they expressed them.

A random sample of seven city blocks was drawn from the 15 metropolitan census tracts containing the largest number of residents 60 years old and older. Fifteen interviewers, similar in age to the study population, made personal calls and collected data, using a pretested questionnaire.

Data were quantified from a total of 531 respondents and the following statistical measures were applied. Gamma was used as a measure of association among the three ordered variables. A z score tested the degree of certainty with which the null hypothesis could be rejected.

Relationships between health self-evaluation, perception of social ties, and personal morale are the only aspects of the survey discussed in this paper. The emotional impact of changes in health and changes in friendships was assessed. A higher association between health and mo-

rale than between social contacts and morale was discovered. An exception to this trend were those persons who believed that their circle of friends had been widening. When friendships were increasing, deteriorating health was not related to low morale. In contrast, when number of friends remained relatively stable or even decreased, deteriorating health could be expected to bring about low morale.

The findings of the study can be applied to the planning of community services for the aged. Priorities should be assigned to preventive, curative, and physical rehabilitative services. Psychological rehabilitation, frequently linked to social activities, nevertheless warrants serious consideration.

*Public Health Reports*, published since 1878 under authority of an act of Congress of April 29 of that year, is issued monthly by the Public Health Service pursuant to the following authority of law: United States Code, title 42, sections 241, 245, 247; title 44, section 220. Use of funds for printing this publication has been approved by the Director of the Bureau of the Budget, August 26, 1963.

ORDER BLANK FOR PHR

To: Superintendent of Documents  
Government Printing Office  
Washington, D.C. 20402

Please enter my Subscription for Public Health Reports. I am enclosing Money Order ☐ Check ☐ for this subscription.  
\$6.50 a year; \$1.75 additional for foreign mailing. A discount of 25 percent is allowed for orders of 100 or more subscriptions. Subscriptions are accepted also for 3-year periods, for the convenience of subscribers, at the established annual rate.)

Please address the PHR as follows: \_\_\_\_\_



UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON, D.C. 20402. 1969

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Subscription price \$6.50 a year, \$1.75 additional for foreign mailing.

Price for a single copy of this issue is 55 cents.

Digitized by Google



U. S. DEPARTMENT OF  
HEALTH, EDUCATION AND WELFARE  
PUBLIC HEALTH SERVICE  
BETHESDA, MD. 20014

OFFICIAL BUSINESS



POSTAGE AND FEES PAID  
U. S. DEPARTMENT OF H. E. W.

If you do not desire to continue receiving this publication, please CHECK HERE ☐;  
cut off this label and return it to the above address. Your name will then be  
promptly removed from the appropriate mailing list.

Public Health Reports

ph  
r



DECEMBER 1969 Volume 84 Number 12

Including ANNUAL INDEX

# PUBLIC HEALTH REPORTS

## *In this issue*

**Trends in Hospital Use in the U.S.**

**Alcohol Levels and Home Accidents**

**Denver's Neighborhood Health Centers**

**Leprosy in U.S. Military Veterans**

**Rabies Vaccinations in Illinois**



U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Public Health Service

Digitized by Google







CONTENTS	PAGE
Denver's neighborhood health program..... <i>David L. Cowen</i>	1027
Use of the survey technique to achieve a highly immunized preschool population..... <i>J. M. Bistowish and Steven J. Barid</i>	1032
Trends in hospital use..... <i>Keith O. Taylor</i>	1037
Alcohol level and home accidents. A study of emergency service patients..... <i>Henry Wechsler, Elizabeth H. Kasey, Denise Thum, and Harold W. Demone, Jr.</i>	1043
Occurrence of leprosy in U.S. veterans after service in endemic areas abroad..... <i>Merlin L. Brubaker, Chapman H. Binford, and John R. Trautman</i>	1051
Parenteral medroxyprogesterone as a contraceptive agent.. <i>F. Douglas Scutchfield and W. Newton Long</i>	1059
Predictors of innovative behavior among local health officers..... <i>Marshall H. Becker</i>	1063

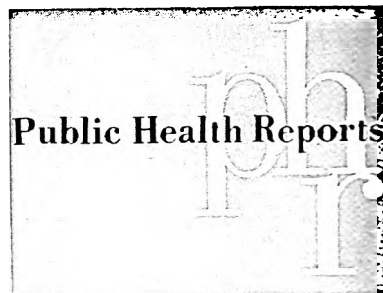
continued

### frontispiece

Boys learn about a dentist's office from hygienist at Denver's Eastside Neighborhood Health Center. Report on Denver's comprehensive care program begins on p. 1027.

CONTENTS continued

	PAGE
Epidemiology of rabies vaccinations of persons in Illinois, 1967-68.....	1069
<i>Russell J. Martin, Paul R. Schnurrenberger, and Norman J. Rose</i>	
Epidemiology of human exposure to rabid animals in Illinois.....	1078
<i>Paul R. Schnurrenberger, Russell J. Martin, Gavin L. Meerdink, and Norman J. Rose</i>	
The relevance of Yoruba medicine men in public health practice in Nigeria.....	1085
<i>Zacchaeus A. Ademuwagun</i>	
Effect of improved sanitary facilities on infant diarrhea in a Hopi village.....	1093
<i>A. Rubenstein, J. Boyle, C. L. Odoroff, and S. J. Kunitz</i>	
1969 index.....	1101
Short reports and announcements:	
Grant to develop group practices.....	1031
New Indian health centers.....	1036
Education notes.....	1042
Federal publications.....	1077
Survey of drug use among Michigan students.....	1084
Program notes.....	1092
Synopses.....	1098



MANAGING DIRECTOR

EDWARD J. McVEIGH

*Assistant Administrator for Information, Office of Information, Health Services and Mental Health Administration.*



STAFF

Keith Kost, M.P.H.	<i>Editor</i>
Marian K. Priest	<i>Managing Editor</i>
Esther C. Gould	<i>Asst. Managing Editor</i>
Eugene Fite	<i>Art Editor</i>

*Address correspondence to Editor, Public Health Reports, Public Health Service, Department of Health, Education, and Welfare, Lee Building, 6935 Wisconsin Avenue, Chevy Chase, Md. 20015.*

Opinions expressed are the authors' and do not necessarily reflect the views of *Public Health Reports* or the Public Health Service. Trade names are used for identification only and do not represent an endorsement by the Public Health Service.

For subscriptions to *Public Health Reports*, please use the order form on the inside back cover.

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

ROBERT H. FINCH, *Secretary*

ROGER O. EGEBERG, *Assistant Secretary for Health and Scientific Affairs*

PUBLIC HEALTH SERVICE

HEALTH SERVICES AND MENTAL HEALTH ADMINISTRATION

JOSEPH T. ENGLISH, *Administrator*

# Denver's Neighborhood Health Program

DAVID L. COWEN, M.D.

THE Denver (Colo.) Department of Health and Hospitals has developed a system of comprehensive health care for Denver's low-income residents. It provides continuous, family-centered care for the medically disadvantaged—persons whose previous care has been almost entirely crisis-oriented and whose experience with preventive care has been scant.

This system is designed to use efficiently funds available from all sources, to provide quality care that is available and acceptable to the community, to make maximum use of existing institutions and staff personnel, to acquire and encourage participation of residents, to develop and train new health professionals, and to demonstrate the reality and value of comprehensive health care.

Denver's neighborhood health program is funded from Federal, State, and local sources. The Denver Department of Health and Hospitals recognized that, in carrying out its traditional city hospital and public health functions, it was not meeting urgent needs in Denver. Early in 1964, the department started working with Denver's mayor to seek ways of improving this situation. When Congress passed the Economic Opportunity Act in August 1964, Denver was prepared, and within days its War on Poverty Agency, now known as Denver Oppor-

tunity, Inc., was incorporated. A study group on medical care and health services, headed by the department's director of public health and preventive medicine, was already devising means of attacking the city's health care problems.

A proposal for neighborhood health centers to serve as focal points of all health activities in low-income areas was presented to the board of the War on Poverty Agency in September 1964. In December, the board approved a plan for a neighborhood health center to be established in an area with a target population of about 20,000. Most residents were Negroes with low incomes. Funded by the Office of Economic Opportunity in August 1965, the Eastside Neighborhood Health Center opened in March 1966.

Acceptance of the eastside center by neighborhood residents was overwhelming. Their reaction was convincing evidence that decentralized facilities were a satisfactory and acceptable means of bringing 20th century medicine to low-income citizens. Planned to accommodate 450 patient visits a week, the eastside center now is averaging more than 2,000 visits a week. The center was remodeled early in 1968 to accommodate such a patient load. In 1968 alone, 106,800 patient visits were recorded. By the end of 1968, the Eastside Neighborhood Health Center had registered almost 30,000 patients and had recorded more than 230,000 visits.

Within 3 months of the opening of the eastside health center, the department of health and hospitals submitted to OEO a proposal for a second neighborhood health center to serve 20,000 to 25,000 low-income residents of the

---

*Dr. Cowen is manager of the Denver (Colo.) Department of Health and Hospitals. The paper is a revised and updated version of one given at the annual meeting of the Confederation of Western Affiliates of the American Public Health Association of Seattle, Wash., on June 26, 1968.*

city's west side. The West Side Neighborhood Health Center opened in late April 1968 and, by the end of January 1969, had registered nearly 16,000 patients. In the first 9 months of operation, the center recorded 56,500 patient visits.

### **Funding**

During the planning of the first neighborhood health center, the department obtained funds from the Children's Bureau to provide maternity and infant care services to eligible mothers in decentralized facilities throughout Denver. The department was also planning, with the Denver Children's Hospital and the University of Colorado School of Medicine, to provide health care to children. Shortly after the eastside center opened, the department obtained a grant from the Children's Bureau for Denver's Project CHILD, which was designed to provide comprehensive, preventive health care for children under 19 years old. Twelve small health stations were to be established throughout the poverty areas to provide pediatric services. To assure continuity of comprehensive care, OEO agreed to fund adult care at these stations.

The OEO program, Project CHILD, and the maternity and infant care project were combined with other categorical grants and existing programs of the department of health and hospitals to form the neighborhood health program, a system of truly comprehensive communitywide services. Support of the program was broadened further in June 1968, when the department received a grant from the Public Health Service to fund establishment of five of the health stations.

In 1968, neighborhood health program grants included \$3.5 million from OEO, \$1.3 million from the Children's Bureau for Project CHILD, \$1 million from the Children's Bureau for the maternity and infant care project, \$689,000 from the Public Health Service, and approximately \$1 million from other categorical grants and existing department programs.

Because grants from the Children's Bureau have failed to increase as the program expanded, support from the Public Health Service has made it possible to continue development of the citywide system of health facilities as originally planned.

The Denver plan calls for establishing 12 small health stations within walking distance for most persons in low-income areas. Seven stations are in operation. For most residents, these are the point of contact with the neighborhood health program.

### **Staffing Patterns**

Depending on the patient load, a typical station is staffed by a family physician, one or two pediatricians, an obstetrician for maternity and family planning sessions, two public health nurses, a registered nurse, two or three pediatric nurse specialists, a licensed practical nurse, a social worker, a nutritionist, a nurses' aide, three or four clerk typists, a statistical clerk, three or four family health counselors, and a delivery clerk.

Such a staff can take care of all the normal health problems of 3,000-5,000 patients—check-ups, immunizations, simple laboratory tests, and treatment and medications (dispensed by physicians) for most noncritical illness. Patients who need more specialized care are referred to backup facilities.

Backup support for the stations are the two larger neighborhood health centers offering a complete range of outpatient services and three participating hospitals—Denver General, University of Colorado Medical Center, and Children's—which provide inpatient treatment and specialized diagnostic and consultative services.

The participating hospitals are responsible for recruitment of physicians to staff stations in their geographic area. The department of health and hospitals is responsible for other aspects of the neighborhood health program. Nurses from the public health division's Visiting Nurse Service staff all the program facilities. Heads of departments of Denver General Hospital recruit program staff and supervise them. Laboratory and X-ray work is done at Denver General Hospital, and the hospital pharmacy supplies all medications. The department of health and hospitals is responsible for administrative operation and maintenance of the neighborhood facilities.

Experience in all health facilities of the department has indicated the importance of full-time physicians to the program's goal of giving continuous, comprehensive care. Full-time phy-



**Pediatrician of the neighborhood health program examines a young patient**

sicians can most easily establish the personal confidence so important in any physician-patient relationship, and they fulfill most efficiently an essential function in comprehensive care—referral of patients to ancillary services.

The Eastside Neighborhood Health Center has four full-time pediatricians, seven other full-time physicians, and four full-time dentists. Of 550 physician hours of service per week at the health center, 440 are provided by full-time persons who range from general practitioners to board-qualified specialists in several fields.

In the newer West Side Neighborhood Health Center, the physician staffing pattern is somewhat different. Four of the 12 full-time physicians are primary physicians such as those advocated in the Millis report. These men, who have had post graduate training in internal medicine and pediatrics, and some in psychiatry, often see all members of a family and refer some

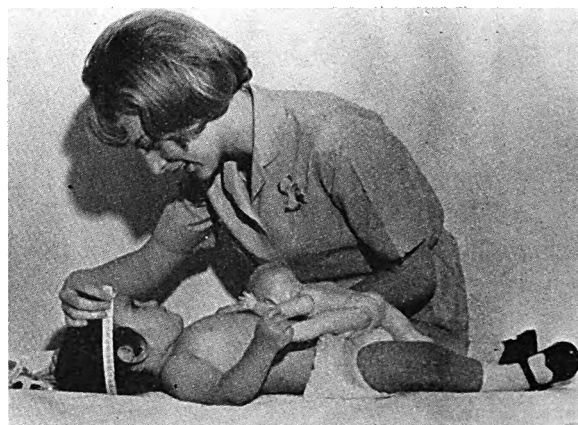
for needed care to specialists at the center or a backup hospital. The remainder of the west side physician staff consists of five pediatricians and and three internists. Specialists in obstetrics, dermatology, podiatry, allergies, urology, surgery, and pulmonary diseases serve part time.

### **Community Involvement**

We in the department of health and hospitals regard community involvement as prerequisite to an effective program. We used several methods to involve the community in establishing the west side health center. In December 1966, even before the center was funded by OEO, interested members of the four action councils in the area started searching for a suitable building. The action councils, whose members are elected by the residents of an area, are part of the operation of Denver Opportunity, Inc. Members of the West Side Health Board, who are appointed by the action council chairmen, narrowed the choice to two locations.

During remodeling of the building, neighborhood people helped program administrators recruit staff for the new center. The personnel committee of the West Side Health Board screened approximately 1,500 applications from area residents to fill the 90 neighborhood aide trainee positions on the 180-member opening staff of the west side center. The personnel committee of the East Side Health Board fulfills a similar function for the other health center and its satellite stations.

The personnel committee of each neighborhood health board selects three suitable appli-



**Pediatric nurse specialist checks a child at Mariposa Health Station**

cants for every trainee position which opens in a station or center in its target area. The administrator of the facility and the section supervisor, who may be a laboratory technician, nursing supervisor, dentist, or social worker, interview the three applicants and together they choose the person to fill the position.

Half of the staff at the west side center are neighborhood people; 90 of the east side center's 200 employees are residents of its service area. Indigenous employees are working in all the other neighborhood program facilities as well as at Denver General Hospital.

All neighborhood personnel in the program are employed under a special training category, neighborhood aide trainee, created by the city's civil service system. The OEO-funded training service of the department of health and hospitals conducts the trainees' general orientation. On-the-job training is the responsibility of the professional supervisor. The training period is limited to 2 years, but many aides are ready to assume jobs in the community within a few months. They may be recommended by their supervisors for promotion to career service positions after a minimum of 6 months as a trainee.

More than 75 trainees have been certified for and placed in career service positions, and many other trainee graduates are now employed by other public agencies or by private businesses. Aides have performed exceptionally well in nursing, social service, mental health, dentistry, admissions, health education, medical records, research and program development, pharmacy, transportation, laboratory, and X-ray departments and as family health counselors and neighborhood representatives.

As is indicated by the proportion of the total staff they comprise, neighborhood employees carry a large part of the workload in the program. More significantly, perhaps, they serve as links with and interpreters of the poverty community. They make traditional health professionals aware of what it is like to live in a world without hope. They inform area residents about health services and provide patients with the personal support which often makes the difference between success and failure in such programs. Perhaps the most valuable innovation of the neighborhood health program has been the acceptance of trainees in the civil service sys-



**Eastside health center staff member counsels a patient**

tem of a local government and in other health agencies, an acceptance that enables them to participate fully in the existing economic system.

### **Innovations**

Other innovations have been incorporated in the Denver program. Patient registration and treatment are on a family basis. When one member of a family comes in for care, other members are registered and scheduled for appointments. For children especially, the importance of preventive checkups and immunization is emphasized. The clinic chart of a patient is accompanied by information on the entire family. Thus a health station social worker, consulted by the public school about a child with learning problems, has at hand results of the child's developmental screening tests and his health history as well as information about the conditions of his home, parents, and siblings—all possible influences on his behavior at school.

Another innovation in the Denver program has been to create a new professional role for nurses, the pediatric nurse specialist. These pub-

lic health nurses have completed a special 4-month course under Dr. Henry Silver of the University of Colorado Medical School and are continuing their inservice training under the supervision of the program's pediatricians. They perform the time-consuming duties of history taking, anticipatory guidance, and physical evaluation, thus giving the supervising pediatricians more time to see patients.

This approach to health care has brought changes to medical training at Denver General Hospital. The hospital's outpatient medical clinic is in its second year of operation as a continuing care clinic. Thirty-three interns, on a rotating basis, spend half a day each week for 1 year as primary physicians for outpatients. Their patients' total health care is their responsibility, and the interns must give the care personally or get appropriate consultations, hospitalization, and so forth, with the patient always returning to his original clinic physician. This arrangement has proved to be beneficial and satisfactory to patients, and, equally important, the staff of the department finds that the continuing care clinic offers valuable training and experience in teaching three-dimensional patient care.

The neighborhood health program provides for many patients their first friendly contact

with the health establishment. Patients have indicated they appreciate the personal, friendly atmosphere of the small neighborhood facilities almost as much as they do the health services received. One patient said of the staff, "I have a feeling they care if you get well."

### Conclusions

The Denver program is demonstrating, we think, that a city hospital and a city health department can do more than provide grudging or indifferent care—that it can indeed provide all who need health care with quality care. We recognize the unique advantages of our combined department of health and hospitals in marshaling available Federal health care funds and in providing an integrated system of neighborhood facilities throughout low-income areas. Nevertheless, we believe this combination—communitywide planning, multiple funding sources, and personnel from the private sector, a medical school, and the health department—represents an accomplishment and a pattern that is replicable in many other communities.

### Tearsheet Requests

Dr. David L. Cowen, Denver Department of Health and Hospitals, W. 6th Ave. and Cherokee St., Denver, Colo. 80204.

## Grant To Develop Group Practices

A Public Health Service grant of \$204,744, to develop 24 prepaid medical group practice plans across the nation, has been awarded to the Group Health Association of America. This grant, sponsored by the Partnership for Health Program, raises to more than \$1 million the current Community Health Service support for development of medical group practices.

Such prepaid group practice plans allow physicians of many specialties to share records, staff, and facilities under one roof to provide patients with comprehensive health services in the most economical and efficient manner. These 24 plans will serve initially an estimated 400,000 members.

Group Health Association of America, in Washington, D.C., is a national organization of prepaid health plans. These plans include such large groups as Kaiser Permanente in California and Oregon, and the Health Insurance Plan of Greater New York. GHAA plans to coordinate the development of the 24 new plans within 5 years.

# Use of the Survey Technique to Achieve a Highly Immunized Preschool Population

J. M. BISTOWISH, M.D., and STEVEN J. BARID, B.S.

**M**ETROPOLITAN Nashville and Davidson County form a community of about 480,000 people including approximately 44,000 preschool children. The area is served by the Metropolitan Health Department which is headed by a director and a five-member board of health.

The department maintains an immunization division to evaluate and respond to the immunization needs of the community. The head of the division, who is responsible to the director of health, has a staff of two clerk-secretaries and four public health field representatives. Professional personnel from the nursing division administer the immunizations.

A goal of the health department is to see that all infants and children in the metropolitan area are immunized against poliomyelitis, diphtheria, pertussis, tetanus, smallpox, and rubeola at the earliest recommended age or as soon after as possible. A health-index survey was conducted in January 1964 to determine the immunization status of preschool children in the community.

## Methods

The 1964 survey was directed by Dr. Robert E. Serfling and Mrs. Ida L. Sherman of the National Communicable Disease Center, Public Health Service. The fieldwork was done by 22 teams, each consisting of a nurse or sanitarian from the Metropolitan Health Department and a volunteer.

The purpose of the survey was to determine the percentage of preschool children immunized against poliomyelitis, smallpox, diphtheria, pertussis, and tetanus. Although the measles vaccine was licensed in 1963, it was not added to the Public Health Service's immunization program until 1965.

A sample of 1,760 dwelling units was chosen. The sample was stratified according to three broad socioeconomic levels (upper, middle, and lower) on the basis of three indices (education of the father, crowding, and conditions of housing) as reported by census tract in the 1960 census. Also included were two groups of census tracts in which 90 percent of the population was reported to be nonwhite.

An interview team visited each dwelling unit and obtained information about the immunization status of preschool children in 1,730, or 98 percent, of the 1,760 households. This survey revealed the following immunization levels for

---

*Dr. Bistowish is director of health, Metropolitan Health Department, Metropolitan Government of Nashville and Davidson County, Nashville, Tenn. Mr. Barid is a public health adviser assigned to the department by the Immunization Branch, State and Community Services Division, National Communicable Disease Center, Public Health Service, Atlanta, Ga. The program was supported by a grant originally awarded under Public Health Service project No. V-65-43-79.*



the 1- through 4-year age group: 60 percent had completed a basic series of immunizations against poliomyelitis; 72 percent had completed a basic series against diphtheria, pertussis, and tetanus; and 47 percent had been vaccinated against smallpox.

On June 1, 1965, the Public Health Service awarded the health department an immunization project grant to provide all preschool children with a complete basic series of immunizations, including measles. Two programs were established to accomplish the purpose of the grant.

1. A followup of all infants born after April 1, 1965, using birth certificates as a basis.

2. A separate followup to reduce the backlog of unimmunized preschool children not included in the first program because they were born elsewhere or before April 1, 1965, or for other reasons. This report deals with the second program. The Public Health Service, as part of the project grant award, assigned E. Thomas Gray to the Metropolitan Health Department, and he participated in the design of the program described in this paper.

A door-to-door survey, beginning in February 1966 and ending in June 1968, was conducted in one census tract at a time until 79 of the 89 tracts in Metropolitan Nashville and Davidson County were covered. The other 10 tracts were in a high-income area with few preschool children.

To complete the survey as quickly as possible, an additional clerk and 12 part-time field representatives were added to the existing staff of the immunization division. Training for the new personnel incorporated basic information and definitions about immunity, specific information about the diseases covered, familiarization with the forms and codes associated with the survey, and sample presentations to parents contacted in the field or by telephone. All of this training enabled the personnel to motivate parents by the use of persuasion and definition, which were the only means available.

*Responsibilities of the full-time clerk.* The clerk assigned the work to be done each day by the field personnel, checked the worksheets covering the visits made on the preceding workday to make sure that all the necessary information was recorded for each preschool age child, re-

corded the previous day's work on the closeout sheets, made telephone calls to the parents of preschool children regarding appointments for immunizations, and forwarded all statistical information to the data processing division for tabulation.

In order to carry out the purpose of the visits and followup logically and efficiently, one census tract was worked at a time. Using a book published by the city planning commission, the clerk listed every street in each census tract, and using the city directory, she determined at which houses the surveyors would start and stop on each street. To the left of each street name she jotted down and circled the total number of housing units, and to the right she noted whether both sides or only one side of the street were in the particular census tract.

After the clerk checked the worksheets for the previous day, she listed all families the field representatives had noted as not at home. She then compiled a list for each street by house address to facilitate visiting the families on it at a later time. When the worksheets were completed, the clerk forwarded them to the data processing division.

The clerk kept track of all of the appointments made by the field representatives and checked the health department's records weekly to determine the status of appointments. She telephoned parents of preschool children who had an incomplete basic series of immunizations and who had not kept the immunization appointments made for them by the field representative. If the clerk failed to motivate parents to keep an appointment after two calls, she re-assigned them for field followup.

*Responsibilities of field representatives.* The field representatives' primary responsibilities were to visit designated houses in Nashville and Davidson County and to record the immunization status of all preschool age children in the 79 census tracts. The representatives were to motivate the parents of children whose immunizations were incomplete to have their children given the required immunizations. The field representatives filled out status cards on all children whose immunizations were not complete so that accurate records could be maintained and the followup continued as long as necessary.

To make sure residents of every home were

contacted and that all children who needed immunizations received them, field representatives were divided into three groups to do different kinds of jobs. The first group made the first weekday visits consecutively according to the census tract lists, the second group made initial visits evenings and Saturdays to people who were not at home when first visited, and the third group revisited the parents who were delinquent in keeping appointments for their children's immunizations.

To field representatives assigned to make initial weekday visits, the clerk gave certain streets to be worked that day. The visits of each representative were recorded on a daily worksheet which included columns for the addresses of the houses visited, comments of the worker, and the immunization status of each child.

Each representative recorded on the worksheet the address of every house visited. If no one was at home or there were no preschool age children in the household, this was recorded under "comments." Complete information was recorded on each preschool age child in the households visited. When a child had completed a basic series of immunizations, the worker wrote "completed" in the comments column and designated who had administered the shots in the "given by" column. If a child's immunizations had not been completed, the worker noted this in the "immunization status" column and motivated the parents to have the child immunized.

When the representative made an appointment for the parents to take the child to their private physician or to the health department clinic for shots, the worker entered this information on an appointment card with the child's name and address on it and gave the card to the parents. The worker also initialed this card and recorded the date and place of appointment in the "comments" column of the worksheet. The appointment card was taken by the parent to a physician or health department clinic where it was signed by the person administering the shots and then returned to the immunization division.

After the worker had completed all of his visits for the day, he filled out a status card for each preschool age child who needed immunizations. This card contained all the information

found on the worksheet, including the date and place of appointment, and served as a working form until the child's immunizations were completed. If the appointment card was returned, the new immunization status was entered on the status card and then included in the records so that the form on the child could be completed. If, however, the appointment was not kept, the status card was assigned to a worker who resumed followup.

The second group of field representatives followed the same procedure for recording data and keeping records as the first group. However, they visited people who were not at home when the daytime visits were made. These visits usually occurred in the evening or on Saturdays.

The third group of representatives received the status cards for further followup if the initial appointment was not kept. They visited the parents again to determine why the appointment was not kept, to help the parent overcome the difficulty, and to set up another appointment.

All information obtained on each child was forwarded to the data processing division, where his immunization status was recorded in regard to poliomyelitis, diphtheria-pertussis-tetanus (DPT), smallpox, and measles vaccine, whether he had had measles, and the source of his immunizations. When immunizations were completed or there was a change in the immunization status as a result of the followup activities, status cards were sent for data processing and the changes in immunization status recorded. The sum of completed immunizations enumerated in the original survey and the changes in status resulting from the followup campaign was the total number of immune preschool age children. The information was printed for each census tract surveyed and for all of the surveyed census tracts combined.

## Results

During the original visits the parents of 26,824 preschool age children were contacted. Of the children whose parents were contacted, 1,200, or 4.6 percent, moved; 570, or 2.1 percent, were refused shots; and the parents of 720, or 3 percent, were not contacted again. Of the children immunized, 22,322, or 83.2 percent, had been immunized against poliomyelitis; 22,318,

**Results of followup campaign to immunize preschool children, Nashville and Davidson County, Tenn., February 1966-June 1968**

Kind of immunization and when enumerated	Where given				Children immunized <sup>1</sup>	
	Physician's office	Health department	Hospital	Other facility	Number	Percent
Poliomyelitis—1968 level.....	10, 404	14, 098	541	495	25, 538	95. 2
First survey.....	10, 198	11, 122	517	485	22, 322	83. 2
Followup.....	206	2, 976	24	10	3, 216	12. 0
Diphtheria-pertussis-tetanus—1968 level.....	10, 448	14, 049	550	434	25, 531	95. 2
First survey.....	10, 273	11, 047	525	473	22, 318	83. 2
Followup.....	175	3, 002	25	11	3, 213	12. 0
Smallpox—1968 level.....	7, 799	7, 506	362	345	16, 012	59. 7
First survey.....	7, 697	6, 711	356	340	15, 104	56. 3
Followup.....	102	795	6	5	908	3. 4
Measles—1968 level.....					24, 692	92. 1
Vaccine before 1968.....	10, 157	8, 359	201	241	18, 958	70. 7
Disease before 1968.....					5, 734	21. 4
First survey.....					16, 332	60. 8
Vaccine.....	9, 152	3, 117	164	214	12, 647	47. 1
Disease.....					3, 685	13. 7
Followup.....					8, 360	31. 3
Vaccine.....	1, 005	5, 242	37	27	6, 311	23. 6
Disease.....					2, 049	7. 7

<sup>1</sup> Of the 26,824 children whose parents were contacted, 1,200, or 4.6 percent, moved; 570, or 2.1 percent, refused shots; and 720, or 3 percent, were not recontacted.

or 83.2 percent, had received DPT vaccine; 15,104, or 56.3 percent, had been vaccinated against smallpox; and 12,647, or 47.2 percent, had received measles vaccine (see table).

In 1968, at the completion of the program, 25,538, or 95.2 percent of the children, had poliomyelitis vaccine; 25,531, or 95.2 percent, had DPT vaccine; 16,012, or 59.7 percent, had smallpox vaccinations; and 18,958, or 70.7 percent, had measles vaccine. Followup activity had increased by 3,216, or 12 percent, the number of children immunized against poliomyelitis; by 3,213, or 12 percent, those protected by DPT vaccine; by 908, or 3.4 percent, those vaccinated against smallpox; and by 6,311, or 23.6 percent, those who had received measles vaccine.

At the time of original contact, 3,685, or 13.7 percent of the children, had already had the measles, and an additional 2,049, or 7.7 percent, contracted the disease during the followup period, so that of the total 26,824 children contacted, 5,734, or 21.4 percent, had experienced the disease. Therefore, 92.1 percent of all the children had become immune to measles.

#### Comments

Several benefits were derived from this intensive survey. The two benefits of greatest importance, however, affect the routine immuniza-

tion responsibilities of the Metropolitan Health Department.

Because of this survey and the associated followup activities, a group of children at the primary school level are substantially immune and less likely to bring home a disease, such as rubeola, and give it to an unimmunized infant.

The other major benefit came from the health education and public relations value. Door-to-door visits made nearly all mothers in Nashville aware of the health department's facilities for giving immunizations and the department's interest in seeing that immunizations are given. Therefore, parental cooperation was easier to obtain in carrying out our routine infant birth certificate followup program.

#### Summary

In April 1965, an estimated 44,000 preschool age children lived in Metropolitan Nashville and Davidson County. The parents of 26,824 children were contacted during an immunization program based on the survey technique with intensive followup. Of the approximately 17,000 children not included, some became of school age between April 1, 1965, and the beginning of the followup in February 1966, others lived in 10 upper income census tracts that were not part of the survey, and a number became of school

age during the nearly 2 years it took to complete the followup program.

Of the children whose parents were contacted, 1,200, or 4.6 percent, moved; 570, or 2.1 percent, were refused shots; and the parents of 720, or 3 percent, were not contacted again. In 1968, at the completion of the program, 25,538, or 95.2 percent of the children, had had poliomyelitis vaccine; 25,531, or 95.2 percent, had DPT vaccine; 16,012, or 59.7 percent, had smallpox vaccination; and 18,958, or 70.7 percent, had measles vaccine. Followup activity had increased by 3,216, or 12 percent, the number of children immunized against poliomyelitis; by 3,213, or 12 percent, those protected by DPT vaccine; by 908, or 3.4 percent, those vaccinated against smallpox; and by 6,311, or 23.6 percent, those who had received measles vaccine.

At the time of original contact, 3,685, or 13.7 percent, of the children had already had measles, and an additional 2,049, or 7.7 percent, contracted the disease during the followup period, so that of the total 26,824 children contacted, 5,734, or 21.4 percent, had experienced the disease. Therefore, 92.1 percent of all the children had become immune to measles.

Overall, the program achieved high levels of immunity and accomplished the goal of protecting preschool children who were not part of a birth certificate followup program. The coverage provided under the two programs insures Metropolitan Nashville and Davidson County of a highly immunized population for the present.

#### **Tearsheet Requests**

Dr. J. M. Bistowish, Metropolitan Health Department,  
311—23rd Ave., North, Nashville, Tenn. 37203

## **New Indian Health Centers**

The recently constructed Duchesne County Hospital and Public Health Service Indian Health Center in Roosevelt, Utah, mark a new pattern of Indian Health Service assistance to communities in the construction of community hospitals.

The Indian Health Service is authorized by Congress under PL 85-151 to assist construction of community hospitals which will serve Indians and non-Indians. In Roosevelt, the Indian Health Service funds were used for the first time to build an Indian health center attached to the hospital, as well as for hospital beds for Indian patients. Joining the two facilities instead of constructing a separate center provides better services for Indian patients, especially in emergencies, and at less cost. The health center will provide services for about 1,100 members of the Ute Tribe living on the Uintah and Ouray Reservation, including dental care, public health nursing, and environmental health. The center will use

the hospital laboratory and X-ray facilities, and Public Health Service physicians will work with local physicians in the case of hospitalized Indian patients.

In addition to two examining rooms, a reception room, a dental office, and offices for auxiliary personnel, the new Indian clinic contains a complete drug room and a small room for collecting sputum for tuberculosis studies.

In Juneau, Alaska, a 68-bed community hospital is being constructed. Eight of these beds are being funded by the Indian Health Service and in addition, an outpatient clinic attached to the hospital is being built.

Indian Health Service staff at Juneau provide outpatient services for Coast Guard personnel and merchant seamen as well as for Alaska Natives—Indians, Eskimos, and Aleuts.

As at Fort Duchesne Health Center, the Indian Health Service will share laboratory and X-ray facilities with the hospital.

# Trends in Hospital Use

KEITH O. TAYLOR

**“THE PROBLEM** of medical care is more acute today than ever before, partly because on every side the enormously augmented possibilities of health confront us. Yet everywhere about us are evidences of maladjustments in the availability of medical facilities and their utilization.” This statement and others like it must sound familiar to practically everyone in the hospital and medical care field today. Yet it comes from a volume published in 1933 by the Committee on the Costs of Medical Care (1).

There have, however, been great changes in hospital use in the United States from 1930 to the present. In the early '30's, according to the committee, physicians as a whole were unoccupied between one-third and one-half of their working time, one-third of the hospital beds were empty most of the year and, as a matter of fact, community hospitals reported in 1933 that nearly 40 percent of the beds were unoccupied. “Thousands of nurses seek employment,” the committee reported, “but in vain. Meanwhile, millions suffer and tens of thousands die from ailments which might be cured or alleviated by medical aid.”

By 1946, the 1930 population of 122 million had increased by less than 25 percent, while admissions to general hospitals—7½ million in 1930—had increased to almost 16 million, or more than double the 1930 admission rate.

---

*Mr. Taylor is professor of hospital administration and director of the program in hospital administration, University of California, Berkeley.*

By 1966, with a population increase over 1930 of some 60 percent, admissions to hospitals had almost quadrupled. In 1966, there were roughly 27 million admissions to general hospitals and more than 29 million admissions to all hospitals.

## Effects of Unmet Needs on Hospital Use

Today we are concerned with the inadequate supply of physicians, rather than with the percentage of time they work, and with the need for more nurses, rather than with the need for finding positions for nurses who are unemployed. Instead of concern over the extent to which a hospital's facilities are being used, there is a great deal of discussion about how these facilities may be used better. Nevertheless, considerable evidence of maladjustment in the availability and use of medical facilities remains. Some thoughtful comments appeared in a paper presented in 1967 at the Hospital Medical Staff Conference at the University of Colorado by Dr. Richard Magraw, director of the Comprehensive Clinic Program, University of Minnesota College of Medical Science (2):

It is, of course, difficult to know just how extensive is the percent of unmet needs, but some hard data are available. Although the concept of need for medical care seems a natural one for us to use as physicians, economists regard the concept without enthusiasm, preferring the concept of demand with its implications of self-determination, individual initiative, and willingness to pay the price for the fulfillment of an expressed “want”. . . . Although they are clearly different in meaning, each term—that is, need and demand—has its own relevance and its limitations.

As we brace ourselves for the crises of service before us for the next five or ten years, we may in time have reason to be grateful that they are not synonymous, in

that at this time and in some segments of our society, needs for medical care are not likely to be quickly translated into the demands of medical services. Grateful, that is, until we realize that what we are feeling good about is someone's sickness and disability.

A good example of the meaning of unmet needs is contained in a report on the Watts area by Dr. Robert Tranquada, chairman of the department of community medicine, University of Southern California School of Medicine, Los Angeles (3). Tranquada indicates that in the Watts area of more than 2½ square miles, there are some 58,000 persons, of whom 90 percent are Negroes. Half the population is 18 years and under; only 4.6 percent is over 65, as compared with 9.6 percent for all Los Angeles County. Nearly two-thirds of the Watts population has resided in that area for 5 years or longer, and nearly half the families have an annual income of \$4,000 or less, with a median income of \$2,500. Watts, Tranquada points out, is economically, socially, racially, culturally, and geographically isolated. Except for the new health center, there are no clinics or hospitals. And of the six small hospitals which are somewhat near the area, only one is accredited. No physicians or dentists live in the area, and before the health center was set up, the physician to patient ratio was 1 to 2,700: it is now 1 to 1,280. The national average is about 1 to 50.

In Alameda County, Calif., the ratio has been one physician to 780 persons. It is not surprising, therefore, that in Watts, as in other areas of poverty, infant mortality rates are about three times the average rates in the country and the tuberculosis rate is four times, the venereal disease rate three times that of the balance of the county. Tranquada (3) states that "Other health statistics are equally depressing."

Watts is only one of many pockets of poverty and illness that will inevitably increase hospital use over the course of time provided that the so-called war on poverty gradually becomes something more than tentative experiments. Much of the unmet need is unmeasured, and even when measured, much of it will not be translated into effective demand until changes occur in the education and attitudes of the subcultures. Health centers such as the one at Watts can do much to reduce hospital bed use through health education and through outpatient thera-

peutic and preventive care. But in instances in which necessary hospital care has been lacking in the past, the backlog of persons needing hospitalization will, at least initially, result in a demand for far more, not less, hospital care.

Hopkins and Harris (4) recently concluded, after testing regression models, that until more and better predictive variables are determined, the needs for the next 5 to 10 years can be more effectively predicted from a simple projection of population growth, holding bed use, population growth, and occupancy rates constant at current levels. Their research included many variables, but the model was limited to (a) deaths at age 65 and over per 1,000 population, (b) births per 1,000 population, and (c) the effective buying income per capita.

Sophisticated quantitative methodologies are receiving more attention as time goes by and, as Hopkins and Harris point out, simple methods of projection that can be fairly accurate for a sizable area may not work too well for an individual institution. Moreover, such projection is essentially the economist's assessment of demand with little or no consideration of people's unexpressed needs. The exact influence of many variables may not be measurable, but recognition of such factors and of their potential for influencing hospital use is essential to any long-range planning. Change is now occurring at such a pace that, even in the short range, we will need to do more than simply plan on the basis of current rates of hospital use.

In our attempts to look forward, however, we must realize that, at present and for the foreseeable future, the initial decision about use of hospitals resides primarily with the individual physician and secondarily with the individual patient. The physician's decision to recommend hospitalization may be based on a determination that his patient's condition and his ability to serve the patient's needs requires it. The physician, however, may also recommend hospitalization when it is not essential if it will serve his own or his patient's convenience. The patient to whom hospitalization is recommended may, on the one hand, accept it because he recognizes the need or the convenience of it or because he will have financial assistance for care only if hospitalized. On the other hand, the patient may

reject hospitalization out of fear, misunderstanding, or financial concern.

Favorable decisions by the physician and the patient are essential to hospital admission and use, but they are not the only determinants. The availability of beds and the hospital's admission policies may impose constraints on use. Also, the elective nature of treatment for a condition may cause a delay in admission as the hospital gives priority to admission of patients with acute cases.

Once a patient is admitted, additional factors determine the use or misuse of facilities. These factors may include the availability or lack of availability of extended care facilities, of home care programs, and of outpatient departments, as well as the level of attention given to the evaluation of hospital use by committees on patient care.

In addition, we are still far from the time when all persons in a community who are ill will, or can, seek medical aid. Thus, as Magraw has pointed out (2), large portions of unmet needs will emerge only slowly. But their emergence under titles 18 and 19 and other legislation is inevitable.

It would be pleasant to produce a magic number or formula to indicate the number of beds and other facilities and programs that would meet our needs, as well as our demands, over the next 10, 20, or 30 years. There is a growing literature—a literature with a long history—on the measurement of needs and on the application of more scientific methods to this measurement. Additional research is being undertaken, and better answers will no doubt become available. Yet there is something to the comment that Anderson of the University of Minnesota made at a conference on research in hospital use called by the Public Health Service in 1961 (5), to the effect that it is utopian to believe that the medical profession can establish and follow objective criteria which will provide a scientific basis for hospital use. Nevertheless, when considering broad trends, we need to consider the major factors which make for increased or decreased use of hospital inpatient facilities and then attempt to strike a balance.

In addition to the effect of a growing population, projected by the U.S. Census Bureau as a minimum of 280 million persons and as many

as 356 million by the year 2015, there appear to be at least a dozen major factors which will affect the rate as well as the magnitude of hospital use (6,7).

### Factors Increasing Hospital Use

The factors making for greater hospital use include:

1. A decreasing physician to population ratio
2. Increased third party coverage of hospital care
3. More social concern for care of poor people and low income groups
4. Better morbidity data
5. Technological advances in care for categories of conditions not previously treated or for which treatment has been considered hopeless
6. Greater acceptance by patients of hospital and medical care.

The relative shortage of physicians in relation to medical care needs and the fact that the population is increasing faster than the production of physicians may well result in an increasing use by physicians of hospitalization for the sake of their own and their patients' convenience. Third party insurance coverage has greatly affected hospital use over recent years. Moreover, as the amount and breadth of coverage increases, more financial constraints on use will be removed. With the Government as a third party covering groups formerly not covered, another important constraint on hospital admissions has been removed. Also, social legislation affecting one-fifth of the population living in poverty or at levels of medical indigency, as well as rising social concern, will reinforce the recognition of needs and stimulate the demand for hospital and medical services.

The need for better morbidity data has been emphasized for many years. We still have a long way to go in obtaining data to the extent desirable. However, automated data processing and some of the information assembled for comprehensive health planning will increase this area of knowledge and result in more objective recognition of unmet needs. As the area of scientific knowledge grows and technology provides the means for caring for patients with diseases or conditions not currently well treated or not now susceptible to treatment, new demands for treatment will fall on hospitals. To-

gether with the increasing level of education and the general public's greater awareness about health, all these factors suggest increased hospital use.

### Factors Decreasing Hospital Use

The factors making for less use of hospitals include:

1. Comprehensive regional and area health planning
2. Developments in preventive medicine
3. Hospital promotion of out-of-bed programs
4. The pressure of third party payers toward lower use
5. More effective review of hospital use
6. Technological advances to permit more effective out-of-bed care.

Comprehensive, regional, and areawide planning has a long way to go, but it will inevitably greatly affect our pattern of hospital care. Because such planning should be based upon a study of needs as well as of demands, its initial effect may well be to increase hospital use, but in the long run use should decrease.

Preventive medicine, mentioned in 1933 by the Committee on the Costs of Medical Care as an important factor in hospital use, has been so designated ever since. Pediatrics has been a leader in this field. Now, however, more consideration is being given to preventive medicine through mental hygiene and school health programs. The long-run effect of such programs should be fewer delays in obtaining needed care and a reduction in the need for many kinds of care at both the acute and chronic stages.

Promotion by hospitals of out-of-bed programs, as developed in the concepts of progressive care (including outpatient, home, and day care and other programs), would limit in-bed use. Moreover, just as third party payments may increase the demand for hospital beds, the increasing costs of hospital operations and their influence upon third party premiums have led, and will increasingly lead, to pressure for more effective hospital use. Particular power resides in the Government as a very interested third party.

Reviews of hospital use are not new. Recently,

a requirement for more effective work by the committees on hospital use has been proposed as a standard for hospital accreditation. Abuse and overuse of the hospital should be reduced under effective reviews of use, but underuse and too rapid discharges should receive equal attention. Finally, technological advances will in some instances require increased use of hospitals, while in other instances advances may lead to the possibility of more effective out-of-hospital care.

### Recent and Future Use of Hospitals

On balance, it appears that the factors making for greater use of hospitals will have more weight in the near future than those making for less use. One result will be an increasing scrutiny of hospital operations by Government and other third parties. In the long run, comprehensive planning and better coordination of inpatient and outpatient care by physicians and hospitals will tend to decrease bed use. This result, however, will take place only in the long run.

The most recent reports of hospital use appear in the American Hospital Association's guide issue of August 1, 1969 (8). The total 7,137 institutions included in the statistical review for 1968 showed an increase of 395,000 admissions over 1967 (8a). The average daily census in 1968 for all hospitals (1,378,398 patients) fell some 2,000 patients below the census of 1967 (8b, 9).

In the 5,820 short-term non-Federal hospitals that account for well over 90 percent of all hospital admissions, the number of admissions in 1968 increased over the previous year by some 288,000, and the average daily census increased by 18,000—from 612,000 patients in 1967 to 630,000 in 1968 (8a).

The number of patient days per 1,000 population under 65 years has changed little in the last few years—785 per 1,000 in 1966 and 782 per 1,000 in 1968. But for the same period, the average patient days per 1,000 population over 65 has increased by more than 17 percent—from 3,386 days in 1966 to 3,990 in 1968 (8c).

A new measure of hospital use was adopted in the guide issue for 1968. Bed days and out-



patient days are included under a single figure of patients per day. This measure is achieved by dividing inpatient revenue per day by outpatient revenue per visit and using the resulting ratio as a correction factor so that the level of hospital effort can be better indicated. Although this method obviously does not provide an exact measurement, it can be useful in some comparisons. More detailed breakdowns, however, will be essential for many study purposes. As shifts occur between the several components of evolving comprehensive health care systems, refined analysis will be essential if we are to predict the use of hospitals and related health care facilities in other than the most general terms.

I have primarily discussed hospital use in the broad context. Bed use in relation to the individual institution is more difficult to estimate, for estimates vary with the individual hospital's staffing, the convenience or inconvenience of its location, the kinds of programs it provides, the support of the local public or the lack of it, the hospital's individual financing, and a variety of other factors. Such relatively simple things as food service may have weight, as well as the availability of special equipment for special types of care. The impact of technological and social change has become so great that there has been a slow but definite increase in hospital mergers, satellite systems, and cooperative sharing of services. James C. Downs, Jr., chairman of the Real Estate Research Corporation of Chicago, has stated that the isolated hospital "going it alone" will go the way of the small independent merchant and be replaced by a chain organization of voluntary hospitals (10).

Whether or not one concurs fully with Downs' statement, undoubtedly either greater voluntary coordination of hospitals will occur or the term "voluntary" as applied to hospitals will become meaningless. In our pluralistic society, which benefits from the challenge provided by varied approaches, it would be unfortunate if the contribution of the voluntary hospital system were lost. Our society, however, is rapidly growing more urbanized and technologically oriented so that the emphasis on individualization tends to decrease. Hospitals, more than ever, are going to be judged by their

ability to meet high standards, one of which is effective use of their facilities in quantitative terms. Hospitals, therefore, must be concerned with meeting this demand; but they must also be prepared to explore and to provide for present unmet needs in a qualitative, as well as quantitative, sense.

In the 1933 report, *The Costs of Medical Care* (1), a paper by Dr. George E. Vincent entitled "The Doctor and the Changing Order," (which had appeared in the *Bulletin of the New York Academy of Medicine* in 1926) was quoted. Vincent stated: "It looks as if society needs to insist upon a more effective organization of medical service for all groups of people, upon distribution of the cost of sickness over large numbers of families and individuals, and upon making prevention of disease a controlling purpose. Just how these ends will be gained, only a very wise or a very foolish man would venture to predict. One thing seems very certain—in the end, society will have its way."

#### REFERENCES

- (1) Falk, I. S., Rorem, C. R., and Ring, M. D.: The costs of medical care. University of Chicago Press, Chicago, 1933.
- (2) Magraw, R.: Present and future medical care and health needs. In Collected papers from the Hospital Medical Staff Conference, Estes Park, Colo., October 2-6, 1967. Office of Postgraduate Medical Education, University of Colorado School of Medicine, Denver, 1967.
- (3) Tranquada, R.: Health center for Watts. *Hospitals* 41:42-47, Dec. 16, 1967.
- (4) Hopkins, C., and Harris, J.: Methods of estimating hospital bed needs. University of California School of Public Health, Los Angeles, October 1967, Ch. VII, pp. 1-14 and Ch. X, pp. 1-10.
- (5) U.S. Public Health Service: Research in hospital use: Progress and problems. Report of conference held Nov. 31-Dec. 1, 1961. PHS Publication No. 930-E-1. U.S. Government Printing Office, Washington, D.C., 1961.
- (6) Cook, R. C., editor: Boom babies come of age: the American family at the crossroads. From a report prepared by G. Solomon. *Pop Bull* (Population Reference Bureau) 22: 61-79, August 1966.
- (7) U.S. Bureau of the Census: Projections of the United States by age and sex to 2015. Technical Series No. 359, p. 25. U.S. Government Printing Office, Washington, D.C., 1967.
- (8) American Hospital Association: Hospitals guide

issue, vol. 43, pt. 2, Aug. 1, 1969: (a) table 1, pp. 474-475; (b) table 2, pp. 476-479; (c) text table 6, p. 467.

- (9) American Hospital Association: Hospitals guide issue, vol. 43, pt. 2, Aug. 1, 1968, table 2, pp. 450-453.
- (10) Downs, J. C., Jr.: Society will save the cities,

says urban expert, and hospitals can share in the recovery. *Mod Hosp* 109: 98-106, November 1967.

#### Tearsheet Requests

Keith O. Taylor, Director, Program in Hospital Administration, University of California School of Public Health, Berkeley, Calif. 94720

## Education Notes

**Surveillance, Prevention, and Control of Hospital-Associated Infections.** This course, to be given at the National Communicable Disease Center, Public Health Service, January 26-February 4, 1970, is designed for nurse administrators in clinical and public health practice, nurse surveillance officers concerned with infections control, and nurse educators associated with basic education and inservice training.

The purposes of the course are to acquaint the nurse with the magnitude and complexity of the problem in hospital-associated infections; present principles and methods for surveillance, prevention, and control of infections and stimulate an increase in awareness of the opportunity inherent in nursing to bring about higher quality patient care.

Subject matter includes review of basic principles of epidemiology; definition of the problem of hospital-associated infections; clinical features of infection; the laboratory, animate and inanimate environment, surveillance, and administrative aspects related to infections control; principles of sterilization, disinfection, and isolation; and motivation for action. Time will be allotted for questions and discussion.

No tuition is charged for attendance or for reference materials distributed during the course. Traineeships are not available, and participants should make their own arrangements for funding travel and living costs. Information on housing is included with a letter of confirmation to accepted applicants.

Additional information is available from Claire M. Coppage, Chief, Nurse Development Activities, Training Program, National Communicable Disease Center, Atlanta, Ga. 30333.

**The Control of Infections in Health Care Facilities.** The University of North Carolina School of Public Health is offering a course in the control of infections in health care facilities, February 16-

20, 1970. The course is being given in cooperation with the Bureau of Disease Prevention and Environmental Control, National Communicable Disease Center, Public Health Service.

The objective of the course is to familiarize participants with the health care administrative structure and to acquaint the participants with environmental control activities usually followed for control of infections. Topics to be covered include organization and management of health care facilities, control and microbiology of the environment in health care facilities, detergents and infections, sterilization, housekeeping, laundry services, the role of the sanitarian in environmental control, food service, solid waste, plumbing systems, ventilation systems, control of ionizing radiation, and evaluation procedures.

Applicants should be professional health personnel in State and local health departments responsible for evaluating control efforts and guiding personnel who are responsible for effecting environmental control in health care facilities. Applications are solicited, also, from administrative and supervisory personnel in health care facilities responsible for environmental control. Enrollment will be limited to 40 persons.

The cost of the course is \$137.50. Some traineeships are available which will cover the cost of registration and provide \$16 per diem expenses. Applicants eligible for traineeships must be citizens of the United States or must have been admitted to the United States for permanent residence.

Applications must be submitted by January 15, 1970.

Additional information is available from Continuing Education and Field Service, School of Public Health, University of North Carolina, Chapel Hill, N.C. 27514.

*Announcements for publication should be forwarded to Public Health Reports 6 months in advance of the deadline date for application for admission or financial aid, whichever is earlier.*

# Alcohol Level and Home Accidents

HENRY WECHSLER, Ph.D., ELIZABETH H. KASEY, M.P.H.,  
DENISE THUM, Ph.D., and HAROLD W. DEMONE, Jr., Ph.D.

**T**HE RELATIONSHIP between alcohol and accidental injuries and deaths has frequently been investigated, but major research has been limited primarily to traffic accidents. In an extensive review, Haddon (1) concluded that a significant relationship had been established between the ingestion of alcohol and the occurrence of traffic accidents. Demone and Kasey (2) reviewed studies of nonmotor vehicle accidents and reported high frequencies of elevated alcohol levels in injured persons. Most of these studies, however, dealt with industrial accidents. In the few that did not, information was lacking on the specific place where the accident occurred. Only two studies were found in the literature concerning the role of alcohol in home accident injuries—our major interest.

In a study of 94 home accident victims admitted to the emergency floor of the Boston (Mass.) City Hospital, Kirkpatrick and Taubenhause (3) obtained inconclusive results on the relationship between alcohol level and type of injury, length of disability, and disposition of the patient. A report by the Metropolitan Life Insurance Co.

(4) concluded that alcohol is an important factor in fatal home accidents among young and middle-aged adults, based on a review of the records of "ordinary life insurance" policyholders who died in home accidents in 1964 and 1965. However, involvement of alcohol was usually inferred from descriptions in the records, since objective measures of alcohol level were not available in most instances.

Lack of systematic research on such an important public health problem as the role of alcohol consumption in home accidents prompted this study. Specifically, our purpose was to test the null hypothesis that the level of alcohol in a population admitted to a hospital emergency service for treatment of home accident injuries does not differ from the level of alcohol in a population admitted for other reasons.

## Research Design

Our study was conducted in the emergency service of the Massachusetts General Hospital in Boston. This site was selected because of its large annual intake of patients and the interest of the hospital administration and staff in the problem being investigated.

The sample was comprised of patients 16 years of age and older, who were admitted to the hospital's emergency service from October 2, 1966, through September 29, 1967. These patients were interviewed during one 8-hour shift of each 24-hour period for 363 consecutive days. The interviews were held during a particular shift on every third day of the study. At least one shift was included on each holiday. This procedure resulted in a one-third sample of all

---

*Dr. Wechsler is director of research, Miss Kasey is health education associate, and Dr. Thum is research associate, all at The Medical Foundation, Inc., Boston. Dr. Demone, who is now executive director of United Community Services of Metropolitan Boston, was formerly executive director of The Medical Foundation, Inc. This research was supported by Public Health Service grant UI-00022.*

*Dr. Arthur J. McBay, formerly supervisor of the Massachusetts Department of Public Safety Laboratory, served as consultant and instructor in the methods used for determinations of alcohol level.*

shifts, with an equal distribution of shifts, days of the week, and months of the year.

Patients routinely excluded from the study were those admitted for psychiatric reasons including alcoholics without injury and persons suspected of attempting suicide by ingestion, those who received only postoperative or continuing care in the emergency service, and those with dental problems of nontraumatic origin. Persons dead on arrival were not included because blood samples for determining alcohol concentration and pertinent information concerning cause of death were difficult to obtain.

The interview was designed to obtain a description of circumstances surrounding the accident or onset of acute symptoms as well as relevant biographical material and information concerning drinking behavior. Patients were interviewed in the emergency service whenever possible. If the patient was too ill to be interviewed in the emergency service and was subsequently admitted to a unit in the hospital, information was obtained either from hospital records or from an interview with the patient or one of his visitors during confinement.

A Breathalyzer reading taken during the interview was used as the primary index of blood alcohol concentration. Studies of the accuracy of breath-sampling methods (5, 6) have correlated blood alcohol levels obtained by direct analysis of the blood with those obtained by analyzing breath samples taken simultaneously. Borkenstein and co-workers (7) have documented the reliability and accuracy of the Breathalyzer in estimating blood alcohol concentrations. If a breath sample could not be procured but a blood sample drawn by the admitting physician was available, the blood sample was used to determine alcohol level. The interviewer also attempted to detect the odor of alcohol on the breath of the patient at the time of admission.

A home accident injury was defined as "any wound or damage to a person occurring in a home or its premises as a result of a chain of events the consequences of which were unintended" (8). Injuries to domestic or service personnel working in private homes were treated as occupation injuries rather than home accident injuries.

The 1965 revised International Classification

of Diseases (9) was used to code all accident and nonaccident cases. Accident cases were coded according to the external cause and nature of the injury and categorized as home, transportation, occupation, and "other" accidents. An additional category comprised all patients injured in fights or assaults. Nonaccident cases were categorized as diseases of the circulatory system, diseases of the digestive system, symptoms referable to systems or organs, and "other" medical conditions.

Alcohol levels in home accident victims were compared with those of persons admitted for other reasons. Because of the small number of patients with alcohol levels above 0.05 percent, Breathalyzer readings were categorized as follows: (a) 0.00 percent (negative), (b) 0.01 to 0.04 percent, and (c) 0.05 percent and over. For some analyses, cell sizes necessitated the use of two categories: (a) patients with readings of 0.00 percent (negative) and (b) those with readings of 0.01 percent and over (positive).

### The Sample

During the 1-year investigation, 16,861 persons were admitted to the emergency service during the study shifts. Of this number, 2,392 were below the age of 16. Of the 14,469 persons who were 16 years of age and older, it was estimated, from a 10 percent sample of excluded patients, that 2,825 were ineligible for the study. A breakdown of the ineligibles indicated that approximately 2,000 were psychiatric patients, 500 were postoperative or continuing care patients, and 300 were dental patients with problems of nontraumatic origin. Thus 11,644 patients were eligible for the project. The 8,461 patients who were included comprised 73 percent of those who were eligible; 3,183 patients were missed by the interviewers.

Despite the inclusion in the study of almost three of four eligible patients, it was important to examine the characteristics of the missed patients to learn whether any bias existed in the inclusion procedures. Therefore, the hospital records were examined for a 10 percent sample, or 313 missed patients. Information was abstracted from the patient's record on the presence or absence of injury at the time of admission, on indications of alcoholism or intoxi-

cation, on the length of time the patient remained in the emergency service, the extent of treatment he received, and the necessity of immediate hospitalization. Comparable information was obtained for 237 randomly selected patients in the study sample.

Comparison of the two groups revealed that injury cases were included more frequently for patients in the sample (54 percent) than for those who were missed (39 percent):  $\chi^2=12.29$ , 1 degree of freedom,  $P<0.001$ . Furthermore, the included patients did not differ from the missed patients in evidence of alcoholism or drinking before admission: 6 versus 7 percent;  $\chi^2=0.28$ , 1 degree of freedom, not significant. Thus there apparently was no systematic exclusion from the sample of persons with injuries or of persons with positive alcohol levels.

As might be expected, the missed patients tended to remain in the emergency service for a shorter time; 44 percent remained for less than 1 hour as compared with only 7 percent of the sample patients. The conditions that brought the missed patients to the emergency service were less severe, as indicated by the extent of treatment received; 42 percent were given an examination only in contrast to 10 percent of the sample patients. And not as many missed patients needed immediate hospitalization; only 10 percent required admission to the hospital as compared with 35 percent of the sample patients.

Information was collected on 8,461 sample patients 16 years of age and older. Seventy-eight percent of the questionnaires were completed during interviews with patients in the emergency service, 18 percent through followup procedures in the hospital, and 4 percent through interviews with persons who accompanied the patients to the emergency service.

Breathalyzer tests were done on 74 percent (6,266) of the sample patients. Of the 2,195 patients for whom no Breathalyzer reading was obtained, other indications of alcohol involvement were available for 1,332 persons. These indicators included venous blood analyses and observations by the interviewers regarding the presence or absence of alcohol odor on the breath of the patient at the time of admission. No information concerning alcohol involvement was available for the remaining 863 persons. Only

3 percent of the total sample, or 224 persons, refused to take a Breathalyzer test.

Because classification by diagnosis or cause of the condition was impossible for 754 patients on whom Breathalyzer readings or other indications of alcohol involvement were available, they were removed from the sample. Thus the sample on which the statistical analyses were made comprised 6,844 patients: 5,622 for whom Breathalyzer readings were available and 1,222 with other indications of the presence or absence of alcohol.

## Results

Analysis of the data presented in table 1 revealed a statistically significant relationship between Breathalyzer results and reasons for admission to the emergency service:  $\chi^2=546.05$ , 16 degrees of freedom,  $P<0.001$ . To evaluate major trends, several other chi-square analyses were done on the data in this table. Not all these analyses were independent of each other, and this fact should be considered when interpreting the findings. The pattern of results, however, is strikingly clear.

*Home accident injuries.* A positive Breathalyzer reading was obtained from 22 percent of the patients with home accident injuries (table 1)—a significantly higher alcohol involvement than for nonaccident patients ( $\chi^2=115.36$ , 2 degrees of freedom,  $P<0.001$ ) or patients with oc-

**Table 1. Breathalyzer alcohol level, by reason for admission of patient**

Reason for admission	Number of patients	Percent negative readings	Percent positive readings	
			0.01-0.04	0.05 and over
Total....	5, 622	83. 2	9. 0	7. 7
Accidents.....	2, 801	78. 5	11. 0	10. 5
Home.....	620	77. 7	11. 0	11. 3
Transportation.....	404	70. 5	12. 4	17. 1
Occupation....	969	84. 4	10. 6	4. 9
Other.....	808	75. 9	10. 9	13. 2
Nonaccidents...	2, 633	91. 2	6. 3	2. 6
Circulatory...	255	92. 2	6. 3	1. 6
Digestive....	481	92. 1	5. 2	2. 7
Symptom....	551	90. 9	5. 8	3. 3
Other.....	1, 346	90. 7	6. 8	2. 5
Fights or assaults.....	188	43. 6	17. 6	38. 8

cupation accident injuries ( $\chi^2=22.54$ , 2 degrees of freedom,  $P<0.001$ ). Patients with transportation accident injuries ( $\chi^2=8.15$ , 2 degrees of freedom,  $P<0.02$ ) or injuries resulting from fights or assaults ( $\chi^2=90.89$ , 2 degrees of freedom,  $P<0.001$ ) had higher percentages of positive alcohol readings than those with home accident injuries. Readings for patients with home accident injuries did not differ from those for patients with "other" accident injuries ( $\chi^2=1.24$ , 2 degrees of freedom, not significant).

*Comparison of accident cases.* For accident cases the type of accident was related to involvement of alcohol at a statistically significant level:  $\chi^2=60.38$ , 6 degrees of freedom,  $P<0.001$ . Transportation accident patients had the greatest proportion of positive readings (29.5 percent). Of 404 patients, 349 were drivers or passengers of motor vehicles and 44 were pedestrians. The role of the remaining 11 patients was not known. Occupation accident patients had the lowest proportion (15.5 percent), while the proportion for home (22.3 percent) and "other" (24.1 percent) accident patients was intermediate. In addition to the findings reported on home accident injuries, chi-square comparisons of separate categories indicated that transportation accidents differed significantly from occupation accidents ( $\chi^2=56.81$ , 2 degrees of freedom,  $P<0.001$ ) but not from "other" accidents ( $\chi^2=4.28$ , 2 degrees of freedom, not significant), and occupation accidents differed significantly from "other" accidents ( $\chi^2=38.73$ , 2 degrees of freedom,  $P<0.001$ ).

*Comparison of nonaccident cases.* Nonaccident patients with circulatory diseases, digestive diseases, symptom disorders, or other medical conditions did not differ in alcohol levels:  $\chi^2=3.99$ , 6 degrees of freedom, not significant. Thus for the remainder of the analyses all nonaccident cases were combined without regard to specific diagnosis.

*Accident versus nonaccident cases.* Twenty-two percent of the accident cases involved alcohol as compared with only 9 percent of the nonaccident cases. The difference was statistically significant:  $\chi^2=188.70$ , 2 degrees of freedom,  $P<0.001$ .

*Accidents by type versus nonaccidents.* Despite the previously cited differences among accident cases, comparisons showed that all types

**Table 2. Presence of alcohol, determined by positive venous blood sample or alcoholic breath, by reason for admission of patient**

Reason for admission	Number of patients	Alcohol involvement	
		Percent negative	Percent positive
Total-----	1, 222	90. 8	9. 2
Accidents-----	310	78. 7	21. 3
Home-----	62	82. 3	17. 7
Transportation-----	83	59. 0	41. 0
Occupation-----	76	86. 8	13. 2
Other-----	89	87. 6	12. 4
Nonaccidents-----	892	95. 7	4. 3
Fights or assaults-----	20	55. 0	45. 0

of accident cases differed beyond the 0.001 level of significance from nonaccident cases with respect to levels of alcohol. The chi-square values for 2 degrees of freedom were as follows: home accidents, 115.36; transportation accidents, 198.46; occupation accidents, 34.08; and "other" accidents, 172.62.

*Fights and assaults.* More than half (56.4 percent) of the patients with injuries resulting from fights or assaults had positive alcohol readings and 39 percent had readings of 0.05 percent or higher. When cases of fights and assaults were compared with nonaccident cases, a statistically significant relationship was present:  $\chi^2=538.16$ , 2 degrees of freedom,  $P<0.001$ . A statistically significant relationship also was found in a comparison of cases of fights and assaults with all accident cases:  $\chi^2=149.79$ , 2 degrees of freedom,  $P<0.001$ .

*Other signs of alcohol involvement.* Distribution of the 1,222 patients in the sample for whom venous blood analyses or observations of alcoholic breath were available is shown in table 2. No Breathalyzer readings were obtained from these patients. The relationship between these signs of alcohol involvement and reason for admission was statistically significant ( $\chi^2=164.13$ , 5 degrees of freedom,  $P<0.001$ ) and, with one exception, separate chi-square analyses were in agreement with the findings based on Breathalyzer readings. Positive venous blood tests or alcoholic breath occurred significantly more often among transportation accident patients than among patients injured in any other type

of accident. However, unlike positive Breathalyzer readings, other positive signs of alcohol were not less frequent among occupation accident patients. Positive venous blood tests or alcoholic breath were observed with approximately equal frequency among home, occupation, and "other" accident patients.

*Breathalyzer results controlled by time of drinking.* On admission to the emergency service, patients were asked whether they had consumed alcohol after the accident or onset of symptoms. Of 5,248 cases for which information was available, 600 patients (11.4 percent) replied that they had a drink after the episode and 4,648 (88.6 percent) said they had not. Information also was obtained on the time interval between the occurrence of the accident or symptom onset and arrival at the emergency service.

For purposes of analysis, the patients were divided into two groups: those who had consumed alcohol after the accident or symptom onset (group 1) and those who had not (group 2). Group 2 was divided into three categories on the basis of how soon the patients arrived in the emergency service after the accident or symptom onset: (a) in less than 3 hours, (b) in 3 to 6 hours, or (c) in 7 or more hours.

Chi-square analyses indicated that for three groups the relationship between level of alcohol and reason for admission was statistically significant beyond the 0.001 level. Chi-square values for 5 degrees of freedom were as follows: group 1, 25.27; group 2a, 281.32; and group 2b,

45.47. Chi-square values could not be computed for group 2c because one cell had no observed cases; the direction of the relationship was maintained for this group, however. As shown in table 3, the presence of alcohol was highest in group 1, who reported having a drink after the episode (38.2 percent with a positive Breathalyzer reading) as compared with the groups who reported no drinking after the episode: group 2a, 19.4 percent; group 2b, 11.0 percent; and group 2c, 7.8 percent. For groups 2a, 2b, and 2c, the frequency of positive alcohol readings was related to delay between accident or onset of symptoms and arrival at the emergency service.

In all groups, persons admitted for home accident injuries had a higher involvement of alcohol than those admitted for nonaccident reasons but lower than those admitted for transportation accident injuries. Furthermore, there was greater involvement of alcohol in all types of accidents as compared with nonaccidents. The greatest involvement was found in transportation accidents and in injuries resulting from fights or assaults. Thus the major relationships held whether alcohol was or was not consumed after the accident or onset of symptoms and regardless of the time interval between the episode and arrival in the emergency service.

*The relationship of alcohol involvement to reason for admission, controlled for social background characteristics.* Because sex, age, marital status, and social class have been significantly

**Table 3. Percentage of patients with positive Breathalyzer readings, by reason for admission, controlled for drinking chronology and delay of treatment**

Reason for admission	Group 1, with drink after episode (N=600)	Group 2, with no drink after episode, who entered emergency service in—		
		less than 3 hours (N=2,418)	3-6 hours (N=699)	7 or more hours (N=1,531)
Total.....	38. 2	19. 4	11. 0	7. 8
Accidents.....	43. 5	21. 6	18. 2	10. 1
Home.....	40. 0	26. 9	17. 4	10. 0
Transportation.....	47. 4	31. 8	32. 4	0
Occupation.....	46. 6	11. 8	14. 3	11. 9
Other.....	43. 0	27. 3	15. 8	10. 9
Nonaccidents.....	28. 2	8. 0	6. 0	5. 8
Fights or assaults.....	71. 4	63. 7	41. 7	24. 2

NOTE: Information on 1 or both variables not available for 374 patients.

associated in other studies with involvement of alcohol, it was necessary to control for these variables in examining associations between level of alcohol and reason for admission.

**SEX.** Reason for admission was significantly related to the presence of alcohol for both men and women: men,  $\chi^2=327.72$ , 5 degrees of freedom,  $P<0.001$ ; and women,  $\chi^2=65.85$ , 5 degrees of freedom,  $P<0.001$ . Persons of both sexes who were admitted for accidents had a higher frequency of positive alcohol readings than persons admitted for nonaccident reasons (table 4). For both men and women, occupation accident injuries had the lowest frequency of positive alcohol readings. Persons admitted for injuries resulting from fights or assaults had the highest frequency of positive readings as compared with persons admitted for other reasons.

**AGE.** Patients were divided into four age groups: 16 to 25 years, 26 to 45 years, 46 to 65 years, and over 65 years. In each age group alcohol involvement was related beyond the 0.001 level to reason for admission. For all groups, accident cases had a higher frequency of positive Breathalyzer readings than nonaccident cases. Chi-square values for 5 degrees of freedom were 16 to 25 years, 134.50; 26 to 45 years, 156.52;

46 to 65 years, 86.05; and over 65 years, 35.24. In nearly all age groups among the accident cases, transportation accident injuries were highest in percentage of positive readings and occupation accident injuries were lowest. Certain cells (table 4) were too small in the oldest age group to permit detailed comparisons.

**MARITAL STATUS.** Marital status was studied by comparing persons who were single, currently married, or previously married (widowed, divorced, or separated). In each of these three categories, the association between alcohol level and reason for admission was significant beyond the 0.001 level. Chi-square values for 5 degrees of freedom were single, 203.34; currently married, 145.68; and previously married, 86.22. In each group, a higher frequency of positive alcohol readings was found for accident patients than nonaccident patients. Among accident patients, the highest proportion of positive readings was found for transportation accident injuries and the lowest for occupation accident injuries. The highest frequency of positive readings was found among patients with injuries resulting from fights or assaults.

**SOCIAL CLASS.** Patients were ranked according to the Hollingshead "Two-Factor Index of

**Table 4. Percentage of patients with positive Breathalyzer readings, by reason for admission, controlled by patient characteristics**

Patient characteristics	Home accidents		Transportation accidents		Occupation accidents		Other accidents		Fights or assaults		Non-accidents	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
<b>Sex:</b>												
Men.....	267	31.5	239	37.7	825	16.5	430	34.9	163	58.3	1,277	10.7
Women.....	353	15.3	165	17.6	144	10.4	378	11.9	25	44.0	1,356	7.0
<b>Age group (years):</b>												
16-25.....	177	19.2	203	27.6	298	9.7	335	21.2	78	48.7	603	7.2
26-45.....	199	25.1	120	35.0	416	19.2	206	32.5	74	66.2	724	12.0
46-65.....	134	23.9	61	32.8	237	16.5	175	26.3	30	60.0	711	10.6
Over 65.....	110	20.0	20	5.0	18	16.7	91	12.1	6	16.7	591	4.7
<b>Marital status:</b>												
Single.....	218	24.8	220	25.4	309	10.7	427	24.8	119	55.5	810	8.2
Married.....	286	19.2	145	33.1	591	17.8	252	23.8	52	53.8	1,267	9.3
Widowed, divorced, or separated.....	113	25.7	36	41.7	67	19.4	125	23.2	17	70.6	533	9.0
<b>Social class:<sup>1</sup></b>												
I and II.....	82	13.4	62	29.0	36	0	125	21.6	18	61.1	236	6.7
III.....	97	21.6	68	29.4	82	13.4	145	20.0	24	58.3	272	12.5
IV.....	193	20.7	157	29.3	486	15.8	257	27.6	68	50.0	783	7.4
V.....	203	26.1	88	30.7	337	17.2	213	22.5	62	61.3	1,109	9.4

<sup>1</sup> Hollingshead "Two-Factor Index of Social Position," reference 10. Classes I and II are high and class V is low.

NOTE: Number=total cases with available information.



**Table 5. Percentage of home accident patients with positive Breathalyzer readings, by external cause and nature of injury.**

Home accident injuries	Breathalyzer readings	
	Number of patients	Percent positive
External cause.....	<sup>1</sup> 612	21. 4
Accidental falls.....	272	22. 8
Cutting and piercing instruments.....	140	25. 7
Collisions with persons or objects.....	63	25. 4
Fires or explosions.....	33	18. 2
Other.....	104	10. 6
Nature of injury.....	<sup>2</sup> 613	21. 4
Lacerations and abrasions.....	208	27. 4
Fractures and dislocations.....	124	15. 3
Contusions.....	113	19. 5
Sprains.....	76	14. 5
Head injuries.....	53	30. 2
Burns.....	31	16. 1
Other.....	8	12. 5

<sup>1</sup> Information not available on 8 patients.

<sup>2</sup> Information not available on 7 patients.

Social Position" (10) and were studied separately in classes I and II (high), class III, class IV, and class V (low). In classes III, IV, and V, reason for admission was related to presence of alcohol beyond the 0.001 level. Chi-square values for 5 degrees of freedom were class III, 38.95; class IV, 144.80; and class V, 163.43. The direction of the relationship was maintained for classes I and II; however, a chi-square analysis could not be done because of the lack of observations in one cell. Again, more accident patients in all social classes had positive alcohol readings than nonaccident patients. Patients with transportation injuries had the highest frequency of positive readings and those with occupation injuries, the lowest. Among all social classes, patients with injuries resulting from fights or assaults had uniformly high frequencies of positive alcohol readings.

*Analysis of home accident injuries.* Home accident injuries were examined in greater detail to learn whether the presence of alcohol, as determined by the Breathalyzer test, was associated with the external cause and nature of the resulting injury. Alcohol involvement was about the same for the major categories of external causes but lower for causes categorized as

"other" (table 5). The relationship was significant:  $\chi^2=9.91$ , 4 degrees of freedom,  $P<0.05$ . The relationship between nature of injury and presence of alcohol was also significant:  $\chi^2=12.93$ , 6 degrees of freedom,  $P<0.05$ . Alcohol involvement was greatest among the patients with head injuries, lacerations, and contusions.

## Discussion

For the first time, an involvement of alcohol in home accidents has been indicated by a systematic large-scale study using objective measures of alcohol level. Some caution, however, must be exercised in interpreting the results.

First, the study is correlational and cannot be viewed as establishing a causal relationship between consumption of alcohol and occurrence of accidental injuries.

Second, the comparison group of nonaccident cases may not have been representative of the community with respect to alcohol level since it was composed of ill persons seeking treatment. Nevertheless, when factors such as general diagnostic grouping, age, sex, marital status, and social class were considered, this comparison group still had a strikingly lower alcohol level than the patients with accident injuries. In theory, it would have been preferable to use control respondents who were selected from residents of the area where the home accident occurred and who were studied at the same time of day and day of the week as the accident, but such a design would be difficult to implement and would result in a much higher refusal rate, thus biasing the sample.

Finally, the alcohol level of the patient was measured at the time of admission rather than at the time of the accident. Several factors precluded the accurate estimation of alcohol level at the time of the accident, including the impracticability of obtaining two Breathalyzer readings for each patient to determine individual decay rates. Analyses that controlled for chronology of drinking and delay in obtaining treatment, however, indicated that the relationship between alcohol level and reason for admission was maintained for those patients who reported no consumption of alcohol after the accident or onset of symptoms and who arrived in the emergency service less than 3 hours after the episode.

## Summary

To determine the presence or absence of alcohol in persons admitted to the emergency service of the Massachusetts General Hospital in Boston for treatment of home accident injuries, Breathalyzer readings for 5,622 patients were collected. Venous blood analyses or observations on alcoholic breath were obtained for an additional 1,222 patients.

The results of statistical analyses, significant at the 0.05 level or beyond, indicated that the presence of alcohol on admittance was associated with the reason for admission. Among patients with home accident injuries, 22.3 percent had a positive Breathalyzer reading. As shown by Breathalyzer tests, the highest involvement of alcohol, 29.5 percent, was for patients with transportation accident injuries. Less alcohol involvement was indicated for patients with occupation accident injuries, 15.5 percent, and "other" accident injuries, 24.1 percent.

A strikingly high involvement of alcohol was found among persons admitted to the emergency service for treatment of injuries from fights or assaults; 56.4 percent had a positive Breathalyzer reading. A uniformly low involvement, 8.9 percent, was found among patients admitted for nonaccident reasons.

These findings were substantiated when other signs of alcohol involvement were used and were maintained when controls were applied for drinking after the accident or onset of symptoms and for delay between the episode and arrival in the emergency service as well as for sex, age, marital status, and social class.

Among home accident injuries, statistically significant relationships were found between presence of alcohol and external cause and nature of the resulting injury. Positive readings for alcohol were equally distributed among those injured in falls, collisions, and fires and by cutting or piercing instruments. Patients with head injuries or lacerations more frequently had positive alcohol readings than patients with other types of injuries such as fractures, contusions, sprains, or burns.

The study established that a higher proportion of positive alcohol readings occurred

among home accident victims and other accident patients than among a comparison group of nonaccident patients admitted to the same hospital emergency service. The findings are consistent and clearcut and implicate alcohol as a factor in home accident injuries as well as in injuries from transportation, occupation (although the findings were less definite here), and other types of accidents and in injuries resulting from fights or assaults.

## REFERENCES

- (1) Haddon, W., Jr.: Alcohol and highway accidents. Proceedings of the Third International Conference on Alcohol and Road Traffic. BMA House, London, 1963, pp. 3-13.
- (2) Demone, H. W., Jr., and Kasey, E. H.: Alcohol and non-motor-vehicle injuries. Public Health Rep 81: 585-590, July 1966.
- (3) Kirkpatrick, J., and Taubenhaus, L.: Blood alcohol levels of home accident patients. *Quart J Stud Alcohol* 28: 734-737 (1967).
- (4) Metropolitan Life Insurance Company: Alcohol and home accidents at the working ages. *Statist Bull Metrop Life Insur Co* 48: 3, October 1967.
- (5) Friedmann, T. E., and Dubowski, K. M.: Chemical testing procedures for the determination of ethyl alcohol. *JAMA* 170: 47-71 (1959).
- (6) Fox, B. H., et al.: Refined comparison of blood- and breath-alcohol measures and variability of breaths around trend of decline. In *Alcohol and traffic safety: Proceedings of the Fourth International Conference on Alcohol and Traffic Safety* Indiana University, Bloomington, 1966. pp. 128-139.
- (7) Borkenstein, R. F., et al.: The role of the drinking driver in traffic accidents. Department of Police Administration, Indiana University, Bloomington, 1964.
- (8) U.S. Public Health Service: Conference on Uniform Definitions of Home Accidents, Chicago, 1957: Uniform definitions of home accidents, PHS Publication No. 577. U.S. Government Printing Office, Washington, D.C., 1965.
- (9) U.S. Public Health Service: International classification of diseases, adapted. Revised edition. PHS Publication No. 719. U.S. Government Printing Office, Washington, D.C., 1965.
- (10) Hollingshead, A. B.: Two-factor index of social position. Yale University, New Haven, Conn. Mimeographed, undated.

## Tearsheet Requests

Dr. Henry Wechsler, The Medical Foundation, Inc., 29 Commonwealth Ave., Boston, Mass. 02116

# Occurrence of Leprosy in U.S. Veterans After Service in Endemic Areas Abroad

MERLIN L. BRUBAKER, M.D., CHAPMAN H. BINFORD, M.D., and JOHN R. TRAUTMAN, M.D.

**M**ORE U.S. CITIZENS than ever before are living in or traveling to virtually every country of the world—many are members of the Armed Forces who are stationed in areas where leprosy is endemic. Thus, it is important to know the incidence of leprosy among U.S. veterans who have served abroad in endemic areas.

This report is concerned with cases of leprosy known to have occurred in U.S. veterans, probably as a result of exposure to the disease while in service. The data were obtained from the records of the Public Health Service Hospital at Carville, La., Public Health Service outpatient clinics, and State departments of health. No information is available on the number of unreported cases which might exist. It is also probable that among veterans, as among nonveterans even in endemic areas, there are undiagnosed cases of leprosy.

Although leprosy was introduced into the Americas from the Old World by explorers, settlers, and African slaves, no case was reported in U.S. veterans of any war until the Spanish-American War in 1898, despite the fighting in the War of 1812 in New Orleans where leprosy had been present for at least 70 years (1).

A 1940 report by Hasseltine (2) dealt with leprosy in U.S. veterans. His study, based on records of those who had been admitted to the hospital at Carville, included 32 veterans of the Spanish-American War and 51 of World War I.

One of the Spanish-American War veterans did not serve outside the United States, one had no record of such service, and the remaining 30 had served in leprosy endemic areas outside the United States. Five of these veterans were born outside the United States, eight came from southern States, including Georgia, and 19 came from northern States.

Of the 51 World War I veterans, 33 had no military service outside the United States. None were born in northern States—18 were from other countries and 33 were born in southern States.

In 1944 Faget (3) reported 14 additional U.S. veterans with leprosy who were admitted to Carville. However, he did not attribute their disease to foreign service.

In 1965 the Veterans' Administration published a report of a study of 90 cases of leprosy

---

*Dr. Brubaker, formerly director of the Public Health Service Hospital at Carville, La., is now director of the Career Development Program in Global Community Health, Public Health Service. Dr. Binford is medical director, Leonard Wood Memorial, Washington, D.C., and chief of the Special Mycobacterial Diseases Branch, Armed Forces Institute of Pathology, Washington, D.C. Dr. Trautman is director of the Carville hospital. Assistance in obtaining and compiling case data was provided by Mrs. Marilyn Sturdivant of the Carville hospital and Miss Delta Derrom of Leonard Wood Memorial.*

in U.S. veterans with military service in 1940 or later (4). (The study, conducted by members of the Leonard Wood Memorial staff, was started by Dr. J. A. Doull and continued after his death by Dr. R. Guinto and Dr. C. H. Binford.) Before their service, 12 of the 90 veterans had signs of leprosy and 15 had a history of exposure to the disease. Twenty-eight had lived in endemic areas before 1940, and 35 probably had leprosy as a result of exposure while serving in endemic areas.

Since the 1965 report (4), 26 additional U.S. veterans with leprosy were admitted to the Carville hospital. Also, 124 veterans with leprosy, not admitted to Carville, were reported to State health departments as follows: California, 27; Hawaii, 71; Texas, 14; and other States, 12. Thus 150 additional cases of leprosy in veterans have come to our attention. Including the 90 cases reported in 1965, a total of 240 cases in veterans with military service from 1940 through December 31, 1968, have been reported.

In 46 of the 240 veterans the infection probably occurred as a result of exposure to leprosy during military service outside the United States. Of the 46 whose cases were considered to be service connected, 35 were reported in 1965, seven were admitted to Carville from June 1, 1964 through December 31, 1968, and during this period four were reported but not admitted to Carville.

The veterans with leprosy who were born or had lived where leprosy was endemic were not included in the number believed to have been service connected. The U.S. endemic areas generally are considered to be southeast Texas, southern and southwest Louisiana, southern Florida, and Hawaii. Other veterans excluded were those born in or who had lived in Mexico, Puerto Rico, Guam, Samoa, and the Philippines.

In summary, from 1940 to 1968 of a total of 240 cases of leprosy in U.S. veterans, 194 were not attributed to exposure while in service and 46 were considered to be service connected.

#### **Cases Considered Service Connected**

The following patients with leprosy regarded to be service connected were admitted to the Public Health Service Hospital at Carville.

*Case 1:* White male, born 1904, Ohio. Moved

to Indiana in 1916 where he lived until 1922 when he enlisted in U.S. Army. During his 21 years of service he was stationed in Panama for 3 years; discharged 1945. The first sign of anesthesia in skin on right elbow was noticed in 1936. In 1939, diagnosis of syringomyelia was made; at the same time he noted partial nasal obstruction. Diagnosis of leprosy was made in 1942. Admitted August 18, 1946.

*Case 2:* White male, born 1919, Montana. No other residence prior to enlistment in U.S. Marine Corps in 1939. Served in American Samoa September 1, 1942 to December 7, 1943; discharged 1945. Onset probably in 1945 when loss of sensation of pain was noticed in right arm. Admitted February 27, 1949. Diagnosis was tuberculoid leprosy.

*Case 3:* White male, born 1894, Missouri. No known foreign residence prior to enlistment in U.S. Army in 1917. Stationed in Philippines, 1934-39; Hawaii, 1939-43; discharged 1946 (retired). Onset probably in 1948 when he noticed numbness of right foot and toes. Diagnosis of leprosy was made in June 1950 when skin lesions appeared. Admitted August 25, 1950. Diagnosis was lepromatous leprosy.

*Case 4:* White male, born 1895, Indiana. Lived there until 1916 when he enlisted in U.S. Army. From 1916 to 1942 he was stationed in San Antonio and Brownsville, Tex. Onset probably in 1947 when numbness of arms and legs was first noticed. Admitted July 19, 1948. Diagnosis was tuberculoid leprosy.

*Case 5:* White male, born 1911, Arkansas. Lived in nonendemic area in northern Texas from 1915 to 1940. No record of other residence or of travel prior to enlistment in U.S. Army in 1938. Stationed in Philippines where he was a prisoner of war in Bilibid and Cavanaguan, November 1941 to March 1945 (in contact with leprosy cases); discharged 1946. Onset probably in 1950 when he noticed red spot on left foot. Admitted January 19, 1951. Diagnosis was tuberculoid leprosy.

*Case 6:* White male, born 1923, Texas. Lived there until he joined U.S. Army in 1944. Served in Honolulu, Saipan, Okinawa, and Japan; discharged 1946. Onset probably in 1947 when areas of numbness were noticed on left leg. Admitted August 3, 1951, and discharged in 1952. Diagnosis was tuberculoid leprosy.

*Case 7:* White male, born 1913, Alabama. Professional soldier for 14 years, 1935-45 and 1949-53. During this period he spent 2 years in Philippines, 2 months in Africa, and 2 years in Japan and Korea; discharged 1953. Onset probably in 1951 while in Korea when he noticed nonpruritic red spots on trunk and extremities. Admitted February 12, 1953. Diagnosis was lepromatous leprosy.

*Case 8:* Negro male, born 1920, Georgia. Lived there until 1943 when he entered U.S. Army. During service he was stationed in New Guinea, Luzon, and Japan; discharged 1946. Onset probably in early 1953 when small light-colored areas appeared on right shoulder and abdomen. Diagnosis of leprosy made in July 1953. Admitted August 5, 1953. Diagnosis was lepromatous leprosy.

*Case 9:* Negro male, born 1917, Pennsylvania. Lived there until 1943 when he joined U.S. Navy. Served in New Guinea and Philippines (1 year); discharged 1946 and returned to Pennsylvania. First sign in 1952 when an erythematous macule appeared on right forearm. Diagnosis of leprosy made in 1953. Admitted October 28, 1953. Diagnosis was lepromatous leprosy.

*Case 10:* White male, born 1895, Kentucky. Lived in Kentucky and Tennessee until he joined U.S. Army in 1942. Served in European theater during 1944 and 1945 and in Philippines 1946-47; discharged 1947 and returned to Kentucky. Onset probably in 1951 when an erythematous macule appeared on left ankle. Admitted May 3, 1954. Diagnosis was lepromatous leprosy (5).

*Case 11:* White male, born 1922, North Carolina. Entered U.S. Army in 1942. Served in New Caledonia, Fiji, Guadalcanal, Luzon (1 year to 18 months), Japan; discharged 1945. Onset probably in 1948 when an injury to right knee caused no pain. In 1951 hypopigmented areas appeared on abdomen and lower extremities. Diagnosis of leprosy made by private physician in 1952. Admitted May 31, 1955. Diagnosis was lepromatous leprosy.

*Case 12:* White male, born 1918, Georgia. Lived in Georgia until he joined U.S. Army in 1942. Served in New Caledonia from January 1943 to May 1945, Philippines (5 months), and Japan (1 month); discharged 1945 and returned

to Georgia. Onset probably in 1948 when he noticed anesthesia of right elbow. Admitted January 18, 1956. Diagnosis was lepromatous leprosy.

*Case 13:* White male, born 1912, Virginia. Entered U.S. Army in 1945. During service spent 1 year in Philippines, otherwise service was in the United States; discharged 1946. Onset probably in 1950 when he noticed a flat red spot on right hip. Diagnosis of leprosy was made in 1956 by skin specialist. Admitted December 14, 1956. Diagnosis was lepromatous leprosy.

*Case 14:* White male, born 1927, Kentucky. Lived in Michigan from 1932 to 1955 except for about 18 months when he served in the U.S. Army during 1946-47. Stationed on Luzon, Philippines, for about 12 months. Onset probably in 1948 when anesthesia of the left ankle was first noted. Diagnosis of leprosy was made in 1954 when an outpatient at Carville hospital. Admitted October 23, 1958. Diagnosis was tuberculoid leprosy.

*Case 15:* Negro male, born 1924, North Carolina. Lived in North Carolina until he entered U.S. Navy in 1942. Served 2 years in North Carolina, 1½ years in Hawaii; discharged 1945 and returned to North Carolina. Onset probably in 1954 or 1955 when a small numb spot on back of right leg was observed. Diagnosed as leprosy in 1956. Admitted March 27, 1957. Diagnosis was lepromatous leprosy.

*Case 16:* White male, born 1915, Indiana. Lived in Indiana until he entered U.S. Army in 1941. Stationed in United States except for 1 year (1944) on Guam; discharged 1946 and returned to Indiana. Onset probably in 1957 when numbness of foot was noticed. Admitted August 1, 1960. Diagnosis was lepromatous leprosy.

*Case 17:* White male, born 1924, Pennsylvania. Entered U.S. Army in 1942. Between 1943 and 1945 served in New Guinea, Dutch East Indies, Philippines, and Australia. Deserted in 1945 and remained in the Far East (Philippines and Japan) for 2 years, then returned to Pennsylvania. Treated for "ringworm" in 1944 in the Philippines. First definite sign of leprosy was anesthesia of the forearm in 1957. Admitted August 3, 1960. Diagnosis was lepromatous leprosy.

*Case 18:* White male, born 1923, South Car-

olina. Lived there until he entered U.S. Army in 1942. During service spent 15 months in South Pacific islands; discharged 1944 and returned to South Carolina. Onset probably in 1959 with hypesthesia of the left knee. Admitted September 28, 1960. Diagnosis was lepromatous leprosy.

*Case 19:* White male, born 1924, Maryland. Moved to Georgia in 1939. Entered U.S. Army in 1945. Stationed in Philippines for 14 months; discharged 1946 and then lived in Miami, Fla. Onset probably in 1959 when he noticed "numbness" of arm. Admitted October 10, 1960. Diagnosis was borderline (dimorphous) leprosy.

*Case 20:* Negro male, born 1916, Alabama. Lived there until he entered U.S. Army in 1942. During service he was stationed in California, 1942-43 and India, 1944-45; discharged 1946 and returned to Alabama. Onset probably in 1958 when he noticed nodular lesions on his legs. Admitted May 25, 1961. Diagnosis was lepromatous leprosy.

*Case 21:* White male, born 1931, Alabama. Lived there until he joined U.S. Army in 1948. Served in South Carolina, 1948-49; Japan, 1949-50; Korea, 1950-51; and Georgia, 1952; discharged 1952 and returned to Alabama. Onset probably in 1960 when he noticed an erythematous plaque on leg. Admitted January 16, 1962. Diagnosis was lepromatous leprosy.

*Case 22:* White male, born 1921, Missouri. Lived there until he joined U.S. Air Force in 1942. During service he was stationed in the United States and in 1944-45 was on Espiritu Santo Island (2 months), other New Hebrides islands (2 months), Okinawa (3 months), and Philippines (5 months); discharged 1946 and then lived in Oregon. Onset probably in 1955 when a hyperpigmented macule on forehead was noted. Admitted February 22, 1962. Diagnosis was lepromatous leprosy.

*Case 23:* White male, born 1925, Florida. Lived there until 1943 when he entered U.S. Army. Served in India during 1944 and 1945; discharged 1946 and returned to Florida. Onset probably in 1952 when anesthesia of the arm was noted. Admitted October 22, 1962. Diagnosis was tuberculoid leprosy.

*Case 24:* White male, born 1925, Ohio. Lived there until he entered U.S. Marine Corps in 1942. Served for 2 years (1943-45) in South Pa-

cific; discharged 1945 and then lived in Florida. Onset probably in 1955 when numbness of arm was noted. Admitted December 10, 1963. Diagnosis was lepromatous leprosy.

*Case 25:* White male, born 1910, North Carolina. Lived there until he entered U.S. Army in 1942. Served in Australia (6 months), New Guinea (7 months in 1944), and the Philippines (10 months 1944-45); discharged 1945. Onset probably in 1950 when nodular lesions of the skin were noticed. Admitted April 30, 1964. Diagnosis was lepromatous leprosy.

*Case 26:* White male, born 1929, Missouri. Lived there until he entered U.S. Army in 1945. Served in the Philippines (1946-48); discharged 1948. Lived in Arizona 1948-56 and in California 1956-64. Onset probably in 1959 when a nodule on the right shoulder was noticed. Admitted August 10, 1964. Diagnosis was lepromatous leprosy.

*Case 27:* Negro male, born 1921, Maryland. Served in U.S. Army 1942-46 in New Guinea (14 months), Australia (8 months), Philippines (12 months), and Japan (6 months). Onset in 1955 with infection of right great toe. Admitted March 2, 1965. Diagnosis was dimorphous tuberculoid leprosy.

*Case 28:* White male, born 1917, Arkansas. Served in U.S. Army April 1945 to July 1946 in Texas (17 weeks) and in Hawaii and New Caledonia. Lived in Civilian Conservation Corps camp in California 1942-45. Onset in 1963 with numbness of right hand; later both feet were numb. Admitted April 12, 1965. Diagnosis was dimorphous leprosy.

*Case 29:* White male, born 1923, New York City. Served in U.S. Air Force March 1940 to 1965 in Louisiana, Texas, California, Guam, Philippines, China, Japan, Okinawa, Hawaii, and numerous European countries. First noted numbness of his toes in 1956. In 1963 he noted small skin lesions on all extremities, chest, and back. Admitted November 11, 1965. Diagnosis was dimorphous lepromatous leprosy.

*Case 30:* White male, born 1921, New Jersey. Served in U.S. Army 1942-45, 1946-52, 1961-66, and in U.S. Marine Corps 1952-55, in Mississippi, Panama, Texas, Philippines, Japan, Korea, Indonesia, California, Washington, Kentucky, and Georgia. First noted anesthesia in left thigh in June 1964. In August had skin

changes in both legs and thighs. In October 1965 noted brownish, swollen area below both eyes. Admitted July 12, 1966. Diagnosis was dimorphous leprosy.

*Case 31:* White male, born 1936, Pennsylvania. Served in U.S. Army January 1955 to January 1958 in New Jersey, Kansas, and Georgia. Served in U.S. Air Force November 1961 to December 1966 in Okinawa (30 months) and in Vietnam (12 months). Onset in April 1965 as paresthesia of the right cheek, but diagnosed as leprosy by biopsy March 1967. Admitted April 10, 1967. Diagnosis was indeterminate leprosy.

*Case 32:* White male, born 1924, Iowa. Lived there until he entered U.S. Air Force in 1943. From 1943 to 1963 served in Okinawa, Philippines, Guam, Cuba, Guatemala, Mexico, Texas, Florida, and Puerto Rico. Onset probably in 1964 when he became aware of a skin rash and sensory loss involving both lower extremities. Admitted February 27, 1968. Diagnosis was lepromatous leprosy.

The following patients were not admitted to the Public Health Service Hospital at Carville.

*Case 33:* White male, born 1929, Louisiana.

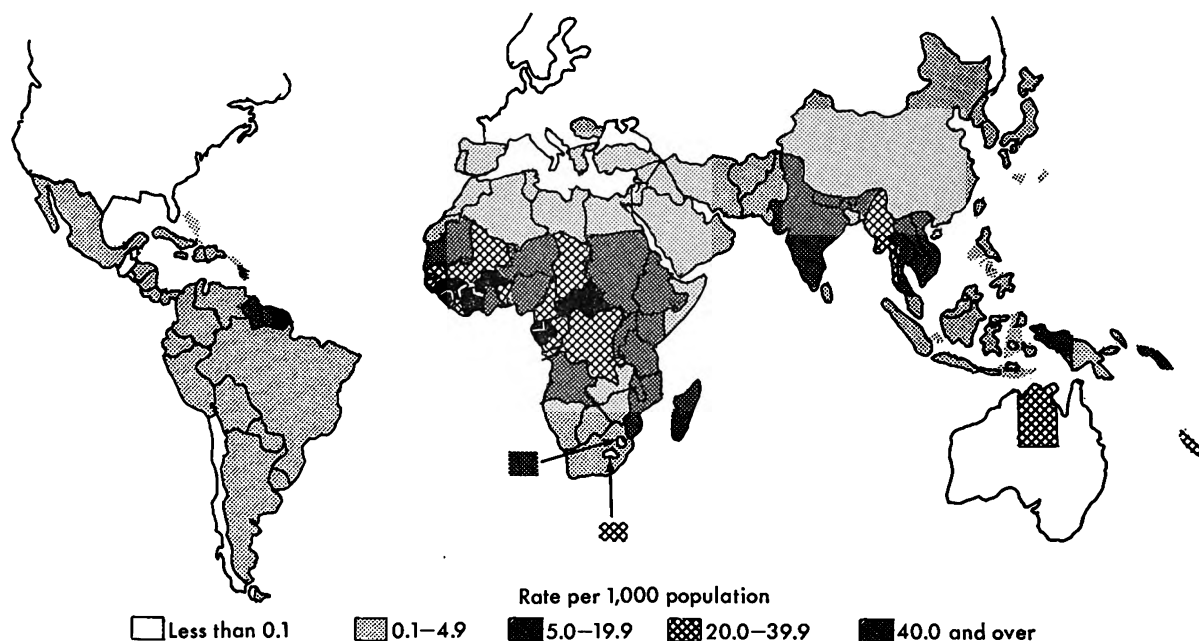
Lived there until he joined U.S. Navy in 1948. No record of foreign travel or other residence prior to service. During service spent 16 months in Pacific theater, with short periods in the Philippines, Hawaii, Okinawa, and Japan; discharged 1952. Onset probably in 1953 when an anesthetic red spot on right forearm was noted. Was examined as outpatient at Carville hospital, December 1953. Diagnosis was tuberculoid leprosy.

*Case 34:* White male, born 1914, Kansas. Lived in Kansas and Missouri until he joined U.S. Army in 1942. During service spent about 2 years in South Pacific theater; discharged 1946. Date of onset unknown but in 1945 was treated for "ringworm." By 1948 this lesion was about the size of a quarter and oval in shape. Diagnosis was tuberculoid leprosy.

*Case 35:* White male, born 1924, western New York State. Lived there until he joined U.S. Army in 1942. Served in Pacific theater—Philippines, 1943–45; discharged 1945. Onset probably in 1958 when sensory loss of both hands occurred, also thickening of facial skin. Diagnosis was lepromatous leprosy in 1959.

*Case 36:* White male, born 1933, Virginia.

### Distribution of leprosy in the world



SOURCE: Adapted from Bechelli, L. M., and Martínez Domínguez, V.: The leprosy problem in the world. Bull WHO 34: 811–826 (1966).

Lived there until he joined U.S. Army in 1954. Spent 15 months in Korea; discharged 1955. Onset probably about 1958 when numbness of left little finger was noticed; later finger became contracted. Diagnosis was tuberculoid leprosy.

*Case 37:* White male, born 1907, Kansas. Lived there until 1940, then in Salt Lake City, Utah (1940-43). Joined U.S. Army in 1943. Was stationed in California, New Guinea, Leyte, and Luzon, Philippines. While on Luzon was quartered on the second floor of a native house. Discharged 1945. Onset probably in 1945 while in the Philippines, when an ulcer appeared on left calf. Lesion healed spontaneously leaving a hypopigmented, anesthetic, atrophic scar. During next 7 years the area of anesthesia enlarged slowly to involve most of the left calf. Diagnosis was indeterminate leprosy in 1953 (6).

*Case 38:* White male, born 1913, Tennessee. Lived there until he joined U.S. Army in 1940. During service spent 1943-45 in South Pacific theater. Discharged 1945 in Brisbane, Queensland, Australia. Onset probably in 1955 with the appearance of pigmented macules and papules on face and ears. Diagnosis was lepromatous leprosy. Died in 1960 of an acute heart condition.

*Case 39:* White female, born about 1911, California. Entered Women's Army Corps in 1942. During service spent 8 months in Hollandia, New Guinea; discharged in 1945. Onset probably about 1947 when leprosy was diagnosed. May have started in New Guinea in 1945. Diagnosis was lepromatous leprosy.

*Case 40:* White male, born 1922, Michigan. While in U.S. Marine Corps was tattooed on extensor surface of lower left forearm in Melbourne, Australia, in June 1943. Subsequently served in endemic areas of the Pacific. In April 1946 he noticed the area of the tattoo and a zone about 1.5 centimeter in width around it had become pale red and was insensitive to light touch and pain. In November 1946 a biopsy was taken. Diagnosis was tuberculoid leprosy (7).

*Case 41:* White male, born 1922, Michigan. While serving in U.S. Marine Corps was tattooed on flexor surface of left arm in Melbourne, Australia, in June 1943. Served in endemic areas of the Pacific. In January 1946 noticed area of tattoo and a zone about 1.5 centimeter

in width was becoming dusky red and numb. In November 1946 a biopsy was taken. Diagnosis was cutaneous tuberculoid leprosy (7).

*Case 42:* Male, race unknown, born 1930, Pennsylvania. Served in U.S. Air Force 1948-52 and U.S. Army 1952-68, in California, Mississippi, Japan (12 months), and Korea (24 months). Served 12 months in Vietnam and then lived in Georgia, Texas, Virginia, and California. Onset late 1967. Diagnosis was tuberculoid leprosy.

*Case 43:* White male, born 1944, California. Served in U.S. Air Force February 1964 to November 1965. Leprosy believed to have been contracted while serving in the Pacific. Diagnosis was lepromatous leprosy.

*Case 44:* White male, born 1907, California. Served in U.S. Army 1942-45 in Hawaii, Makin, and Saipan. Red spot on right deltoid region was diagnosed as leprosy, July 16, 1965. Type not reported.

*Case 45:* Negro male, born 1931, Tennessee. Military service in Korea 1951-52. Burned left forearm without experiencing pain in 1955. Diagnosis of tuberculoid leprosy (clinical and nerve biopsy) was made in Cleveland in 1960.

*Case 46:* White male, born 1924, Connecticut. Lived there until he entered military service. Served from 1943 to 1945. Spent 1 year in Guam. Diagnosis was tuberculoid leprosy in 1963.

## Discussion

The occurrence of leprosy in 46 U.S. veterans with service from 1940 to 1968 can be attributed to exposure during military duty in endemic areas. Others not included because of their geographic origins may also have contracted the disease during military service rather than their place of residence before enlistment. All but one of the 46 veterans reported here had been exposed prior to 1960.

The total effect of the Vietnam war on leprosy in members of the Armed Forces will not be known for 10 years or longer because the incubation period is generally considered to be 3-5 years and the time lag between the first observed lesions and diagnosis will perhaps be several more years.

The prevalence of leprosy in Vietnam and the neighboring countries of Southeast Asia is estimated at 5 per 1,000 or higher; therefore,



from the experience of World War II and the Korean war, during the next decade some new cases can be expected among U.S. veterans. Also in this period, a few cases will probably occur in former members of the Peace Corps.

No study has been reported of contacts of veterans whose disease was probably the result of exposure while in military service. One as yet unreported family study has come to our attention (personal communication from Dr. P. Fasal, Public Health Service Hospital, San Francisco, December 13, 1968). A U.S. veteran (case 22) apparently contracted the disease while serving 1 year in the Philippines, Okinawa, and New Hebrides with the U.S. Air Force. In 1962 he was admitted to Carville, 7 years after the onset of his disease. His son, born in 1952, was admitted at the same time with a diagnosis of tuberculoid leprosy of recent origin.

Examination of the other members of the veteran's family revealed that his wife had a reddish-brown and slightly infiltrated macule on the right side of her face; it had been present for several months. The histopathological diagnosis was tuberculoid leprosy. Lesions in a daughter, age 9, and a son, age 7, were diagnosed as indeterminate leprosy with histopathological confirmation. A fourth child, age 14, had no clinical evidence of the disease. The mother and three of the four children apparently became infected from contact with the father who contracted leprosy while serving in the U.S. Armed Forces overseas. The family lived in a nonendemic area in the United States.

The foregoing family study illustrates how leprosy can be transmitted to susceptible individuals. It also illustrates the importance of early diagnosis. Fasal, in his communication mentioned earlier, stated that the father was under medical care for 4 years before the diagnosis of leprosy was made. The 4-year delay in diagnosis prevented the father from receiving effective treatment while the disease was in the early stage; had he been treated at this time, the other members of his family probably would have been spared.

The long delay in diagnosis cited in the foregoing case is not unique. A study of admissions to Carville revealed that in many cases patients had been under medical observation for several

years before leprosy was considered by physicians (8). A similar delay has been reported in outpatients by Fasal (9).

Pathologists likewise may fail to consider leprosy among the differential diagnoses of skin lesions. One of us (C.H.B.) reported six cases of leprosy (10) in which pathologists on initial or subsequent biopsy examinations did not consider leprosy.

If leprosy can be overlooked by both the clinician and the pathologist, especially in its earlier stages, then delays on the part of the patient can be also expected. Even if the patient suspects leprosy, he may choose to hide the disease, hoping it will go away. A study of patients admitted to the hospital at Carville from 1955 to 1965 showed an average delay of 14.5 months after the onset of signs or symptoms before a physician was seen (8). Marshall (11) and Brubaker (12) and their associates reported factual knowledge of widespread leprosy in all age groups among Ryukyu islanders. Despite this knowledge, however, leprosy continues to be a crippling and deforming disease in the Ryukyu Islands—probably because of late diagnosis and late treatment (12, 13). Too often such is the case in the United States as elsewhere in the world.

As Marshall's study (11) pointed out, and what is now almost universally recognized, one reason for delay in seeking medical aid when the disease is suspected is because of the fear of social ostracism or of being sent away when leprosy is discovered. The high proportion of patients coming to light with deformity indicates delayed diagnosis and treatment. Failure of physicians to promptly suspect or recognize leprosy is to a great extent the result of the lack of emphasis on leprosy in medical schools. The reluctance of a person who suspects leprosy in himself or a member of his family to seek medical assistance has been fostered by archaic laws and public health regulations dealing with the person who has the disease. Changes in these legal restrictions are taking place in many States and foreign countries concerned with the problem, yet much remains to be done to match public health and humane concern with the present knowledge of the disease.

Irrespective of the absence of clinical activity,

a history of leprosy excludes a citizen from being able to enlist or to be commissioned in any branch of the U.S. Armed Forces. With rare exceptions, when leprosy is diagnosed in a person on active duty in a military service, regardless of how mild or amenable to treatment the disease may be, he is given a medical discharge.

Of interest is a young man who had been treated at the hospital at Carville and discharged because his disease was arrested. He applied for duty in one of the services and was accepted. He stated in his medical history that he had had Hansen's disease. After a few months of duty, the discovery was made that Hansen's disease was leprosy. Based on his history of leprosy, despite the lack of signs of active disease or deformity, he was discharged immediately. This and other examples, in and out of the service, indicate needed change in attitude as well as regulations if leprosy is to be placed in the mainstream of medicine and acceptable public health practice. Only with these essential changes will the medical profession gain the confidence of patients and potential patients that will encourage them to seek medical care at the earliest possible moment. When leprosy is diagnosed in its early stages and treatment begun promptly, public health and other physicians can give patients assurance that the disease can be arrested, that deformities can be prevented, and that they can live normally.

### Summary

Before 1940, 83 cases of leprosy were reported in U.S. veterans. Thirty of these cases were considered to be the result of exposure to the disease outside the continental United States during the Spanish-American War.

From 1940 through 1968, 240 cases of leprosy were reported in U.S. veterans. As indicated in a résumé of their cases, 46 veterans were considered to have service-connected leprosy as a result of their exposure outside the United States.

No study has been reported of contacts of veterans with leprosy. However, one situation was brought to our attention in which leprosy was diagnosed in the wife and three children

of an infected veteran. The family lived in a nonendemic area.

Delay in the early diagnosis of leprosy is caused by the failure of both patients and physicians to suspect the disease. Early diagnosis and treatment assure the best possible opportunity for arresting the disease and preventing disability and further spread by reduction of the infectious reservoir.

### REFERENCES

- (1) Aycock, W. L., and Gordon, J. E.: Leprosy in veterans of American wars. *Amer J Med Sci* 214: 329-339, September 1947.
- (2) Hasseltine, H. E.: Leprosy in men who served in United States military service. *Int J Leprosy* 8: 501-508, October-December 1940.
- (3) Faget, G. H.: Leprosy in military service. *Int J Leprosy* 12: 65-66, December 1944.
- (4) Guinto, R. S., and Binford, C. H.: Leprosy. *Med Bull Veterans Admin MB-10*. Washington, D.C., 1965, p. 7.
- (5) Fenton, R. L.: Indeterminate leprosy acquired during military service. Report of a case and review. *Arch Int Med (Chicago)* 99: 290-293, February 1957.
- (6) Levan, N. E.: Leprosy acquired in military service during World War II. Report of a case. *JAMA* 156: 126-127, Sept. 11, 1954.
- (7) Porritt, R. J., and Olsen, R. E.: Two simultaneous cases of leprosy developing in tattoos. *Amer J Path* 23: 805-817, September 1947.
- (8) Brubaker, M. L., and Johnwick, E. B.: Ten-year review of hospital admissions of patients with leprosy. *Public Health Rep* 83: 155-160, February 1968.
- (9) Fasal, P.: Leprosy occurs everywhere. *GP* 32: 95-102, October 1965.
- (10) Binford, C. H.: Leprosy as a diagnostic problem in surgical pathology. *Southern Med J* 51: 200-207, February 1958.
- (11) Marshall, C. L., Maeshiro, M., and Korper, S. P.: Attitudes toward leprosy in the Ryukyu Islands. *Public Health Rep* 82: 795-801, September 1967.
- (12) Brubaker, M. L., and McCullough, J. C.: A program for leprosy control in the Ryukyu Islands. *Public Health Rep* 82: 802-806, September 1967.
- (13) Enna, C. D.: A survey of leprosy deformities in the Ryukyu Islands. *Int J Leprosy* 36: 271-281, July-September 1968.

### Tearsheet Requests

Dr. Merlin L. Brubaker, Career Development Program in Global Community Health, Public Health Service, Bldg. 31, Room 2A-32, 9000 Rockville Pike, Bethesda, Md. 20014

# Parenteral Medroxyprogesterone as a Contraceptive Agent

F. DOUGLAS SCUTCHFIELD, M.D., and W. NEWTON LONG, M.D.

**D**EPOT-medroxyprogesterone acetate is a long-acting steroid supplied for parenteral administration as Depo-Provera (4). DMPA has been used since 1958 for the treatment of endometriosis and threatened or habitual abortion. In 1962, it was observed to produce post partum sterility in women treated for threatened abortion. Based on this observation, Coutinho and co-workers began clinical trials with DMPA as a female contraceptive (1). Mishell and associates (2) and Zarnartu and associates (3) also reported on its effectiveness and side effects. [This drug has not yet been approved by the Federal Drug Ad-

ministration, Consumer Protection and Environmental Health Service. Ed.] Prompted by these reports, we began to administer 150 mg. of DMPA every 3 months to women attending the Emory University Family Planning Clinic at Grady Memorial Hospital, Atlanta, Ga.

## Clinic Setting

The Family Planning Program of Emory University, a grant-supported program, has operated a service at Grady Memorial Hospital since the 1930's. It primarily provides for the initiation of contraception for women receiving 6-week post partum examinations. It also, however, provides contraceptive services for women who are eligible for treatment at Grady Memorial Hospital, the charity hospital for Fulton and De Kalb Counties.

## Methods

In April 1967, 150 mg. of depot-medroxyprogesterone every 3 months was introduced as a contraceptive method in this clinic. Initially, we gave DMPA only to those women who had experienced contraceptive failures with oral contraceptives, intrauterine devices, or both. Later it was also given to other women whom staff physicians considered unlikely to be able to use pills or intrauterine devices successfully.

We reviewed the charts of women entering the study between April 1967 and December 1968 for demographic data and information on the contraceptive and medical difficulties en-

---

*Dr. Scutchfield, formerly epidemic intelligence service officer, Epidemiology Program, National Communicable Disease Center, Public Health Service, and assistant director of the family planning program of Emory University School of Medicine, Atlanta, Ga., is now assistant professor, department of community medicine, University of Kentucky School of Medicine, Lexington. Dr. Long is professor of gynecology and obstetrics and director of the division of research and training in maternal health and family planning, Emory University School of Medicine. Mrs. Betty Corey, Miss Lora Hutson, Mrs. Ruth Robinson, and Ronald Jenkins, of the Emory University family planning program, assisted in collection and analysis of the data. The research described was sponsored by the department of gynecology and obstetrics and supported by grants from the Sunnen and Rockefeller Foundations.*

countered with this form of contraception. Review of the charts was delayed until February 1969 to allow time for the resolution of questions pertaining to events which occurred during the period of the study. Our method of analysis was a modification of the life table that Tietze used for analysis of the effectiveness of intrauterine devices (4). Since DMPA was available only at Grady Hospital, we assumed that patients lost to followup had discontinued this method 3 months after their last injection.

## Results

None of the 723 patients for whom treatment with medroxyprogesterone was begun between April 1967 and December 1968 became pregnant. Seventy-three received DMPA for contraception until they could have either a tubal ligation or a hysterectomy. These 73 were eliminated from further analysis. The remaining 650 patients had a total of 5,082 woman-months of experience with this method of contraception. Table 1 shows the distribution of the 650 by age, number of living children, and marital status.

The cumulative net discontinuance rates at the end of 1 year for the 650 women, according to reason for termination of the drug, were as follows:

Reason for termination	Rate per 100 women
Irregular vaginal bleeding.....	13.5±1.8
Amenorrhea .....	2.8±.8
Other medical.....	5.5±1.2
Nonmedical .....	14.6±1.9
Unknown (lost to followup).....	6.8±1.3
Total terminated at end of year....	43.2.....
Active at end of year.....	56.8±2.6

**Bleeding and amenorrhea.** At the end of 1 year, 71 women, or 13.5 per 100 who began use of DMPA, had stopped using the drug because of abnormal bleeding. Fifty-one women required treatment at least once for abnormal bleeding. Only three patients needed treatment more than twice. Some of the women who needed such treatment are included in the 71 who discontinued use of DMPA. The rates of first treatment with estrogens among the women using DMPA are shown in table 2, by ordinal months from the first injection with DMPA. Calculations based on life tables were used to arrive at the denominator data for these rates.

The net cumulative rate of discontinuance of DMPA on account of amenorrhea was 2.8 per 100 women who began the use of medroxyprogesterone. In addition, four women required treatment with estrogens to produce withdrawal bleeding.

**Other medical reasons for stopping DMPA.** A total of 31 patients stopped using DMPA for medical reasons other than bleeding and amenorrhea. Although some of these reasons may not necessarily be related to the medication, they are included here for data analysis. These other medical reasons for discontinuance, according to the number of patients affected, were as follows:

Reason for stopping DMPA	Number of patients
Nausea .....	11
Excessive weight gain.....	5
Nervousness .....	4
Headache .....	3
Pregnant at time of first injection.....	3
Rash .....	2
Pelvic inflammatory disease.....	1
Hypertension .....	1
Vaginitis .....	1
Total .....	31

**Table 1. Demographic characteristics of 650 patients using depot-medroxyprogesterone as a contraceptive**

Characteristics	Number of patients	Percent of total
Age (years):		
0-14.....	13	2.0
15-19.....	110	16.9
20-24.....	174	26.7
25-29.....	136	20.8
30-34.....	121	18.7
35-39.....	68	10.6
40-44.....	26	4.0
45 and over.....	2	.3
Living children (number):		
0.....	38	5.8
1.....	91	14.0
2.....	126	19.3
3.....	96	14.7
4.....	70	10.7
5.....	70	10.7
6.....	32	5.1
7.....	47	7.4
8 or more.....	80	12.3
Marital status:		
Married.....	325	50.2
Single.....	160	24.5
Separated.....	136	20.9
Divorced.....	21	3.2
Widowed.....	8	1.2

**Table 2. Rate of estrogen treatment for bleeding among women using depot-medroxy-progesterone acetate**

Number of injections	Ordinal months from first injection	Woman-months of experience in period	Number of women requiring treatment for bleeding	Rate of treatment per 100 woman-months	Rate of treatment by number of injections per 100 woman-months
1-----	1	638.0	6	0.94	5.31
	2	596.5	15	2.51	
	3	535.5	10	1.86	
2-----	4	472.5	8	1.96	3.72
	5	418.5	4	.95	
	6	369.5	4	1.08	
3-----	7	326.0	0	0	.35
	8	283.5	1	.35	
	9	246.5	0	0	
4-----	10	207.0	0	0	1.26
	11	169.5	1	.58	
	12	146.0	1	.68	

*Nonmedical reasons for stopping DMPA.* Seventy-six of the 650 women studied discontinued depot-medroxyprogesterone acetate for such nonmedical reasons as spouse's objection to the method, fear of sterility, and change of marital status. The cumulative net rate of discontinuance for nonmedical reasons per 100 women at the end of 1 year was 14.6. A tabulation of the nonmedical reasons for discontinuance follows.

Reason	Number of patients
Moved from Atlanta area-----	23
Lack of transportation-----	11
Doesn't need birth control-----	8
Fear of sterility-----	6
Desires another method-----	4
Unable to leave job-----	3
Unable to obtain babysitter-----	3
Cannot afford clinic visit-----	3
Spouse objects to method-----	3
Forgot appointment-----	2
Decreased libido-----	2
Loss of hospital eligibility-----	2
Miscellaneous-----	6
Total-----	76

*Patients lost to followup.* We were unable to contact 28 patients. For Grady patients, the only source of DMPA is Grady Hospital. For this reason, any patient lost to followup was assumed, for the purpose of data collection, to have discontinued the drug 3 months after her last injection.

## Discussion

The cumulative net continuance rate for depot-medroxyprogesterone at the end of 1 year was 56.8 per 100 women with first injections of DMPA. Moreover, P. C. Schwallie, M.D., has

pointed out, in a personal communication in August 1967, that the net cumulative continuance rate probably understates the total demographic effectiveness of this method since the lower limit of action of one injection is 3 months. Also, the largest number of our patients who discontinued the drug did so for nonmedical reasons. Approximately 28 of the 76 women who discontinued for nonmedical reasons probably would have continued taking DMPA if it had been widely available. To our knowledge, ours is the first analysis of this method of contraception with calculations based on life tables.

No conceptions occurred in 5,082 woman-months of use of DMPA. Other authors have reported a pregnancy rate of 0.5 pregnancies per 100 woman-years (2, 3). Probably none of the women in our study who were lost to follow-up became pregnant either, since all of them who had been pregnant previously came to Grady Memorial Hospital for obstetrical care. In addition, Wright has pointed out that, of 424 visits to physicians by patients who were using a method of contraception originally obtained at Grady Hospital, only two visits, or 0.5 percent, were made to private physicians (4).

The primary medical reason that patients stopped using DMPA was abnormal bleeding. Of our 650 patients, 51, or 7.8 percent, required treatment at least once for this complication. Treatment consisted of diethylstilbesterol, 0.1 mg. per day for 20 days. This result is consistent with Schwallie's observation, in his August 1967 communication, that the amount of abnormal bleeding a patient experiences after receiving

DMPA decreases with each injection. Bleeding is the most important block to acceptance of DMPA by either physicians or patients.

The other frequent medical complaint is amenorrhea. Mishell indicated that with continuous progesterone stimulation, endometrial atrophy will eventually occur (5). In our patients, amenorrhea was less common than irregular menses. As mentioned previously, some patients discontinued DMPA because of medical reasons which were perhaps not related to this drug. Apparently, however, nausea and vomiting, as well as "nervousness," may well be related to its use. The discontinuance of DMPA by two patients because of a possibly allergic rash indicates that this etiology should be considered in the differential diagnosis of women with allergic dermatitis. The cumulative net rate of continuance of DMPA compares favorably with the rate of 63.8 calculated by Wright for the Lippes Loop D in the same population (6). It is better than the 51 percent 1-year continuance rate for oral contraceptives cited by Wright in an earlier publication (7).

### Conclusion

Although abnormal menses, including amenorrhea, limit the use of depot-medroxyprogesterone acetate as a contraceptive, its high rate of effectiveness—comparable to the theoretical effectiveness of oral contraceptives—and its high continuance rate make DMPA an excellent drug for use in family planning clinics.

### Summary

As a contraceptive, depot-medroxyprogesterone acetate (DMPA) was given intramuscularly in 150 mg. doses every 3 months to 650 women in a family planning clinic. This treatment represents 5,082 woman-months of experience. To date, there have been no pregnancies.

Calculations based on life tables show that, at

the end of 1 year, 56.8 of every 100 women who started using DMPA, continued to use it. Of the 43.2 per 100 who stopped using it, 13.5 did so because of abnormal bleeding, 2.8 because of amenorrhea, 5.5 because of other medical problems, and 14.6 because of nonmedical problems; 6.8 were lost to followup.

Since there have been no pregnancies with this method and the continuance rate is high, we consider DMPA to be an effective and acceptable method of contraception.

### REFERENCES

- (1) Coutinho, E. M., DeSouza, J. C., and Csapo, A. I.: Reversible sterility induced by medroxyprogesterone injections. *Fertil Steril* 17: 162-266 (1966).
- (2) Mishell, D. R., El-Habashy, M., Good, R. G., and Moyer, D. L.: Study of long-acting medroxyprogesterone acetate for contraceptive use. *Advances Planned Parenthood* 3: 77-80 (1967).
- (3) Zanartu, J., Rice-Wray, E., and Goldheizer, J. W.: Fertility control with long-acting injectable steroids. *Obstet Gynec* 28: 513-515 (1966).
- (4) Wright, N. H.: Evaluation of a plastic intrauterine loop in a post partum family planning program. *Public Health Rep* 83: 119-126, February 1968.
- (5) Mishell, D. R.: Effect of 6-methyl-17-hydroxyprogesterone on urinary excretion of leutinizing hormone. *Amer J Obstet Gynec* 99: 86-90 (1966).
- (6) Tietze, C.: Recommended procedures for the statistical analysis of intrauterine contraceptive devices. National Committee on Maternal Health, Inc., New York City, 1965.
- (7) Wright, N. H., and Swartout, J. R.: A program in mass family planning for the urban indigent in a charity hospital. *Amer J Obstet Gynec* 97: 181-188 (1967).

### EQUIPMENT REFERENCE

(A) Depo-Provera. Upjohn Pharmaceutical Company. Kalamazoo, Mich.

### Tearsheet Requests

Dr. F. Douglas Scutchfield, Department of Community Medicine, University of Kentucky School of Medicine, Lexington, Ky. 40506

# Predictors of Innovative Behavior Among Local Health Officers

MARSHALL H. BECKER, Ph.D., M.P.H.

**R**ECENT surveys show that, despite continued encouragement by leaders of the profession, many local health departments have failed to adopt important new programs needed to meet changing health needs (1-4). An imposing time lag exists between disclosure and application of new public health knowledge, a lag which deprives the public of many benefits of medical research. The Public Health Service has estimated (5) that "failure to use new findings results each year in 88,000 unnecessary deaths from cancer, 20,000 deaths from rheumatic heart disease, and needless suffering of countless victims of other ailments."

This study attempted to identify attitudes and other characteristics of health officers that might be related to "innovativeness"—the extent to which a health officer undertakes innovations earlier than his colleagues (6). Attitudes and characteristics of local health officers in three States were correlated with their times of adoption of two health programs. It was hypothe-

sized that a health officer's attitudes toward his profession, role, and scope of legitimate activity, and his opinion of the community would be related to whether he was an early or late adopter or perhaps had not yet accepted the innovation.

Attitudes are persistent personal orientations toward the environment. They develop over time and are potentially mutable. Findings linking specific orientations to innovative behavior carry implications for modifications in recruitment, training, and other circumstances surrounding the health officer which might increase the likelihood of earlier acceptance of new programs.

## Attitude Measures

Six dimensions of attitudes were examined: cosmopolitanism, ideology, activism, community progressiveness, community willingness to innovate, and political orientation.

Merton (7) has popularized the terms "local" and "cosmopolitan" to distinguish between a person interested mainly in his own community's affairs and one oriented more strongly toward society beyond his community. While the cosmopolite health officer aims to attain professional goals and seeks the approval of his professional colleagues, the localite is oriented toward his own department and places greater value on approval of his staff and the local community (8).

The cosmopolitan looks outside his group for new ideas and learns of innovations before the

---

*Dr. Becker is assistant professor of pediatrics, School of Medicine, and assistant professor of behavioral sciences, School of Hygiene and Public Health, Johns Hopkins University, Baltimore, Md. This study was supported by Public Health Service research grant CH 00044. At the time of the study, the author was research associate and project director, Public Health Practice Research Program, University of Michigan School of Public Health, Ann Arbor.*

local; further, because he is oriented to professional goals, the cosmopolitan is more likely to adopt programs advocated by public health leaders. Thus, cosmopolitanism is seen as a predictor of the early innovators.

A 19-question scale was constructed to measure degree of cosmopolitanism, including 12 questions developed and employed by Gouldner (9) and modified for relevance to public health. For most items, the respondent was asked to indicate (on a 5-point scale from "strongly agree" to "strongly disagree") his feelings toward statements such as the following:

It is unfortunate, but true, that there are really very few people in this community with whom one can share his professional interests.

While both are important, it is really *more* important to me to have the admiration of the people in my community than to have the respect of my fellow health officers.

On balance, I think that I would, in general, prefer to be the health officer of a relatively small-sized community where I could get to know many of the people.

I think that it is very important for a health officer to contribute to the advancement of basic public health knowledge.

I have few contacts with community influentials other than on the official level.

The scale also included several items relating to professional activity, such as number of papers published or presented at professional meetings during the past 5 years.

In an attempt to assess motivation to innovate in public health, Mohr (10) designed two measures: an "ideology" scale, based on questions measuring the health officer's opinions concerning the local health department's "proper" scope of services, and an "activism" score, based on such characteristics as the health officer's willingness to fight for support for public health measures, to seek funding beyond his local area, to seek out health problems in the community, and so forth. Both scales were employed in the current research, and their relationships to time of adoption of the programs calculated.

Because his position is appointive, and oriented toward treating a "public" rather than an individual patient (11), the local health officer may be expected to be politically sensitive to the demands of the community. Cognizance of the political nature and "representational role" (12) of the public health administrator, as well as evidence that norms relevant to adoption of innovations vary among geographic areas (13),

led to the expectation that a health officer's perceptions concerning the degree of his community's progressiveness and willingness to undertake both health and other civic innovations would be associated with the time at which he adopted the program. Personal estimates rather than direct data on area norms were sought in the questionnaire because of the supposition that the respondent behaves according to his subjective picture of his community, regardless of the objective realities of the situation. The concern, then, was with the health officer's view of his community's norms, and the possible association between this attitude and his adoptive behavior, rather than with the accuracy of his opinion.

The health officer was given a 5-point scale on which to rate his community's general progressiveness; he was then asked to select one of four categories to describe the community's readiness to plan and innovate:

Generally innovative on health matters, and also generally innovative about other community matters.

Generally innovative on health matters, but hesitant to be innovative about other community matters.

Generally *not* innovative on health matters, but otherwise generally innovative about other community matters.

Generally *not* innovative either in health matters or in other community matters.

These categories are a modified version of a "citizen's readiness" typology developed by Agger and Goldstein (14).

Finally, respondents were asked whether, in their political thinking, they considered themselves to be liberal, middle-of-the-road, or conservative. It was hypothesized that health officers with a relatively liberal orientation would be more likely to favor a health department's participation in a wide scope of health services and hence be more likely to initiate change and additions in their own agencies than would their more conservative colleagues.

## Methods

Data were collected in March, April, and May 1967 by a combination of mailed self-administered questionnaires (attitude scales) and a followup telephone interview (to ascertain times of program adoption and gather demographic and background information). All health officers in the three States were asked to participate; of 103 potential respondents, 95 completed



both questionnaires and interviews, a response rate of approximately 92 percent for the study.

Two pretest series were conducted in areas outside the study States. The first, involving seven face-to-face interviews with both medical and nonmedical health officers, led to several major revisions in the questionnaire. The second series tested the mail-telephone method of data collection. A comparison of the two techniques indicated that the mail-telephone combination was no less effective and far more efficient than the face-to-face interview.

Time of adoption was established as a composite of a series of dates, from the time of initial consideration of the program by the health officer to the time that the innovation was actually introduced. This information was supplemented (when possible) by annual reports, correspondence, and the recollections of staff closely concerned with the innovation.

Public health programs were selected as the unit of innovation (as opposed, for example, to new methods of providing old services) because programs may be assumed to produce more substantial change in the health department itself. Five "expert judges" (persons who are now or were local health officers with substantial professional reputations) rated 18 public health programs as to likelihood of ease of adoption. This dimension, termed "adoptive potential," included estimates of such factors as the extent to which each program "is of obvious practical value in the minds of most professionals in the field," "represents a major departure from tra-

ditional public health activity," and "might be supported or opposed by the majority of interested groups in the community." On the basis of these ratings, "measles immunizations" was taken as a program with high adoptive potential (HAP), while "screening for diabetes" was used as the program with low adoptive potential (LAP). However, in one State, measles immunization programs are required by law, and "topical fluoride application" was substituted as the program with high potential for adoption. This selection technique helped to assure that findings based on the two study programs may be generalized to other programs with similar likelihoods of acceptance.

In instances where the health department had adopted the program before the present health officer took office, the respondent was dropped from the analysis.

Because examination of the frequency distributions for the study variables indicated that parametric statistics were inappropriate, the nonparametric Goodman-Kruskal gamma was employed instead of the more popular Pearson coefficient. As with the Pearson coefficient, gamma is a correlation coefficient that varies between  $-1$  (perfect negative association) and  $+1$  (perfect positive association).

## Results

Table 1 presents data on the degree of association between various attitude measures employed in the study and health officers' times of adoption of the two programs. All scales were

**Table 1. Relationships (gamma coefficients) between health officers' scores on six attitude measures and time of adoption of each study program**

Attitude measure	Program with high potential for adoption		Program with low potential for adoption	
	Number of health officers <sup>1</sup>	Gamma coefficient	Number of health officers <sup>1</sup>	Gamma coefficient
Cosmopolitanism scale.....	81	0. 463	85	0. 357
Mohr ideology scale.....	81	. 390	85	. 327
Mohr activism scale.....	81	. 313	85	. 400
Community progressiveness scale.....	80	. 364	84	. 262
Community willingness to innovate scale.....	81	. 311	85	. 402
Political orientation scale.....	79	. 642	83	. 524

<sup>1</sup> If the department had adopted the program before the current health director took office, the respondent was dropped from the analysis; therefore the numbers are less than 95.

NOTE: All coefficients significant at  $P < 0. 05$ .

observed to have some predictive power, and all relationships were significant below the 0.05 level.

The stronger a health officer's orientation toward his profession and professional goals, the more likely was his early acceptance of new public health programs. However, cosmopolitanism was a better predictor of time of adoption of programs which have a relatively high likelihood of general acceptance within the health officer community. Further analysis revealed that the lower correlation in the LAP innovation case was due to the presence of "pioneers" (defined arbitrarily as the first two adopters of each innovation in each State) who had low cosmopolitanism scores, a finding that fits well with sociological theory concerning the orientations of persons who are first to undertake less popular innovations (6). When these LAP-innovation pioneers are removed from the analysis, the correlation rises to the HAP-innovation level.

Similarly, the broader the scope of activities envisioned by the health officer as appropriate to a health department, the earlier his adoption of the study innovations. The ideology scale scores, however, were somewhat poorer predictors of time of acceptance than was cosmopolitanism. But, with Mohr's activism scale, an interesting reversal occurred; activism was more highly associated with early adoption of LAP than of HAP innovations. Since activism is a measure of the extent to which a health officer attempts to manipulate his environment to gain support for his health plans and programs, this finding indicates that those persons who express a greater willingness to fight are likely to be earlier adopters of less popular programs.

In considering relationships between both community progressiveness and willingness to innovate and time of adoption, there would appear to be a possibility for reverse causality. One may speculate that a health officer who is innovative will perceive his community as progressive and ready to innovate, while a laggard will blame his community for his failure to adopt new programs. Clearly, in a paradigm relating individual innovativeness to community progressiveness, two cells represent dissonant situations: the health officer is innovative and the community is not; the health officer is

not innovative and the community is. The danger of biased responses lies in the possible desire of the respondent to reduce this dissonance by announcing a view of his community's progressiveness that will match his own activities.

Anecdotal evidence obtained both during the pretests and in the study suggested that health officers were able to view themselves as progressive and their communities as conservative; comments such as "this place is very conservative, and I have to constantly fight for the new programs I know we need" were common. The second dissonant situation, in which a noninnovative respondent views his community as progressive, may be ameliorated because the health officer will answer in terms of his own perception of himself as an innovator, which is not necessarily correlated with this study's objective measure of innovativeness. Thus, it would probably not be uncommon for a person, found to be noninnovative by this study, to nonetheless perceive himself as progressive, and such an individual would not incur dissonance in reporting his community to be progressive. However, such instances would reduce severely correlations between time of adoption and both community progressiveness and readiness-to-innovate estimates.

It is clear from table 1 that perceived community progressiveness was a better predictor of time of adoption of the HAP innovation, while community willingness to innovate was most highly associated with adoption of the LAP program. Further examination of the tables from which these correlations were generated revealed this difference to be due largely to the responses of the HAP and LAP pioneers. While pioneers of both innovations tended to rate the progressiveness and willingness to innovate of their communities higher than did the remaining respondents, LAP pioneers gave substantially higher ratings to their community's willingness to innovate than did HAP pioneers; in fact, each LAP pioneer gave his community the highest possible rating.

It is unusual that a measure based on a single question should yield the substantial correlations obtained in the replies concerning political orientation. Relative liberalness of the health officer was a good predictor of when he under-

took new programs relative to his peers. Since the responses represent general self-perceptions, it may be that the relatively high correlations occurred because the question tapped some attitudinal dimension or Weltanschauung far broader than the political realm. Since advocacy of change is a signaling feature of the term "liberal," such persons might be expected to look to their profession and outside their local communities for information concerning change in their field and would hold general attitudes favoring change. To check this, the gamma for the relationship between political orientation and cosmopolitanism was computed for 93 respondents and found to be 0.515.

### Discussion

If attitudes affect innovativeness, it would seem desirable to explore some of the background characteristics that might adhere to persons with different attitudinal sets. At this point, "attitudes" change from independent to dependent variables. The usual demographic information was obtained, but variables more closely related to values and social structuring might be expected to make a greater contribution toward understanding why certain persons hold certain attitudes.

Table 2 presents the relationships between certain background variables and four of the attitude measures. For simplicity, those background variables that did not produce meaning-

ful correlations with attitudes were excluded from the table; such variables included age, religion, length of time in private practice, time in the community, and number of positions held before the present one.

Generally, the cosmopolitan health officer traced his national ancestry (birthplace of mother) to central, southern, or eastern Europe. He graduated more recently from medical school, where he attained higher rank in his graduating class, tended to specialize, and went on to obtain more academic degrees than his less cosmopolitan peers. The health officer's philosophy concerning the proper scope of public health was strongly related to rank in his graduating class and additional academic degrees, but it was unaffected by year of graduation and whether or not he specialized. However, his class rank affected his activism to a lesser degree than it had his ideology, and number of degrees held became the best predictor of his willingness to fight for programs. Class rank was highly predictive of general political orientation, suggesting a connection between academic success and a willingness to accept or favor change.

Rank in medical school graduating class was, therefore, the best general indicator of "high" scores on attitude measures which, in turn, were predictors of innovativeness. Other indicators, in decreasing order of ability to predict, were degrees held beyond the baccalaureate, national

**Table 2. Relationships (gamma coefficients) between selected background variables<sup>1</sup> and health officers' scores on four attitude measures**

Attitude measure	National ancestry (N=92 <sup>2</sup> )	Rank in medical graduating class (N=80)	Year of graduation from medical school (N=83)	Formerly general practitioner or specialist (N=66)	Degrees held beyond baccalaureate (N=95)
Cosmopolitanism scale.....	0. 323	0. 373	0. 239	0. 236	0. 235
Mohr ideology scale.....	. 301	. 485	. 188	. 098	. 392
Mohr activism scale.....	. 277	. 340	. 256	. 108	. 396
Political orientation scale.....	. 384	. 737	. 289	. 123	. 459

<sup>1</sup> To obtain positive correlations, the background variables were ordered against high-to-low attitude scores as follows: National ancestry (birthplace of mother)—central, southern, or eastern Europe and other; U.S.A.; western Europe. Rank in medical school graduating class—upper 5 percent, upper 25 percent, upper 50 percent, lower 50 percent. Year of graduation from medical school—most recent to earliest. Specialization—specialist, general practitioner. Degrees beyond baccalaureate—more to fewer.

<sup>2</sup> Since time of program adoption is not considered in this table, respondents previously dropped were included in the analysis. Numbers less than 95 are due to nonresponse; also 10 health officers were not physicians, and 19 physicians had never engaged in specialty or general practice.

<sup>3</sup> N=93.

NOTE: All coefficients significant at  $P < 0.05$  except those set in italics.

ancestry, year of graduation from medical school, and whether the health officer, if previously in practice, had been a specialist.

### Summary

Surveys indicate that new programs needed to meet changing health requirements spread slowly through the health system. This study explored the usefulness of six attitude measures in predicting when (relative to their peers) health officers would undertake two kinds of public health programs. Findings showed that health officers who adopt new programs earlier generally tend, relative to their peers, to be more cosmopolitan; to define a broad area of services as legitimate activities for a health department; to express strong willingness actively to seek support from the environment for new programs; to view their communities as generally progressive and willing to innovate in health and other civic areas; and to express a general political orientation favoring change.

Additional analysis yielded five background variables related to the attitude measures. The best general predictors of attitudes related to innovativeness were rank in medical school graduating class and degrees held beyond the baccalaureate. The more usual demographic variables such as age and time in the community were not observed to be associated with the attitude measures to a statistically significant extent. In general, the results emphasize the importance of attempting to recruit recent, well-qualified graduates into public health and of providing them with opportunities for advanced public health training.

### REFERENCES

- (1) Department of Medical Service, American Medical Association: Public health in relation to

the private practice of medicine. Chicago, Ill., 1962. Mimeographed.

- (2) Mytinger, R. E.: Mandates for change in local health departments. *Public Health Rep* 81: 437-448, May 1966.
- (3) Mytinger, R. E.: Barriers to adoption of new programs as perceived by local health officers. *Public Health Rep* 82: 108-114, February 1967.
- (4) Mohr, L. B.: Determinants of innovation in organizations. *Amer Pol Sci Rev* 63: 111-126, March 1969.
- (5) Folsom, M. B.: Today's health needs and tomorrow's services. *Amer J Public Health* 53: 863-871, June 1963.
- (6) Rogers, E. M.: Diffusion of innovations. Free Press, New York, 1962.
- (7) Merton, R. K.: Social theory and social structure. Free Press, Glencoe, Ill., 1957.
- (8) Glaser, B. G.: The local-cosmopolitan scientist. *Amer J Soc* 69: 249-259, November 1963.
- (9) Gouldner, A. W.: Cosmopolitans and locals: toward an analysis of latent social roles—I and II. *Admin Sci Quart* 2: 281-306, December 1957, and 444-480, March 1958.
- (10) Mohr, L. B.: Determinants of innovation in organizations. Ph.D. dissertation, University of Michigan, Ann Arbor, 1966.
- (11) Back, K. W., et al.: Public health as a career of medicine: secondary choice within a profession. *Amer Soc Rev* 23: 533-541, October 1958.
- (12) Romani, J. H.: How public health administrators perceive their constituencies. *Public Health Rep* 83: 239-244, March 1968.
- (13) Marsh, P.C., and Coleman, A. L.: Group influences and agricultural innovations: some tentative findings and hypotheses. *Amer J Soc* 61: 588-594, May 1956.
- (14) Agger, R. E., and Goldstein, M. N.: Interim report of the community readiness study. July 14, 1965. (Mimeographed copies available from Dr. Becker or R. E. Agger, department of political science, McMaster University, Hamilton, Ontario).

### Tearsheet Requests

Dr. Marshall H. Becker, Department of Pediatrics, OMSO 1102, Johns Hopkins Hospital, 601 North Broadway, Baltimore, Md. 21205.

# Epidemiology of Rabies Vaccinations of Persons in Illinois, 1967-68

RUSSELL J. MARTIN, D.V.M., M.P.H., PAUL R. SCHNURRENBERGER, D.V.M., M.P.H.,  
and NORMAN J. ROSE, M.D., M.P.H.

**R**ABIES is usually considered a fatal disease in mammals. For this reason prophylactic measures are initiated when a human being has been exposed to a suspected rabid animal. The rabies prophylaxis consists of thorough cleansing of the bite wound, administration of rabies vaccine, and occasionally anti-rabies serum. Each year an estimated 30,000 persons in the United States receive postexposure prophylactic rabies vaccine (1). The surveillance program described delineates the circumstances in Illinois which lead to the administration of rabies vaccine.

## Materials and Methods

Ultraviolet irradiated rabies vaccine of rabbit brain origin is prepared by the Illinois Department of Public Health, division of laboratories, and supplied without cost for administration to Illinois residents.

Each physician requesting State-supplied rabies vaccine in 1967 and 1968 was sent a coded punchcard. The card contained spaces for the following information.

Date of exposure

Species of animal

Status of animal:

Dead-brain tissue submitted to laboratory for examination

Dead-brain tissue not submitted

Under veterinarian's observation

Not located

Total number of persons exposed

Age and sex of vaccinated person

Anatomic site of exposure

Type of exposure:

Multiple bite

Single bite

Nonbite

The interval between exposure and administration of vaccine was calculated, using the date of exposure and the date the vaccine was mailed or delivered to the physician plus the addition of 1 day to compensate for any shipment delay. When available, the actual date vaccination was initiated was used in calculating the interval. The data for each year were tabulated separately, compared, and combined.

The data obtained from this surveillance program were compared with the findings from routine investigations of animal rabies cases (2).

## Results

The 1967 and 1968 data were similar for the seven factors previously listed.

Rabies vaccine was dispensed to Illinois physicians on 1,063 occasions in 1967 and 1968. The coded cards were returned by attending physi-

---

*All the authors are with the division of preventive medicine, Illinois Department of Public Health, Springfield. Dr. Martin is regional public health veterinarian, Dr. Schnurrenberger is chief public health veterinarian, and Dr. Rose is chief, bureau of epidemiology.*

cians in 937 instances (88 percent). These 937 animals (fig. 1) had exposed 1,011 vaccinees. In 884 instances the animal exposed only one person; 38 animals exposed two or more persons. The number of persons exposed to the other 15 animals was not recorded. The 38 animals exposing two or more persons represented all classifications of species except the bat.

*Sex.* Of the persons receiving vaccine, 652 (64 percent) were male, 352 (35 percent) were female, and in seven instances (1 percent) the sex was not stated. The number of males was significantly greater ( $P=0.00001$ ) than the number of females. Sex was not associated with any of the other variables studied.

*Age.* The under-5-year age group contained 132 (13 percent) of the 1,011 vaccinees; 249 (25 percent) were between 5 and 9 years. Thirty-eight percent were 15 or older (table 1). Age was not stated for 67 vaccinees (7 percent).

*Type of exposure.* A total of 249 patients (25 percent) received two or more bites, and 625 patients each received a single bite (table

1). Nonbite exposures were recorded for 96 persons, and type of exposure was not recorded for 41.

Of the patients less than 5 years old, 36 percent had multiple bites.

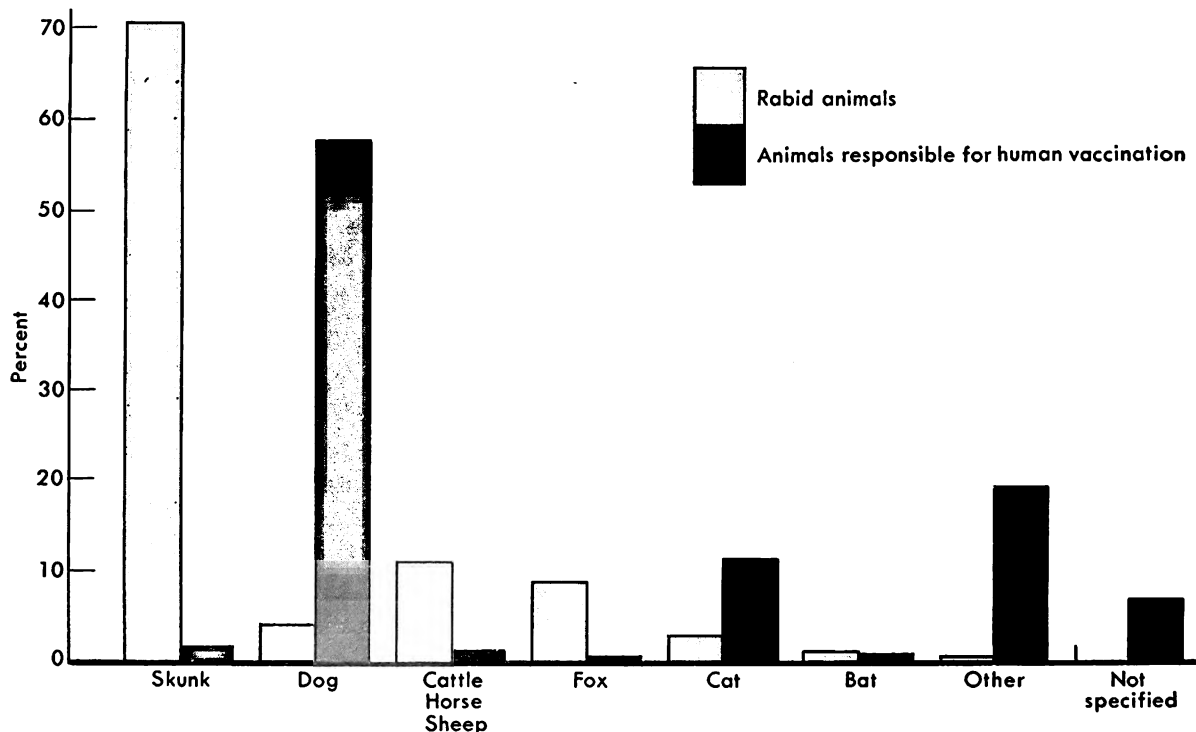
*Anatomic site of exposure.* Nearly a majority, 472 of the 1,011 vaccinees, reported exposure on hand or arm, and 221 patients were exposed on the head or neck (table 1). Of these 221, 154 were less than 10 years old; 88 had received multiple bites.

*Species.* Although skunks were only 2 percent (fig. 1) of the 937 animals responsible for human vaccination, this species accounted for 71 percent of the 347 rabid animals reported from Illinois in 1967 and 1968. Conversely, dogs made up 58 percent of the 937 exposing animals but only 4 percent of the State's reported rabies cases.

Of the 1,011 vaccinees, 55 percent were exposed to dogs while only 3 percent were exposed to skunks (fig. 2).

Dogs exposed 82 (62 percent) of the children

**Figure 1. Comparison among species of 347 cases of reported animal rabies and 937 animals causing human rabies vaccine to be administered, Illinois, 1967-68**



NOTE: Other includes squirrel, rat, mouse, raccoon, chipmunk, gopher, woodchuck, hamster, monkey, rabbit, unidentified rodent, beaver, guinea pig, mole, muskrat, opossum, and shrew.

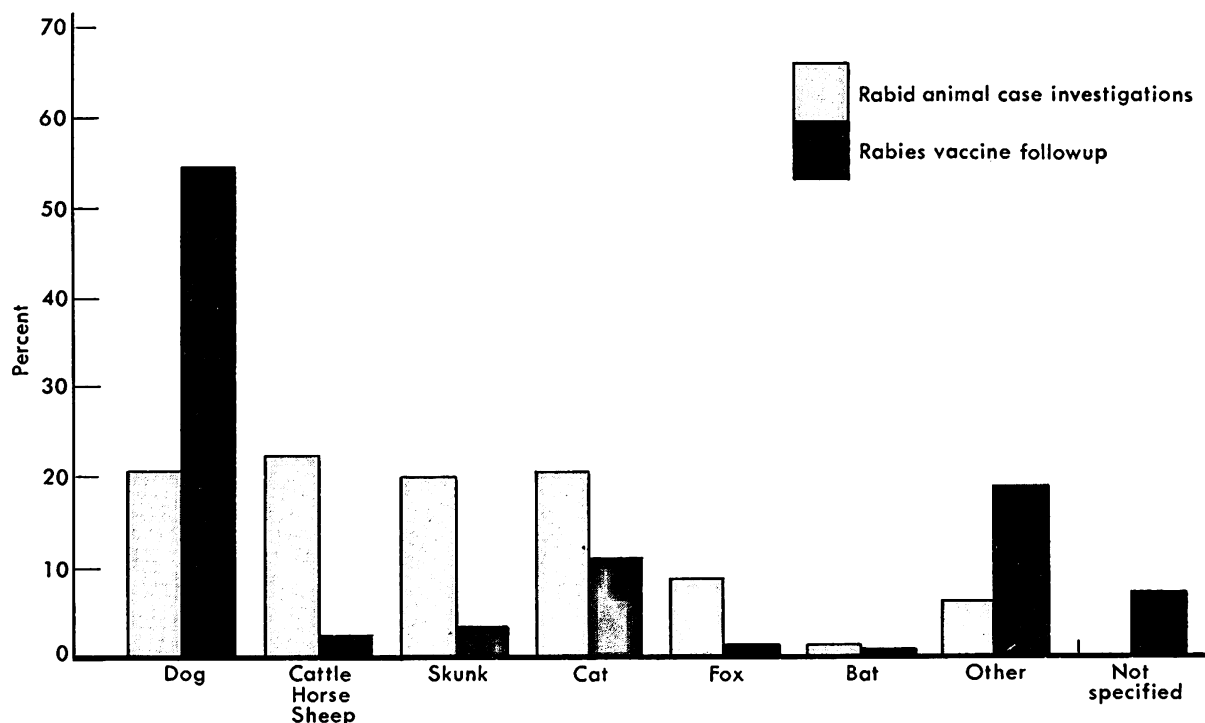
0-4 years of age and 155 (62 percent) of the 249 vaccinees with multiple bites. Also, 181 of the 221 persons exposed on the head or neck received vaccine because of contact with dogs.

Fifty-five percent of the vaccinees were exposed from May through September (fig. 3). When the data were tabulated by month of exposure and species, 79 percent (26 persons) of

**Table 1. Age distribution and type of exposure, by anatomic site, of 1,011 Illinois residents receiving rabies vaccine, 1967-68**

Age and type of exposure	Legs	Trunk	Head and neck	Arms	Not stated	Total
Age group (in years)-----	210	33	221	472	75	1, 011
0-4-----	11	5	75	38	3	132
5-9-----	44	10	79	100	16	249
10-14-----	41	10	29	93	8	181
15-19-----	21	1	10	45	3	80
20-29-----	18	3	5	42	2	70
30-39-----	18	1	4	44	5	72
40-49-----	17	0	2	36	2	57
50-59-----	21	0	5	25	2	53
60 or older-----	14	2	3	31	0	50
Not stated-----	5	1	9	18	34	67
Type of exposure-----	210	33	221	472	75	1, 011
Multiple bite-----	48	7	88	102	4	249
Single bite-----	152	25	123	306	19	625
Nonbite-----	6	1	6	61	22	96
Not stated-----	4	0	4	3	30	41

**Figure 2. Species of animal exposing Illinois residents to rabies—1,011 persons reported on physicians' followup and 175 persons found in rabies cases investigations, 1967-68**



NOTE: Other includes squirrel, rat, mouse, raccoon, chipmunk, gopher, woodchuck, hamster, monkey, rabbit, unidentified rodent, beaver, guinea pig, mole, muskrat, opossum, and shrew.

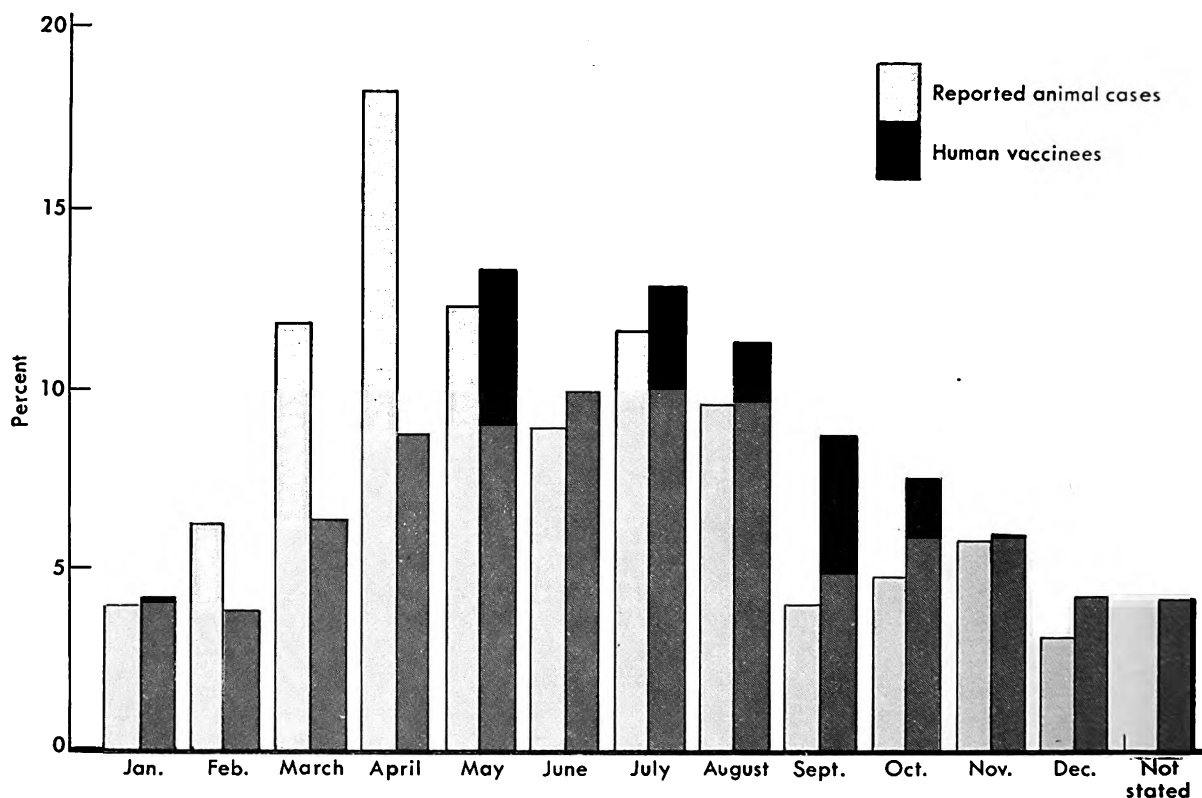
the exposures to skunks occurred May through July. Twenty-two (67 percent) of the 33 persons exposed to skunks were 15 years of age or older.

Of the animals causing human rabies vaccine to be administered, 20 percent (fig. 1) belonged to other species (squirrel, rat, mouse, raccoon, chipmunk, gopher, woodchuck, hamster, monkey, rabbit, unidentified rodent, beaver, guinea pig, mole, muskrat, opossum, and shrew). Only

one animal, a raccoon, was reported rabid from this species list in 1967-68.

*Status of exposing animal.* Of the 1,011 vaccinees 211, or 21 percent, were exposed to animals that later were under the observation of a veterinarian; 583 (58 percent) were exposed by animals that were not located (table 2). Animals exposing 68 (52 percent) of the 132 vaccinees in the less-than-5-year age group were placed under observation, and only 44 (33 per-

**Figure 3. Monthly distribution of 347 reported animal rabies cases and administration of rabies vaccine to 1,011 human beings, Illinois, 1967-68**

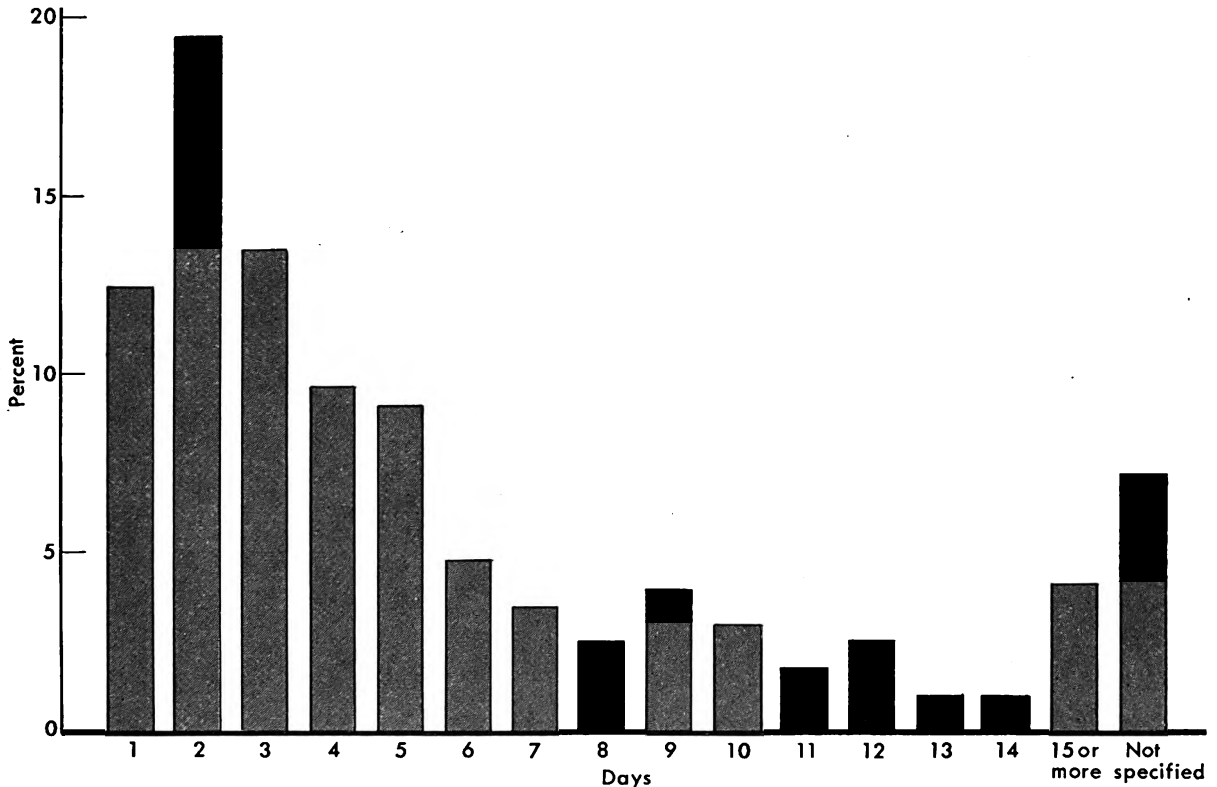


**Table 2. Age distribution of 1,011 Illinois residents receiving rabies vaccine by status of exposing animal, 1967-68**

Age in years	Dead, brain submitted	Dead, brain not submitted	Under observation	Not located	Status not given	Total
0-4.....	10	8	68	44	2	132
5-9.....	13	6	58	154	18	249
10-14.....	21	15	31	110	4	181
15 or older.....	65	25	39	241	12	382
Not stated.....	8	2	15	34	8	67
Total.....	117	56	211	583	44	1,011



Figure 4. Interval in days between exposure and first injection of vaccine, 1967-68



cent) of these children were exposed by animals that were not located.

Among the 211 vaccinees whose exposing animals were placed under observation were 73 (35 percent) multiple bite victims and 169 dog bite victims. Also, 157 of the 221 persons exposed in the head or neck had contact with animals that were placed under the observation of a veterinarian. The animal was not located in only 13 (14 percent) of the 96 nonbite instances (table 1). Of the 193 vaccinees exposed to the species listed as other, 153 (79 percent) of the animals were not located (fig. 1).

*Interval from exposure to vaccination.* Only 46 percent (fig. 4) of the vaccine series were initiated within 3 days after exposure, while 20 percent had a delay of 8 days or more before first inoculation of the vaccine. The interval between exposure and first inoculation was not associated with the type of exposure, species of exposing animal, or the total number of persons exposed per incident. Seventy-five (57 percent) of the 132 vaccinees less than 5 years of age had vaccination initiated within 3 days of exposure.

Vaccination was also initiated within 3 days for 136 of those 221 patients exposed in the head or neck.

Of the 211 persons receiving vaccine as a result of exposure that led to placing an animal under observation, 144 (68 percent) had the series initiated within 3 days of exposure.

*Rabid animal case investigations.* A total of 175 persons received rabies vaccine as a result of exposure to the 347 rabid animals reported from Illinois in 1967-68 (fig. 2). Of these patients 64 (37 percent) received State-supplied vaccine.

#### Discussion

The 88 percent punchcard return rate from physicians indicated the concern the practicing physician has for a patient receiving a series of rabies vaccinations. Perhaps the incident was so unusual that the physician was more likely to supply information than on more routine, reportable diseases or conditions. This high return rate was especially gratifying because in 1967

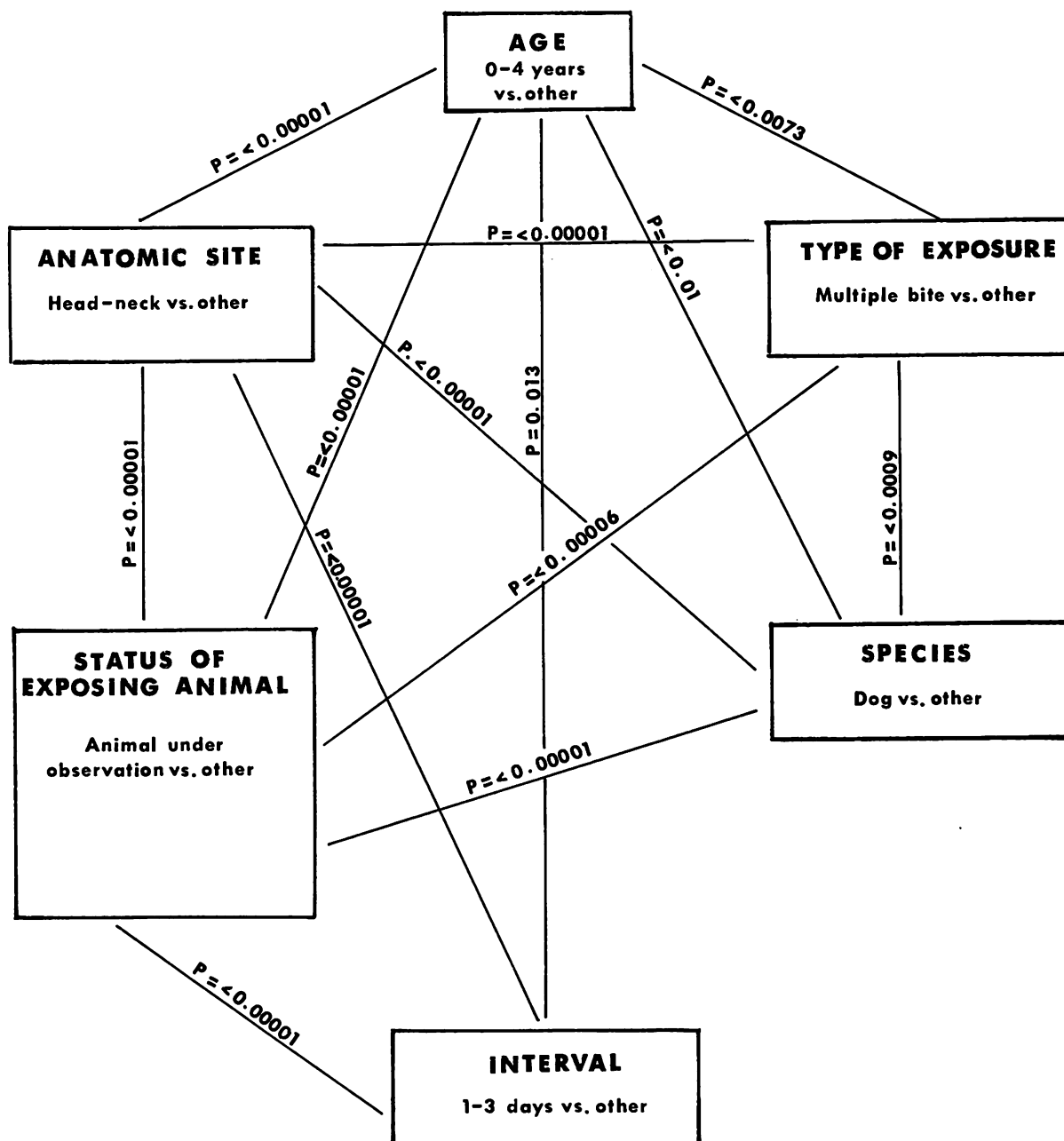
it was obtained with only a single request for information.

Bias could have entered this study at several places. The 1,011 vaccinees represented persons for whom vaccine was ordered, but they did not necessarily receive the entire series. Preliminary data indicated that approximately 60 percent

of the vaccinees received 14 or more inoculations of vaccine and 3 percent received none.

Because not all physicians used State manufactured rabies vaccines, this study does not include all incidents in which rabies vaccine was administered in Illinois in 1967-68. The circumstances preceding the administration of com-

**Figure 5. Interrelation of six factors to the administration of rabies vaccine, Illinois, 1967-68**



NOTE: P values determined by chi-square test.

mercial rabies vaccine possibly might differ from the ones described in this paper, although there was no apparent difference between the vaccinees exposed to reported rabid animals and the entire vaccinated population.

Six factors appear interrelated when the data are examined (fig. 5) :

Age—0-4 years of age versus others

Type of exposure—multiple bites versus others

Anatomic site of exposure—head or neck versus others

Species—dogs versus others

Status of biting animal—animal placed under observation versus others

Interval between exposure and initiation of vaccination—within 3 days of exposure versus others

The children 0-4 years old appeared to have been bitten more often on the head or neck, perhaps because short stature places the head close to a biting animal. This young victim could also have been less able to defend himself against the bite or to flee from the animal, thereby increasing his chances of receiving multiple bites. Parental concern may be greater for the young bite victim, thus increasing the likelihood that a physician would be consulted for wound treatment and possible vaccination.

Usually children less than 5 years old are under the supervision of a responsible person who limits their mobility. Further, they are more likely to be exposed to the family pet or the pet of a relative or friend than to a stray animal. These facts would all increase the likelihood that animals exposing small children would be located, identified, and placed under the observation of a veterinarian.

Head or neck exposures were associated with the other five factors (fig. 5). Dogs were more frequently implicated in head or neck exposures than other species. Sixteen percent of the dogbite victims received head or neck bites in a study by Parrish and co-workers (3) ; in another study Brobst and co-workers (4) observed such bites in 14 percent of the victims. However, because bites in these areas are considered extremely dangerous (1), it is logical to assume that persons bitten in the head or neck are more likely to receive vaccine than persons bitten in other parts of the body ; a

larger number of persons in this study were bitten in the head or neck than in other studies.

Those persons with head or neck exposures received their initial inoculation earlier than did persons exposed at other anatomic sites. Perhaps when exposures occur in the head region, the person is more concerned, and a physician is consulted sooner than for other exposure sites. Probably physicians are impressed with the dangers associated with a head exposure and are more inclined to start giving the vaccine immediately.

According to the division of health planning and resource development of the Illinois Department of Public Health, only 20 percent of the 1967 Illinois population was projected to be less than 10 years of age. Almost 38 percent of the 1,011 vaccinees were in this age group, which demonstrates the need for educating children to prevent animal bites.

Of the vaccinees exposed to dogs, 42 percent were less than 10 years of age, approximating the number exposed in studies conducted in Pittsburgh (3, 4).

The discovery that the majority of the exposures to skunks occurred in persons 15 years of age or older probably indicates that this age group is more likely to encounter this species during work or recreation.

Because time is an important factor in determining the success or failure of rabies prophylaxis (1), it is disturbing to see that more than 50 percent of the series were not started until 4 or more days after exposure. The data do not indicate whether this delay was caused by the patient or physician. Obviously prophylaxis cannot be initiated until the physician is consulted ; therefore, educational programs stressing the importance of immediate action are definitely indicated for the general public. The critical need for starting the vaccinations promptly should be stressed in courses on infectious diseases in medical colleges.

The fact that 682 (67 percent) of the exposures were on the extremities probably shows that arms and legs are used to ward off attacking animals and that they provide a better biting surface than does the trunk.

Since 583 persons were exposed to animals that were not located, the number of vaccinations could possibly be reduced by stressing the

importance of identifying and capturing biting animals and intensifying local stray animal control programs.

Nonbite exposures occurred in 66 percent of the 64 vaccinees exposed to reported rabid animals, whereas only 9 percent of the total vaccinated population reported nonbite exposures. The ratio of vaccinee to exposing animal also was higher in the group exposed to rabid animals ( $64 \text{ to } 27 = 2.37$ ) as compared with the total vaccinated population ( $1,011 \text{ to } 937 = 1.08$ ). This difference supports the suggestion that emotion may prevail over logic when the exposing animal is known to be rabid (2). A thorough search for exposed persons is indicated whenever a rabid animal is discovered, but transmission of the disease cannot occur unless the saliva of the animal contacts exposed nerves.

Although 71 percent of the reported rabid animals were skunks in 1967-68 in Illinois, this species formed only 2 percent of the animals causing persons to be vaccinated. This low percentage indicates that there is little danger of a person contacting a rabid skunk. Although dogs accounted for only 4 percent of the rabid animals in 1967-68, they represented 58 percent of the animals causing rabies vaccine to be administered. A similar but smaller difference also is seen in the exposures to cats.

Unfortunately, 19 percent of the vaccinees received rabies vaccine because of exposure to animals classed in the other species. Since 79 percent of these persons had been bitten by animals that were not located, there appeared to be a tendency to vaccinate when the animal in question was not located even though that species is seldom infected with rabies. One exception is the raccoon in sections of Georgia and Florida.

The temporal distribution of the reported rabid animals peaks in the early spring months because of rabid skunks, while the monthly distribution of the human vaccinees peaks during the summer months. These are the months when most animal bites occur (4). It is interesting that 79 percent of the persons receiving rabies vaccine as a result of exposure to skunks were exposed May through July. Similar time results are reported for vaccinees exposed to reported rabid wildlife (2). These are the months during

which recreational and agrarian activities take place in environments where skunks are likely to be encountered.

Regardless of the circumstances surrounding the bite, immediate, thorough scrubbing of the wound is indicated. Current recommendations stress that if circumstances indicate vaccination, it should commence immediately. If the biting animal is apprehended, its clinical status will be important in determining whether vaccination should be initiated. Examination of brain tissue of the animal by using the fluorescent antibody technique is rapid and reliable; therefore, if the animal must be killed, test results can be obtained within 24 hours.

A large majority of the biting animals cannot be captured, however, and the physician faces the question "to vaccinate or not to vaccinate?" Each exposure must be evaluated individually, considering (a) species of biting animal, (b) provocation (or lack of provocation) for the bite, (c) location and severity of the bite wound, and (d) presence (or absence) of rabies in animals in the region. Because the administration of rabies vaccine can be dangerous, this evaluation should be weighed against the probability that the patient was actually exposed to the rabies virus.

### Summary

Illinois physicians receiving State-manufactured rabies vaccine in 1967-68 were requested to supply information delineating the circumstances which led to the administration of vaccine. Vaccine was dispensed on 1,063 occasions; information was returned in 937 instances involving 1,011 patients. Males comprised 64 percent of the vaccinees. Thirty-eight percent of the vaccinees were less than 10 years of age. Twenty-five percent of the vaccinees received two or more bites, 62 percent received a single bite, and nonbite exposures were recorded for 9 percent. Sixty-seven percent of the persons reported exposures on the extremities, 22 percent, exposures on the head or neck.

Dogs exposed 55 percent of the persons vaccinated, skunks exposed 3 percent, and 19 percent of the vaccinees reported exposure to a species not usually infected with rabies. Fifty-eight percent of the vaccinees were exposed to animals that were not located, while 21 percent

were exposed to animals that later were under the observation of a veterinarian. Only 46 percent of the vaccine series were initiated within 3 days after exposure; 20 percent had a delay of 8 days or more.

#### REFERENCES

- (1) U.S. Public Health Service Advisory Committee on Immunization Practices: Rabies prophylaxis. Morbidity and Mortality Weekly Report 16: 152-155, May 13, 1967.
- (2) Schnurrenberger, P. R., Martin, R. J., Meerdink,

G. L., and Rose, N. J.: Epidemiology of human exposure to rabid animals in Illinois. Public Health Rep 84: 1078-1084, December 1969.

- (3) Parrish, H. M., Clack, F. B., Brobst, D., and Mock, J. F.: Epidemiology of dog bites. Public Health Rep 74: 891-903, October 1959.
- (4) Brobst, D., Parrish, H. M., and Clack, F. B.: The animal bite problem. Vet Med 54: 251-256, May 1959.

#### Tearsheet Requests

Dr. Russell J. Martin, Bureau of Epidemiology, Illinois Department of Public Health, Springfield, Ill. 62706



**Hill-Burton Program, Progress Report, July 1, 1947-June 30, 1968.** PHS Publication No. 930-F-3; revised 1968; 68 pages; 70 cents. Presents national and State statistics on more than 9,500 projects which have been approved for the construction, modernization, and replacement of voluntary nonprofit hospitals and other health facilities throughout the country. Shows, in tabulations, the progress of the program over the past 5 years rather than the cumulative picture since the beginning of the program.

**Kidney Disease Services Facilities and Programs in the United States.** PHS Publication No. 1942; May 1969; 229 pages; \$1. Presents information collected on a State-by-State basis by the staff of the Kidney Disease Control Program in collaboration with the nine Public Health Service Regional Offices, the State health departments, and a variety of other organizations and sources. Provides information on such resources as official kidney disease advisory and study groups, kidney disease voluntary agencies, State and local health planning groups, educational and training programs, screening programs, special (research) studies and projects, chronic and acute dialysis facilities in operation, transplantation facilities, tissue typing

laboratories, special State legislation to assist end-stage patients, anatomical gifts legislation relative to renal homotransplantation. Includes a summary of various official and private sources of financial assistance which may contribute to supporting hemodialysis and kidney transplantation services.

**Some Physical Factors Affecting Radiographic Image Quality: Their theoretical basis and measurement.** PHS Publication No. 999-RH-38; by Lloyd M. Bates; August 1969; 101 pages.

Presents data resulting from a project carried out under contract between the Johns Hopkins University and the Bureau of Radiological Health, Public Health Service. Reviews the medical diagnostic process involved in determining the pathological condition of a patient made on the basis of available roentgenological information. In diagnostic roentgenology, information relating to the patient is made available through X-rays and is displayed in the form of a visual image.

Several years ago, a program on the physics of diagnostic roentgenology was established at the Johns Hopkins University to carry out fundamental study of the parameters of an imaging system that affect image quality, to devise methods to meas-

ure these parameters, and to make available to the field of radiology the results of these measurements on the apparatus currently available in the United States.

Includes details on the manner in which the measurements were analyzed and a summary of the characteristics of radiographic films and screens currently available. Also provides a set of tables and curves in the appendix of this report which indicate the format in which detailed data from measurements will be published in a separate report.

**State-Interstate Solid Waste Planning Grants and Agencies, January 1969.** PHS Publication No. 1912; 1969; 17 pages. Lists the names and addresses of the solid waste planning agencies for all States, Territories, and the District of Columbia. Gives certain additional information for the State and interstate agencies with solid waste planning grants.

This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared with Federal support.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington, D.C. 20201.

The Public Health Service does not supply publications other than its own.

# Epidemiology of Human Exposure to Rabid Animals in Illinois

PAUL R. SCHNURRENBERGER, D.V.M., M.P.H., RUSSELL J. MARTIN, D.V.M., M.P.H.,  
GAVIN L. MEERDINK, and NORMAN J. ROSE, M.D., M.P.H.

**R**ABIES has long been a serious public health problem in the United States, with 47 deaths of human beings reported in 1938. This number was reduced to two in 1967 and one in 1968, with both 1967 exposures occurring in Africa. Consequently, this country's primary rabies problem is no longer cases in human beings, but rather the emotional trauma experienced when a suspected exposure occurs and the possibility that vaccine may be administered without cause.

Therefore, it is important to define the circumstances precipitating administration of rabies vaccine to man. This information could suggest methods of reducing the number of exposures and vaccinations. This paper is a report of a preliminary epidemiologic investigation into incidents of rabies exposure.

## Materials and Methods

The study period extended from January 1, 1963, through December 31, 1968. Each time a specimen of animal brain tissue was found to be positive for rabies in the laboratories serving the State of Illinois and each time a practicing veterinarian submitted a clinical diagnosis of rabies to the Illinois Department of Agriculture, a questionnaire was sent to the attending veterinarian. Information was requested on the number of persons receiving rabies vaccine, and the age, sex, and extent of exposure for each person.

The completed questionnaire was then returned to the Illinois Department of Public Health.

Each case of animal rabies resulting in one or more persons receiving rabies vaccine is referred to in this report as an exposure incident. Persons 15 years of age or older were classified as adults in this study. Dogs that had encountered rabid skunks and weapons used to destroy rabid animals were considered fomites. Fomite contact does not include the cleansing of water containers; this cleansing was considered saliva contact.

## Results

From January 1, 1963, through December 31, 1968, a total of 1,272 cases of animal rabies were reported in Illinois (table 1). These cases resulted in 332 exposure incidents (26.1 percent of all cases) and led to vaccination of 856 persons. An average of 67 persons were vaccinated

---

*Dr. Schnurrenberger, Dr. Martin, and Dr. Rose are with the division of preventive medicine, Illinois Department of Public Health, Springfield. Dr. Schnurrenberger is chief public health veterinarian, Dr. Martin is regional public health veterinarian, and Dr. Rose is chief, bureau of epidemiology. Mr. Meerdink, a senior student at the Iowa State College of Veterinary Medicine, at the time of the study was a communicable disease investigator for the Illinois Department of Public Health.*

per 100 cases of rabies, or 258 per 100 exposure incidents.

*Species.* Skunks accounted for 62 percent of the cases of rabies, but only 19.6 percent of the exposure incidents and 11.9 percent of the persons vaccinated (see chart). As shown in table 1, skunks had the lowest rate of exposure incidents, eight per 100 cases of rabies, and the lowest rate of persons vaccinated per 100 incidents (157). Cats accounted for only 10.8 percent of the cases, but 31.9 percent of the exposure incidents and 39 percent of the persons receiving vaccine (see chart).

The exposure incident rate was lowest for wildlife, 12 per 100 cases. Only 20 of the 109 incidents resulted in more than two persons receiving vaccine, for an average of 21 vaccinees per 100 cases of rabies in wildlife. The exposure incident rate per 100 cases in farm animals was 44.2, with 16 of the 61 incidents involving more than two persons for an average of 94 persons vaccinated per 100 cases.

Dogs and cats had the highest incident rate, with exposures in 72.6 percent of the cases. More than two persons were involved in 68 of the 162 incidents, giving a rate of 240 persons vaccinated for each 100 cases in dogs or cats. These relative positions of the three groups persisted for the number of persons vaccinated per 100 incidents. The rate for wildlife was 175; for

farm animals, 213; and for dogs and cats, 330 (table 1). Eighteen veterinarians received vaccine because of cattle exposure compared with 14 because of exposure to dogs and cats (seven each).

*Age and sex.* Of the persons receiving rabies vaccine, 31.9 percent were adults, 27.2 percent were children, and the ages of 40.9 percent were not reported (table 2). The greatest age difference was in the group vaccinated because of rabid farm animals; 53.1 percent of these vaccinees were adults and only 4.6 percent were children. Adults also predominated in exposures to wildlife; 39.8 percent of those exposed were adults and 30.4 percent were children. Children were more commonly exposed to dogs and cats; 31.6 percent of such exposures were of children and 23.9 percent were of adults.

The distribution of the vaccinees by sex was 46 percent male, 24.4 percent female, and 29.6 percent not reported (table 2). The difference in rates by sex was most marked among persons vaccinated because of exposure to farm animals—78.5 percent males and 12.3 percent females—followed by persons exposed to wildlife—62.8 percent males and 19.4 percent females. Little difference was noted in persons receiving vaccine as a result of exposure to dogs and cats—32.1 percent males and 29.2 percent females.

**Table 1. Persons vaccinated because of exposure to rabid animals, Illinois, 1963-68**

Species	Number of rabies cases	Exposure incidents	Incidents per 100 cases	Persons vaccinated per incident						Total persons vaccinated	Vaccinations per 100 incidents	Vaccinations per 100 cases
				1	2	3-6	7-10	11-19	20-27			
Wildlife.....	911	109	12.0	75	14	18	1	1	0	191	175	21
Skunk.....	789	65	8.2	49	7	8	1	0	0	102	157	13
Fox.....	76	19	25.0	11	5	3	0	0	0	33	174	43
Bat.....	26	13	50.0	9	0	4	0	0	0	23	177	88
Raccoon.....	12	6	50.0	3	1	1	0	1	0	21	350	175
Squirrel.....	6	4	66.7	2	1	1	0	0	0	7	175	117
Coyote.....	1	1	100.0	0	0	1	0	0	0	4	400	400
Mouse.....	1	1	100.0	1	0	0	0	0	0	1	100	100
Farm.....	138	61	44.2	27	18	15	1	0	0	130	213	94
Cow.....	125	55	44.0	25	15	15	0	0	0	113	205	90
Horse.....	10	4	40.0	0	3	0	1	0	0	15	375	150
Sheep.....	2	1	50.0	1	0	0	0	0	0	1	100	50
Pig.....	1	1	100.0	1	0	0	0	0	0	1	100	100
Pet.....	223	162	72.6	67	27	46	17	3	2	535	330	240
Cat.....	137	106	77.4	44	22	29	7	2	2	334	315	244
Dog.....	86	56	65.1	23	5	17	10	1	0	201	359	234
Total.....	1,272	332	26.1	169	59	79	19	4	2	856	258	67

*Type of exposure.* Among the persons given vaccine, the specific type of exposure most frequently recorded (29.8 percent) was handling rabid animals. Eighteen percent of the vaccinees had been bitten, 7.4 percent had saliva contact, 6.9 percent had been scratched, 2 percent had handled fomites, 6 percent had other types of exposures, and the type of exposure for 30 percent was not reported (table 2). Wildlife contributed the highest percentage of bites, 36.1 percent, and contacts with fomites, 7.3 percent. Farm animals were the source of most saliva contacts, 22.3 percent, and dogs and cats contributed the highest percentage of scratches, 10.3 percent. The three categories had approximately equal percentages of persons receiving vaccine as a result of handling rabid animals.

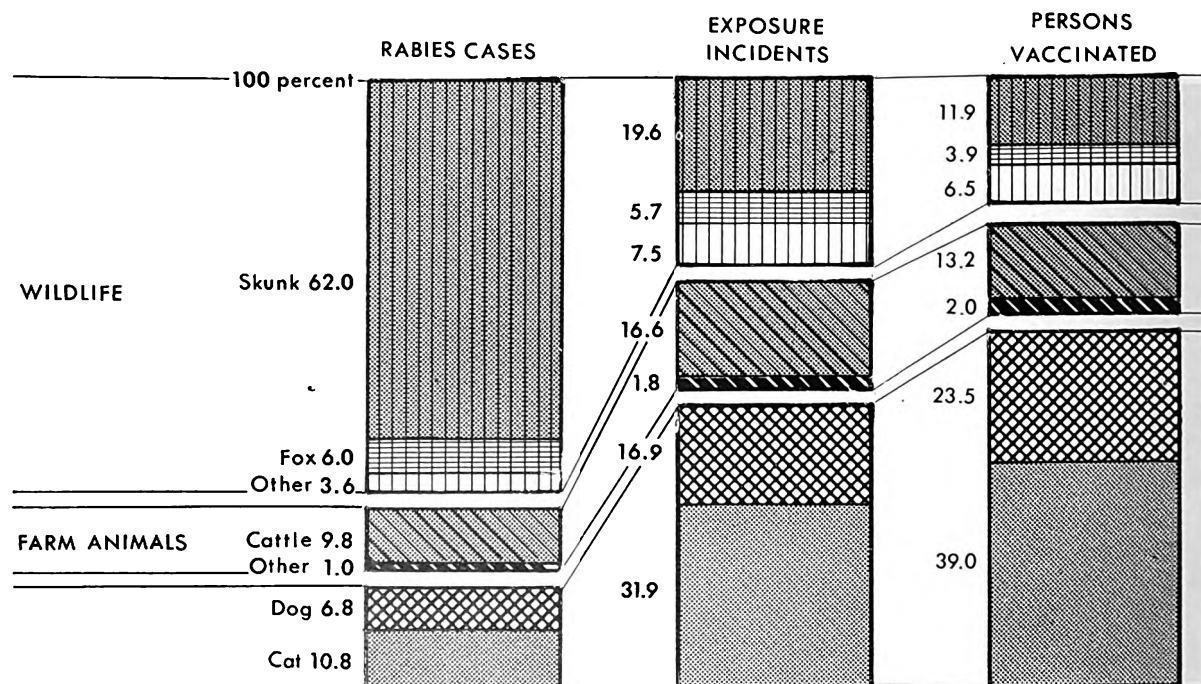
Head bites accounted for 2.1 percent (five of 233) of the exposures of children but only 0.4 percent (one of 273) of adults. The relative frequency of hand and arm bites was reversed in the two age groups, 6.4 percent of those in children compared with 11.4 percent of those in adults. Saliva exposure was experienced by 2.6 percent (six of 233) of the children, and 13.2 percent (36 of 273) of the adults. The only im-

portant sex-related exposure was scratches, which accounted for 13.9 percent (29 of 209) of the exposures of females and 4.8 percent (19 of 394) of those of males.

Exposures listed as "other" include "spattered with skunk's blood," "in the same yard," "walking barefoot through the yard," "skinning fox," "dressing squirrel," "butchering cattle," "saliva on shoe," "autopsy," "removing the brain with tear in glove," and "had a cold while treating animal." Three persons were vaccinated although the exposure was described as "none." Also three persons were vaccinated whose exposure consisted of drinking tea prepared from water which had been boiled in a saucepan used the previous day to bathe the eyes of a rabid dog. A blacksmith shod a pony the day before it became ill with rabies, and as a result four persons received vaccine—the blacksmith, his wife, who brushed his clothes that evening, and two friends he visited the following day.

*Month.* As shown in table 3, March and April had the highest percentage of total cases (26.9 percent). Cases in wildlife were most frequent March through May (42.8 percent), 33.3 percent of the cases among farm animals were

**Percent distribution of reported cases of rabies, incidents of human exposure, and persons vaccinated against rabies, by category of animal involved, Illinois, 1963-68**





**Table 2. Age, sex, and type of exposure of 856 persons exposed to rabid animals, by category of animal involved, Illinois, 1963-68**

Characteristics of vaccinee and type of exposure	Wildlife		Farm		Dog or cat		All persons	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent of total
<i>Age (years)</i>								
Under 15-----	58	30.4	6	4.6	169	31.6	233	27.2
15 and over-----	76	39.8	69	53.1	128	23.9	273	31.9
Not reported-----	57	29.8	55	42.3	238	44.5	350	40.9
<i>Sex</i>								
Male-----	120	62.8	102	78.5	172	32.1	394	46.0
Female-----	37	19.4	16	12.3	156	29.2	209	24.4
Not reported-----	34	17.8	12	9.2	207	38.7	253	29.6
<i>Exposure</i>								
Total bites-----	69	36.1	3	2.3	82	15.3	154	18.0
Head or neck-----	2	1.0	0	0	4	.7	6	.7
Hand or arm-----	31	16.2	2	1.5	36	6.7	69	8.1
Foot or leg-----	18	9.4	0	0	14	2.6	32	3.7
Trunk-----	1	.5	1	.8	0	0	2	.2
Not reported-----	17	8.9	0	0	28	5.2	45	5.3
Scratch-----	4	2.1	0	0	55	10.3	59	6.9
Saliva-----	2	1.0	29	22.3	32	6.0	63	7.4
Handled-----	51	26.7	48	36.9	156	29.2	255	29.8
Fomite-----	14	7.3	2	1.5	1	.2	17	2.0
Other-----	17	8.9	14	10.8	20	3.7	51	6.0
Not reported-----	34	17.8	34	26.2	189	35.3	257	30.0
Total-----	191	100.0	130	100.0	535	100.0	856	100.0

reported February through April, and cases in dogs and cats were most prevalent July through September (46.6 percent).

Incidents of exposure to wildlife were most frequent June through August (51.4 percent). Farm animal incidents were most common February through April (36 percent) with another peak (13.1 percent) in September. Incidents of exposure to dogs and cats occurred mostly July through September (49.5 percent).

Most vaccinations because of wildlife exposure (57.6 percent) occurred June through August while vaccinations due to farm animal exposures were most common February through April (43.1 percent). Vaccinations due to dog and cat exposures were most common July through September (57.8 percent).

The June through October average was 21 incidents per 100 cases of rabies in wildlife in contrast to six per 100 cases for the remainder of the year. The seasonal difference was less marked for the other species groups, with dogs and cats having a rate of 79 incidents per 100

cases for July through September and December through February in contrast to 62 for the other 6 months. The farm animal average was 55 incidents per 100 cases for March through May and September through November with 35 for the rest of the year.

There were 201 persons vaccinated per 100 wildlife incidents July through December but only 136 the remainder of the year. The farm animal rate was 263 December through April and 163 for May through November. The rate for dogs and cats peaked June through August, with 404 vaccinations per 100 incidents in contrast to 269 for the other 9 months.

The vaccination rate per 100 cases also varied markedly by month, especially as related to wildlife, with 39 vaccinees per 100 rabies cases June through October, in contrast to 10 per 100 cases the remainder of the year. The rate associated with dogs and cats had a peak of 288 for May through September, compared with 167 the rest of the year. There was no seasonal trend in farm animals.

The percentage of male vaccinees was higher October through April (78.8 percent) than in the rest of the year (56.6 percent). Seventy-seven of the 156 males whose ages were known were children, compared with 65 of 152 females.

*Pet wildlife.* Fourteen of the 911 rabid wild animals had been kept as pets. Eleven of the 14 cases resulted in exposure incidents with 39 persons being vaccinated. This was a rate of 279 vaccinations per 100 pet wildlife cases, in contrast to 17 per 100 for all other wildlife cases. Eight of the 11 incidents involved more than two persons, compared with 12 of 98 for all other wildlife. Six of the 11 incidents and 23 of the 39 vaccination series were in July. Pet wildlife as a group accounted for a lower than

average percentage of bites, with more persons receiving vaccine as a result of handling.

*Stray dogs and cats.* Stray dogs and cats accounted for 38 incidents involving 126 persons. The 332 vaccinations per 100 incidents approximates the 330 rate for all dogs and cats.

### Discussion

Interpretation of the data in this paper is complicated by the large number of unreported elements in each category. However, it is apparent that many factors are operating to influence the number of persons exposed to rabid animals. On preliminary examination, it would seem that a major factor is the species of animal infected with the disease. Efforts should continue toward

**Table 3. Monthly distribution of rabies cases, exposure incidents, and persons vaccinated, by category of animal involved, Illinois, 1963-68**

Month	Wildlife		Farm		Pet	
	Number	Percent <sup>1</sup>	Number	Percent <sup>1</sup>	Number	Percent <sup>1</sup>
Rabies cases.....	911	100.0	138	100.0	223	99.8
January.....	25	2.7	11	8.0	11	4.9
February.....	51	5.6	16	11.6	17	7.6
March.....	116	12.7	16	11.6	10	4.5
April.....	170	18.7	14	10.1	16	7.2
May.....	104	11.4	7	5.1	13	5.8
June.....	90	9.9	12	8.7	19	8.5
July.....	99	10.9	9	6.5	36	16.1
August.....	64	7.0	12	8.7	48	21.5
September.....	49	5.4	11	8.0	20	9.0
October.....	54	5.9	10	7.2	17	7.6
November.....	58	6.4	8	5.8	8	3.6
December.....	31	3.4	12	8.7	8	3.6
Exposure incidents.....	109	100.1	61	100.0	162	100.2
January.....	3	2.8	5	8.2	9	5.6
February.....	2	1.8	6	9.8	14	8.6
March.....	7	6.4	8	13.1	7	4.3
April.....	9	8.3	8	13.1	9	5.6
May.....	8	7.3	3	4.9	13	8.0
June.....	15	13.8	3	4.9	9	5.6
July.....	27	24.8	3	4.9	27	16.7
August.....	14	12.8	4	6.6	38	23.5
September.....	10	9.2	8	13.1	15	9.3
October.....	7	6.4	5	8.2	10	6.2
November.....	4	3.7	4	6.6	4	2.5
December.....	3	2.8	4	6.6	7	4.3
Persons vaccinated.....	191	100.0	130	100.1	535	100.0
January.....	4	2.1	11	8.5	35	6.5
February.....	2	1.0	14	10.8	34	6.4
March.....	8	4.2	19	14.6	10	1.9
April.....	16	8.4	23	17.7	14	2.6
May.....	10	5.2	3	2.3	43	8.0
June.....	20	10.5	3	2.3	39	7.3
July.....	56	29.3	8	6.2	124	23.2
August.....	34	17.8	7	5.4	136	25.4
September.....	15	7.9	12	9.2	49	9.2
October.....	13	6.8	12	9.2	15	2.8
November.....	6	3.1	4	3.1	14	2.6
December.....	7	3.7	14	10.8	22	4.1

<sup>1</sup> Total may be more or less than 100 because of rounding.

developing disease control techniques for wildlife, since this is the primary reservoir in the United States.

However, further efforts are needed to reduce the number of cases in domestic animals, since each rabid dog or cat results in approximately 22 times as many human vaccinations as a rabid skunk. This is probably a minimum figure in view of the disparity in reporting of the domestic animal and wildlife cases. The natural defense of the skunk discourages human contact and could account in part for the low rate of incidents and vaccinations associated with skunks.

There was a marked difference between the months in which rabies cases were most common and the months in which most of the exposures occurred. Cases in wildlife were most common in spring, but human exposures to these animals were most frequent in the summer when recreational and occupational activities take people into wild animals' habitats.

Adults were exposed more commonly than children to wildlife species, suggesting either that adults' activities bring them into wild animals' habitats or that adults handle the situation when wild animals enter human habitations. On the other hand, children seem more likely to contact rabid dogs and cats.

Although there were fewer vaccinations per incident for wild animals than for dogs and cats, the difference vanished when only wild animals kept as pets were considered, strongly suggesting that the human-pet relationship was more important than the species of animal involved in the exposure. Human exposure to rabid farm animals would seem to be an occupational hazard in view of the high percentage of adult males vaccinated. A major proportion of these exposures was the result of examining or treating sick farm animals, thus accounting for the age distribution of saliva contacts.

It has been suggested that their short stature predisposes children to head or neck bites (1). This theory is supported by the present study.

It is disturbing that more than one-third of the vaccine series were administered for reasons which are not consistent with recommended immunization practices (2). Possibly a certain percentage of these persons actually were exposed, and insufficient information was submitted to

document the incident. On the other hand, there were numerous instances in which the situation was described adequately and there obviously was no saliva contact, suggesting that some series might be administered as psychotherapy. This practice is deplorable in view of the dangers associated with the indiscriminate use of any biological product. This same consideration should preclude administration of vaccine to unexposed persons for legal rather than medical reasons.

The importance of the human factors in exposures to rabies illustrates that educational programs for the general public are needed urgently. Persons should be cautioned to avoid wild animals which act tame. Further, persons should be discouraged from making pets of wild species. Elimination of this practice alone would have effected a 22 percent reduction in the number of persons exposed to rabid wildlife.

Exposure to rabid farm animals should be approached as an occupational hazard to farmers and veterinarians. These persons should have a greater index of suspicion towards rabies in farm animals and wear protective covering on the hands and arms during examination and treatment.

Thirty-two of the 856 vaccinees were veterinarians, an exposure rate which is 312 times higher than for the general population. This confirms the value of preexposure immunization of veterinarians (3).

Although rates were no higher following exposure to stray dogs and cats than for pets, stray animals still accounted for approximately one-fourth of the persons exposed to dogs and cats and one-seventh of the total vaccinees, documenting the need for improved control of stray dogs and cats.

### Summary

All cases of animal rabies occurring in Illinois from 1963 through 1968 were investigated to determine the number of persons receiving rabies vaccine. There were 856 persons vaccinated because of exposure to 332 of the 1,272 reported rabid animals.

Dogs and cats posed the greatest hazard, with 240 persons vaccinated per 100 animal cases in contrast to 13 per 100 rabid skunks. When wild animals were kept as pets, the vaccination

rate was similar to the rate following cases associated with dogs and cats. Exposure to rabid farm animals appeared to be occupational.

One-third of the vaccine series were administered in instances where a true exposure was unlikely. Public education should be intensified in an effort to reduce the number of persons exposed.

#### REFERENCES

- (1) Martin, R. J., Schnurrenberger, P. R., and Rose, N. J.: Epidemiology of rabies vaccinations of

persons in Illinois, 1967-68. *Public Health Rep* 84: 1069-1077, December 1969.

- (2) Public Health Service Advisory Committee on Immunization Practices: Rabies prophylaxis. *Morbidity Mortality Weekly Rep* 16: 152-154, May 13, 1967.
- (3) Tierkel, E. S., and Sikes, R. K.: Pre-exposure prophylaxis against rabies. *JAMA* 201: 911-914, Sept. 18, 1967.

#### Tearsheet Requests

Dr. Paul R. Schnurrenberger, Illinois Department of Public Health, Springfield, Ill. 62706

## Survey of Drug Use Among Michigan Students

A survey of University of Michigan students indicated that approximately eight out of 10 have never tried a nonmedically prescribed narcotic, amphetamine, tranquilizer, or hallucinogen. Well under 1 percent of the student population used such drugs regularly, but 44.1 percent had used marihuana or hashish at least once.

The university's drug education committee, made up of faculty and students, reported on a survey of drug usage and educational needs in September 1969. A random selection of 1,000 students was given an opportunity to respond anonymously, with no threat or detection or self-incrimination. About 600 responded.

Percentages of those with no experience with various drugs were as follows: medically prescribed narcotics (83.1 percent), amphetamines (75.3 percent), tranquilizers (87.8 percent), or hallucinogens (87.8 percent). A majority (55.9 percent) have never tried marihuana or hashish, while 43 percent have never tried tobacco and 10.1 percent have never tried alcohol.

Usage appears to be predominantly experimental. Those using drugs only once or seldom were as follows: narcotics—16.2 percent; tranquilizers—10.9 percent; hallucinogens—9.9

percent; amphetamines—21 percent; marihuana or hashish—28.7 percent; tobacco—23.4 percent, and alcohol—45.5 percent.

The percentage of students who have used marihuana or hashish at least once is considerably higher than the figure reported in most surveys of drug use by college students. This percentage indicates that the use of marihuana has increased or is increasing rapidly or that students responding anonymously in the Michigan sample were more willing to report their usage of this substance.

Analysts of the survey data found a general tendency for drug usage to increase as students progress from freshman to senior year. However, at the graduate level there is a drop in usage of all substances except tranquilizers which increases and alcohol which remains stable.

More than 80 percent of all students responding said there was a need for a campus drug education program, which offers (a) current and objective information about the physical and psychological consequences of drug use, (b) information on resources available to assist students with problems relating to the use of drugs, and (c) information on the legal aspects of drug use.

# The Relevance of Yoruba Medicine Men in Public Health Practice in Nigeria

ZACCHAEUS A. ADEMUWAGUN, Ed.D., M.P.H.

**S**HORTAGE of trained health manpower severely hampers the provision of health care in Nigeria. Adadevoh recognized this problem in rural health services in Nigeria (1):

Highly trained local medical personnel for executive duties, local facilities for trained medical personnel, the control of highly endemic diseases through mass treatment, the control of epidemics and adequate health education of the people at all community levels remain the problems of health delivery to our peoples. . . Present health concepts for the nation must still place emphasis on rural health and the delivery of health care to the mass of the population who for inadequate facilities cannot seek or get medical aid. Staff shortage and finance continue to embarrass the total executive of Nigerian Health Programmes.

At a time when all available manpower resources should be tapped and genuine teamwork prevail in health services, an unhealthy competition, coupled with fear and suspicion, exists between the native doctors, or medicine men, and the professional health workers who are Western trained. I propose to document the values and benefits that can be derived by adding the medicine men to the public health team in Nigeria. I recognize that there is risk in developing new staff and new staff patterns, but the risk is worth taking, as others facing manpower shortages have pointed out (2).

Reliable vital and health statistics for Nigeria are lacking at present. As a result, it is difficult to secure valid statistics on the number of pa-

tients per physician in both urban and rural areas. According to *Your Health*, a quarterly publication of the Federal Ministry of Health of Nigeria, there were in 1968 about 2,000 physicians and nurses in the country (3). The World Health Organization put the ratio of physicians to patients at 1 to 33,000 in 1960 (4).

In the light of this situation, Western-trained health workers should seek to understand the knowledge and skills of the local or community medicine men among the Yorubas rather than treating them flippantly or as of no use in modern public health practice. Considering the realities of Nigeria's shortage of trained manpower, the government or health agencies also need not be oblivious of the traditional medicine men's capabilities.

Even where modern health facilities are accepted and accessible, the people persevere in their traditional beliefs and practices. Literate or unlettered, the people still commute freely between the homes of local medicine men and hospitals, clinics, dispensaries, and physicians' offices. This ambivalent attitude toward health care makes teamwork between the modern health workers and the traditional practitioners necessary and advisable.

As medical care and health services reach into remote areas of Nigeria, health workers, particularly physicians, nurses, dispensers, and midwives in rural areas, face problems more complex and demanding than the problems they encounter in the cities. A number of reasons

---

*Dr. Ademuwagun is a lecturer in health education at the University of Lagos College of Education, Lagos, Nigeria.*

favor teamwork between the medicine men and professional health workers, particularly in rural areas where the native doctors are numerous.

Rural folk have poor or inadequate transportation, which limits their access to the limited health services that are provided for them. Cultural and language differences impede communication between the mass of health care recipients and health care implementors (this is also true in urban areas). There are many medicine men in every locality; in rural areas they form about 10 percent of the adult population and in urban areas, about 4 percent. As part and parcel of the community, they are unhampered by sociocultural, communication, and transportation barriers and therefore can reach the hard-to-reach who need health services. If they are given relevant training, they can become effective paramedical personnel.

The Yorubas, among whom trained medicine men could work, form about 30 percent of Nigeria's population of approximately 62 million. The people of Western, Lagos, and Kwara States, three of the 12 in the Federation of Nigeria, are predominantly Yoruba. Other groups in Nigeria have their counterparts of the Yoruba native doctors who use similar methods and techniques in dealing with patients.

This paper is focused on the attitudes and behavior of Nigerian health workers, particularly most physicians trained in modern public health practice, and on the sociocultural, psychological, and medical activities of the traditional medicine men in public health. I use Yorubaland only as a paradigm of the possible use of medicine men as paramedical health care workers and health educators. I propose to examine the medicine men's methods and understandings in health practices in order to identify those which fit functionally into public health care and health education.

### **Traditional Medicine Men of the Yorubas**

The traditional native doctors are of three categories—diviners, herbalists, and shrine priests.

*Diviners.* The Yoruba generic name for the diviners is "babalawo." Through "Ifa," the Yoruba oracle divinity, the diviners diagnose and counsel about the causes of ill health or

misfortune and then prescribe the necessary sacrifice. The causes may be supernatural or ritual, such as an offense to some divinity or the contravention of certain taboos; they may be natural or sociocultural, such as rudeness to an elderly person, stealing, backbiting, or contravention of some other social value. Any of these causes may be related to levels of well-being. The babalawo function within an ecological concept of health as far as the beliefs of their clients are concerned.

*Herbalists.* The Yorubas designate the herbalists "baba-ologun" or "adahunse." The herbalists cure and prevent illness or misfortune through the use of herbs, roots, barks, incantations, talismen, therapy, sacrifice, and immunization ("igbere"). They diagnose, counsel, prescribe, and treat.

*Shrine priests.* The priests are called "baba olorisa" or "onimale." They perform rituals related to health. For example, they offer sacrifices of appeasement or thanksgiving; the sacrifices may be performed in behalf of an individual person or the community. Particularly in times of national danger or disaster, such as pestilence or an epidemic (smallpox, for example), the priests are of socio-ritual significance.

*Diviner-herbalists.* One person may be both diviner and herbalist. Diviner-herbalists are variously designated "adahunse," "babalawo," "oni-Ifa," and "ologun." They treat the whole person.

In diagnosing, prescribing, and counseling, all the adahunse function within the psychological framework of their clients' beliefs and expectations. They display common sense, great eloquence, great boldness, generous sentiments, disinterested virtues, reverential faith, and sublime speculation (5, 6)—all essential features of traditional medical practice. I do not deny that some quack native doctors play upon the intelligence of their clients, particularly in the urban areas where health care is becoming very much commercialized. I exclude the quacks from this discussion.

On the ecological relationships of culture, health, and disease, Mead described the method of knowing and treating the total personality to allay the patient's fear, anxiety, stress, and strain (?):

Local communities expect the practitioner to take a detailed and personal interest in the patient. He on his side considers it important to create an atmosphere of confidence and trust to allay the anxiety felt by the patient and his friends, and he establishes this atmosphere by an unhurried and patient question-and-answer process, as well as by the kind of inquiries he makes about the illness and its symptoms. Each symptom is considered and treated separately and not as a complex. Local practitioners are willing to be "called" and to visit the patient in his own home, surrounded by his relatives. Even more important, the local practitioner speaks to the patient and his relatives about the illness and treatment in language and concepts that are familiar to them, and that they can understand and gratefully accept.

In this way the medicine men have built up their system of folk medicines and traditional care for the sick and those affected by misfortune. They satisfy patients because they also invoke cultural supports, both religious and psychological, in curing and preventing disease and in restoring patients to correct balance with their total environment.

The adahunse "treat" mental illness, epilepsy, tetanus, cholera, lumbago, piles, intestinal worm diseases, smallpox, cough, craw-craw, yaws, leprosy, gonorrhea, and fevers of various types. They also set broken bones, perform massage, and engage in prenatal and postnatal care as well as in the care of infants' ailments (8-14).

Clients have trust and confidence in the adahunse because of the traditional authenticity of their work in the community. Psychologically, clients are inclined to obey the medicine men. They surrender themselves in empathic identification with the medicine men and achieve an emotional security that reduces the stress of ailments or misfortunes.

The medicine men are conscious of their responsibilities toward their clientele as well as of the need to protect and defend their profession. In modern times they have formed into a strong association (6). They are apprehensive of the incursion of Western-trained physicians, whom they view with suspicion as potential rivals. However, they take their profession seriously; the existence of modern health facilities has not eliminated them, crippled their practices, or driven them out of the local health market. The local medicine men and the Western-trained health professionals each continue to have their own clients in both rural and urban areas. My observation has been that the medicine men continue to command, as their clients a large number, if not the majority, of

the masses, particularly the expectant mothers, the very young, and the very old. Literacy has not significantly modified the attitudes of these clients toward adahunse.

### Implications for Public Health Education

The objective of health education is to change attitudes and behavior and thereby to improve health; its focus is on people and their health actions. Health education is a process of creating particular cognitive, perceptive, behavioral, and motivational structures in the client. To be effective and lasting, change in health behavior must take into account the realities and the possibilities in each situation—the local culture, felt needs, interests, and resources in money and manpower.

The medicine men's knowledge of the culture and of people's needs and interests as generated by the local environment is particularly relevant when changes in health practices are sought. Consider the following attributes of the adahunse.

*Social and ritual significance.* The Yoruba masses view health as a complex, ecologically contained phenomenon, with natural, supernatural, ritual, and social causation. The medicine men, in one way or another, recognize this attitude and attempt to relieve their patients of anxiety, especially in the socio-ritual aspects of the patients' well being. Thus the medicine men have become socio-ritual figures who are respected and looked to as opinion leaders in their neighborhoods.

*Cultural and personal proximity.* The medicine men are close to their clients. Night and day they are ready to listen to their complaints and render timely help. Their proximity carries with it accessibility, availability, acceptability, and dependability.

*Identification and sympathy.* The medicine men genuinely identify with their patients through knowledge, understanding, and concern for health in all its ecological ramifications. They diagnose, prescribe, and counsel, and they also undertake the responsibility of carrying out prescriptions on behalf of patients, rather than engaging in referrals which the patients often cannot afford to pursue. The adahunse may even locate the patients' relatives and advise them about the best way to carry out a prescription.

They act promptly, carefully, emphatically, patiently, and with concern.

*Counselor and mentor.* The medicine men counsel as part of their healing armamentarium. They advise both the patient and his relatives in matters affecting health. The medicine men regard relatives as the best "reference group" to the patient because they can motivate the patient to follow the medicine men's prescriptions or advice. Invariably, most of the advice is followed, since the people regard the medicine men as mentors.

*Familiarity with therapy.* The medicine men use therapeutic devices which are consonant with the psychological temperament of their patients. The prescriptions are not altogether strange; they are day-to-day acts or foods or drinks, for example. The patient has no fear of taking or of doing what is not familiar and no dread of its consequences. The medicine men's prescriptions take cognizance of the clients' taboos and superstitions. Also, the medicine men use the language, dialect, or idiom of their clients. No interpreters are needed.

*Fees.* The fees are relatively small compared with the charges of the hospitals and Western-trained physicians and, therefore, are an attractive alternative to expensive Western care. Thus many patients continue to visit both hospital clinics and the shrines of the babalawo-adahunse.

To summarize, there are seven reasons why the medicine men are relevant to the public health team.

1. They can fill the vacuum in health care created by the shortage of health manpower and the high cost of training modern health workers.

2. They have developed traditional skills in dispensing curative, preventive, and rehabilitative care.

3. In their treatment techniques they use an astute approach to human ecology and health.

4. They belong to the same culture as their patients, sharing common beliefs, values, and symbols of communication.

5. They are effective in some aspects of psychosomatic medicine and in the use of local herbs, roots, and barks for symptomatic treatment.

6. They are unhampered by inadequate trans-

portation in rural areas and so can reach hard-to-reach patients.

7. They have skills in interpersonal relations, including counseling with sympathy, identification, and concern.

### Case for Partnership

Cooperation between the babalawo and the Western-trained professional health worker is logical. Each is a health agent working in his own way to improve the health of the people. Their goals are similar; their methods may differ.

On one hand, the Western-trained physician is much concerned with the scientific approach to the causes of sickness. He uses standard measures and modern tools in his prescriptions and treatment, but only a little general psychology to help him reach his client. On the other hand, the babalawo-adahunse, while not altogether destitute of the scientific approach to ill health, is hampered by an inability to explain the causes and treatment of sickness in scientific language. He has his own dosages which are familiar to people in the locality. To his medical and health knowledge and skills he adds a wealth of specific rather than general psychology when he deals with clients because he knows their needs, expectations, and responses.

The adahunse's knowledge of the beliefs, values, and psychology of the people is an advantage which modern physicians and other health workers might try to use to promote health. Since most professional health workers have limited knowledge of the cultural factors likely to promote or inhibit health, they would do well to consider working in partnership with native doctors.

At present, fear and suspicion of the native doctors exists among the Western-trained health professionals because the traditional medicine men do not possess scientific knowledge and skills. The professionals also suspect that there are many quacks among the medicine men. However, they are not all quacks and even the quacks may be willing to learn proper methods.

Modern physicians, as well as other Western-trained professionals, need to understand what is useful in the knowledge and skills of the traditional practitioners as well as in their ecologi-



cal approach, an approach which encompasses both sociocultural and physical environments when seeking the causes of ill health.

The need for partnership between the traditional practitioners and Western-trained professionals is stressed by Spicer in a discussion of the problems of cross-cultural change. He realized that more delicacy is required in trying to change people's customs than in performing surgery, especially when an external agent of change is involved (15a) :

The extension worker and public health nurse both attempt to alter traditional ways by demonstrating the advantages of the new. . . . They are working across certain barriers. These barriers are differing language, belief, and custom. Coming out of the world of the highly literate, the technologist has a way of talking, acting, and thinking which is ordinarily sharply different from that of the people among whom his work is cast. It is this throwing together of two different cultural backgrounds that gives rise to the special group of problems that confront workers in these fields.

These problems could be overcome if the professional health workers worked with and through local people who have a way of life similar to the groups they hope to reach. Indigenous agents, such as the *adahunse*, could be a powerful force in motivating health practices and in establishing a lasting change among the recipients of health care through constant contacts and consulting between the two groups.

Dooley used native agents in Laos. He worked through and with these aides whom he trained to perform health care services. He stated (16) :

This idea of Asians helping Asians is much superior to Americans helping Asians. When the patient received medicine, he would turn to the Asian student (the dispenser) and say, "Cup chai." They knew the help was American but they were grateful to the Asian student too. My Asian students will be here all their lives. I will not. I dispensed nothing, the Asians did.

Similar use can be made of the *adahunse* by the modern professionals, providing that the training and trust exist for the two to work together. Dooley and his team used their Asian aides to perform such duties as dressing wounds, vaccinating, immunizing, and so forth. The native doctors can be trained to perform such tasks. Further, the psychological readiness of the target group in the presence of the familiar *adahunse* would be an incentive for patients to follow prescriptions.

It has been observed that communication with patients from some subgroups is more effective with peers or near peers of the patients

than with professionals. "The neighborhood worker," according to Clack and Wishik, "by using the vocabulary of the residents to explain public health services, is more able to overcome superstition and isolation and to stimulate community involvement in developing health programs to meet the neighborhood's needs" (2). Such workers can also tell professionals about otherwise unknown barriers to health services (17).

It is fashionable nowadays for professional health workers to take the attitude that the target group resists change, especially when a health program fails. For example, when people fail to change a food habit, contrary to the health officer's anticipation, he charges that the people are rigidly conservative.

We health workers must realize that nothing is as permanent as change itself. Every culture changes continuously, although rates of change vary. Yet we often encounter people who vigorously resist change. Why? Change must not be haphazardly approached in any cultural setting, since all aspects of each culture are dynamically interrelated. To be explicit, whatever affects nutrition in health affects nutrition in its ecological dimensions of geography, culture, occupation, economy, education, and so forth. To this end, Spicer remarked, "Customs and beliefs are linked into a whole [so] that changes in one aspect of life will have repercussion on the other aspects" (15b). The *adahunse* may understand these complex relations when they concentrate on treating the whole personality of their patients.

On people's resistance to change, Spicer stated (15c) :

Understanding that change is a process which people are undergoing all the time gives us a vantage point from which to view conscious efforts to alter culture. We begin to see resistance as a symptom of something wrong in the cross-cultural situation, perhaps of unsatisfactory relations between the worker and the people. Once resistance is seen as a symptom of special conditions rather than as a constant element, it becomes possible, through the study of cases in which resistance appears, to discover causes of success and failure.

Using opinion leaders in the community, such as the *adahunse*, is to acknowledge the realities of cultural factors in health education. Cassel, in describing a health program among Zulus in Africa, declared that "a thorough understanding of local ways and values and the impor-

tance of fitting new ideas into the existing cultural framework of the people were shown to be essential if lasting results were to be achieved" (18).

The cognition and perception of the adahunse enable them to function freely among most of their own people, probably more so than those professional health workers who have made fantastic progress in studying their target group's culture. One principle of health education, according to Nyswander, is that "the perceptions of those who are to be taught furnish important data to be used in program planning" (19).

Well-conducted teamwork with the adahunse participating could result in a wealth of information about the cultural bases and realities of health in a community; it will particularly encourage free and purposive research into native psychology. Collaboration could also lead to the collection and classification of local medicinal plants if the native doctors helped and served as resource persons.

I suggest that government and health agencies consider encouraging collaboration of the local medicine men in health programs aimed at changing the health behavior or attitudes of target groups. Government may consider budgeting for serious research in the environmental factors of health and medicine in Nigeria. The shortage of health manpower and the shortage of money are strong arguments for the effective utilization of the native doctors.

Although the Universities of Ibadan and Lagos include tropical medicine in their curriculums, there is little evidence of involvement of the native doctors. However, the success or failure of "tropical medicine" will largely depend on how much partnership exists between the native doctors and the modern doctors in many tropical countries.

The modern physicians and the native doctors could view their medical and health activities as complementary rather than contradictory. Such an attitude could discourage the tendency toward unhealthy competition, which is likely to increase patients' anxiety, stress, and strain. The physician and the native doctor must respect the knowledge, skills, and competencies of each other and function in a partnership that reflects a division of labor,

specialization, and a unity of purpose aimed at improving the health attitudes and behaviors of the people through modern medical and health technology.

As sociopsychologists unique in their localities, the adahunse can implement the modern concept of health as total physical, mental, and social well-being and not the mere absence of illness and disability. While not scientifically oriented in the technical sense, the adahunse are nonetheless functional to the best of their ability in their health promoting and improving activities. Their shortcomings, if they are thus considered, should not make us oblivious of their other contributions to the total well-being of their clients. Scientifically oriented physicians can still learn from these people.

### **Suggested Lines of Action**

Following are some of the ways that those engaged in modern medical and health practices could involve the adahunse to help solve health problems. This involvement can be effected by the government and by the universities, through medical schools, schools of public health, and schools of education.

1. Systematically and scientifically investigate human ecology and health in all parts of Nigeria to enable physicians and other modern health professionals to learn more about the variables other than the biological ones which are the major preoccupations of traditional medical practice in Nigeria. That is, try to determine how the total well-being of people is affected by their constant interaction with the physical, biological, and social environments.

2. Learn the local health idioms, dialects, and slang to improve communication between the patient and physician and other health professionals. Miscommunication can breed misdiagnosis and result in futile medication. The local medicine men know the terms people use to describe particular parts of the body or disease or illness. For example, a Yoruba woman may complain of pain in her buttocks but mean a pain in the vagina. The medicine man will know that she is using more modest language for such a culturally important, not to be carelessly mentioned part of the body.

3. Study the local medicines used by the adahunse by working with and through them; ren-

ovate and modernize the information from such study through scientific findings and technology, for example, by providing measures for doses. This undertaking will require allocation of funds, perhaps by government.

4. Conduct research on the healing, prevention, and rehabilitation techniques of the adahunse to discover what can be beneficially adapted to modern health services and practices. Rapport and trust must be established between the adahunse and the health professionals before such research could be fruitful.

5. Work with and through the most reputable adahunse in the locality and other local lay influentials in special health projects, such as eradication of yellow fever and campaigns against communicable diseases or for mass immunization.

6. Employ adahunse in health departments and medical schools with whom physicians and medical students can identify and work. Together they could realistically confront environmental health problems. Most of these problems are known to the adahunse, although they may not be able to explain them in scientific terms. The adahunse can act as interpreters, therapists, and advisers in research and diagnosis; they can also serve in general referrals of patients from the physicians.

7. Under government auspices, form a Nigerian or regional council of health workers—involving physicians, nurses, adahunse, health educators and social workers—to discuss periodically possible solutions to health problems. This organization will encourage mutual trust and regard between the adahunse, the clinically oriented health workers, and others working on community health problems.

#### REFERENCES

- (1) Adadevoh, B. K.: Rural health in Nigeria. *J Nigeria Med Assoc* 5: 37-38, January 1969.
- (2) Clack, F. B., and Wishik, C. S.: New staff for public health. *Public Health Rep* 83: 150-154, February 1968.
- (3) Editorial comment! Your Health (Federal Ministry of Health, Nigeria) 1: 3, September 1968.
- (4) World Health Organization: World health directory of medical schools. Geneva, 1963, p. 339.
- (5) Lambo, T. A.: African traditional beliefs: Concept of health and medical practice. Ibadan University Press, Ibadan, Nigeria, 1963.
- (6) Prince, R.: Some notes on Yoruba native doctors and their management of mental illness. Paper presented at the First Pan-African Psychiatric Conference, Aro-Abeokuta, Nigeria, 1960.
- (7) Mead, M.: Culture, health, and disease. Tavistock Publications, Ltd., London, 1966, p. 21.
- (8) Odumoso, J.: Iwe Orisirisi egbogi ti ile Yoruba [A book of the various medicines of Yorubaland]. James Townsend and Sons, London, 1906.
- (9) Idowu Adigboluja, C. A.: The African family physician. Ola-Oluwa Press, Lagos, Nigeria, 1946.
- (10) Olarerin, O. F.: The African physician. Awarunmagbeje Institute, Ibadan, Nigeria, 1938.
- (11) Fasina: Iwe egbogi ajebidan: Ekun-dayo [A book of the most effective medicines: comfort replaces discomfort]. Asaya Printing Press, Ibadan, Nigeria, 1950.
- (12) Amaku, E. A.: Itoju awon omo owo [Care of the infants]. C. M. S. Press, Lagos, Nigeria. Undated.
- (13) Okunade, E. A.: Egbogi iwosan fun itoju okunrin ati obirin [Medicines for curing men and women patients]. Lisabi Press, Ibadan, Nigeria, 1934.
- (14) Okunade, E. A.: Onisegun ile fun orisirisi arun [Household physician for various diseases]. Ilare Press, Ibadan, Nigeria. Undated.
- (15) Spicer, E. H., editor: Human problems in technological change. Russell Sage Foundation, New York, 1953; (a) p. 15; (b) p. 17; (c) p. 18.
- (16) Dooley, T. A.: The night they burned the mountain. Farrar, Straus & Company, New York, 1960, pp. 66-67.
- (17) Domke, H. R., and Coffey, G.: The neighborhood-based public health worker: Additional manpower for community health services. *Amer J Public Health* 56: 603-608, April 1966.
- (18) Cassel, J.: A comprehensive health program among South African Zulus, Part I. Reeducating the community. Case I. In *Health, culture and community*, edited by B. D. Paul. Russell Sage Foundation, New York, 1955, p. 40.
- (19) Nyswander, D. B.: Education for health: Some principles and their application. Paper presented at the Health Education Conference, Chapel Hill, N.C., 1956, p. 3.

#### Tearsheet Requests

Dr. Zacchaeus A. Ademuwagun, University of Lagos College of Education, Yaba-Lagos, Nigeria

## Program Notes

### **Men Rejected for Medical Cause**

Colorado's health referral service for men rejected by the Armed Forces for medical reasons formerly operated on a Federal grant, but the grant was not renewed. In contrast to many other States, plans have been made to continue the program.

An agreement was reached between the department of health and the division of rehabilitation of the department of social services to continue serving the men in need of rehabilitation. The program is to be funded mutually; the former staff has been retained and a counselor added from the division of rehabilitation.

Colorado was the first State to offer statewide referral services for men rejected by the Armed Forces. From initiation of the project on November 1, 1964, approximately 5,366 men have been referred to private physicians, vocational rehabilitation, or nonprivate resources.—*Colorado's Health*, July–August 1969.

### **Anti-Rat Sterilizing Agent**

Post mortem examinations of male rats treated with a chemical sterility agent under laboratory-controlled conditions showed the agent to be effective in 70 percent; further impairment of fertility in the remaining 30 percent was also considered probable. The New York State Department Of Public Health's rat control laboratory in Troy performed the examinations.

The rat sterilization project is part of a \$4.5 million emergency rat control program announced for the State by Governor Nelson A. Rockefeller in July 1967. The project is based on experiments that Dr. Sheldon Segal and Dr. Harry Rudel of the biochemical division of the Population Council conducted on the inhibition of the fertility of male and female rats through use of the compound mestranol. The cor-

responding phase of the control program is concerned with elimination of rat harborage and of their sources of food and water.—*New York State Department of Health Bulletin*, Vol. 22, No. 14, June 9, 1969.

### **Free Toothbrushing Kits**

Each child in Scotland entering school in the fall of 1969 was scheduled to receive a free toothbrushing kit from the Government. The kit contains a toothbrush, toothpaste, and a plastic beaker. Parents are to receive a letter on the care of children's teeth.

Children will have an opportunity to become members of the "Happy Smile Club." If they successfully complete a course in regular brushing, they will receive a "Happy Smile" badge.

After the project has been in operation for several months, a survey will be taken to judge its effectiveness in improving children's dental care. *This Week in Public Health* (Massachusetts Department of Public Health), Aug. 4, 1969.

### **Treatment of Wastewater**

A chemical-physical process of wastewater treatment, developed by New York University researchers, is to be tested for 3 months at the sewage treatment plant of New Rochelle, N.Y. The process converts wastewater into reusable higher quality water at a cost described as less than present processes. Ecolotech Research, Inc., of New York City, has been awarded the contract for the design, construction, and operation of the prototype wastewater treatment plant.

After the New Rochelle test period, the pilot plant will be moved to Waterford in Saratoga County, where a full-scale chemical-physical waste treatment plant is expected to be built. The effluent from the proposed plant is scheduled for possible

use by the Mohawk Paper Mill in Waterford.

According to Dr. Hollis S. Ingraham, the State health commissioner, the increased demand for high-quality water is becoming more pronounced, not only for domestic use, but also for recreational, industrial, and commercial supplies. The chemical-physical process requires only two steps to remove substantially all the organic material present in wastewater, in contrast to conventional treatment processes in which costly tertiary treatment is required.

### **Genetic Information Center**

A genetic information center has been established at the Connecticut State Department of Health in Hartford to provide a common source of up-to-date technical information for physicians and other family counselors. A practitioner will be able to obtain information at the center on the mode of inheritance of a genetic condition and learn where to obtain specialized laboratory services.

### **Small County With Big Goal**

Custer County in the State of Colorado has only 1,300 residents, and 56 percent of them have poverty-level incomes. Yet, early in 1969, the people in it formed the Custer County Medical Foundation and launched a drive to collect \$5,000 in matching funds by July 1 for a community health center. The total estimated cost of the proposed center is \$18,000.

The \$5,000 goal was surpassed in May.

For the past 5 years there has been only one practicing physician in Custer County, Dr. Karen Dolby, who serves also as county coroner, school physician, and acting health officer. In emergencies, a registered nurse and a licensed practical nurse assist her.—*Colorado's Health*, July–August 1969.

---

*Items for this page: Health departments, health agencies, and others are invited to share their program successes with others by contributing items for brief mention on this page. Flag them for "Program Notes" and address as indicated in masthead.*

# Effect of Improved Sanitary Facilities on Infant Diarrhea in a Hopi Village

A. RUBENSTEIN, J. BOYLE, M.D., C. L. ODOROFF, Ph.D., and S. J. KUNITZ, M.D.

**D**IARRHEA is a major health problem among southwestern Indian infants (1, 2). Many environmental factors have been implicated in the high prevalence of diarrheal disease on Indian reservations and at all socioeconomic levels where living conditions are poor. Among these factors, the availability of water for personal hygiene is of prime importance in the control of diarrheal disease (3-5). Adequate sewage disposal systems including indoor flush toilets are also important in diarrheal disease control (6).

Although the infant in his first year of life neither uses a toilet nor washes himself, the sanitary problems of his mother are reflected in the infant's health status. Because children

in the first 12 months of life are extremely susceptible to infectious diarrhea and therefore to the results of poor sanitation, the number of infants who become ill with diarrhea provides a subtle indication of the effectiveness of sanitary control measures. We investigated the influence of indoor water and toilets on the prevalence of infant diarrhea in the first year of life, as reflected in hospital use of infants living in a Hopi pueblo in northern Arizona.

## Subjects and Methods

Moenkopi, a Hopi Indian village of approximately 700 people, is 2 miles from the Public Health Service Indian Hospital in adjacent Tuba City, Ariz. Moenkopi is divided both politically and geographically into traditional (lower Moenkopi) and progressive factions (upper Moenkopi).

Nagata gives a detailed ethnographic study of this village (7). In this paper we can only indicate the ways that the two segments of the village differ.

The upper village elects representatives to the tribal council and at least superficially appears to be more cooperative with government representatives. Its traditional ceremonial cycle and clan system are not intact.

The lower village does not participate in tribal council affairs and still attempts to rely on the traditional theocratic forms of social control. It, too, has a ceremonial cycle and clan system that is no longer intact and self-con-

---

*Mr. Rubenstein is a medical student at the Tufts University School of Medicine, Dr. Boyle is an intern in the department of medicine, University Hospitals of Cleveland, Dr. Odoroff is assistant professor of psychiatry and preventive medicine (statistics), University of Rochester School of Medicine and Dentistry, and Dr. Kunitz is a postdoctoral fellow, department of sociology, Yale University.*

*At the time of the study Mr. Rubenstein was supported by a Public Health Service summer traineeship in preventive medicine (AT-134-R) granted to the department of preventive medicine, University of Rochester School of Medicine and Dentistry; Dr. Boyle was supported by the Public Health Service's Commissioned Officers Student Training and Extern Program.*

tained. Many of its members, however, are related to families in Oraibi, a traditional village 50 miles to the east, and many of them participate in ceremonials held there.

The two segments of Moenkopi are similar in that in both there is a heavy reliance on work for wages. They are roughly equal in numbers. In addition to differing political and cultural attitudes the two divisions of Moenkopi differ in their plumbing facilities. Indoor plumbing is limited almost exclusively to the progressive upper village.

In the spring of 1964, indoor plumbing lines were constructed by the Public Health Service with the cooperation of the upper villagers under Public Law 86-121, the Indian Sanitation Facilities Act. The lower villagers refused to cooperate in this project and continued to use the outdoor water taps and outdoor privies. The lower village, however, benefited indirectly from this project because the common spring which provides water for both the indoor upper Moenkopi system and the outdoor lower Moenkopi system was protected from contamination at this time (personal communication of November 1, 1967, from J. A. Confrancesco, sanitary engineer, office of environmental health, Indian Health Service).

In this study children from Moenkopi were classified according to residence in the upper or lower village to compare their rates of hospital use for diarrheal complaints. Because we lacked useful official census data, information on the total population of Moenkopi children was gathered from the following sources: the patient and field health records of the Public Health Service's Tuba City Indian Hospital, a sanitation survey of Moenkopi by the Service's Keams Canyon Indian Hospital, and the testimony of several village residents. Comparison of our list of children with the unofficial census information provided in a recent study of Moenkopi (7) suggested that our census was complete.

The Tuba City and Keams Canyon Hospital records were examined to identify all children born on or after January 1, 1961, who had completed at least 1 year of life as of July 1, 1967, and whose parents resided in Moenkopi at that time. There were 124 children who fulfilled these requirements; 20 boys and 20 girls from

upper Moenkopi and 42 boys and 42 girls from lower Moenkopi. One boy and two girls from lower Moenkopi had died and were omitted from the study.

The following information was abstracted from the hospital records for each infant's first year of life: (a) outpatient department visits for all causes and for diarrhea, by month of visit, and (b) admissions, by month of admission, and diagnosis on discharge. Well-baby visits were not counted as outpatient visits. To compare the effect of the indoor plumbing installed in 1964, Moenkopi infants from both upper and lower villages were classified according to whether they had spent their first summer, the peak diarrheal season, before or after the water lines were built.

To gain an idea of how socioeconomic factors such as mother's education may influence the effects of the presence or absence of indoor plumbing on infant health, the mothers of 58 lower Moenkopi children were interviewed. These were the mothers of all lower Moenkopi children born in 1961 and 1962 plus their siblings born in the 6½-year sample period.

## Findings and Discussion

Table 1 summarizes hospital use by Moenkopi infants in the first year of life from January 1, 1961 to July 1, 1967. Upper Moenkopi infants had fewer outpatient visits and admissions, both for all causes and for diarrhea, than did lower

**Table 1. Average hospital outpatient visits and admissions per year in the first year of life of 121 infants, January 1, 1961 to July 1, 1967**

Type of hospital contact	Upper Moenkopi	Lower Moenkopi	<sup>1</sup> t-value
Outpatient visits, all causes-----	7.75	8.90	1.12
Outpatient visits, diarrhea-----	1.40	3.00	<sup>2</sup> 3.34
Admissions, all causes-----	.32	.81	<sup>2</sup> 2.50
Admissions, diarrhea-----	.12	.25	<sup>2</sup> 1.84

<sup>1</sup> t-test for comparing means of two independent samples.

<sup>2</sup>  $P < 0.05$ ,  $df = 119$ .

NOTE: Ratio of admissions per year (all causes) to outpatient visits per year (all causes) was 1:23 for upper Moenkopi and 1:10 for lower Moenkopi.

**Table 2. Average outpatient visits per year of infants in first year of life before and after indoor waterlines were installed**

Areas and reason for visit	Before water		After water		df	t-value
	Number infants	Average visits	Number infants	Average visits		
Upper Moenkopi:						
All causes.....	20	9.5	20	6.0	38	<sup>1</sup> 2.32
Diarrhea.....	20	2.0	20	.85	38	<sup>1</sup> 2.02
Lower Moenkopi:						
All causes.....	41	8.6	40	9.5	79	.72
Diarrhea.....	41	3.1	40	2.6	79	.78

<sup>1</sup>  $P < 0.05$ .

Moenkopi infants. The ratio of admissions to outpatient visits is much higher for the lower village infants. That is, a lower village infant is more than twice as likely to be admitted to the hospital for inpatient care when he is brought to the outpatient department as an upper village infant.

This higher admission rate suggests that lower village children are more seriously ill when they are brought to the clinic, and it may also suggest that their parents are more reluctant to bring them until they are seriously ill compared with upper village families who are less reluctant to bring in children earlier and before hospitalization is necessary. Another indication of this possible reluctance is that 25 percent of upper Moenkopi children required hospitalization in the first year of life for all causes compared with 45.7 percent of lower village children. The number of infants hospitalized for diarrheal disease alone was 12.5 percent in the upper village and 21.0 percent in the lower village.

As mentioned previously, indoor plumbing was installed in the upper village in the spring of 1964. This installation seems to have made a difference in admissions and clinic use in the upper village. Before plumbing was installed, children from the upper village averaged two clinic visits a year for diarrhea in their first year and after plumbing was installed, 0.85 visits. For the same period, the average visits of lower village children was 3.1 compared with 2.6. What this indicated is that upper Moenkopi infants had significantly fewer clinic visits after water was available indoors than before ( $P$  less than 0.05,  $df=38$ ), whereas there was no

significant change for lower village infants ( $P$  more than 0.05). Table 2 gives the detailed figures.

Although it is obvious that this does not prove causation and may indicate nothing more than that the changes in both plumbing and hospital use were caused by some third factor, we are unable to determine what that factor might be if it indeed exists. We are unable to find, for instance, any changed attitudes towards the Public Health Service that would account for the observed changes in hospital use.

Average number of outpatient visits per child for diarrhea by month of year during the 6½-year period is shown in the following table.

Month	Lower Moenkopi	Upper Moenkopi
January.....	0.02	0.01
February.....	.02	.01
March.....	.07	.02
April.....	.12	.03
May.....	.11	.02
June.....	.13	.05
July.....	.20	.11
August.....	.16	.11
September.....	.13	.13
October.....	.14	.13
November.....	.08	.08
December.....	.07	.08

The peak of incidence of diarrhea in the lower village occurred in July, but the peak incidence in the upper village occurred in September and October. Possibly infectious diarrhea reached its peak in the lower village in July and then gradually spread to upper village infants by interpersonal contact of older siblings and relatives.

Hospital use for 58 lower Moenkopi infants by mother's educational level is listed in table 3.

**Table 3. Hospital use for 58 lower Moenkopi infants by mother's educational level**

Education of mother	Average number per year		
	Outpatient visits, all causes	Outpatient visits, diarrhea	Admissions, all causes
34 infants whose mothers attended high school.....	9.80	2.90	0.51
24 infants whose mothers did not attend high school.....	7.90	3.40	.72

The 7.80 average outpatient visits for all causes for lower Moenkopi infants whose mothers attended high school approached the 7.75 of upper Moenkopi infants (table 1). Although the 2.90 average outpatient visits for diarrhea of lower Moenkopi infants whose mothers attended high school were lower than the 3.40 for children of nonhigh-school-educated lower Moenkopi mothers, they were still twice the average outpatient diarrhea visit rate of 1.40 for upper Moenkopi infants (table 1). Too few upper Moenkopi mothers were available for interviewing to determine the effects of education on their children's hospital use.

In lower Moenkopi, the mother's education apparently does influence overall hospital use of infants, but the lack of indoor plumbing is the limiting factor in determining the rate of hospital use for infant diarrhea.

### Conclusion

Many other socioeconomic conditions and values may contribute to the differences in hospital use observed between upper and lower Moenkopi infants in the first year of life. An important uninvestigated variable may be differences between mothers who breast feed their babies and those who do not. Other differences in diet between the two segments were assumed to be minimal, because the villagers buy most of their food from the same stores. In addition, practically all households in both segments of the village have refrigerators of their own or the use of one.

Still another variable that has not been measured is willingness to use the hospital and other modern facilities. The refusal of the villagers of lower Moenkopi to install water indoors was in large part a political decision and not necessarily hostility to good health practices. Indeed, the villagers of lower Moenkopi had installed

their own outdoor water taps without government help long before the residents of the progressive upper village got their facilities by cooperating with the government. Rather than rejecting sanitary facilities as such, the traditional element of the village seems unwilling to become embroiled in the political machinations of the progressive villagers and the Public Health Service.

Although this is not the place to describe the intricacies of Hopi politics, it can be stated briefly that the major cleavage in the tribe is between the procouncil and anticouncil factions (8). Under the Wheeler-Howard Act, Indian tribes were authorized to vote for or against a constitutional form of government and democratically elected councils that would be empowered to deal with the Federal Government. Many traditional Hopis refused to vote at all as voting would have implied *de facto* recognition of the Federal Government's right to make laws pertaining to their own social organization. Those who did vote therefore voted for the new form of government, and in areas where they held the majority, effectively destroyed the old theocracy. The feeling between the two groups at present is so intense that it is virtually impossible for them to cooperate on any project, including the installation of water and sewerlines.

The lower villagers are not opposed to modern conveniences *per se* and many homes have gas refrigerators. The lower villagers also installed waterlines years before the upper villagers, and many lower villagers work for wages and have automobiles. The two segments differ on how the village is to be governed and how the dominant society is to be dealt with.

The lower villagers do use the hospital. Another important and uninvestigated variable, however, is whether they seek help as early as



the upper villagers. Coming to the hospital and waiting in the clinic to be seen by a physician is time consuming. Upper village people tend to have more contacts in the hospital and are better able to manipulate the system to get themselves seen earlier with less waiting. This ability to deal with the hospital does not seem to be as characteristic of lower villagers.

Nevertheless, the data indicate that constructing indoor plumbing lines in itself does make a measurable difference in the health of children, especially in the first year of life, even considering some of the aforementioned variables.

We particularly mention the first year of life because as the children of the village get older, the differences in health tend to equalize so that by the time they reach school age, their health records become indistinguishable. Whether this equalization indicates the direct effect of adequate medical care for both groups or that diseases that afflict the children earlier are not severe enough to measurably retard them is not yet known, although we feel that good health care is the major contributing factor. What we can say is that sanitary facilities do make a measurable difference in hospital use and in the frequency and severity of childhood disease in this group and presumably to others like them.

### Summary

The differences in hospital use for infectious diarrhea of two groups of infants living within the same Hopi pueblo were described. One group, the upper villagers, is allied with the procouncil faction within the tribe and elected to cooperate with the Public Health Service in construction of sanitary facilities under the Indian Sanitation Facilities Act, P.L. 86-121. The other group, the lower villagers, did not cooperate in the construction of these facilities.

Before construction, children from the upper and lower village who were less than a year of age had similar patterns of hospital use for in-

fectious diarrhea. After construction, hospital use for infants of the upper village decreased, but use remained essentially unchanged for infants of the lower village. The differences in use between children of the upper and lower villages were only significant for those under 1 year of age. Subsequent age groups tended to have patterns of hospital use that were indistinguishable.

### REFERENCES

- (1) Sievers, M. L.: Disease patterns among southwestern Indians. *Public Health Rep* 81: 1075-1083, December 1966.
- (2) Lasersohn, W.: Acute diarrheal diseases in a Zuni community. *Public Health Rep* 80: 457-461, May 1965.
- (3) Watt, J., Hollister, A. C., Beck, M. D., and Hemphill, E. C.: Diarrheal diseases in Fresno County, Calif. *Amer J Public Health* 43: 728-741, June 1953.
- (4) Hollister, A. C., Beck, M. D., Gittelsohn, A. M., and Hemphill, E. C.: Influence of water availability on *Shigella* prevalence in children of farm labor families. *Amer J Public Health* 45: 354-362, March 1955.
- (5) Stewart, W. H., McCabe, L. J., Hemphill, E. C., and Decapito, T.: Diarrheal disease control studies. IV. The relationship of certain environmental factors to the prevalence of *Shigella* infection. *Amer J Trop Med* 4: 718-724, July 1955.
- (6) Schliessmann, D. J., Atchley, F. O., Wilcomb, M. J., Jr., and Welch, S. F.: Relation of environmental factors to the occurrence of enteric diseases in areas of eastern Kentucky. PHS Publication No. 591 (Public Health Monograph No. 54). U.S. Government Printing Office, Washington, D.C., 1958, p. 22.
- (7) Nagata, S.: Modern transformations of Moenkopi pueblo. University of Illinois Press, Urbana, Ill., 1969.
- (8) Levy, J. E., Kunitz, S. J., Odoroff, C. L., and Bollinger, J.: Hopi deviance: an historical and epidemiological survey. In *Essays in honor of Fred Eggan*, edited by A. Spoehr. In press.

### Teasheet Requests

Dr. Stephen J. Kunitz, 13 Marlen Drive, North Haven, Conn. 06473

**BISTOWISH, J. M.** (Metropolitan Health Department, Nashville, Tenn.), and **BARID, STEVEN J.:** *Use of the survey technique to achieve a highly immunized preschool population. Public Health Reports, Vol. 84, December 1969, pp. 1032-1036.*

In April 1965, an estimated 44,000 preschool age children lived in Metropolitan Nashville and Davidson County. The parents of 26,824 children were contacted during an immunization program based on the survey technique with intensive followup. Of the approximately 17,000 children not included, some became of school age between April 1, 1965, and the beginning of the followup in February 1966, others lived in 10 upper income census tracts that were not part of the survey, and a number became of school age during the nearly 2 years it took to complete the followup program.

Of the children whose parents

were contacted, 1,200, or 4.6 percent, moved; 570, or 2.1 percent, were refused shots; and the parents of 720, or 3 percent, were not contacted again. In 1968, at the completion of the program, 25,538, or 95.2 percent of the children, had had poliomyelitis vaccine; 25,531, or 95.2 percent, had DPT vaccine; 16,012, or 59.7 percent, had smallpox vaccination; and 18,958, or 70.7 percent, had measles vaccine. Followup activity had increased by 3,216, or 12 percent, the number of children immunized against poliomyelitis; by 3,213, or 12 percent, those protected by DPT vaccine; by 908, or 3.4 percent, those vaccinated against smallpox; and

by 6,311, or 23.6 percent, those who had received measles vaccine.

At the time of original contact, 3,685, or 13.7 percent, of the children had already had measles, and an additional 2,049, or 7.7 percent, contracted the disease during the followup period, so that of the total 26,824 children contacted, 5,734, or 21.4 percent, had experienced the disease. Therefore, 92.1 percent of all the children had become immune to measles.

Overall, the program achieved high levels of immunity and accomplished the goal of protecting preschool children who were not part of a birth certificate followup program. The coverage provided under the two programs ensures Metropolitan Nashville and Davidson County of a highly immunized population for the present.

**WECHSLER, HENRY** (The Medical Foundation, Inc., Boston), **KASEY, ELIZABETH H., THUM, DENISE,** and **DEMONE, HAROLD W., Jr.:** *Alcohol level and home accidents. A study of emergency service patients. Public Health Reports, Vol. 84, December 1969, pp. 1043-1050.*

To determine the presence or absence of alcohol in persons admitted to the emergency service of the Massachusetts General Hospital in Boston for treatment of home accident injuries, Breathalyzer readings for 5,622 patients were collected. Venous blood analyses or observations on alcoholic breath were obtained for an additional 1,222 patients.

The results of statistical analyses, significant at the 0.05 level or beyond, indicated that the presence of alcohol on admittance was associated with the reason for admission. Among patients with home accident injuries, 22.3 percent had a positive Breathalyzer reading. As shown by Breathalyzer tests, the highest involvement of alcohol, 29.5 percent, was for patients with transportation accident injuries. Less alcohol in-

volvement was indicated for patients with occupation accident injuries, 15.5 percent, and "other" accident injuries, 24.1 percent.

A strikingly high involvement of alcohol was found among persons admitted to the emergency service for treatment of injuries from fights or assaults; 56.4 percent had a positive Breathalyzer reading. A uniformly low involvement, 8.9 percent, was found among patients admitted for nonaccident reasons.

These findings were substantiated when other signs of alcohol involvement were used, and were maintained when controls were applied for drinking after the accident or onset of symptoms and for delay between the episode and arrival in the emergency service as well as for sex, age, marital status, and social class.

Among home accident injuries,

statistically significant relationships were found between presence of alcohol and external cause and nature of the injury. Positive readings for alcohol were evenly distributed among those injured in falls, collisions, and fires and by cutting or piercing instruments. Patients with head injuries or lacerations more frequently had positive alcohol readings than patients with other types of injuries such as fractures, contusions, sprains, or burns.

The study established that a higher proportion of positive alcohol readings occurred among home accident victims and other accident patients than among a comparison group of nonaccident patients admitted to the same hospital emergency service. The findings are consistent and clearcut and implicate alcohol as a factor in home accident injuries as well as in injuries from transportation, occupation (although the findings were less definite here), and other types of accidents and in injuries resulting from fights or assaults.

**BRUBAKER, MERLIN L.** (Public Health Service), **BINFORD, CHAPMAN H.**, and **TRAUTMAN, JOHN R.**: *Occurrence of leprosy in U.S. veterans after service in endemic areas abroad. Public Health Reports, Vol. 84, December 1969, pp. 1051-1058.*

Before 1940, 83 cases of leprosy were reported in U.S. veterans. Thirty of these cases were considered to be the result of exposure to the disease outside the continental United States during the Spanish-American War.

From 1940 through 1968, 240 cases of leprosy were reported in U.S.

veterans. As indicated in a résumé of their cases, 46 veterans were considered to have service-connected leprosy as a result of their exposure outside the United States.

No study has been reported of contacts of veterans with leprosy. One situation was brought to light, however, in which leprosy was diag-

nosed in the wife and three children of an infected veteran. The family lived in a nonendemic area in the United States.

Delay in the early diagnosis of leprosy is caused by the failure of both patients and physicians to suspect the disease. Early diagnosis and treatment assure the best possible opportunity for arresting the disease and preventing disability and further spread by reduction of the infectious reservoir.

**SCUTCHFIELD, F. DOUGLAS** (University of Kentucky School of Medicine), and **LONG, W. NEWTON**: *Parental medroxyprogesterone as a contraceptive agent. Public Health Reports, Vol. 84, December 1969, pp. 1059-1062.*

Depot-medroxyprogesterone acetate (DMPA) was given intramuscularly in 150 mg. doses every 3 months for contraception to 650 women in a family planning clinic. This treatment represents 5,082

woman-months of experience. To date, there have been no pregnancies.

Calculations based on life tables show that, at the end of 1 year, 56.8 of every 100 women who started using DMPA, continued to use it.

Of the 43.2 per 100 who stopped using it, 13.5 did so because of abnormal bleeding, 2.8 because of amenorrhea, 5.5 because of other medical problems, and 14.6 because of nonmedical problems; 6.8 were lost to followup.

Since there have been no pregnancies with this method and the continuance rate is high, we consider DMPA to be an effective and acceptable method of contraception.

**BECKER, MARSHALL H.** (Johns Hopkins University School of Medicine and School of Hygiene and Public Health, Baltimore, Md.): *Predictors of innovative behavior among local health officers. Public Health Reports, Vol. 84, December 1969, pp. 1063-1068.*

Local health departments have generally failed to undertake new programs advocated by health professionals and national agencies as ways of meeting changing health needs. This study examines the relationships between various attitudes held by the health officer and the time, relative to his peers, at which he adopted two public health innovations.

Ninety-five local health officers from three States participated in the

study, conducted in early 1967 by mail questionnaires and followup telephone interviews. Expert judges rated "measles immunizations" as a program representative of those with high potential for acceptance by health departments, and "screening for diabetes" as having low potential for acceptance.

Health officers who undertook these programs earlier than their colleagues were more oriented toward their profession (cosmopolitan-

ism), considered a larger number of activities as within the legitimate scope of public health (ideology), and expressed greater willingness to fight for support for new programs (activism); they perceived their communities as being more progressive and ready to innovate in both health and other civic matters; and they held a more liberal outlook (political orientation) than the later adopters.

Best predictors of high (innovative) scores on the attitude measures were high rank in his medical school graduating class, number of degrees held beyond the baccalaureate, and recent graduation from medical school.

**MARTIN, RUSSELL J.** (Illinois Department of Public Health), **SCHNURRENBERGER, PAUL R.**, and **ROSE, NORMAN J.**: *Epidemiology of rabies vaccinations of persons in Illinois, 1967-68. Public Health Reports. Vol. 84, December 1969, pp. 1069-1077.*

Illinois physicians receiving State-manufactured rabies vaccine in 1967-68 were requested to supply information delineating the circumstances which led to the administration of vaccine. Vaccine was dispensed on 1,063 occasions; information was returned in 937 instances involving 1,011 patients. Males comprised 64 percent of the vaccinees.

Thirty-eight percent of the vaccinees were less than 10 years of age. Twenty-five percent of the vaccinees received two or more bites, 62 percent received a single bite, and non-bite exposures were recorded for 9 percent. Sixty-seven percent of the persons reported exposures on the extremities, 22 percent, exposures on the head or neck.

Dogs exposed 55 percent of the persons vaccinated, skunks exposed 3 percent, and 19 percent of the vaccinees reported exposure to a species not usually infected with rabies. Fifty-eight percent of the vaccinees were exposed to animals that were not located, while 21 percent were exposed to animals that later were under the observation of a veterinarian. Only 46 percent of the vaccine series were initiated within 3 days after exposure; 20 percent had a delay of 8 days or more.

**SCHNURRENBERGER, PAUL R.** (Illinois Department of Public Health), **MARTIN, RUSSELL J.**, **MEERDINK, GAVIN L.**, and **ROSE, NORMAN J.**: *Epidemiology of human exposure to rabid animals in Illinois. Public Health Reports, Vol. 84, December 1969, pp. 1078-1084.*

All cases of animal rabies occurring in Illinois from 1963 through 1968 were investigated to determine the number of persons receiving rabies vaccine. There were 856 persons vaccinated because of exposure to

332 of the 1,272 reported rabid animals.

Dogs and cats posed the greatest hazard, with 240 persons vaccinated per 100 animal cases in contrast to 13 per 100 rabid skunks. When wild

animals were kept as pets, the vaccination rate was similar to the rate following cases associated with dogs and cats. Exposure to rabid farm animals appeared to be occupational.

One-third of the vaccine series were administered in instances where a true exposure was unlikely. Public education should be intensified in an effort to reduce the number of persons exposed.

**RUBENSTEIN, A.** (Tufts University School of Medicine), **BOYLE, J.**, **ODOROFF, C. L.**, and **KUNITZ, S. J.**: *Effect of improved sanitary facilities on infant diarrhea in a Hopi village. Public Health Reports, Vol. 84, December 1969, pp. 1093-1097.*

The differences in hospital use for infectious diarrhea of two groups of infants living within the same Hopi pueblo were described. One group, the upper villagers, is allied with the procouncil faction within the tribe and elected to cooperate with the Public Health Service in construc-

tion of sanitary facilities under the Indian Sanitation Facilities Act, P.L. 86-121. The other group, the lower villagers, did not cooperate in the construction of these facilities.

Before construction, children from the upper and lower village who were less than a year of age had

similar patterns of hospital use for infectious diarrhea. After construction, hospital use for infants of the upper village decreased but use remained essentially unchanged for infants of the lower village. The differences in use between children of the upper and lower villages were only significant for those under 1 year of age. Subsequent age groups tended to have patterns of hospital use that were indistinguishable.







# 1969 INDEX

## Public Health Reports

Volume 84, January–December

*and*

## Public Health Monograph No. 78

THIS INDEX to *Public Health Reports* and Public Health Monographs is divided into a subject index and an author index.

The subject index carries one or more entries for each item published. In addition to the subject headings, categorical headings include ANNOUNCEMENTS (ORGANIZATIONS and PERSONNEL), CONFERENCE REPORTS, PHS GRANTS, and TRAINING COURSES.

The Public Health Monograph published concurrently with *Public Health Reports* in 1969 appears under the category heading MONOGRAPHS. The monograph summary appearing in the journal is indexed under the appropriate subject heading.

### Key to Dates and Pages

<i>Pages</i>	<i>Month of issue</i>	<i>No.</i>
1-94	January.....	1
95-188	February.....	2
189-290	March.....	3
291-384	April.....	4
385-478	May.....	5
479-572	June.....	6
573-666	July.....	7
667-760	August.....	8
761-838	September.....	9
839-932	October.....	10
933-1026	November.....	11
1027-1120	December.....	12

### Key to Classification Code

- (\*) Original, signed article
- (CR) Conference report
- (MS) Monograph summary
- (SR) Short report

In the author index, two asterisks (\*\*) before the page number indicate a monograph.



# Subject Index

ABNORMALITIES *see* Birth Defects; Genetics

## ACCIDENTS

- alcohol level and home accidents; study of emergency service patients, Boston..... \*1043
- control, study of traffic accidents and violation rates of mental hospital discharges (CR) ..... 225

## ADMINISTRATION

- see also* Health Departments; Information Systems
- bicephalic management hurts New York City's Medicaid program (CR)..... 194
- Federal Budget process, updated..... \*149
- hospitals, trends in use..... \*1037
- proposed standard measure of recurrence of out-of-wedlock births to adolescents.... \*839

ADOLESCENTS *see* Child Health and Welfare

## AFRICA

- bacteriological safety of hot tapwater in West African hotels..... \*812

## AGED

- HEW and HUD campaign to provide older people with increased services and greater role in Model Cities program (SR)..... 1022
- relating health and social contacts to morale of elderly persons; results of a survey.... \*1013

## AIR MICROBIOLOGY

- advances in large-volume air sampling (CR) ..... 276
- survival of micro-organisms in aerosols produced in cleaning and disinfecting walls with high-pressure sprays or brushes ..... \*547

## AIR POLLUTION

- automobile, PHS contracts for development of Rankine cycle vapor system to combat (SR) ..... 882
- citizens act to curb (CR)..... 280
- effects on New York City mortality (CR).... 283
- quality criteria on sulfur oxides and particulate air pollutants announced (SR)..... 424

## ALASKA

- availability and use of medical services, Hooper Bay, 1966..... \*845
- life tables for natives..... \*65

## ALCOHOL

- alcohol level and home accidents; study of emergency service patients, Boston..... \*1043

## ALCOHOLISM

- research at Downstate Medical Center, State University of New York (SR).... 403
- State and local cooperation for comprehensive treatment programs (CR)..... 265
- survey of effect of A.A. on its members (SR) ..... 120

## AMEBIASIS

- and ascariasis, prevalence in Cherokee Indian school children..... \*907

## ANEMIA

- sickle cell, awareness of occurrence among Negroes of Richmond, Va..... \*949

ANIMALS *see* name of animal; name of disease; Zoonoses

## ANNOUNCEMENTS, ORGANIZATIONS

- Center for Population Research contract program, National Institute of Child Health and Human Development..... 165
- Center for Studies of Schizophrenia, National Institute of Mental Health..... 138
- Community Mental Health Centers Support Branch, National Institute of Mental Health ..... 623
- Community Mental Health Services Development Branch, National Institute of Mental Health..... 623
- John Crerar Library, Chicago, designated Midwest Regional Medical Library by National Library of Medicine..... 379
- Lister Hill National Center for Biomedical Communications planned..... 8
- New graduate school of medical sciences at University of the Pacific in San Francisco ..... 126
- New York Academy of Medicine and University of California at Los Angeles awarded PHS grants for regional medical libraries ..... 610
- University of Pittsburgh establishes School of Health-Related Professions..... 506

## ANNOUNCEMENTS, PERSONNEL

- Bruce, Harry W., Jr., director, Division of Educational and Research Facilities, NIH ..... 646
- Bucher, Robert M., deputy director for institutional development, Bureau of Health Professions Education and Manpower Training, NIH..... 513
- Cavanaugh, James H., director, Office of Planning and Program Coordination, DHEW ..... 38
- Cross, Edward B., Assistant Surgeon General, PHS..... 444
- Egeberg, Roger Olaf, Assistant Secretary for Health and Scientific Affairs, DHEW.... 755
- English, Joseph T., administrator of Health Services and Mental Health Administration, PHS..... 287
- Feldman, Saul, associate director for Community Mental Health Services, PHS.... 623

## ANNOUNCEMENTS, PERSONNEL—Continued

Moore, Raymond T., associate commissioner of Environmental Control Administration, Consumer Protection and Environmental Health Service, PHS.....	863
Nirenberg, Marshall W., National Heart Institute Laboratory of Biochemical Genetics, awarded Nobel Prize.....	58
Resnik, Harvey L. P., chief, suicide prevention program, PHS.....	513
Whiteside, Daniel, director, Division of Health Manpower Educational Services, NIH .....	646
ANTIBIOTICS <i>see</i> Drugs	
ASCARIASIS	
and amebiasis, prevalence in Cherokee Indian school children.....	*907
AUDIOMETRY	
calibration and working condition of 100 audiometers tested at Health and Speech Center, University of North Carolina....	*311
AUTOMATED DATA PROCESSING	
application of computers to everyday dietary practices (SR).....	953
computer analysis used to determine effect of drugs on hospital patients.....	*39
computers in medical education (SR).....	984
computer methods tried in hospital X-ray department (CR).....	221
family planning data computerized by Maryland and Georgia (CR).....	203
input, emphasis on (CR).....	251
use in District of Columbia Department of Public Health.....	*409
BEHAVIOR	
attitude of health department clients toward an immunization error.....	*521
attitude of public toward mentally ill.....	*59
child-rearing attitudes of Negro teenage primiparous girls (CR).....	237
criminality and XYY syndrome link not yet demonstrated (SR).....	914
failure syndrome avoided by early intervention, Quincy (Mass.) public schools (CR) ..	215
innovativeness, predictors of among local health officers.....	*1063
personal versus telephone interviews, effect on responses.....	*773
school children at risk of future learning problem, early identification (CR).....	215
social and behavioral aspects of patients attending Baltimore chest clinics, preliminary findings.....	*159
subjective perceptions and social status of 250 men after first myocardial infarction...	*989
use of independent variables and importance of distinguishing types for program planning .....	*831
BERYLLIUM	
survey of production and use (SR).....	429

## BIBLIOGRAPHIES

<i>Current Bibliography of Epidemiology</i> (CuBE), new periodical for medical and public health libraries (SR).....	91
National Library of Medicine.....	327, 711
BIOCHEMISTRY	
a specialized modification of clinical biochemistry (CR).....	273
BIRTH CONTROL <i>see</i> Family Planning	
BIRTH DEFECTS	
malformations recorded on birth certificates following A2 influenza epidemics.....	*971
BLASTOMYCOSIS	
North American, use of case survey technique to detect origin, California.....	*514
BLINDNESS	
oxygen and retrolental fibroplasia in neonates (CR).....	16
BOTULISM	
pouch-packed vegetables tested for botulinum (CR).....	272
CAMPS	
Camp Concern, day program for disadvantaged youth in Baltimore.....	*508
CANADA	
comparative study of the pulmonary mycoses of Canada and the United States, epidemiologic aspects.....	*869
CANAL ZONE	
prevalence of antistreptolysin O in young Panamanians .....	*77
CANCER	
carcinoma of the cervix, decline in mortality, 1962-67, Beverly, Mass.....	*826
cervical screening with the Davis pipet on a door-to-door basis in Rhode Island....	*553
diagnosis, value of oral cytology confirmed (CR) .....	227
leukemia risk greater in some ethnic groups (CR) .....	226
lung, mortality among religious and ethnic groups, Montreal (CR).....	226
melanoma: sex, site, and sunlight (CR)---	227
CHILD HEALTH AND WELFARE	
<i>see also</i> Maternal Health; School Health	
adolescents' use of hospital emergency rooms, clues to community problems (CR) .....	198
childhood development studies of 1- to 5-year age group sponsored by Children's Bureau (SR).....	672
child-rearing attitudes of Negro teenage primiparous girls (CR).....	237
comparison of answers to questionnaire with serum antibody determinations to estimate children's susceptibility to measles...	*373
compulsory personal health measure legislation, analysis and commentary.....	*341
day camp (Camp Concern) for Baltimore's disadvantaged youth.....	*508

## CHILD HEALTH AND WELFARE—Continued

dental care survey (SR).....	310
detection of phenylketonuria carriers in high-risk population, New York State...	*144
effect of improved sanitary facilities on infant diarrhea in a Hopi village.....	*1093
health defects and need for treatment of adolescents in low-income families; summer work program, Boston.....	*705
health status of Neighborhood Youth Corps adolescents, Santa Clara County, Calif....	*585
immunization status of white children in Hopkins County, Ky.....	*605
infant mortality rates, by ranking countries..	*19
intolerant society blamed for alienation of youth (CR).....	223
low birth weight and perinatal mortality; an attempt to define and explain differences between the United States and Sweden .....	*030
malformations recorded on birth certificates following A2 influenza epidemics...	*971
maternal knowledge of iron-deficiency anemia .....	*527
maternity and infant care project in Chicago decreases infant mortality (CR).....	237
new treatment for hyaline membrane disease (SR).....	332
night safety, reflectorized materials recommended (SR).....	970
nurse-midwives in Alaska (SR).....	7
out-of-wedlock births to adolescents, proposed standard measure of recurrence...	*839
oxygen and retrolental fibroplasia in neonates (CR).....	16
rat-inflicted injuries to children.....	*1
sickle cell anemia, awareness of occurrence among Negroes of Richmond, Va.....	*040
tuberculin skin testing programs, influence of prevalence of infection on.....	*883
urban infants, continuity of care for (CR) ..	199
use of a survey technique to achieve a highly immunized preschool population, Metropolitan Nashville and Davidson County, Tenn .....	*1032
<b>CHRONIC DISEASES</b>	
<i>see also</i> name of disease	
effect of disability from chronic mental or physical conditions on labor force.....	*291
<b>CIRRHOISIS <i>see</i> Liver Cirrhosis</b>	
<b>COMMUNICABLE DISEASES <i>see</i> name of disease</b>	
<b>COMMUNICATIONS</b>	
public facilities used to encourage enrollments and inform New York City residents on benefits of Medicaid.....	*767
<b>COMMUNITY HEALTH</b>	
clues to community ills through young people's use of hospital emergency rooms (CR) .....	198

## COMMUNITY HEALTH—Continued

neighborhood health program for low-income residents, Denver.....	*1027
neighborhood health program includes nutrition education, Denver (CR).....	212
survey of health concerns and attitudes regarding a fluoridation program, Detroit...	*655
treated as social problem at Martin Luther King, Jr., Health Center in Morrisania area of Bronx.....	*761
<b>CONFERENCE REPORTS</b>	
American Public Health Association, 96th, 1968 .....	189
national conference on mental health in public health training.....	*135
oxygen and retrolental fibroplasia in neonates .....	16
<b>CYTOLOGY</b>	
oral, value in cancer diagnosis (CR).....	227
<b>DEMOGRAPHY</b>	
nomograms for simplified calculations.....	*431
<b>DENTAL HEALTH</b>	
dental care missing for patients in Regional Medical Program project (CR).....	244
dental care patterns of low-income Negro and white families with children in Boston's Head Start program of 1967.....	*721
dental care under Medicaid, Erie County, N.Y. (CR).....	241
dental health programs, Federal support (CR) .....	242
occlusal relations in white and Negro children born in a community having fluoridation (CR).....	243
orthodontic treatment influenced by importance of oral self-image to child (CR)...	245
use of dental care under prepayment, social factors (CR).....	240
<b>DIABETES</b>	
and heart disease in employed men, preventive effect of periodic health examinations (CR) .....	262
glycosuria tests performed at home, study of diabetics' accuracy in reading results of Tes-tape and Clinitest.....	*28
large-scale screening, new technique (CR)...	274
reproducibility of glucose tolerance in 101 nondiabetic women.....	*353
<b>DIET <i>see</i> Nutrition</b>	
<b>DIPHThERIA</b>	
immunization status of white children in Hopkins County, Ky.....	*605
<b>DISASTERS <i>see</i> Emergency Health Services</b>	
<b>DRUG ADDICTION</b>	
"abuse" applies to all drugs (CR).....	218
abuse by students, ways by which schools can provide alternatives (CR).....	217
preventive approaches to drug abuse (CR)...	218
progress report on Narcotic Addict Rehabilitation Act program (SR).....	64

## DRUG ADDICTION—Continued

- studies of marihuana and teenage drug users supported by National Institute of Mental Health grants (SR)----- 76
- treatment centers, National Institute of Mental Health grants for staffing (SR)--- 581

## DRUGS

- contribution of aspirin to formation of ulcers (SR)----- 27
- depot-medroxyprogesterone acetate as a parenteral contraceptive agent----- \*1059
- doxycycline monohydrate, use of single oral dose for treating gonorrheal urethritis in man ----- \*182
- effect on hospital patients determined by computer analysis----- \*39
- for parasitic diseases, available at National Communicable Disease Center (SR)----- 541
- oral contraceptives, risk of thromboembolism from use (CR)----- 204
- penicillin dose effectiveness tests against gonorrhea, Alameda County Health Department clinic, California----- \*980
- psychotropic, international referral system established in National Institute of Mental Health (SR)----- 304
- use among University of Michigan students surveyed (SR)----- 1084
- use of antimicrobials and hospital-associated infections, survey at PHS Hospital, Staten Island, N.Y.----- \*451

## ECONOMICS, HEALTH

- application of cost-benefit analysis to public health programs----- \*95
- labor force loss due to disability from chronic conditions----- \*291

## EDUCATION NOTES see Training Courses

## EGYPT

- visual acuity and field of vision of urban and rural Egyptians----- \*955

## EMERGENCY HEALTH SERVICES

- civil disturbances, role of health department (CR)----- 246
- Emergency Medical Identification (EMI) symbol (SR)----- 680
- Hurricane Beulah, during and after, Texas, 1967 (CR)----- 246
- Poor People's Campaign, 1968, Washington, D.C. ----- \*102

## ENTEROVIRUS INFECTIONS

- in New York State population (CR)----- 261

## ENVIRONMENTAL HEALTH

- advances in large-volume air sampling (CR) ----- 276
- chasms separate science and citizen consumer (CR)----- 280
- community problems shut out by "mini-world" creators (CR)----- 190
- diminished living space, effects (CR)----- 192

## ENVIRONMENTAL HEALTH—Continued

- law enforcement essential in public health work (CR)----- 285
- planning, relationship with comprehensive health planning----- \*647
- problems, population crisis as a factor (CR) ----- 191
- rat control in Detroit (CR)----- 283
- rat infestation programs, use of record-keeping system to evaluate and develop control, Contra Costa County, Calif.----- \*625
- rat-inflicted injuries in urban America----- \*1
- survival of micro-organisms in aerosols produced in cleaning and disinfecting walls with high-pressure sprays or brushes ----- \*547
- tritium in the environment from nuclear powerplants ----- \*363
- value of good data information system for food inspection programs (CR)----- 284

## EPIDEMIOLOGY

- bovine cysticercosis and human taeniasis in the United States (CR)----- 210
- computer analysis of epidemiologic data used to determine effect of drugs on hospital patients----- \*39
- current bibliography (CuBE) (SR)----- 91
- human exposure to rabid animals in Illinois ----- \*1078
- pulmonary mycoses of Canada and the United States, comparative study----- \*869
- QRS axis measurement (CR)----- 261
- rabies vaccinations of persons in Illinois, 1967-68 ----- \*1069
- relative roles of respiratory and skin infections in relation to reservoir and transmission of *Corynebacterium diphtheriae* infections (CR)----- 207
- role of cutaneous infection in spread of group A streptococci and epidemiology of acute glomerulonephritis (CR)----- 206
- stroke in a rural area, second year of Mid-Missouri stroke survey----- \*878
- studies of infectious mononucleosis with Epstein-Barr virus (CR)----- 208
- transmission foci of *Echinococcus granulosus* identified in California----- \*531

## ESCHERICHIA COLI

- in clinical specimens and foodstuffs, status of immunofluorescence techniques for detecting ----- \*887

## FAMILY PLANNING

- American Indians, program for (CR)----- 205
- clinic, need-use rates measured in Charlotte, N.C. (CR)----- 205
- data computerized by Maryland and Georgia (CR) ----- 203
- depot-medroxyprogesterone acetate as a parenteral contraceptive agent----- \*1059

# FAMILY PLANNING—Continued

effect of chronically ill child on family size (CR) .....	233
nomograms for simplified demographic calculations .....	*431
sources of referral to a Los Angeles center .....	*404
survey of policies and activities of State and territorial health and welfare departments, fiscal 1967 .....	*127
thromboembolism risk from use of pill (CR) .....	204
\$12 million awarded to 41 States for 79 projects (SR) .....	856
use of matched pairs in evaluation of a birth control program, District of Columbia Department of Public Health .....	*445

# FEDERAL BUDGET

the process; updated version of 1959 report .....	*149
---------------------------------------------------	------

# FERTILITY *see* Family Planning

# FILMS

descriptive announcements ... 80, 526, 624, 795, 979	
------------------------------------------------------	--

# FLUORIDATION

relationship to bone density in Kingston and Newburgh, N.Y. ....	*815
survey of health concerns and attitudes, Detroit .....	*655

# FOODBORNE DISEASES *see* name of disease

# FOOD PROTECTION

canned cured meat, factors affecting safety of thermally processed (CR) .....	213
meat, new inspection laws for consumer protection (CR) .....	214

# FRACTURES

in women 45 years old and over, relation to osteoporosis .....	*33
----------------------------------------------------------------	-----

# GASTROENTERITIS

outbreak related to water pollution, Lake Erie (CR) .....	259
-----------------------------------------------------------	-----

# GENETICS

link between XYY syndrome and criminality not yet demonstrated (SR) .....	914
sickle cell anemia, awareness of occurrence among Negroes in Richmond, Va. ....	*949

# GONORRHEA

comparative study of two therapies at Alameda County Health Department clinic, California .....	*980
gonorrheal urethritis in men, use of single oral dose of doxycycline monohydrate for treatment .....	*182
humoral response to <i>Neisseria gonorrhoeae</i> (CR) .....	279

# GRANTS, PHS

for alcoholism research, Downstate Medical Center, State University of New York (SR) .....	403
for comprehensive rehabilitation pavilion, San Antonio, Tex., Hill-Burton program (SR) .....	696
for 18 migrant health projects (SR) .....	615

# GRANTS, PHS—Continued

for regional medical libraries, New York Academy of Medicine and University of California at Los Angeles (SR) .....	610
for rehabilitating bright, disturbed college dropouts, Hahnemann Medical College and Hospital, Philadelphia, Pa., experimental program, National Institute of Mental Health (SR) .....	357
for self-instruction in medicine using computers, Ohio State University College of Medicine (SR) .....	984
for staffing narcotic addiction treatment centers, National Institute of Mental Health (SR) .....	581
for studies of marihuana and teenage drug users (SR) .....	76
for training program to help professional city planners design socially acceptable cities (SR) .....	15
new Duchesne County Hospital and PHS Indian Health Service Center, Roosevelt, Utah (SR) .....	1036
\$71 million awarded in five grants for construction of health professions educational facilities (SR) .....	766
support work of the National Center for Health Services Research and Development .....	*358
to Group Health Association of America for 24 medical group practice projects (SR) ..	1031
\$12 million awarded to 41 States for 79 family planning projects (SR) .....	856
\$2.5 million awarded to six comprehensive health projects (SR) .....	689

# GROUP PRACTICE *see* Medical Care

# HANDICAPPED

few medical rejections among special hire applicants, New Jersey Bell Telephone Co. (CR) .....	239
------------------------------------------------------------------------------------------------	-----

# HEALTH ADVOCATES

functions at Martin Luther King, Jr., Health Center in Morrisania area of Bronx .....	*761
---------------------------------------------------------------------------------------	------

# HEALTH AIDES

disadvantaged trained for home nursing, Alameda County, Calif. ....	*617
education trainee project, California division of American Cancer Society .....	*459
indigenous, as counselors to parents on nutrition .....	*328
learn marketable skills (CR) .....	232
need of training in communication skills (CR) .....	230
role in community public health programs ..	*998
training and using health auxiliaries, experiences of the Public Health Service .....	*681
tribal community representatives of the Indian Health Service .....	*965

# HEALTH DEPARTMENTS

contract to collect and disseminate health	
--------------------------------------------	--

## HEALTH DEPARTMENTS—Continued

data to city and county health departments awarded to U.S. Conference of Mayors (SR).....	596
creating a county health department, variables related to a referendum vote.....	*639
evaluation of birth control program by use of matched pairs, District of Columbia Department of Public Health.....	*445
local, predictors of innovative behavior among health officers.....	*1063
migrant farmworker program, San Luis Obispo County, Calif.....	*690
public health library, Nassau County, N.Y.....	*465
recall program for persons with inactive tuberculosis, preliminary report, Denver Department of Health and Hospitals.....	*985
use of automatic data processing system, District of Columbia Department of Public Health.....	*409
use of recordkeeping system in Contra Costa County to evaluate rat infestation and to develop control programs.....	*625

## HEALTH EDUCATION

attributes of physician-patient interaction relating to patient satisfaction and compliance with medical advice (CR).....	253
future implications for educators and health education practice (CR).....	252
Philadelphia pharmacists as health educators (CR).....	255
program for disadvantaged youth at Camp Concern, summer day camp in Baltimore.....	*508
role of community health aides in public health programs.....	*998
school dropouts learn health department tasks (CR).....	253
television series; Baltimore's 20th year of "Your Family Doctor" (SR).....	552

## HEALTH FACILITIES

<i>see also</i> Health Services; Nursing Homes	
converting a compact station wagon to a mobile health unit.....	*71
functions of health advocates at Martin Luther King, Jr., Health Center in Morristown area of Bronx.....	*761
Hill-Burton grants reach 10,000 (SR).....	696
institutional needs of the health industry.....	*305
neighborhood health centers for low-income residents, Denver.....	*1027
new Duchesne County Hospital and PHS Indian Health Service Center at Roosevelt, Utah, sets new pattern in assistance to communities (SR).....	1036
self-guided tour acquaints people in community with new mental health centers in Santa Clara County, Calif. (SR).....	340
urban tuberculosis clinics, characteristics of patients, Baltimore study.....	*159

## HEALTH PLANNING

*see also* Health Facilities; Model Cities Program

and politics go hand in hand (CR).....	268
application of cost-benefit analysis to public health programs.....	*95
comprehensive laws, Philadelphia's experience.....	*86
comprehensive, under Public Law 89-749, problems of a State agency (CR).....	265
distribution of personal health services, review of methods used.....	*573
exclusion of affected persons from community self-study groups (CR).....	266
future-oriented society must cast off bonds (CR).....	268
health defects and need for treatment of adolescents in low-income families, summer work program, Boston.....	*705
ideal planning versus pragmatic (CR).....	269
nurse-midwives in Alaska (SR).....	7
planners: learn to quantitate outcomes (CR).....	271
pluralistic planning suggested (CR).....	267
program control, professional and community should share (CR).....	270
relationship between comprehensive and environmental planning.....	*647
training and using health auxiliaries, Public Health Service experiences.....	*681
unaffiliated physicians need continuing education (CR).....	271

## HEALTH SERVICES

*see also* Health Aides

availability and use of medical services, Hooper Bay, Alaska, 1966.....	*845
comprehensive care for migrant farmworkers, San Luis Obispo County (Calif.) Health Department.....	*690
comprehensive, for American Indians under PHS Health Program Systems Center.....	*697
comprehensive health projects (six) awarded PHS grants (SR).....	689
converting a compact station wagon to a mobile health unit.....	*71
defining, measuring, and assessing the quality; perspectives and suggested framework.....	*415
for city poor, far from "model" (CR).....	193
for low-income residents, Denver's neighborhood health program.....	*1027
for the poor, coordinated effort needed (OR) grant and contract support work of National Center for Health Services Research and Development.....	*358
Partnership for Health Program and Medicare, augmenting potential of programs... Poor People's Campaign, 1968, Washington, D.C.....	*899
role of social workers in community medicine (CR).....	*102
	194

<b>HEALTH SERVICES—Continued</b>	
Sweden's system.....	*81
<b>HEARING see Audiometry</b>	
<b>HEART DISEASE</b>	
and diabetes in employed men, preventive effect of periodic health examinations (CR) .....	262
mass screening of school children with portable analog-digital computer, Sacramento, Calif .....	*479
myocardial infarction; social status and subjective perceptions of 250 men after first attack .....	*989
QRS axis deviation may be predictor (CR) ..	261
<b>HODGKIN'S DISEASE</b>	
in wood industry workers.....	*385
<b>HOME CARE</b>	
new directions seen (CR) .....	199
<b>HOSPITALS</b>	
<i>see also</i> Health Facilities	
ambulatory clinics, performance indices (CR) .....	202
computer methods tried in X-ray department (CR).....	221
emergency departments need coordinated system in civil disturbances (OR).....	247
emergency room use by young people, clues to community ills (CR) .....	198
nonprofit, \$25 million joint HEW and HUD construction project begins with Illinois hospital (SR).....	905
patient characteristics, hospital characteristics, and hospital use (CR).....	201
reported use by low-income inpatients and outpatients, verification study, New York City .....	*107
survey of hospital-associated infections and use of antimicrobials, PHS Hospital, Staten Island, N.Y.....	*451
trends in use.....	*1037
<b>HOSPITALS, MENTAL</b>	
effects of long-range treatment at outpatient clinics and psychiatric day hospitals, Baltimore (CR).....	224
<b>HYALINE MEMBRANE DISEASE</b>	
new treatments for (SR) .....	332
<b>HYDATID DISEASE</b>	
transmission foci of <i>Echinococcus granulosus</i> identified in California.....	*531
<b>ILLEGITIMACY</b>	
out-of-wedlock births to adolescents, proposed standard measure of recurrence....	*839
<b>IMMUNIZATION</b>	
changes recommended for international travel (SR).....	450
compulsory, in the United States; a review of State laws and regulations.....	*787
DTP and poliomyelitis status of white children evaluated in Hopkins County, Ky .....	*605

<b>IMMUNIZATION—Continued</b>	
levels of pertussis immunity in adults, comparative study of prebooster and post-booster titers 7-13 years after vaccination .....	*9
use of a survey technique to achieve a highly immunized preschool population, Metropolitan Nashville and Davidson County, Tenn .....	*1032
<b>INDIANS, AMERICAN</b>	
effect of improved sanitary facilities on infant diarrhea in a Hopi village.....	*1093
family planning program (CR).....	205
new Duchesne County hospital and PHS Indian Health Service Center at Roosevelt, Utah, sets new pattern in assistance to communities (SR).....	1036
outbreak of shigellosis from potato salad, Yakima Reservation.....	*563
prevalence of ascariasis and amebiasis in Cherokee Indian school children.....	*907
to receive comprehensive services under PHS Health Program Systems Center....	*697
tribal community health aides representing Indian Health Service.....	*965
<b>INDIGENT</b>	
adolescents' health defects and need for treatment; summer work program, Boston .....	*705
care under Medical Assistance Program, Baltimore (CR).....	197
health careers for urban poor (CR).....	229
poverty cycle, coordinated efforts needed to break (CR).....	192
services for city poor far from "model" (OR) .....	193
<b>INDUSTRIAL HYGIENE see Occupational Health</b>	
<b>INFANTS see Child Health and Welfare</b>	
<b>INFECTIOUS DISEASES</b>	
<i>see also</i> Mycoses; Parasitic Diseases; name of disease	
relative roles of respiratory and skin infections in relation to reservoir and transmission of <i>Corynebacterium diphtheriae</i> infections (CR).....	207
role of cutaneous infection in spread of group A streptococci and epidemiology of acute glomerulonephritis (OR).....	206
<b>INFLUENZA</b>	
A2 epidemics, malformations recorded on birth certificates following.....	*971
<b>INFORMATION SYSTEMS</b>	
data management (CR).....	251
international referral system on psychotropic drugs established in National Institute of Mental Health (SR).....	304
public health library, Nassau County Department of Health, N.Y.....	*465

# INFORMATION SYSTEMS—Continued

Smithsonian Institution Science Information Exchange, services and fee schedule (SR) .....	457
--------------------------------------------------------------------------------------------	-----

# INTERNATIONAL HEALTH

bacteriological safety of hot tapwater in developing countries, tests in West African hotels .....	*812
border health resources survey, U.S. and Mexican medical students draft and pretest questionnaires .....	*736
international referral system on psychotropic drugs established in National Institute of Mental Health (SR) .....	304
nomograms for simplified demographic calculations .....	*431
occurrence of leprosy in U.S. veterans after service in endemic areas abroad .....	*1051

# LABORATORIES

diagnostic infectious specimen containers leak-tested by high-velocity impact to meet mailing specifications .....	*783
importance of laboratory backup in epidemiologic investigation of human diseases; ecological investigation of vectors and reservoirs (CR) .....	274
laboratory requirements for ecological studies of human infectious agents (CR) .....	277
present status of automated detection of streptococcus (CR) .....	275
teamwork role in disease eradication program (CR) .....	279

# LABORATORY ANIMALS

miniature pigs bred for research, University of Minnesota (SR) .....	802
----------------------------------------------------------------------	-----

# LABORATORY EQUIPMENT

monitor to detect tritium (SR) .....	289
--------------------------------------	-----

# LABORATORY TESTS AND TECHNIQUES

automation of fluorescent treponemal antibody-absorption (FTA-ABS) test for syphilis (CR) .....	278
biochemists aim for presymptom screening (CR) .....	273
experience with a new technique in large-scale diabetes screening program (CR) ..	274
fluorescent antibody techniques for detecting <i>Salmonella</i> , <i>Shigella</i> , and <i>Escherichia coli</i> in clinical specimens and foodstuffs, status report .....	*887
human rabies immune globulin, progress in development at National Communicable Disease Center (CR) .....	207, *797
humoral response to gram-negative bacteria: <i>Neisseria gonorrhoeae</i> (CR) .....	279
rubella HAI antibody levels determined on serums of Rhode Island women of child-bearing age .....	*139
serotyping of Enterobacteriaceae, U.S. current status (CR) .....	277

# LABORATORY TESTS AND TECHNIQUES—Continued

use of Perry's single fasting-sample procedure to detect phenylketonuria carriers ..	*144
--------------------------------------------------------------------------------------	------

# LAWS AND REGULATIONS

<i>see also</i> Health Advocates	
better standards needed for home heating items (CR) .....	286
child abuse, mandatory reporting by school personnel, Syracuse, N.Y. (CR) .....	219
comprehensive health planning, Philadelphia's experience .....	*86
compulsory personal health measure legislation, analysis and commentary .....	*341
effective legal enforcement of environmental health programs (CR) .....	285
meat inspection, new laws for consumer protection (CR) .....	214
on compulsory immunization in the United States, a review of State requirements ..	*787
school health, New York State legislation (CR) .....	216
shipment of diagnostic infectious specimens leak-tested by high-velocity impact of containers .....	*783
standards and criteria for health protection (CR) .....	286

# LEPROSY

occurrence in U.S. veterans after service in endemic areas abroad .....	*1051
-------------------------------------------------------------------------	-------

# LEUKEMIA

risk greater in some ethnic groups (CR) ..	226
--------------------------------------------	-----

# LIVER CIRRHOSIS

increase in deaths among 25- to 44-year olds, Baltimore (CR) .....	263
--------------------------------------------------------------------	-----

# MANPOWER

<i>see also</i> Health Aides; Nurses; Physicians; Sanitarians	
health careers for urban poor (CR) .....	229
health educators, role in survey of nursing homes for Medicare participation, Montgomery County, Md .....	*469
health planners and administrators, undergraduate programs for training .....	*864
labor force loss due to disability from chronic conditions .....	*291
possible use of medicine men as paramedical health care workers and health educators, Nigeria .....	*1085
school health personnel utilization project in New York City, phase 2 .....	*729
scientists in various specialties, average age at death .....	*661
U.S. and Mexican medical students draft and pretest questionnaires for border health resources survey .....	*736
versatility of health department volunteers (CR) .....	231



**MARBURG VIRUS**

- outbreak traced to African green monkeys  
(CR) ----- 210

**MATERNAL HEALTH**

- see also* Child Health and Welfare; Family  
Planning  
dietary habits of girls pregnant at 16 years  
old or under (CR) ----- 213  
effectiveness of public health nurse teach-  
ing in increasing compliance of patients  
with medical advice (CR) ----- 255  
followup study of fertility rates for mothers  
under 17 years old, Allegheny County,  
Pa. (CR) ----- 236  
maternal and child health services given  
in ghetto center, Detroit (CR) ----- 235  
nurse-midwives in Alaska (SR) ----- 7  
rubella antibodies in Rhode Island women  
of childbearing age ----- \*139  
special care for high-risk patients cuts pre-  
maturity rate (CR) ----- 235  
special school for pregnant teenagers, New  
Haven, Conn. (CR) ----- 233

**MEASLES**

- see also* Rubella  
attitude of health department clients toward  
immunization dose error ----- \*521  
children's susceptibility to, comparison of  
answers to questionnaire with serum  
antibody determinations ----- \*373  
epidemic in Chicago, preschoolers hit hard-  
est (CR) ----- 260  
immunization, national benefits ----- \*673

**MEDICAL CARE**

- ambulatory clinics, performance indices  
(CR) ----- 202  
automated multiphasic health testing ----- \*582  
Emergency Medical Identification (EMI)  
symbol (SR) ----- 680  
for urban infants, continuity (CR) ----- 199  
Group Health Association of America  
awarded PHS grant for 24 group practice  
projects across nation (SR) ----- 1031  
Medicaid benefits publicized and enroll-  
ments encouraged in New York City ----- \*767  
Medicaid, bicephalic management hurts New  
York City's program (CR) ----- 194  
Medicaid, new regulations limit fees to  
physicians, dentists, and other providers  
of medical services (SR) ----- 898  
Medicaid, participation of optometrists in  
New York City program ----- \*1008  
Medicaid patients served by high-volume  
practitioners, New York City (CR) ----- 196  
Medicaid program in New York City, stand-  
ard setting and surveillance of services  
(CR) ----- 195  
Medical Assistance Program, Baltimore  
(CR) ----- 197  
Medicare's impact varies with group health  
plans (CR) ----- 200

**MEDICAL CARE—Continued**

- new proxy measures for health status  
(CR) ----- 250  
Partnership for Health Program and  
Medicare, augmenting potential ----- \*899  
programs of National Center for Health  
Services Research and Development,  
Public Health Service, and evaluation of  
medical care (CR) ----- 271  
role of health educators in survey of nursing  
homes for Medicare participation, Mont-  
gomery County, Md. ----- \*469  
sources, reported use by low-income in-  
patients and outpatients, verification  
study, New York City ----- \*107  
survey of group practice in the United  
States, 1965 ----- \*597

**MEDICAL SCHOOLS**

- recommendations on curriculums (SR) ---- 181

**MEDICINE MEN**

- possible role in paramedical health care  
and health education, Nigeria ----- \*1085

**MEDICINE, PREVENTIVE**

- automated multiphasic health testing ----- \*582  
Medicaid benefits publicized and enrollments  
encouraged, New York City ----- \*767

**MENINGITIS**

- research offers new hope for control (CR) -- 257

**MENTAL DISORDERS**

- among patients of general practitioners and  
internists, Monroe County, N.Y. ----- \*167  
relationship between mental illness and traf-  
fic accidents and violations (CR) ----- 225  
schizophrenia, center for studies (SR) ----- 138

**MENTAL HEALTH**

- availability of suicide counseling to students,  
Richmond, Va. ----- \*118  
care in rural areas (SR) ----- 811  
center lacks advantages of hospital (CR) --- 225  
Community Mental Health Centers Support  
and Development Branches, National In-  
stitute of Mental Health (SR) ----- 623  
effects of long-range treatment at outpatient  
clinics and psychiatric day hospital, Balti-  
more (CR) ----- 224  
experimental program to rehabilitate bright,  
disturbed dropouts, Hahnemann Medical  
College and Hospital, Philadelphia (SR) -- 357  
Foundation of Thanatology established, New  
York City (SR) ----- 1012  
in public health training, national con-  
ference ----- \*135  
intolerant society blamed for alienation of  
youth (CR) ----- 223  
psychiatric consultation for staff of New  
York City welfare center (CR) ----- 224  
public acceptance of mentally ill ----- \*59  
public health nurses provide counseling  
without traditional mental health team,  
Columbus, Ga. (CR) ----- 223

## MENTAL HEALTH—Continued

- self-guided tour acquaints people in community with new centers in Santa Clara County, Calif. (SR)----- 340
- statistics, survey of State-level programs-- \*803
- study center, analysis of requests for help in Prince George's County, Md----- \*923
- suicides in Los Angeles, Calif., and Vienna, Austria; an intercultural study of two cities ----- \*389
- teenage drug users and marihuana, studies supported by National Institute of Mental Health grants (SR)----- 76
- 30 Vermont nurses trained as part-time community crisis counselors (CR)----- 224

## MICRONESIA

- status of health services since 1963 poliomyelitis epidemic----- \*915

## MIGRANTS

- comprehensive care program for farmworkers, San Luis Obispo County (Calif.) Health Department----- \*690
- 18 health projects awarded PHS grants (SR) ----- 615

## MODEL CITIES PROGRAM

- campaign to provide older people with increased services and greater role in program announced by HEW and HUD (SR) ----- 1022
- health department involvement increased by health data collection contract awarded to U.S. Conference of Mayors (SR)----- 596
- planning for model neighborhoods (SR)----- 604

## MOLLUSCIDES

- control of schistosomiasis in Patillas, P.R.-- \*1003

## MONKEYS

- African green, source of Marburg virus outbreak (CR)----- 210

## MONOGRAPH

- No. 78. A study of the application of laminar flow ventilation to operating rooms (PHS Publication No. 1894). Summary article-- 1021

## MONONUCLEOSIS

- epidemiologic studies of infectious mononucleosis with Epstein-Barr virus (CR) 208

## MORTALITY *see* Vital Statistics

## MYCOSES

- pulmonary, in Canada and the United States; epidemiologic aspects----- \*869
- zoonotic, recent developments (CR)----- 208

## NARCOTICS ADDICTION *see* Drug Addiction

## NIGERIA

- Yoruba medicine men, relevance in public health practice----- \*1085

## NURSES

- pediatricians assign office nurses public health duties (CR)----- 256
- perform preplacement health screening at Bell Telephone Co. of Canada (CR)----- 240

## NURSES—Continued

- public health, effectiveness of teaching in increasing compliance of maternity patients with medical advice (CR)----- 255
- public health, provide counseling without traditional mental health team, Columbus, Ga. (CR)----- 223
- study of interest in career advancement (CR) ----- 228
- 30 Vermont nurses trained as part-time community crisis counselors (CR)----- 224

## NURSING

- agency audits quality of its care (CR)----- 201
- education, seven accrediting bodies recognized by U.S. Office of Education (SR)-- 530

## NURSING HOMES

- and related facilities, long-term beds pass 1 million mark (SR)----- 922
- interim regulations describe standards for skilled services (SR)----- 928
- operators' licensing examination (SR)----- 473
- role of health educators in survey for Medicare participation, Montgomery County, Md ----- \*469

## NUTRITION

- application of computers to everyday dietary practices----- 953
- counseling for parents by indigenous health aides ----- \*328
- dietary habits of girls pregnant at 16 years old or under (CR)----- 213
- economic and other effects (CR)----- 211
- education included in neighborhood health program, Denver (CR)----- 212
- hunger in obese triggered by external stimuli (CR)----- 211
- iron deficiency anemia, questionnaire survey of maternal knowledge related to----- \*527
- lower daily calorie allowances (SR)----- 117
- malnutrition in the United States, HEW's proposed system to combat----- \*667

## OCCUPATIONAL HEALTH

- dose-response to hazardous agents is basis for exposure limits (CR)----- 238
- few medical rejections among "special hire" applicants, New Jersey Bell Telephone Co. (CR)----- 239
- potential hazards of lasers and X-ray radiography (CR)----- 239
- preplacement health screening by nurses, Bell Telephone Co. of Canada (CR)----- 240
- studies of DDT and DDE in blood samples of occupationally exposed workers, Dade County, Fla----- \*53
- survey of beryllium production and use (SR) ----- 429
- wood industry workers, risk of Hodgkin's disease ----- \*385

<b>OPTOMETRISTS</b>		
participation in New York City Medicaid program .....	*1008	
<b>OSTEOPOROSIS</b>		
relationship to incidence of fractures in women 45 years old and over .....	*33	
relationship to water fluoridation in Kingston and Newburgh, N.Y. ....	*815	
<b>PARASITIC DISEASES</b>		
<i>see also</i> name of disease		
drugs available at National Communicable Disease Center (SR) .....	541	
<b>PEPTIC ULCER</b>		
increasing among children under 16 (CR) ..	264	
<b>PERTUSSIS</b>		
agglutinin levels in institutionalized and non-institutionalized adults, comparative study of prebooster and postbooster titers 7-13 years after vaccination .....	*9	
immunization status of white children in Hopkins County, Ky. ....	*605	
<b>PESTICIDES</b>		
studies of DDT and DDE in blood samples of occupationally exposed workers, Dade County, Fla. ....	*53	
<b>PHENYLKETONURIA</b>		
detection of carriers in a high-risk population, New York State .....	*144	
<b>PHYSICIANS</b>		
attributes of physician-patient interaction relating to patient satisfaction and compliance with medical advice (CR) .....	253	
extent of diagnosis and treatment of psychiatric disorders by general practitioners and internists, Monroe County, N.Y. ....	*167	
home visiting program benefits future physicians (CR) .....	256	
in school health services, views of relations with medical and nonmedical agencies ..	*542	
Physician Augmentation Program authorized under Health Manpower Act of 1968 (SR) .....	988	
<b>PIGS</b>		
miniature, bred for research at University of Minnesota (SR) .....	802	
<b>POLAND</b>		
salmonellosis in man, 1957-66 .....	*712	
<b>POLIOMYELITIS</b>		
immunization status of white children in Hopkins County, Ky. ....	*605	
in Micronesia, evaluation of rehabilitation of victims of 1963 epidemic .....	*915	
<b>POPULATION</b>		
<i>see also</i> Family Planning		
research, National Institute of Child Health and Human Development (SR) .....	165	
<b>PUERTO RICO</b>		
control of schistosomiasis in Patillas .....	*1003	
<b>RABIES</b>		
epidemiology of human exposure to rabid animals in Illinois .....	*1078	
epidemiology of vaccinations of persons in Illinois, 1967-68 .....	*1069	
human immune globulin, progress in development at National Communicable Disease Center (CR) .....	207, *797	
<b>RADIATION</b>		
analytical X-ray equipment, safety recommendations (CR) .....	222	
dose reduction with electronic radiographs (CR) .....	221	
nuclear medicine strives for <sup>131</sup> I dose reduction (CR) .....	222	
possible reduction of patient dose in thyroid gland function tests by use of iodine-123 rather than iodine-131 (SR) .....	414	
potential hazards of lasers and X-ray radiography (CR) .....	239	
radiation-producing electronic equipment in high school science classes, State-Federal survey (SR) .....	520	
semiportable monitor to detect small amounts of tritium (SR) .....	239	
standards for control of public exposure (CR) .....	222	
treatment effects on urban wastewaters (CR) .....	220	
tritium in the environment from nuclear powerplants .....	*363	
wise use of X-rays, responsibility of physician (CR) .....	221	
X-ray beam sizes, need for control stressed (CR) .....	220	
<b>RATS <i>see</i> Rodents</b>		
<b>RECORDS</b>		
hospital, used in verification study of reported inpatient and outpatient incidents, New York City .....	*107	
Maryland rheumatic fever registry evaluated .....	*333	
<b>RESEARCH</b>		
grant and contract support work of the National Center for Health Services Research and Development .....	*358	
Smithsonian Institution Science Information Exchange, services and fee schedule (SR) .....	457	
use of independent variables and importance of distinguishing types for program planning .....	*831	
use of miniature pigs in laboratory studies, University of Minnesota (SR) .....	802	
<b>RESPIRATORY DISEASES</b>		
<i>see also</i> Hyaline Membrane Disease		
new criteria in pulmonary function test, Alabama program (CR) .....	204	
review of virus infections in Milwaukee area, 1955-65 .....	*175	

<b>RESPIRATORY DISEASES—Continued</b>	
screening results on 10,000 industrial workers, breathmobile project (CR)-----	263
<b>RHEUMATIC FEVER</b>	
evaluation of Maryland registry-----	*333
<b>RODENTS</b>	
citizen participation in Detroit control program (CR)-----	283
infestation, use of recordkeeping system to evaluate and develop control programs, Contra Costa County, Calif.-----	*625
posters promoting rat eradication in Baltimore, Md. (SR)-----	954
rat-bite incidence in urban America-----	*1
<b>RUBELLA</b>	
antibodies in Rhode Island women of child-bearing age-----	*139
epidemics, susceptibility in a college population-----	*559
HPV-77 vaccines prove highly effective (CR)-----	258
vaccine; first license approved by HEW for production of a live attenuated German measles virus vaccine (SR)-----	964
<b>RUBEOLA <i>see</i> Measles</b>	
<b>RURAL AREAS</b>	
mental health care (SR)-----	811
<b>SAFETY</b>	
<i>see also</i> Accidents	
of children at night; reflectorized materials recommended (SR)-----	970
<b>SALMONELLA</b>	
in clinical specimens and foodstuffs, status of immunofluorescence techniques for detecting-----	*887
penetration of turtle eggs by <i>S. braenderup</i> -----	*156
<b>SALMONELLOSIS</b>	
in man in Poland, 1957-66-----	*712
<b>SANITARIANS</b>	
professional, recruitment program (CR)---	231
<b>SANITATION</b>	
disinfection of swimming pool water (CR)---	281
effect of improved facilities on infant diarrhea in a Hopi village-----	*1093
<b>SCHISTOSOMIASIS</b>	
control in Patillas, P.R.-----	*1003
<b>SCHOOL HEALTH</b>	
child abuse, mandatory reporting by school personnel, Syracuse, N.Y. (CR)-----	219
drug abuse by students, ways by which schools can provide alternatives (CR)---	217
drug use among University of Michigan students surveyed (SR)-----	1084
early identification of child at risk of future learning problem (CR)-----	215
education needs, New York State legislation (CR)-----	216
epidemic rubella, susceptibility in a college population-----	*559

<b>SCHOOL HEALTH—Continued</b>	
failure syndrome avoided by early intervention, Quincy (Mass.) public schools (CR)---	215
longitudinal study of absences and health problems of school children (CR)-----	219
mass screening of children for heart disease with portable analog-digital computer, Sacramento, Calif.-----	*479
one child in 10 has learning disability (CR)-----	217
personnel utilization project in New York City, phase 2-----	*729
prevalence of ascariasis and amebiasis in Cherokee Indian school children-----	*907
preventive approaches to drug abuse (CR)---	218
school physicians' views of relations with medical and nonmedical agencies-----	*542
survey of suicide counseling available to students, Richmond, Va.-----	*118
<b>SCHOOLS OF PUBLIC HEALTH</b>	
biostatistics programs at master and doctoral levels-----	*299
curriculums, proposal for revision-----	*933
must relate to society (CR)-----	191
University of Pittsburgh establishes School of Health-Related Professions (SR)----	506
<b>SCREENING PROGRAMS</b>	
automated multiphasic health testing-----	*582
for cervical cancer, use of Davis pipet on a door-to-door basis in Rhode Island-----	*553
for heart disease in school children, with portable analog-digital computer, Sacramento, Calif.-----	*479
pilot program to identify health problems among Neighborhood Youth Corps adolescents, Santa Clara County, Calif.-----	*585
reproducibility of glucose tolerance in 101 nondiabetic women-----	*353
tuberculin skin testing programs, influence of prevalence of infection-----	*883
use of breathmobile for mass screening of industrial workers for chronic respiratory disease (CR)-----	263
<b>SHEEP</b>	
hydatid infection in ewes from California workers surveyed for tularemia, Montana	*531 *611
<b>SHIGELLA</b>	
in clinical specimens and foodstuffs, status of immunofluorescence techniques for detecting-----	*887
<b>SHIGELLOSIS</b>	
outbreak from potato salad, Yakima Indian Reservation-----	*563
<b>SKIN DISEASES <i>see</i> name of disease</b>	
<b>SMALLPOX</b>	
continuous revaccination program in Stockholm hospital, study of take and complications-----	*635
vaccination campaign for Rhode Island hospital personnel, 1967-----	*425

SMOKI  
con  
a  
den  
imm  
SNAILS  
cont  
SOCIAL  
role  
SPECIM  
diag  
ve  
tic  
STATIS  
biost  
tor  
healt  
ment  
gra  
STREPT  
autor  
ent  
preva  
Par  
role  
gro  
acu  
STROKE  
epide  
yea  
SUICIDE  
in Lo  
an  
surve  
Ric  
SURVEYS  
border  
med  
tion  
drug  
stud  
epide  
ond  
for ra  
in h  
eral  
Nation  
needs  
sion  
lic  
of gro  
Stat  
of heal  
comm  
of hos  
antin  
Islam  
opinion  
social  
person  
on r

**SMOKING**

- control methods, critical review and evaluation of 62 studies..... \*483  
 dentists to alert smokers to cancer risk (CR) 244  
 immediate effects on healthy young men... \*121

**SNAILS**

- control of schistosomiasis in Patillas, P.R. \*1003

**SOCIAL WORKERS**

- role in community medicine (CR)..... 194

**SPECIMENS, INFECTIOUS**

- diagnostic, containers leak-tested by high-velocity impact to meet mailing specifications ..... \*783

**STATISTICS**

- biostatistics programs at master and doctoral levels in schools of public health... \*299  
 health, priorities for advances (CR)..... 248  
 mental health, survey of State-level programs ..... \*803

**STREPTOCOCCAL INFECTION**

- automated detection of streptococcus, present status (CR)..... 275  
 prevalence of antistreptolysin O in young Panamanians ..... \*77  
 role of cutaneous infection in spread of group A streptococci and epidemiology of acute glomerulonephritis (CR)..... 206

**STROKE**

- epidemiologic study in a rural area, second year of Mid-Missouri stroke survey..... 878

**SUICIDE**

- in Los Angeles, Calif., and Vienna, Austria; an intercultural study of two cities..... \*389  
 survey of counseling available to students, Richmond, Va..... \*118

**SURVEYS**

- border health resources, U.S. and Mexican medical students draft and pretest questionnaires for..... \*736  
 drug use among University of Michigan students (SR)..... 1084  
 epidemiology of stroke in a rural area, second year of Mid-Missouri stroke survey... \*878  
 for radiation-producing electronic equipment in high school science classes, State-Federal effort (SR)..... 520  
 National Nutrition Surveillance System.... \*667  
 needs and interests of public health professionals in continuing education in public health, 12-State survey..... \*741  
 of group practice of medicine in the United States, 1965..... \*597  
 of health concerns and attitudes regarding a community fluoridation program..... \*655  
 of hospital-associated infections and use of antimicrobials in PHS Hospital, Staten Island, N.Y..... \*451  
 opinions of the aged about their health and social contacts..... \*1013  
 personal versus telephone interviews, effect on responses..... \*773

**SURVEYS—Continued**

- State-level programs in mental health statistics ..... \*803  
 use of a survey technique to achieve a highly immunized preschool population, Metropolitan Nashville and Davidson County, Tenn..... \*1032  
 use of case survey technique to detect origin of *Blastomyces* infections, California.... \*514  
 visual acuity and field of vision of urban and rural Egyptians..... \*955

**SWEDEN**

- differences from United States in low birth weight and perinatal mortality; an attempt to define and explain..... \*939  
 health services system..... \*81

**SWIMMING POOLS**

- operators, training and certificate needed (CR) ..... 282  
 public, few meet health standards (CR).... 281

**SYPHILIS**

- automation of fluorescent treponemal antibody-absorption (FTA-ABS) test for syphilis (CR)..... 278

**TETANUS**

- immunization status of white children in Hopkins County, Ky..... \*605

**THYROID GLAND**

- function tests, possible reduction of patient dose by use of iodine-123 rather than iodine-131 (SR)..... 414

**TRAINING**

- see also* Grants, PHS; Medical Schools and using health auxiliaries, experiences of the Public Health Service..... \*681  
 biostatistics programs at master and doctoral levels in schools of public health... \*299  
 health aides need training in communication skills (CR)..... 230  
 health education aide trainee project, California division of American Cancer Society ..... \*459  
 health education aides learn marketable skills (CR)..... 232  
 health planners and administrators, undergraduate programs..... \*864  
 health professionals, PHS grants for construction of five educational facilities (SR) ..... 766  
 medical; PHS grant for self-instruction program using computers at Ohio State University College of Medicine (SR)..... 984  
 national conference on mental health in public health training..... \*135  
 physical therapists, community health aspects (SR)..... 704  
 public health professionals, survey of needs and interests in continuing education in public health..... \*741

## TRAINING—Continued

recommendations on medical school curricula (SR).....	181
school dropouts learn health department tasks (CR).....	253
schools of public health must relate to society (CR).....	191

## TRAINING COURSES

advances in water quality improvement, University of Texas.....	185
air pollution control administration, Pennsylvania State University.....	474
air pollution technician training, Pennsylvania State University.....	475
alcohol and problems of addiction, Trent University, Ontario.....	185
applied epidemiology for physicians, National Communicable Disease Center, Public Health Service, Atlanta.....	756
community mental health psychiatric nursing, Arizona State University College of Nursing.....	475
comprehensive health planning, graduate department of community planning, University of Cincinnati.....	184
comprehensive health planning, University of California.....	288
control of infections in health care facilities, University of North Carolina School of Public Health.....	1042
courses for physicians in maternal and child health, University of California School of Public Health, Berkeley.....	757
dissertation research grants in medical and pharmaceutical economics, Pharmaceutical Manufacturers Association, Washington, D.C.....	948
doctoral program in urban and regional planning, University of Michigan.....	381
doctoral study in social work and social science, University of Michigan.....	801
environmental health fellowships, Consolidated University of North Carolina.....	184
environmental health sciences graduate programs, Harvard School of Public Health.....	474
executive development: planning as a community function, Columbia University School of Public Health and Administrative Medicine.....	474
graduate program in biomedical communication, Tulane University School of Medicine.....	380
graduate program in chronic disease, adult health, and aging, University of Michigan School of Public Health.....	288
graduate program in public health nutrition, Tulane University School of Public Health and Tropical Medicine, New Orleans.....	756
graduate study in medical care administration, Sloan Institute of Hospital Administration, Cornell University.....	558

## TRAINING COURSES—Continued

graduate summer session in epidemiology, University of Minnesota.....	185
health administrators development program, Sloan Institute of Hospital Administration, Cornell University.....	558
health planning fellows, University of Michigan.....	475
health planning, University of Michigan.....	756
hospital and health care administration, St. Louis (Mo.) University.....	801
institute for physicians and nurses in care of premature and other high-risk infants at New York Hospital-Cornell Medical Center.....	616
mental health communication, Syracuse University School of Journalism.....	184
milieu therapy at Institute of Gerontology, University of Michigan-Wayne State University.....	474
pesticides and public health, National Communicable Disease Center.....	380
principles of epidemiology, National Communicable Disease Center.....	757
program for master of public administration degree, Institute of Public Policy Studies, University of Michigan.....	558
public health and medical aspects of chemical and biological defense, Public Health Service and Army Chemical Center and School, Fort McClellan, Ala.....	756
public health traineeships, University of Southern California.....	558
Regional Planning Program, University of Michigan School of Natural Resources.....	616
residency in general preventive medicine, University of Michigan School of Public Health.....	757
seminars in European community mental health practice, International Community Mental Health Seminars.....	380
six health-related home study courses, National Communicable Disease Center.....	507
special program for urban and regional studies of developing areas, Massachusetts Institute of Technology.....	288
summer statistical session at Seattle, University of Washington.....	381
surveillance, prevention, and control of hospital-associated infections, National Communicable Disease Center.....	1042
training program in mental health statistics, University of North Carolina School of Public Health.....	184
Western Institute of Drug Problems, Portland (Oreg.) State University.....	616

## TUBERCULOSIS

characteristics of patients attending Baltimore chest clinics, preliminary findings.....	*159
prevalence, influence on tuberculin skin testing programs for children.....	*883

# TUBERCULOSIS—Continued

- recall program for persons with inactive disease, preliminary report by Denver Department of Health and Hospitals..... \*985

# TULAREMIA

- skin-test survey, Montana sheep-raising county ..... \*611

# TURTLES

- penetration of eggs by *Salmonella bradycrup* ..... \*156

# ULCERS

- contribution of aspirin to formation (SR) .. 27

# URBAN DEVELOPMENT

- see also* Model Cities Program
- designing socially acceptable cities; training program for professional planners (SR) 15

# URBAN HEALTH *see* Environmental Health

# VACCINATION

- continuous smallpox revaccination program in Stockholm hospital, study of take and complications ..... \*635
- epidemiology of rabies vaccinations of persons in Illinois, 1967-68..... \*1069
- measles, national benefits..... \*673
- smallpox, for Rhode Island hospital personnel, 1967..... \*425

# VACCINES

- experimental rubella derived from HPV-77 strain (CR)..... 258
- measles, attitudes of health department clients toward a dose error..... \*521
- rubella; first license approved by HEW for production of a live attenuated German measles virus vaccine (SR)..... 964

# VENEREAL DISEASE *see* Gonorrhea; Syphilis

# VETERANS, MILITARY

- occurrence of leprosy after service in endemic areas abroad..... \*1051

# VIRUSES

- see also* name of virus
- review of infections in Milwaukee area, 1955-65 ..... \*175

# VISION

- acuity and field, urban and rural Egyptians \*955

# VITAL STATISTICS

- average age at death of scientists in various specialties ..... \*661
- cause of death, 14 comparability areas among States proposed for valid reporting by physicians..... \*857
- decline in mortality, 1962-67, from carcinoma of the cervix, Beverly, Mass..... \*826
- effects of air pollution on mortality in New York City (CR)..... 283
- effect of International Classification of Diseases Adapted revision on cause-of-death data (CR)..... 249
- experience with the new standard certificates of vital events (CR)..... 251
- infant mortality and weight at birth, 1960 U.S. birth cohort (CR)..... 249
- infant mortality decreased by maternity and infant care project, Chicago (CR) .. 237
- infant mortality rates, by ranking countries ..... \*19
- life tables for Alaska Natives..... \*65
- morbidity and mortality experiences from July 1966 heat wave in St. Louis, pertinence to general health care (CR)..... 284
- perinatal mortality and low birth weight; an attempt to define and explain differences between United States and Sweden.. \*939
- U.S. birth and marriage rates, 1968 (SR) .. 638

# WATER POLLUTION

- in Lake Erie, related to gastroenteritis outbreak (CR)..... 259

# WATER SUPPLY

- bacteriological safety of hot tapwater in developing countries; tests in West Africa ..... \*812

# WHOOPING COUGH *see* Pertussis

# X-RAY, DIAGNOSTIC *see* Radiation

# ZOONOSES

- see also* name of disease
- bovine cysticercosis and human taeniasis in the United States, epidemiologic study (CR) ..... 210

# Author Index

Adair, Rita M.....	*425	Cavanagh, Jerome P.....	192	Erhardt, Carl L.....	251
Adams, Charles N.....	264	Cavanaugh, R. L.....	273	Evans, Alfred S.....	208
Adams, Michael W.....	*479	Cayler, Glen G.....	*479	Ewing, William H.....	277
Ademuwagun, Zacchaeus A.....	*1085	Chase, Helen C.....	*19, 249	Farberow, Norman L.....	*389
Ahl, Norman C.....	*736	Cherry, William B.....	*887	Feeley, James C.....	*156
Ajello, Libero.....	*869	Chin, Tom D. Y.....	274	Feinberg, Helen C.....	263
Alexander, Raymond (S.).....	194,	Clavery, Odette.....	*107	Feldman, Jacob J.....	256
	*767, *1008	Clinton, James M.....	*1	Ferguson, Frederick F.....	*1003
Allen, William A.....	255	Cohen, Allan Y.....	218	Fienberg, Robert.....	*826
Anderson, H. D.....	*9	Cohen, Lois.....	245	Fifer, Ellen Z.....	265
Arnold, Mary F.....	268	Cole, William S.....	221	Finch, Robert H.....	*667
Atwood, G. F.....	275	Coleman, Philip H.....	277	Finklea, J. F.....	*559
Axnick, Norman W.....	*673	Colombotos, John.....	*773	Fisher, Russell.....	263
Ayers, W. R.....	*582	Colón, Aida Z.....	*1003	Fleming, John R.....	231
Bahn, Ralph.....	*149	Compton, Ariel S.....	*585	Fleming, Sally J.....	*605
Baillie, J. H.....	240	Conley, Ronald W.....	*291	Fleming, Timothy G.....	*605
Balfe, Bruce E.....	*597	Connelly, John P.....	256	Flook, Evelyn.....	*358
Barid, Steven J.....	*1032	Cook, Hale H.....	192	Fodor, J. T.....	*121
Basco, Delores.....	219	Corsa, Leslie, Jr.....	*127	Fortune, Robert.....	*845
Becker, Marshall H.....	*1063	Cowen, David L.....	*1027	Fox, Donald G.....	*1021
Bellin, Lowell E.....	195, *1008	Cox, Sherman L.....	244	Francy, D. Bruce.....	274
Belsey, Mark A.....	207	Crawford, Charles O.....	*639, *831	Friedman, David B.....	*328
Berg, Gordon W.....	227	Croog, Sydney H.....	*989	Gabrielson, Ira W.....	233
Berg, Robert B.....	*705	Crowell, L. R.....	214	Gaetano, Leonard F.....	*39
Bews, D. C.....	240	Csima, Adele.....	*857	Galiher, Claudia B.....	*469
Binford, Chapman H.....	*1051	Daniel, Ralph.....	265	Gardner, Elmer A.....	*167
Bisgeier, George P.....	239	Davies, John E.....	*53	Geijerstam, Gunnar af.....	*939
Bissell, G. Donald.....	241	deCastro, Fernando.....	*527	Gitlin, Joseph N.....	221
Bistowish, J. M.....	*1032	Decker, Herbert M.....	276	Glass, L. H.....	*121
Black, A. P.....	281	Demone, Harold W., Jr.....	*1043	Gleason, Neva N.....	*907
Blyth, William.....	225	Dempsey, John J.....	*839	Glick, Charles A.....	*783
Bokat, Robert.....	*907	Densen, Paul M.....	199	Gold, Edwin M.....	235
Bonner, Mary Frances.....	251	Deutsch, Allan M.....	*553	Goldstein, Hyman.....	*955
Borden, Harvey H.....	259, 261	Diefenbach, Viron L.....	242	Goldston, Stephen E.....	*135
Boyle, J.....	*1093	Discher, David P.....	263	Gordis, Leon.....	*333
Bracht, Neil F.....	194	Domescik, Gerald.....	*182	Gordon, Joseph.....	*508
Bradbury, Betty A.....	*118	Downs, Elinor F.....	198	Gornick, Marian E.....	197
Brand, Frank R.....	*878	Doyle, Joe.....	243	Gorwitz, Kurt.....	*299, *803
Braymen, Donald T.....	*547	Drake, Benjamin M.....	*883	Gottshall, Russell Y.....	*9
Brown, Morton L.....	220	Duhl, L. J.....	190	Grad, Frank P.....	285
Brubaker, Merlin L.....	*1051	Eckstrom, Philip T.....	*878	Graham, Josephine.....	223
Buczowski, Z.....	*712	Edlavitch, Stanley A.....	*878	Graham, Saxon.....	226
Bujack, Wilma.....	*479	Edmundson, Walter F.....	*53	Graning, Harald M.....	*305
Bunney, W. E.....	*9	Edwards, L. D.....	*451	Grant, Murray.....	*102, *409
Burnham, Clinton E.....	*353	Eelkema, Robert C.....	225	Grayston, J. T.....	258
Byrne, Earl B.....	*139	Elsner, Victor.....	223	Greenberg, Richard A.....	*883
Caceres, C. A.....	*582	Eliot, Johan W.....	*127	Greene, John C.....	*971
Callan, Laurence B.....	*459, *741	El-Kashlan, Khalil.....	*955	Griffin, Carol Lee.....	215
Casad, Donald E.....	*514	Ennes, Howard.....	280	Grimley, K. W.....	264
Cashman, John W.....	*899	Enterline, Philip E.....	226	Gross, Jack E.....	218
Casper, Elizabeth A.....	*611				



Grove, Robert D.....	251	Kasey, Elizabeth H.....	*1043	Mannerstedt, Gordon.....	*479
Gururanjappa, Bale S.....	*65	Kavaler, Florence.....	196, *1008	Margulies, Stanley I.....	221
Gutelius, Margaret.....	237	Keeve, J. Philip.....	236	Markush, Robert E.....	204
		Kelly, Sally.....	*144	Martin, Dan A.....	*605
Hahn, Harlan.....	*655	Kendrick, Pearl L.....	*9	Martin, Russell J.....	*1069, *1078
Halpert, Harold P.....	*59	Kerr, Markay.....	*415	Maxwell, Virginia B.....	*469
Hamlin, Genevieve P.....	232	Kessner, Norman S.....	220	Maynard, Jean M.....	*553
Hanes, B.....	*521	Kettler, Richard E.....	*736	McCollum, Robert W.....	208
Hanlon, John J.....	246	Kirchner, Corinne.....	*107	McDonald, Donald J.....	222
Hansen, Chris A.....	193	Kirschenbaum, Jack.....	251	McDonald, Glen W.....	*353
Hardy, George E., Jr.....	260	Kisch, Arnold I.....	250	McFadden, Grace M.....	*729
Harper, George L.....	*690	Kisielewski, Julie.....	*923	McLone, David G.....	*182
Harting, Donald.....	*127	Kissling, Robert E.....	210	Meerdink, Gavin L.....	*1078
Harward, Ernest D.....	*363	Klebba, A. Joan.....	249	Metts, Albert.....	*647
Hay, Sylvia.....	*971	Klerman, Lorraine V.....	233	Meyer-Lie, Arnt.....	*81
Haynes, M. Alfred.....	270	Knudson, Eleanor Gray.....	228	Michael, Jerrold M.....	*681
Hayes, Richard L.....	227	Kogan, B. A.....	*521	Michaels, Richard.....	*373
Healy, George R.....	*907	Konheim, B. Brand.....	280	Miley, William D.....	340
Heidbreder, G. A.....	*521	Korns, Robert F.....	*815	Milio, Nancy.....	235
Heller, Marian H.....	*542	Korra, Ahmad.....	*955	Millar, J. D.....	279
Henschel, A.....	284	Korsch, Barbara M.....	253	Miller, William B., Jr.....	221
Hermos, John A.....	210	Kramer, Karl.....	263	Milner, Jean.....	*857
Hershey, Nathan.....	*341	Krimerman, Eleanor.....	256	Mindlin, Rowland L.....	199
Hesslein, Shirley.....	*465	Kuller, Lewis.....	263	Mitchell, Jocelyn T.....	256
Hewitt, David.....	*857	Kunitz, S. J.....	*1093	Monto, Alexander V.....	340
Hilleboe, Herman E.....	*933			Monto, Arnold S.....	*77
Hilmar, Norman A.....	286	Lampe, John M.....	215	Moody, Max D.....	275
Hinchcliffe, Malcolm C.....	*139	Lane, John C.....	*949	Moore, Thomas M.....	222
Hochberg, H. M.....	*582	Lanz, Richard.....	*373	Moosbrucker, Jane.....	*721
Hodgson, Thomas A., Jr.....	283	Larkin, Vincent dePaul.....	271	Morris, Miriam.....	*404
Hoff, Wilbur.....	230, *617, *998	Larson, William.....	*328	Morrison, Lewis F.....	227
Hogarty, Gerard E.....	224	Lawrence, Philip S.....	248	Mott, Basil J. F.....	268
Holmes, Mary E.....	233	Leck, Ian.....	*971	Muchnick, Carl N.....	*736
Horowitz, Herschel S.....	243, 245	Lee, John A. H.....	227	Murdock, C. George.....	219
Horowitz, Isadore.....	226	Lee, Mathew.....	*915		
Hubbard, Lloyd S.....	282	Lehr, Eugene L.....	286	Nachman, Gigi A.....	*53
Huessy, Hans.....	224	Leifson, June.....	*28	Najac, Harold.....	*1008
Hunt, Harold S.....	*479	Leonard, Alvin R.....	*741	Nakagawa, H.....	*521
Huntley, Robert R.....	271	Lerner, Raymond C.....	*107	Navarro, Vicente.....	*573
		Levin, Lowell S.....	252, *542	Neiderman, James C.....	208
Ibrahim, Michel A.....	261	Levine, Sheldon.....	*373	Nelson, Morton.....	*980
Immerwahr, George E.....	*431	Levine, Sol.....	*989	Neumann, H. H.....	*812
Insalata, N. F.....	272	Levy, Marvin R.....	217	Newbold, Milton W.....	*531
Ipsen, Johannes.....	262	Lewis, Charles E.....	267	Newman, Harold F.....	200
Iskrant, Albert P.....	*33	Lewis, W. Frank.....	*353	Nikias, Mata K.....	240
Israel, Robert A.....	249	Lewis, George Parker.....	*39		
		Liben, Florence.....	224	O'Brien, Margaret J.....	*729
Jackson, Charles L.....	*787	Lilienfeld, Abraham.....	*333	O'Connell, Morgan J.....	237
James, George.....	191	Lipworth, Leslie.....	*39, *826	O'Connor, Patricia A.....	*527
Jekel, James F.....	*883	Lisella, F. S.....	*71	Odoroff, C. L.....	*1093
Jick, Hershel.....	*39	Lloyd, Humphrey E. D.....	*826	Okada, Louise M.....	*445
Jobin, William R.....	*1003	Locke, Ben Z.....	*167	O'Neill, Rita.....	*553
Johnson, Peggy Jean.....	*118	Lockhart, H. B.....	211	Onstad, G. David.....	*985
Johnson, Walter L.....	202	Long, W. Newton.....	*1059	O'Shea, Robert M.....	241
Jong, Anthony.....	*721	Lowe, Marie L.....	255	Owen, Joseph K.....	247
		Luria, S. M.....	*661		
Kaiser, Leland R.....	253	Lynch, Francis G.....	284	Palmer, Juan R.....	*1003
Kaplan, Edward L.....	206			Parlette, Nicholas.....	*741
Kaplan, Emanuel.....	273	Mackey, Dan M.....	*182	Parrish, Henry M.....	*878
Kaplan, William.....	208	Mackey, Richard A.....	*923	Pearson, Elizabeth.....	*465
		Maholick, Leonard T.....	223	Peavy, James E.....	246

Peckinpaugh, Robert O.....	257	Said, Mohyi-Eldin.....	*955	Talbot, Eugene.....	217
Pendergrass, John A.....	238	Salisbury, Arthur J.....	*705	Tanner, Grace.....	*479
Peterson, Harold T., Jr.....	*363	Sandifer, S. H.....	*559	Taschman, Harvey A.....	*923
Petrelli, Richard L.....	*139	Sasuly, Richard.....	269	Taylor, Carl E.....	*431
Phaneuf, Maria C.....	201	Sawyer, John C.....	*531	Taylor, Eugene J.....	*915
Philip, Robert N.....	*611	Sbarbaro, John A.....	*985	Taylor, Keith O.....	*1037
Pietkiewicz, K.....	*712	Schaffner, William.....	*139, *425	Thatcher, F. S.....	213
Piraino, Frank F.....	*175	Schantz, Peter M.....	*531	Thomas, William C.....	*933
Pitkin, Olive E.....	*729	Schlafman, Irving H.....	*697	Thomas, William G.....	*311
Pitts, O. M.....	*559	Schmale, John D.....	279	Thomason, Berenice M.....	*887
Pivnick, Hilliard.....	213	Schnurrenberger, Paul R.....	*1069, *1078	Thum, Denise.....	*1043
Plager, Hildegard.....	201	Schultz, Myron G.....	210	Tierney, John T.....	*553
Podair, Simon.....	*767	Schwabe, Calvin W.....	*531	Top, Franklin H.....	*9
Polk, Lewis D.....	*86	Schwartz, Jerome L.....	*483	Touhill, C. J.....	220
Pond, Harry.....	*907	Schweitzer, Morton D.....	91	Trantow, Don J.....	*415
Preslar, Mack J.....	*311	Scott, Deanna C.....	*605	Trautman, John R.....	*1051
Prindle, Richard A.....	191	Scott, Robert B.....	*949	Treger, Michael D.....	*156
Rabeau, Erwin S.....	205	Scotti, Angelo.....	*182	Tucker, Eve B.....	*118
Raffel, Marshall W.....	*864	Scutchfield, F. Douglas.....	*1059	Uhrich, Richard B.....	*965
Randolph, Verdun.....	239	Shapiro, Samuel.....	*39	Urvant, Penny.....	*761
Rasmussen, W. A.....	*71	Shavell, Steven M.....	*673	Vander Veer, Joseph B., Jr.....	*563
Ravenel, J. M.....	*559	Shultz, Carl S.....	*542	Vlasak, George J.....	*159
Reaud, Angel.....	205	Seigel, Daniel G.....	204	Volinn, Ilse, J.....	*1013
Redfern, Jack.....	*508	Siegel, Earl.....	205	Volk, V. K.....	*9
Reinherz, Helen.....	215	Sikes, R. Keith.....	207, *797	Wagner, Marsden G.....	*542
Reinke, William A.....	*431	Silverman, William A.....	17	Waller, Elden J.....	*625
Reynolds, R. G.....	274	Simon, Maria D.....	*389	Walton, Robert A.....	264
Rice, Dorothy P.....	*95	Sklar, S. Harvey.....	198	Ward, Paul.....	269
Rice, E. E.....	211	Slone, Dennis.....	*39	Watson, Carol M.....	212
Rich, Herbert.....	235	Smith, Richmond W., Jr.....	*33	Weaver, Charles L.....	*363
Ro, Kong-kyun.....	201	Smith, Florence.....	213	Wechsler, Henry.....	*1043
Roberts, Doris E.....	219	Smith, James W.....	*508	Wedum, Arnold G.....	*783
Robinson, Roslyn Q.....	210	Snow, Donald L.....	222	Weiner, J. M.....	*121
Rodriguez, Romeo.....	*333	Snyder, Arnold L.....	255	Weir, John A.....	244
Roeth, Robert L.....	*53	Snyder, Gary Richard.....	203	Weinstock, Edward.....	*404
Rogers, Kenneth D.....	*373	Somers, R. K.....	214	Wellman, Henry N.....	222
Roper, Margaret.....	*907	Sorensen, Royal H.....	*514	Wheatley, William.....	*563
Rose, Frederick.....	*144	Spencer, F. J.....	*118	Wilson, Robert N.....	266
Rose, Norman J.....	*1069, *1078	Speno, Edward J.....	216	Wingert, Willis A.....	*328
Rosenbluth, Lucille.....	*729	Spielholz, Jess B.....	*1013	Wisniewski, Henry J.....	*175
Rosenfeld, Leonard S.....	202	Spiers, Philip S.....	*385	Witte, John J.....	*673, *971
Rosenstock, Irwin M.....	211	Stableford, Sue.....	*127	Woodward, Lowell H.....	*469
Rosenthal, Jesse.....	*1008	Steinberg, Sheldon S.....	229	Woolsey, Theodore D.....	248
Rosner, Lester J.....	*729	Sterne, Mrs. Eugene, Jr.....	231	Yankauer, Alfred.....	256
Ross, William L.....	227	Stewart, Joseph L.....	*311	Young, M. M.....	232
Rubenstein, A.....	*1093	Stone, M. L.....	235	Zackler, Jack.....	237
Rusk, Howard A.....	*915	Stout, Genevieve W.....	278		
Ruskin, John H.....	283	Sultz, Harry A.....	233, *264		
Ryder, Claire F.....	199	Summers, Raymond R.....	*311		
Rylander, Ragnar.....	*635				

*Public Health Reports*, published since 1878 under authority of an act of Congress of April 29 of that year, is issued monthly by the Public Health Service pursuant to the following authority of law: United States Code, title 42, sections 241, 245, 247; title 44, section 220. Use of funds for printing this publication has been approved by the Director of the Bureau of the Budget, August 26, 1963.

**ORDER BLANK FOR PHR**

**To: Superintendent of Documents  
Government Printing Office  
Washington, D.C. 20402**

Please enter my Subscription for Public Health Reports. I am enclosing Money Order ☐ Check ☐ for this subscription. (\$6.50 a year; \$1.75 additional for foreign mailing. A discount of 25 percent is allowed for orders of 100 or more subscriptions. Subscriptions are accepted also for 3-year periods, for the convenience of subscribers, at the established annual rate.)

Please address the PHR as follows: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON, D.C. 20402. 1969

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.  
Subscription price \$6.50 a year, \$1.75 additional for foreign mailing.  
Price for a single copy of this issue is 55 cents.

U. S. DEPARTMENT OF  
HEALTH, EDUCATION AND WELFARE  
PUBLIC HEALTH SERVICE  
BETHESDA, MD. 20014

OFFICIAL BUSINESS



POSTAGE AND FEES PAID  
U. S. DEPARTMENT OF H. E. W.

If you do not desire to continue receiving this publication, please CHECK HERE ☐;  
cut off this label and return it to the above address. Your name will then be  
promptly removed from the appropriate mailing list.

Public Health Reports  
ph  
r











UNIVERSITY OF FLORIDA



3 1262 07191 2801

614.0973

U5p

University of Florida ALF



31262071912801