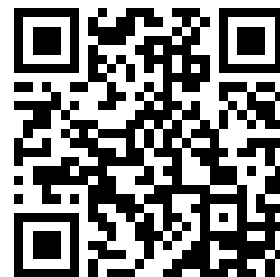

This is a reproduction of a library book that was digitized by Google as part of an ongoing effort to preserve the information in books and make it universally accessible.

Google™ books

<https://books.google.com>



338.1
Un33ae
no.308
cop.3

UNIVERSITY OF
ILLINOIS LIBRARY
AT URBANA-CHAMPAIGN
AGRICULTURE

11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100

101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178
179
180
181
182
183
184
185
186
187
188
189
190
191
192
193
194
195
196
197
198
199
200

201
202
203
204
205
206
207
208
209
210
211
212
213
214
215
216
217
218
219
220
221
222
223
224
225
226
227
228
229
230
231
232
233
234
235
236
237
238
239
240
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
269
270
271
272
273
274
275
276
277
278
279
280
281
282
283
284
285
286
287
288
289
290
291
292
293
294
295
296
297
298
299
300

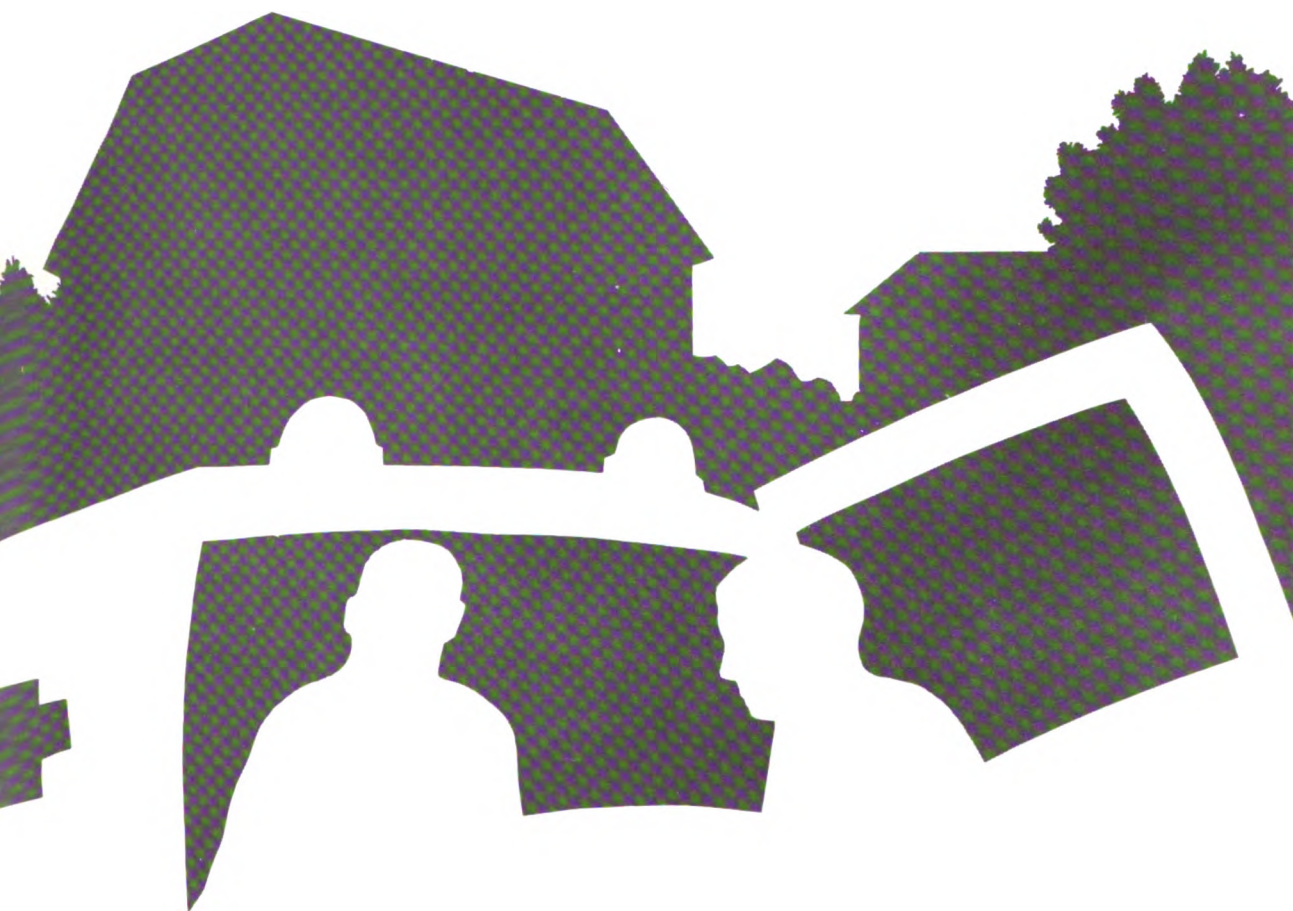
301
302
303
304
305
306
307
308
309
310
311
312
313
314
315
316
317
318
319
320
321
322
323
324
325
326
327
328
329
330
331
332
333
334
335
336
337
338
339
340
341
342
343
344
345
346
347
348
349
350
351
352
353
354
355
356
357
358
359
360
361
362
363
364
365
366
367
368
369
370
371
372
373
374
375
376
377
378
379
380
381
382
383
384
385
386
387
388
389
390
391
392
393
394
395
396
397
398
399
400

401
402
403
404
405
406
407
408
409
410
411
412
413
414
415
416
417
418
419
420
421
422
423
424
425
426
427
428
429
430
431
432
433
434
435
436
437
438
439
440
441
442
443
444
445
446
447
448
449
450
451
452
453
454
455
456
457
458
459
460
461
462
463
464
465
466
467
468
469
470
471
472
473
474
475
476
477
478
479
480
481
482
483
484
485
486
487
488
489
490
491
492
493
494
495
496
497
498
499
500

1
3AE
308
3

CIRCULATING COPY
AGRICULTURAL LIBRARY

ECONOMICS OF RURAL AMBULANCE SERVICE IN THE GREAT PLAINS



United States
Department of
Agriculture

Economic
Research
Service

Agricultural
Economics
Report No. 308

Digitized by Google

ECONOMICS OF RURAL AMBULANCE SERVICE IN THE GREAT PLAINS. By Gerald A. Doeksen, Jack Frye, and Bernal Green. Economic Development Division, Economic Research Service, U.S. Department of Agriculture. AER No. 308.

ABSTRACT

In 1969, 221 funeral home businesses provided ambulance service in Oklahoma; by 1973, the number had declined to 124, a 44 percent decrease. Faced with rising labor and equipment costs, funeral home operators chose to discontinue the service. The study area for this report consisted of eight counties in northwest Oklahoma, the socio-economic data being applied to Alfalfa County specifically.

A procedure to estimate receipts for Emergency Medical Service (EMS) was designed from the supplied data. Expenses were based on a consideration of each major component comprising an EMS system. These are (1) ambulances, (2) life-saving equipment, (3) technicians with special training, (4) two-way radio communications, and (5) interfacing with the hospital emergency room. With selected assumptions, estimated receipts and expenses were formulated for Alfalfa County, Oklahoma. Four alternative EMS systems were evaluated. The procedures for estimating receipts and expenses were generalized in forms which leaders can adapt to their respective situations. Thus, these forms provide a basis for a self-applied feasibility study for EMS.

Key words: Rural, Health, Emergency Medical Service, EMS budgeting, Great Plains, EMS alternatives, Self-applied feasibility studies.

ACKNOWLEDGMENTS

This study was conducted in cooperation with the Cooperative Extension Service and the Agricultural Experiment Station, Oklahoma State University, and supported in part by special project funds from the Extension Service, U.S. Department of Agriculture.

Special thanks are given to the county Extension personnel who developed data on ambulance use. These include: Donald Tallent, Gerald W. Cupp, Dale Oldham, Joyce K. Jones, Wilbur Tripp, LeRoy Howell, Max Barth, Jr., and Patricia Trotter.

Appreciation is also extended to Margaret Banton and Marguerite Summers, who provided data on population projections, and to Neil Schmitt, Department of Electrical Engineering, University of Arkansas, who provided valuable assistance concerning two-way communications systems.

Washington, D.C. 20250

November 1975

338.
 '31
 No. 308
 COP. 3

UNIVERSITY OF ILLINOIS
 ADMINISTRATIVE SERVICES

CONTENTS

	<i>Page</i>
HIGHLIGHTS	ii
INTRODUCTION	1
Objectives and Information Needs	1
Data and Study Area	2
ESTIMATING RECEIPTS FROM AN AMBULANCE SERVICE	2
The Procedure	2
ESTIMATING COSTS OF SUPPLYING AMBULANCE SERVICE	5
Capital Expenditures (Vehicle)	5
Capital Expenditures (Communications)	5
Operating Expenses (Vehicle)	7
Operating Expenses (Medical)	7
Operating Expenses (Labor)	8
Fully Staffed System	8
Volunteer System	8
Hospital-Based System	8
Other Expenses	8
PROCEDURE FOR ESTIMATING AMBULANCE RECEIPTS AND COSTS	9
Application of Procedures	9
TRAINING AND OTHER REGULATIONS	15
Training for EMS Technician	15
Emergency Medical Services Systems Act of 1973, PL 93-154	15
Emergency Medical Services Vehicle	16
LITERATURE CITED.....	17
APPENDIX: FORMS	18
Form I Procedure used to estimate number of calls, mileage, and receipts for ambulance service	18
Form II Procedure used to estimate annual costs of supplying ambulance service.....	20
Form III Procedure used to compare estimated annual receipts and costs for alternative ambulance delivery systems	22

HIGHLIGHTS

Funeral home operators, historically the main providers of ambulance services in the Great Plains, are discontinuing this service. In Oklahoma, 221 funeral home businesses provided ambulance service in 1969; only 124 remained in 1973.

This puts urgent pressure on areas where Emergency Medical Service (EMS) is no longer available. Alternatives to consider include EMS systems incorporated into police departments, fire departments, volunteer groups, private firms, or hospitals.

The study area, eight northwest Oklahoma counties, was selected for analysis mainly because (1) the counties represent Great Plains conditions and (2) there was an expressed willingness by local leaders there to assist.

A procedure to estimate receipts for EMS was designed. It considered the annual number of (1) highway accidents; (2) patient transfers between hospitals; and (3) all other medical calls by age strata of the population in the study area in 1973. Estimated mileage and a charge per call and mileage fees were also taken into account.

This, along with an estimate of those actually paying, gave an estimate of annual receipts. A typical fee per ambulance trip was \$25 plus a one-way mileage charge. About one-third of EMS bills remained unpaid.

Expenses were based on considering each major component of an EMS system: (1) ambulance, (2) life-saving equipment, (3) technicians with special training, (4) two-way radio communications, and (5) interfacing with the hospital emergency room.

A procedure—including design of forms for a “do-it-yourself” feasibility study—was developed to help policymakers construct their own basic economic analyses regarding EMS. To demonstrate their use, the procedures were applied to socio-economic conditions in Alfalfa County, Oklahoma. In Alfalfa County, total ambulance

calls were predicted to be about 335 during 1974. Expenses were computed for four alternative EMS systems—(1) hospital-based unit with two technicians; (2) police or fire department-based system, with city personnel making calls from 8 a.m. to 5 p.m. and with volunteers making calls from 5 p.m. to 8 a.m. at \$5 per call or 10 cents per mile; (3) police or fire department-based system, with city personnel making calls from 8 a.m. to 5 p.m. and volunteers making other calls at \$5 per night; and (4) a fully staffed EMS system.

Here is a brief summary of the estimated results:

1. Receipts, 100% collection rate, \$19,870
Receipts, 80% collection rate, \$15,896
Receipts, 70% collection rate, \$13,909
2. Expenses
 - a. Hospital EMS,
minimum staff \$21,313
 - b. Police or fire
with volunteers
paid on a call
basis \$13,715
 - c. Police or fire
with volunteers
paid low flat
rate \$13,353
 - d. Fully staffed
EMS system \$34,232

Thus, policymakers in Alfalfa County or similar areas could reasonably expect that with a 100% collection rate they would have to subsidize a hospital-based system with about \$1,500 a year. A fully staffed EMS system would require an annual subsidy of about \$15,000. At the *more realistic collection* rate of 70%, policymakers could expect receipts of only \$14,000, increasing subsidization by about \$6,000 a year. Only systems with modestly paid volunteers could be provided without a substantial subsidy.

ECONOMICS OF RURAL AMBULANCE SERVICE IN THE GREAT PLAINS

by Gerald A. Doeksen, Jack Frye, and Bernal L. Green¹

INTRODUCTION

County and community leaders throughout the Great Plains are facing the problem of how best to provide vital Emergency Medical Services (EMS) to people in sparsely populated areas. The situation is especially acute since many private providers (often funeral home operators) are discontinuing ambulance service, primarily because of increased costs of labor and equipment. For example, in 1969, there were 221 funeral home ambulance operators in Oklahoma and in 1973 the number had declined to 124 [8].² The changes occurred mainly in the larger communities.

In western Oklahoma, typical of Great Plains conditions, the problem of discontinued ambulance service by private operators is fairly recent. For instance, in the 8 counties included in this study, there were 19 private ambulance operators and 3 community operated systems in January 1973. During that year, five private ambulance operators gave notice to their respective community leaders that they would discontinue ambulance service.

Local leaders in these sparsely populated rural areas are now facing the problem of trying to provide emergency medical service within their financial capabilities. This study, therefore, was undertaken to provide information about possible options for such local leaders, and to formulate a procedure for others to conduct their own EMS feasibility analyses.

In studying their problem, leaders must also consider other changes taking place today. Prior to the recent (1966) Federal support for EMS, the emphasis was on speedy delivery of a patient to the hospital. The contemporary emphasis is on professionalism and upgrading of the emergency medical system as a complete system—technicians with special training, more adequate vehicles, life-saving equipment, and two-way radio communications with a hospital emergency room. Speed has been de-emphasized. In the near future, the major emphasis will likely be on more comprehensive training involving technicians and emergency room physicians and/or nurses.

Objectives and Information Needs

The basic objective of the study was to provide a general procedure for designing economically feasible ambulance services for a sparsely populated area. Specific information was needed concerning:

1. An estimate of receipts for a proposed service area;
2. An estimate of costs associated with alternative systems (private, hospital-based, volunteer, or city); and
3. Information related to national and State legislation affecting rural ambulance services.

In this report, the study area and collected data are discussed first. Second, a method to predict receipts is presented. Third, expenses associated with the several EMS systems are presented. Fourth, a self-applied feasibility analysis and application of the forms are discussed and presented. Fifth, national legislation affecting rural ambulance service is discussed.

¹Doeksen is an agricultural economist stationed at Oklahoma State University (OSU), Frye is employed by the OSU Cooperative Extension Service, and Green is an agricultural economist stationed at the University of Arkansas. Doeksen and Green are employed by the Economic Development Division, Economic Research Service, U.S. Department of Agriculture.

²Numbers in brackets refer to references cited on page 17.

Data and Study Area

An area in western Oklahoma was selected for the study. Counties included were Harper, Woods, Woodward, Alfalfa, Grant, Major, Blaine, and Kingfisher.³ The area is delineated in figure 1. These counties are typical sparsely populated Great Plains counties, with a predominantly agricultural economic base.

A major problem for county officials faced with providing new emergency medical systems is to estimate demand for ambulance service and probable receipts. Often, the best source of information will be ambulance operators in the general area. For example, in the eight counties mentioned, ambulance operators provided information on the number of calls made, type of calls, age of patients, fees charged, and the proportion of bills actually collected (table 1). Similarly, dealers in ambulance equipment and ambulance operators helped with cost estimates.

Table 1—Summary of ambulance service

Ambulance calls in 1973	2,950
Calls on which information as to type of call was available	1,853
Calls on which age of victim was available	1,295

³Garfield County, which includes a city of over 44,000, was omitted from the study area, since urban residents use ambulance services more frequently.

Information about number of patients paying their bills was given by a few ambulance operators (table 2).

Table 2—Payment of ambulance bills

	No.
Ambulance calls reported which were	
Highway accidents	191
Transfers	183
Other medical calls	1,225
Total	1,599
Ambulance calls paid	1,052
Highway calls	118
Transfers	136
Other medical calls	798
	Pct.
Victims paying bills	66
Highway accident victims	62
Transfer patients	74
Other medical victims	65

Other data came from several sources: ambulance dealers provided information about capital expenditures, including cost of various types of vehicles and medical equipment; EMS operators supplied data on medical expenses and vehicle operation expenses. Dealers of communication systems provided information regarding costs of communication equipment. Information was collected from various kinds of systems (fire and police based, private, hospital, and volunteer).

ESTIMATING RECEIPTS FROM AN AMBULANCE SERVICE

This section analyzes patient flow data gathered from the eight counties and develops a procedure to predict receipts of an ambulance service. The procedure was designated in such a way that other areas in the Great Plains facing similar problems can use it to predict receipts from an EMS system.

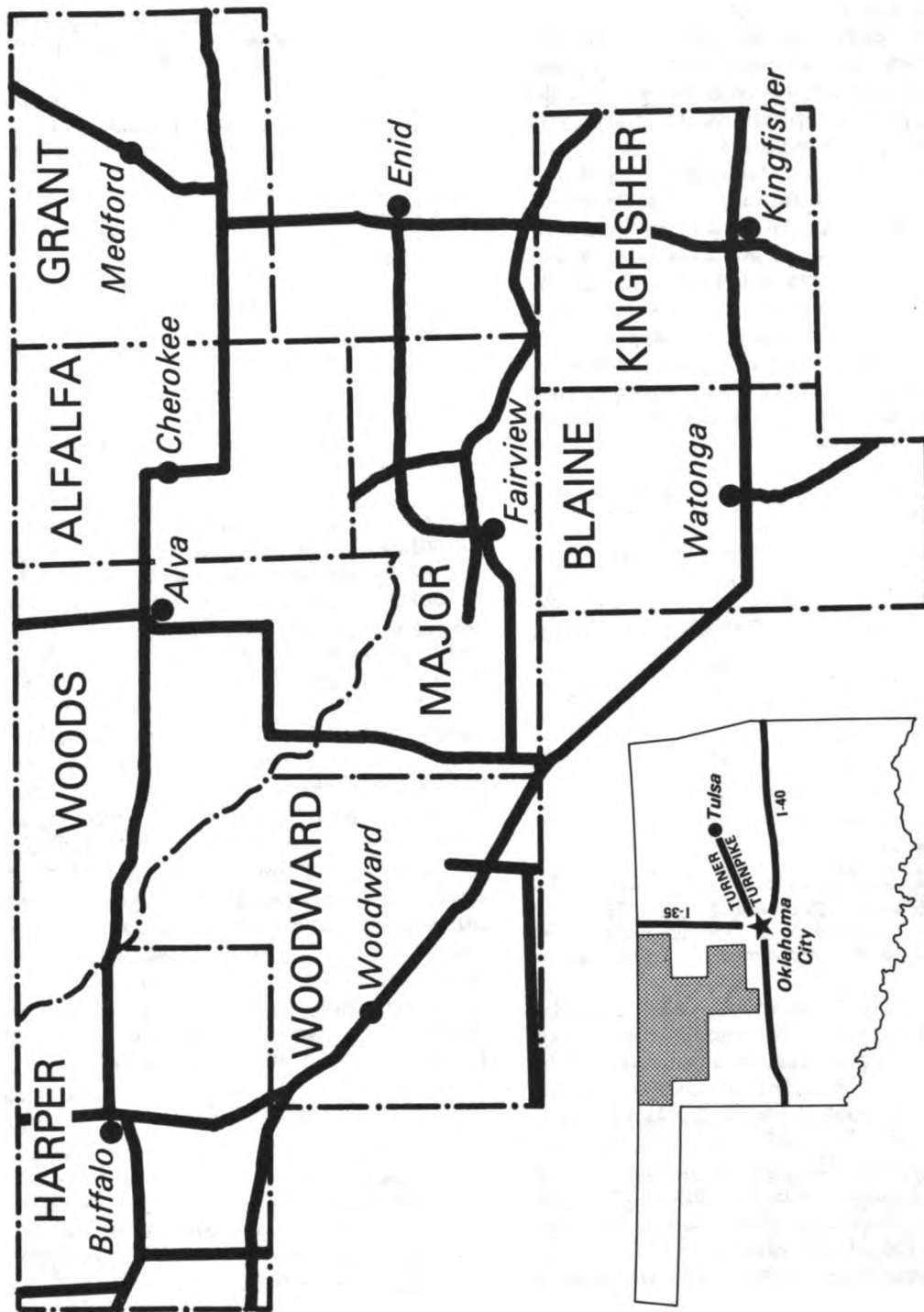
The Procedure

The procedure which follows consists of three basic parts: sections to estimate the number of ambulance calls, mileage, and receipts. A form was prepared to aid in the application of the research and is presented on pages 10-13.

The first step was to estimate the number of calls for a given service area. Ambulance calls were classified into three types: (1) *highway*

accident calls include all calls from accidents occurring on the highways whether involving automobiles or other vehicles; (2) *transfer calls* include the movement of patients between hospitals; and (3) *other medical calls* include calls other than those associated with highway accidents and transfers (some of the more common are for heart attacks, strokes, and home or industrial accidents).

Highway accidents requiring ambulance service depend on variables such as population, density of population, highway miles, and highway conditions. For the study, highway injuries for 1972 and 1973 were obtained from the Oklahoma Department of Highways (table 3). The data received from ambulance operators estimated 352 ambulance calls resulting from highway accidents in 1973. This figure differs slightly from highway department



Population of counties and county seat communities in study area, 1970:

ALFALFA	7,224
Cherokee	2,119
BLAINE	11,794
Watonga	3,686
GRANT	7,117
Medford	1,304
HARPER	5,151
Buffalo	1,579
KINGFISHER	12,867
Kingfisher	4,042
MAJOR	7,529
Fairview	2,894
WOODS	11,920
Alva	7,440
WOODWARD	15,537
Woodward	8,710

Figure 1. Study area showing county seat, towns, and major highways, as well as location in Oklahoma.

figures, but is not unusual in situations where estimates come from different sources. For prediction purposes, the average number of highway injuries is suggested as a way to estimate the number of expected ambulance calls per year resulting from highway accidents.

Ambulance calls for transferring patients between hospitals are a function of the size and services of the local hospital, the local medical staff, and other medical or personal factors. For the study area, data were collected from ambulance operators to gain an idea of the number of ambulance transfer calls.⁴ It is impossible to use a rule of thumb to predict transfers for a given service area. But, an estimate of transfers could be obtained from records of ambulance operators and local hospitals.

Table 3—Injury cases from traffic accidents

County	Year		Average
	1972	1973	
	<i>Number</i>		
Alfalfa	27	28	27.5
Major	35	43	39.0
Blaine	84	62	73.0
Kingfisher	45	57	51.0
Grant	23	18	20.5
Woods	50	55	52.5
Woodward	87	91	89.0
Harper	20	18	19.0
Total	371	372	371.5

Source: Oklahoma Department of Highways. Unpublished data compiled from investigating officers' reports submitted to the Department of Public Safety.

Other or regular medical calls can be projected as a function of the age distribution of the population.⁵ From the data collected from the study area, the number of medical ambulance calls was estimated to be 2,301 in 1973. The population of the study area was grouped into eight categories. The age groupings and the number of ambulance calls for regular medical reasons per age group are presented in table 4. Population of the study area in 1973 by age groups is also presented in table 4.⁶ Ambulance

⁴Some States may have gathered patient flow data which would be useful. For example, the Oklahoma State Health Planning Agency prepared a study of movement of Oklahoma residents seeking hospital services [2].

⁵Another possibility would be to use annual average number of other medical calls for the area in last 1 to 3 years, if such data are readily available.

⁶Population projections were made from a demographic model which utilized birth rate, death rate, and migration data. Most State governments have a depart-

Table 4—Population, ambulance calls for regular medical reasons, and utilization rates for study area by age strata¹ -

Age	1973 population	Medical ambulance calls	Utilization rate per 1,000 in age group
19 & under	26,242	85	3.23
20-29	10,129	108	10.66
30-39	7,965	90	11.29
40-49	8,620	76	8.81
50-59	8,886	188	21.15
60-69	8,753	331	37.81
70-79	5,904	814	137.87
80+	2,807	609	216.95
Total	69,306	2,301	29.01

¹Excludes calls for traffic accidents and inter-hospital patient transfers.

utilization rates (defined as the number of ambulance calls per 1,000 population per year) for other medical calls were derived from the ambulance call data and data on population by age groups. For example, there were 3.23 calls per thousand population for those 19 years old or younger and 216.95 ambulance calls per year per 1,000 population for those 80 years or older. Utilization rates increase as age increases, with one exception—the 40-49 age group. It appears that this group has fewer industrial and home accidents and heart attacks, strokes, and other health problems than the 20-29 and 30-39 age groups.⁷ These utilization rates could be used with area population data to predict the number of other ambulance calls or they could be derived to fit local situations in other areas by following a similar procedure.

Information as to the day of the week on which calls were made was obtained. The percentage distribution was as follows:

Day of Week	Percentage of calls
Monday	15.3
Tuesday	15.7
Wednesday	14.4
Thursday	15.4
Friday	16.5
Saturday	14.0
Sunday	8.7

Information on time of day when calls were made was not available from the ambulance

ment responsible for population projections between census years.

⁷Utilization rates were also derived for an urban area with approximately 31,000 population. The utilization rates were larger in all cases, but the same pattern existed, with the 40-49 age group having a smaller utilization rate than the 30-39 age group.

operators in the study area. However, this information was available from a large operator in an adjacent county for 1972 and 1973. The total number of calls and percentage distribution of calls made between certain hours follow:

<i>Time of Day</i>	<i>Num- ber</i>	<i>Percent- age of total</i>
From 12 p.m. to 5:59 a.m.	186	9.5
From 6 a.m. to 11:59 a.m.	597	30.4
From 12 a.m. to 5:59 p.m.	712	36.2
From 6 p.m. to 11:59 p.m.	469	23.9
	1,964	100.0

From these records, it was estimated that 81% of the calls were made between 7 a.m. and 11 p.m., and 19% between 11 p.m. and 7 a.m. Calls made between 8 a.m. and 5 p.m. were 55% of the total, with the remaining 45% occurring between 5 p.m. and 8 a.m. Also, it was estimated that 37% of the calls were made (1) on weekends and (2) between 11 p.m. and 7 a.m. on week days. Finally, it was estimated that 61% of the calls were made (1) on weekends and (2) between 5 p.m. and 8 a.m. on week days.

ESTIMATING COSTS OF SUPPLYING AMBULANCE SERVICE

Ambulance service costs, as well as receipts, are needed if community leaders are going to determine a method of providing ambulance service within their financial capabilities. Dealers selling ambulances and medical equipment and those selling communication equipment were interviewed to estimate capital expense. Ambulance operators provided information as to operating expenses of the vehicles and the medical supplies used.

Capital Expenditures (Vehicle)

A number of different types of vehicles are sold to provide ambulance service. These include vans, high-top vans, and auto chassis units (fig.2). In 1974, the regular vans cost approximately \$8,000, the high-top vans approximately \$10,000, and the auto chassis approximately \$14,000.⁸ These prices include prices for the vehicles with basic equipment and basic medical equipment. The upper limit of the price range for each type depends on the vehicle and medical extras desired. In selecting a vehicle, three major decisions become apparent: (1) determining how many dealers to consult to

⁸ Five dealers were interviewed in March and April 1974 to arrive at these figures. These figures should be regarded as representing a minimum more closely than an average.

The third section of form I of the procedure can be used to estimate receipts, following completion of the first two sections. To complete this section, estimated mileage, information related to the ambulance fee, and payment data is needed. The rate charged in the study area ranged from \$5 per call plus mileage to \$35 per call plus mileage. Average mileage information can be obtained by ascertaining the size of the service area and the spatial distribution of the population.

Approximately 66% of the patients paid their bills, the range being 33% to 95%. The operators who made special efforts to collect their fees by sending out monthly statements had the higher payment percentages.

The number of expected ambulance calls could be estimated, given the number of highway accidents resulting in injuries, an estimate of patient transfers between hospitals, and the age of the population. Then, based on the selected fee, average mileage estimates, and percentage of patients expected to pay their bills, an estimate of receipts for an ambulance service area could be derived.

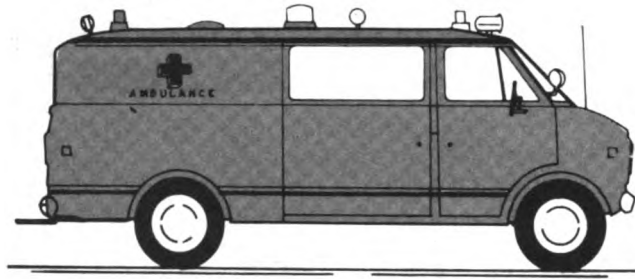
obtain the best bid; (2) evaluating the options, such as renting or buying a used vehicle; and (3) checking with the various Federal and State agencies to make sure the prospective vehicle meets regulations.

The life of a vehicle depends mainly on amount of use and the quality of the maintenance it gets. In general, dealers and operators said they desired to use a unit as a backup vehicle after it has been driven 75,000 miles.

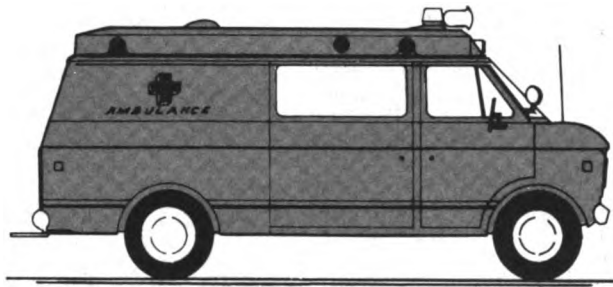
Capital Expenditures (Communications)⁹

Among the five major components of an EMS system, the communications system is probably the least well understood. When the Federal Communications Commission (FCC) was established, one of its purposes was the protection of life and property through radio. Its responsibilities are to license broadcasters, assign frequencies, and set station operating power

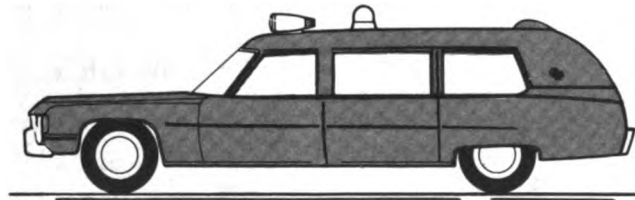
⁹ Information based on an interview with Neil Schmitt, Dept. of Electrical Engineering, Univ. of Arkansas, Fayetteville, June 6, 1974. He had helped design a Statewide EMS communication system for Arkansas, under contract with the Arkansas Health Systems Foundation, Little Rock. Both Oklahoma and Arkansas have a Statewide EMS system designed and are seeking funds to implement the system. If funds become available, this would reduce cost for those supplying EMS.



Regular Van



Hightop Van



Auto Chassis

Figure 2. Types of ambulance vehicles most often used.

[3]. Arrangements for legally setting up the communications component of an EMS should be made through the Special Emergency Radio Division of the FCC.¹⁰ In considering the smallest set of basic communications, a local policymaker needs answers to the following questions:

1. What general specifications should be met to provide good communications over a distance of 30 to 40 miles?
2. How much will a communication unit cost?
3. Should a consultant be employed?

Two choices are open to the local leaders in regard to question one. If the community has a fire or police department with an acceptable communications system, it is possible to use it at a much lower cost. A two-way radio in an EMS vehicle would cost about \$2,000. For about \$150 a "phone patch" can be installed at the fire or police department through which telephone communications can be established with the hospital. A doctor at the hospital could talk to the EMS technician out on call via a "phone patch."

If the community does not have an acceptable communications system, a new one will have to be constructed. The general specifications for the hospital-based communications component might logically call for a 100-watt base station. The station would have a two-frequency capability with one frequency available for paging (via a beeper) EMS technicians nearly anywhere within a 10-mile radius. The antenna tower would need to be 60 to 100 feet high, depending on the area to be served. The functional life expectancy of a communications system is 10 years. Each EMS vehicle would need to have a two-way radio unit.

Typical 1974 costs were:

Hospital-based station (with paging encoder, \$200)	\$5,700
Two-way radio in vehicle	2,000
Pager for EMS technician	300
	\$8,000

If there were four vehicles and four pagers, the costs would be:

Hospital-based system	\$5,700
Four two-way radios in vehicles	8,000
Four pagers	1,200
	\$14,900

A well-qualified consultant generally saves time and money, especially if more than one

¹⁰ For specific details a State or regional office of the Federal Communication Commission should be contacted.

hospital and/or more than a single county will be involved. For the simplest communications component just described, a consultant could provide the necessary guidance at a cost of about \$200 plus expenses. The consultant should be aware of legislation, passed and pending, which offers financial assistance for Emergency Medical Services which meet relevant specifications, and can offer expert advice on types of equipment best suited to local needs and resources.

Operating Expenses (Vehicle)

Included in vehicle operating expenses are costs of gasoline, tires, oil, filters, lubrication, tuneups, and miscellaneous repairs. Based on records of existing ambulance services,¹¹ 1974 costs of these were estimated and are presented in table 5. Also, included in this table is an estimated cost of the communications system maintenance.

Table 5—Vehicle operating expense

Item	Costs and usage
Gasoline	10 miles per gallon @ 54 cents per gallon
Tires	Replaced every 20,000 miles @ \$50 per tire
Oil	Changed every 1,500 miles or every other month @ 80 cents per quart
Oil filters	Replaced each oil change @ \$3.50 each
Lubrication	Done with each oil change @ \$1.75 each
Tuneups	Every 10,000 miles @ \$30 each
Miscellaneous repairs	\$50 every 10,000 miles
Communication system	\$78 per year for service contract

Ambulance operators indicated that they preferred to use an ambulance as a backup unit once it has 75,000 miles on it. Thus, depreciation costs were determined based on estimated yearly mileage. Vehicle insurance was also determined from ambulance operators' records. From the surveyed ambulance operators, a yearly insurance cost estimate of \$500 was obtained.

Operating Expenses (Medical)

Expenses for medical supplies depend on the extent the unit was used and were estimated

¹¹ Operating expenses were derived from ambulance operator records in April and May, 1974. Some of these figures might need modification in other areas. For example, a full-time mechanic in the county highway garage might have time to provide maintenance services at prices lower than commercial rates.

from 1974 records of ambulance operators (table 6). The cost of linen is the largest medical supply expense. Some operators used disposable paper "linens", whereas others had contracts with a linen company. Some medical equipment and sterile bandages and related items are expendable supplies that need to be replaced after each call.

Table 6—Medical supply expenses

Item	Costs
Linens	\$1 per call
Medical equipment maintenance ¹	10¢ per call
Sterile bandages and related expendable items	17¢ per call

¹ Includes items such as splinting kit, dead on arrival (DOA) kit, and oxygen, etc.

Operating Expenses (Labor)

Labor is a big item in operating an ambulance service. Rural areas with a limited budget need to know their options in order to seek an economic solution. For this reason, labor requirements under a number of alternative systems are discussed. These include a fully staffed system, a hospital-based system, and several volunteer-type systems.

Fully Staffed System.—To operate a fully staffed system, a minimum of four emergency medical technicians (EMT's) are required, two technicians to work from 7 a.m. to 3 p.m. and the other two from 3 p.m. to 11 p.m. During weekends and from 11 p.m. to 7 a.m., two EMT's would be on call and would receive overtime for any ambulance calls made during off-duty hours. Assuming the EMT's were paid \$2.50 per hour, their yearly salary would be \$5,200 each, plus overtime payments. Labor costs for a system with four technicians would be \$20,800 plus overtime charges. This variation of a fully staffed system is minimum. If a fully staffed system had two technicians on duty at all times, the system would need eight EMT's with labor costs of \$41,600. In addition, another 10% will need to be added to allow for annual leave, sick leave, and the like. Since many rural communities do not have funds for this type of system, some sort of volunteer or hospital-based system might be more appropriate.

Volunteer Systems.—The system is referred to as volunteer, but in fact, volunteers may be paid for their time. A number of volunteer systems have been employed in Oklahoma. They differ as to when the volunteers are used and

how they are paid. Three variations of the volunteer systems will be discussed:

1. Ambulance calls come to the dispatcher located at the fire station or police station. The dispatcher alerts the two volunteers on call, and they make the trip. The volunteers often are off-duty policemen or firemen and are paid \$5 per call or 10 cents per mile, whichever is greater.

2. This volunteer system is much like the first one. Calls come to the dispatcher at the police or fire station. Between 8:00 a.m. and 5:00 p.m. on weekdays, community personnel make ambulance runs. From 5:00 p.m. to 8:00 a.m. on weekdays and on weekends, the dispatcher alerts 2 volunteers, who make the calls. They are paid \$5 a call or 10 cents a mile, whichever is greater.

3. Under this system calls come to the dispatcher. Between 8:00 a.m. and 5:00 p.m. on weekdays, salaried community personnel make the ambulance runs. Volunteers are used on weekends and weekdays between 5:00 p.m. and 8:00 a.m. Two volunteers are on call each night and on weekends and are paid \$5 per night, and \$5 each day on weekends—whether or not they respond to ambulance calls.

Hospital-Based System.—An ambulance service operated from a hospital could also have a number of labor combinations. At a minimum, a hospital-based ambulance service in a rural area would need two technicians. One EMT would work from 7 a.m. to 3 p.m. while the other would work from 3 p.m. to 11 p.m. These men may work as orderlies when not making ambulance calls. If a call came between 7 a.m. and 11 p.m., the EMT on duty plus a licensed practical nurse (LPN) or registered nurse (RN) would respond to the call. If a call came between 11 p.m. and 7 a.m. or on weekends, the EMT on call would respond. An LPN or RN on duty at the hospital would accompany him on each call. The EMT would be paid overtime for calls made during off-duty hours.

Other Expenses

To complete the costs analysis, several other items need to be mentioned. Among these are storage, as well as vehicle and malpractice insurance. A decision will have to be made if vehicle insurance is desired. States differ as to whether malpractice insurance is needed—a good practice would be to check with the county attorney as to whether this protection is needed.

In most areas, the vehicle would have to be stored in a heated garage in winter. The city may have facilities for this; otherwise facilities will have to be purchased or rented.

PROCEDURE FOR ESTIMATING AMBULANCE RECEIPTS AND COSTS

The study was primarily undertaken to provide methods to estimate ambulance receipts and costs. However, to be directly useful to local leaders, the information must be such that any county or community in the Great Plains area can readily adopt it. For this reason, forms I, II, and III were developed. Form I was developed so that local leaders could predict the number of ambulance calls, mileage, and receipts. Form II was developed to estimate the costs of alternative systems. Form III is used to compare alternatives and to specify the difference between receipts and costs (see appendix A for copy of blank forms).

Application of Procedures

In 1973, community leaders in Alfalfa County in western Oklahoma learned from operators of funeral homes in the county that ambulance service would be discontinued. If the county were to have such service, the communities or the county would have to provide it. The researchers, applying information gained from this study and the tables developed in the previous section, could estimate receipts and costs for the various systems. Forms I, II, and III were formulated on the basis of several assumptions. It was assumed for this study that Alfalfa County would provide the service from Cherokee, a community with a population of 2,119 in 1970.¹² The next largest communities are Helena and Carmen with 1970 populations of 769 and 519, respectively. Also, assumed was a fee of \$25 within the community, and \$25 plus \$1 per mile one way for calls outside the community of Cherokee.

Using these assumptions, the forms were completed (fig. 3). The estimated total number of ambulance calls was 335 for 1974.

From form I, the estimated potential receipts were \$19,870, but assuming a 80% payment rate, estimated receipts were \$15,896. Estimated mileage for 335 ambulance calls was 23,108, which would round up to 24,000 miles. Data in form II provided cost estimates for different vehicles, communication systems, and labor systems. Vehicle depreciation was given for all

three types of vehicles. The costs of communication systems were presented for a new system and for one connected to city or fire communication systems. The listed vehicle and medical operating expenses were based on estimated usage. Finally, estimates of labor costs were presented for (1) a fully staffed system, (2) for several volunteer systems, and (3) for a hospital-based system.

Form III was used to depict costs and receipts. The first section estimated receipts for a number of payment rates. The second section listed four alternatives or various combinations community leaders might consider. For illustrative purposes, four alternatives were calculated for Alfalfa County. A hightop van was assumed purchased, and ultimately when the vehicle has been driven 75,000 miles, it would serve as a backup unit. (One of the funeral home operators has donated an old unit which could serve as the present backup unit.) Also, it was assumed that a new communication system would be constructed. The differences between the alternative systems reflect labor arrangements. The first system is hospital based with two EMT's working and an RN or LPN riding in the vehicle on calls. The second is based on policemen or firemen (paid by the city) making calls from 8 a.m. to 5 p.m. on weekdays. Volunteers make other calls and are paid \$5 per night whether or not a call is received. The third is similar to the second, except that volunteers making calls are paid \$5 per call or 10 cents a mile, whichever is greater. The final choice is a fully staffed system. This alternative is included to illustrate the costs that a private ambulance operator faces. If a community or county has an option to subsidize a private system, this would suggest the amount of the subsidy needed.

The data on form III summarize the situation for Alfalfa County. Potential receipts equalled \$19,870. Assuming 80% of the patients paid their bills, yearly receipts would equal \$15,896. The total cost of the first alternative (hospital-based system, new communication system, and hightop van) was \$21,313. If the community desired a hospital-based system, they would have to subsidize the system by \$5,417 per year. Alternatives 2 and 3 (volunteer type systems) would break even if 80% of the patients paid their bills. Finally, if the county subsidized a fully staffed private system and if 80% of the patients paid their bills, the county would have to subsidize the service with \$18,336 per year.

¹² The researchers are not advocating a county-wide system, but are using it only to illustrate costs and receipts. If the community leaders prefer two services, they could prepare the tables for each service to derive receipts and cost alternatives for each.

Form I. Procedure used to estimate number of calls, mileage, and receipts for ambulance service.

Specify service area and community where ambulance is located.

ALFALFA COUNTY - CHEROKEE

I. Estimated number of calls for service area

A. Estimated number of calls for highway accidents¹ =

31

B. Estimated number of transfers (calls transferring patients between hospitals)² =

41

C. Estimated number of other medical calls:³

Population by age groups	Population of service area	Number of calls per thousand in each age group per year	Number of calls in each age group per year
< 20	<u>1,913</u>	3.23	<u>6.18</u>
20-29	<u>877</u>	10.66	<u>9.35</u>
30-39	<u>545</u>	11.29	<u>6.72</u>
40-49	<u>713</u>	8.81	<u>6.28</u>
50-59	<u>834</u>	21.15	<u>17.64</u>
60-69	<u>956</u>	37.81	<u>36.15</u>
70-79	<u>729</u>	137.87	<u>100.51</u>
80+	<u>370</u>	216.95	<u>80.27</u>

Total other medical calls =

263.10

D. Total ambulance calls: 31 (highway calls) + 41 (transfer calls) + 263 (other medical calls) =

335

II. Estimated mileage⁴

A. Mileage for highway accidents:⁵

(1) 2 (number of calls within community) X 4 (average round-trip mileage to community hospital) =

8

(2) 9 (number of calls outside community) X 10 (average round-trip mileage to community hospital) =

90

(3) 20 (number of calls outside community and victims taken to hospital outside community service area) X 90 (average round-trip mileage) =

1,800

B. Mileage from transfers:⁶

(1) 41 (number of hospital transfer calls) X 90 (average round-trip mileage) =

3,690

Figure 3. Application of feasibility forms to Alfalfa County, Oklahoma.

C. Mileage from other medical calls:⁷

(1) <u>30</u> (number of calls within community) X <u>4</u> (average round-trip mileage to community hospital) =	<u>200</u>
(2) <u>22</u> (number of calls outside community) X <u>10</u> (average round-trip mileage to community hospital) =	<u>220</u>
(3) <u>191</u> (number of calls occurring outside community and victims taken to hospital outside community service area) X <u>90</u> (average round-trip mileage) =	<u>17,190</u>
 Total mileage (A ₁ + A ₂ + A ₃ + B ₁ + C ₁ + C ₂ + C ₃) =	<u>23,198</u>
 Round up to next thousand =	<u>24,000</u>
 One way mileage for calls outside community $\frac{A_2 + A_3 + B_1 + C_2 + C_3}{2}$ =	<u>11,495</u>

III. Estimated receipts

A. Ambulance fee collections: <u>335</u> (number of calls) X \$ <u>25</u> (ambulance fee) =	\$ <u>8,375</u>
B. Mileage charge collections: <u>11,495</u> (total one way mileage for calls outside community) X \$ <u>1.00</u> (charge per mile) =	\$ <u>11,495</u>
C. Total potential receipts: \$ <u>8,375</u> (ambulance fee collections) + \$ <u>11,495</u> (mileage charge collections) =	\$ <u>19,870</u>
D. Estimated yearly receipts: \$ <u>19,870</u> (total potential receipts) X <u>80</u> (% paying bills) =	\$ <u>15,896</u>

¹ Highway patrol records indicate number of fatal and injury accidents in previous year. Use average of previous 2 years. ² Contact hospitals or operator of previous ambulance services to estimate number of transfers (ambulance calls between hospitals). ³ Obtain population data from Census or from sub-State planning office. ⁴ Obtain average one-way mileage based on distribution of population outside community where

ambulance is located. ⁵ Highway patrol records indicate number of highway injury accidents occurring within and outside community where ambulance is located. ⁶ Obtain average one-way mileage based on where most of the transfers are going. ⁷ Estimate number of calls occurring within community in proportion to population residing in community where ambulance is located.

Figure 3 (continued).

Form II. Procedure used to estimate annual costs of supplying ambulance service.

I. Capital expenditures

A. Depreciation:

(1) Vehicle depreciation [(cost of unit)/(75,000 miles ÷ yearly mileage)] (round years depreciation to nearest tenth).

Van \$ 2,580 Hightop van \$ 3,225 Auto chassis \$ 4,576

(2) Communication system depreciation [(cost of system)/(10 years)].

New system \$ 500 Attach to present system \$ 215

B. Interest:

[\$ 10,000 (cost of vehicle) + \$ 8,000 (cost of communication system) X .08 % (interest rate)] =

\$ 1,440

C. Vehicle insurance (yearly rate) =

\$ 500

TOTAL

\$ 1,940

II. Operating expenses

A. Vehicle:

(1) Gasoline (yearly mileage ÷ 10 mpg) X \$.54 (cost per gallon) =

\$ 1,296

(2) Tires (yearly mileage ÷ 20,000) X \$.50 (cost per tire) X 4 tires =

\$ 240

(3) Oil (yearly mileage ÷ 1,500 miles) X (5 qt. capacity) X \$.80 (cost per quart) =

\$ 64

(4) Filter (yearly mileage ÷ 1,500 miles) X \$ 3.50 (cost per filter) =

\$ 56

(5) Lubrication (yearly mileage ÷ 1,500 miles) X \$ 1.75 (cost of lubrication) =

\$ 28

(6) Tuneup (yearly mileage ÷ 10,000) X \$ 36 (cost per tuneup) =

\$ 72

(7) Miscellaneous repairs (yearly mileage ÷ 10,000) X \$ 50

\$ 120

(8) Two-way radio service contract (\$ 78 yearly maintenance contract) =

\$ 78

Vehicle subtotal =

\$ 1,954

B. Communication system at station [base station, remote control and inco-der at \$ 21 (maintenance contract)] =

Communication subtotal =

\$ 252

C. Medical:

(1) Linens [\$ 1.00 (costs per call) X 335 (number of calls)] =

\$ 335

(2) Medical equipment maintenance [\$.10 (medical equipment maintenance costs per call) X 335 (number of calls)] =

\$ 33

(3) Sterile bandages and related items [\$.17 (costs of sterile bandages and related items per call) X 335 (number of calls)] =

\$ 56

Medical subtotal =

\$ 424

TOTAL

\$ 2,630

III. Labor costs

A. Fully staffed system (37% of the calls are made on weekends and weekdays between 11 p.m. and 7 a.m.):

(1) [4 (number of EMT's) X \$ 5,200 (year salary) = \$ 20,800 X 110% for benefits =

\$ 22,880

(2) 261 (hours overtime) X \$ 7.50 (overtime hourly wage rate) =

\$ 1,957

Subtotal =

\$ 24,837

Figure 3 (continued).

B. Volunteer system (volunteers make all calls, paid \$5 per call or 10 cents a mile whichever is greatest):		
(1)	<u>81</u> (number of calls under round-trip mileage of 50 miles) X \$10 (cost of volunteers) =	\$ <u>810</u>
(2)	<u>257</u> (number of calls over round-trip mileage of 50 miles) X <u>90</u> (average mileage) X 20 cents (per mile cost of volunteers) =	\$ <u>4,572</u>
(3)	(bookkeeping and billing charge = \$2) X <u>335</u> (number of calls) =	\$ <u>670</u>
	Subtotal =	\$ <u>6,052</u>
C. Volunteer system (city personnel making calls from 8 a.m. to 5 p.m. on weekdays; otherwise, volunteers make calls and are paid \$5 per call or 10 cents per mile whichever is greater; 61% of the calls are made by volunteers):		
(1)	<u>48</u> (number of calls under round-trip mileage of 50 miles between 5 p.m. and 8 a.m.) X \$10 (cost of volunteers) =	\$ <u>480</u>
(2)	<u>156</u> (number of calls over 50 miles between 5 p.m. and 8 a.m.) X <u>90</u> (average round-trip mileage) X 20 cents (per mile cost of volunteers) =	\$ <u>2,808</u>
(3)	Bookkeeping and billing charge = \$2 X <u>335</u> (number of calls) =	\$ <u>670</u>
	Subtotal =	\$ <u>3,958</u>
D. Volunteer system (city personnel make calls from 8 a.m. to 5 p.m. on weekdays; otherwise volunteers make calls and are paid \$5 per night regardless if call made or not; 61% of the calls are made by volunteers) X (365 days per year X \$10) =		\$ <u>3,650</u>
	(bookkeeping and billing charge = \$2 X <u>335</u> (number of calls) =	\$ <u>670</u>
	Subtotal =	\$ <u>4,320</u>
E. Hospital-based system (37% of the calls are made on weekends and weekdays between 11 p.m. and 7 a.m.):		
(1)	[<u>2</u> (number of EMT's) X <u>\$200</u> (yearly wage) = <u>400</u>] X 110% for benefits =	\$ <u>11,440</u>
(2)	<u>261</u> (hours overtime worked) X <u>\$3.75</u> (hourly overtime rate) =	\$ <u>978</u>
	Subtotal =	\$ <u>12,418</u>
IV. Other expenses:		
A.	Storage costs:	\$ <u>300</u>
B.	Malpractice insurance:	\$ <u>500</u>
	TOTAL =	\$ <u>800</u>

Figure 3 (continued).

Form III. Procedure used to compare estimated annual receipts and costs for alternative ambulance delivery systems

I. Estimated receipts (potential receipts) = \$ 19,870
 Potential receipts X 60% payment rate = \$ 11,922
 Potential receipts X 70% payment rate = \$ 13,909

Potential receipts X 80% payment rate = \$ 15,896
 Potential receipts X 90% payment rate = \$ 17,883

II. Estimated costs

	1st alternative	2nd alternative	3rd alternative	4th alternative
Specify vehicle, communication system and labor system:	<u>Highter van</u>	<u>Highter van New</u>	<u>Highter van New</u>	<u>Highter van, new</u>
	<u>New Communication</u>	<u>Communication</u>	<u>Communication</u>	<u>Communication</u>
	<u>Hospital based</u>	<u>Volunteer</u>	<u>fee from San Jose</u>	<u>Fully Staffed System</u>
		<u>(570/yr)</u>	<u>(paid \$/callor 10/yr)</u>	

A. Capital expenditure:

Vehicle depreciation	\$ <u>3,225</u>	\$ <u>3,225</u>	\$ <u>3,225</u>	\$ <u>3,225</u>
Communication depreciation	\$ <u>800</u>	\$ <u>800</u>	\$ <u>800</u>	\$ <u>800</u>
Interest	\$ <u>1,440</u>	\$ <u>1,440</u>	\$ <u>1,440</u>	\$ <u>1,440</u>
Insurance	\$ <u>500</u>	\$ <u>500</u>	\$ <u>500</u>	\$ <u>500</u>
Subtotal	\$ <u>5,965</u>	\$ <u>5,965</u>	\$ <u>5,965</u>	\$ <u>5,965</u>

B. Operating expense:

Vehicle	\$ <u>1,954</u>	\$ <u>1,954</u>	\$ <u>1,954</u>	\$ <u>1,954</u>
Communication	\$ <u>232</u>	\$ <u>232</u>	\$ <u>232</u>	\$ <u>232</u>
Medical	\$ <u>424</u>	\$ <u>424</u>	\$ <u>424</u>	\$ <u>424</u>
Subtotal	\$ <u>2,630</u>	\$ <u>2,630</u>	\$ <u>2,630</u>	\$ <u>2,630</u>

C. Labor costs: Subtotal

	\$ <u>12,418</u>	\$ <u>4,320</u>	\$ <u>3,958</u>	\$ <u>24,837</u>
--	------------------	-----------------	-----------------	------------------

D. Other expenses: Subtotal

	\$ <u>300</u>	\$ <u>800</u>	\$ <u>800</u>	\$ <u>800</u>
--	---------------	---------------	---------------	---------------

TOTAL

	\$ <u>21,313</u>	\$ <u>13,715</u>	\$ <u>19,353</u>	\$ <u>34,232</u>
--	------------------	------------------	------------------	------------------

Figure 3 (continued).

TRAINING AND OTHER REGULATIONS

Community or county leaders who face the problem of providing emergency medical service need information as to national regulations and training programs for EMS technicians. Training programs which EMS technicians take include the U.S. Department of Transportation's (DOT) Rescue and Emergency Medical Training and Red Cross Training. National regulations which are important to know include those of the Emergency Medical Services Systems Act of 1973 [1] and the Highway Safety Act of 1966.¹³

Training for EMS Technician

DOT, with major responsibility for EMS, takes the position that the ambulance attendant or technician does not properly fall into the category of unskilled labor as had tended to be the attitude before 1966 [6]. DOT maintains that the attendant should be a person highly trained and skilled in both life-saving and life-sustaining techniques. Thus, the DOT's Rescue and Emergency Medical Training Program was developed to assist States in meeting emergency medical care requirements of the Highway Safety Act of 1966 [5]. The first phase of the program consists of a *Basic Training Course* [4] and a *Refresher Training Course*. The *Basic Training Course* consists of 25 lessons in 71 hours of classroom instruction, and 10 hours of in-hospital training (81 hours total).

¹³ There are 3 other programs which have major facets affecting EMS: 1) Rural Development Act of 1972, 2) Medicare, and 3) Medicaid. State or regional program representatives are available to explain their EMS related functions at the multi-county district and State levels, but the basic points are included here:

1. Rural Development Act of 1972. The State representative is the State Director of the Farmers Home Administration. Title I, § 104 of the Act provides funds for essential rural community facilities, including necessary related equipment. Applications for funds for EMS equipment would not be out of order according to the wording in § 104.
2. Medicare. The policy under part B, medical insurance, is for payment to be made to EMS providers for services based on one-way distance between the patient's location and nearest hospital adequate to serve the patient's needs. Requirements for payment are physician's signature, that EMS technician have certain training and equipment, and that transportation by other means could endanger the patient's health.
3. Medicaid. The general policy is to provide EMS payment for those persons who have met the qualifications for and have a Medicaid card. Two basic low-income groups are likely to have such cards—those receiving Aid to Families with Dependent Children, and those receiving Supplemental Security Income payments administered by the Social Security Administration.

Emergency Medical Services Systems Act of 1973, PL 93-154

This Act, when fully implemented, is of considerable importance to State and local health service policymakers. It is a new title added to the Public Health Service Act, the exact wording being "Title XII, Emergency Medical Services Systems." This new title covers sections 1201 through 1210. Section 1201 includes definitions and the last three sections cover administration and reports:

Sec. 1202	Grants and contracts for (EMS) feasibility studies and planning.
Sec. 1203	Grants and contracts for establishing (EMS) and initial operation. The grant can normally be up to 50 percent, or 75 percent in cases of exceptional need.
Sec. 1204	Grants and contracts for (EMS) expansion and improvement (50 and 75 percent limits apply).
Sec. 1205	Grants and contracts for research. None may be made for over \$35,000 without special approval.
Sec. 1206	General provisions respecting grants and contracts.
Sec. 1207	Authorization of appropriations:
	Sections
	1202,
	1203,
	1204
	FY74 \$30 mil.
	FY75 \$60 mil.
	Sections
	1203,
	1204
	FY76 \$70 mil.
	Section
	1205
	FY74 \$5 mil.
	FY75 \$5 mil.
	FY76 \$5 mil.

One of the most important criteria regarding use of the resources is contained in section 1203, (C), (5):

In considering applications which demonstrate exceptional need for financial assistance, the Secretary shall give special consideration to applications submitted for emergency medical services systems for *rural areas* (under 50,000 population).

The Public Health Service Act, Part E, Title VII, was also amended to include funds for "training in emergency medical services."

Emergency Medical Services Vehicle

The Highway Safety Act of 1966 provided one of the major sources of funds for marked improvement in the transportation component of EMS [3]. This act had two titles—title I being highway safety, and title II being administration and reporting. Section 402(a) required that “each State shall have a highway safety program approved by the Secretary of Transportation, designed to reduce traffic accidents and deaths, injuries, and property damage resulting therefrom.” Funds provided by the Act are used for such things as (1) emergency service plans, (2) demonstration projects, and (3) research fellowships in highway safety.

Based on the above Act¹⁴ and efforts of other interested groups, a “standard ambulance” was defined. Its design is in general accord with the Ambulance Design Criteria of the National Highway Safety Administration (DOT) as reported by the Committee on Ambulance Design Criteria, National Research Council, National Academy of Engineering, Washington, D.C. In January 1974, criteria for ambulances were approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies [9]. To provide illustrations, only 10 major criteria of a long list are shown. The vehicle should:

1. Be designed to have driver compartment and a patient compartment accommodating one medical technician and two litter patients (6.1)

2. Have a patient compartment at least 116 inches long and at least 60 inches high, with a clear walkway between cot and the squad bench at least 12 inches wide in Type II ambulances (van-type) (3.10.4);
3. Be equipped to supply intensive life-support services for at least one patient during transit (6.1);
4. Have a hospital-type piped oxygen system capable of storing and supplying a minimum of 3,000 liters of medical oxygen (3.12.1);
5. Have a vacuum-operated engine or electrically powered suction aspirator system, provided for the primary patient (3.12.3);
6. Have a two-way radio, “intercom,” and public address system—12 volt, D.C., (3.14.1);
7. Have a 110 volt A.C. power supply, and applicable accessory wiring system (3.7.1);
8. Be equipped with complete climate environmental systems in both driver and patient compartments (3.13.1);
9. Be equipped with dual 12 volt battery system with a switch allowing use of one or both simultaneously (3.7.7); and
10. Be equipped with siren and public address system. The system shall include upgrading features; radio amplification capability, complete with two speakers; noise cancelling microphone, etc. [9].

¹⁴ Especially important is standard 11 entitled “Emergency Medical Services,” one of the uniform standards promulgated by the Secretary of Transportation.

LITERATURE CITED

- (1) Emergency Medical Services System Act of 1973.
Public Law 93-154, November 16, 1973.
- (2) Federal Communications Commission
37th Annual Report, Fiscal Year 1971,
Washington, D.C., pp. XI and XII.
- (3) Highway Safety Act of 1966
Public Law 89-564, September 9, 1966.
- (4) National Highway Traffic Safety Administration, U.S. Dept. of Transportation
Basic Training Program for Emergency Medical Technician—Ambulance, Concepts and Recommendations. The Basic Training Course is often referred to as the "Dunlap Course." (Dunlap and Associates, Inc., Darien, Connecticut 06820).
- (5) DOT Training Programs, Emergency Medical Technician—Ambulance (Pamphlet) GPO 928-213.
- (6) Emergency Medical Services, Questions and Answers (Pamphlet) September, 1973.
- (7) Office of Community Affairs and Planning and Oklahoma State Health Planning Agency.
Patient Origin Study, A Report Identifying the Movement of Oklahoma Residents Seeking Hospital Services, 1974.
- (8) Oklahoma State Department of Health, Emergency Medical Service.
Comprehensive Emergency Medical Services Plan for the State of Oklahoma FY 1974, 1974.
- (9) U.S. Department of Transportation
Federal Specification Ambulance, Emergency Medical Care Vehicle, Washington, D.C., KKK-A-1822, January 2, 1974.

APPENDIX: FORMS

Form I. Procedure used to estimate number of calls, mileage, and receipts for ambulance service.

Specify service area and community where ambulance is located

I. Estimated number of calls for service area

A. Estimated number of calls for highway accidents¹ = _____

B. Estimated number of transfers (calls transferring patients between hospitals)² = _____

C. Estimated number of other medical calls:³

Population by age groups	Population of service area	Number of calls per thousand in each age group per year	Number of calls in each age group per year
< 20	_____	3.23	_____
20-29	_____	10.66	_____
30-39	_____	11.29	_____
40-49	_____	8.81	_____
50-59	_____	21.15	_____
60-69	_____	37.81	_____
70-79	_____	137.87	_____
80+	_____	216.95	_____

Total other medical calls = _____

D. Total ambulance calls: _____ (highway calls) + _____ (transfer calls) + _____ (other medical calls) = _____

II. Estimated mileage⁴

A. Mileage for highway accidents:⁵

(1) _____ (number of calls within community) X _____ (average round-trip mileage to community hospital) = _____

(2) _____ (number of calls outside community) X _____ (average round-trip mileage to community hospital) = _____

(3) _____ (number of calls outside community and victims taken to hospital outside community service area) X _____ (average round-trip mileage) = _____

B. Mileage from transfers:⁶

(1) _____ (number of hospital transfer calls) X _____ (average round-trip mileage) = _____

C. Mileage from other medical calls:⁷

(1) _____ (number of calls within community) X _____ (average round-trip mileage to community hospital) = _____

(2) _____ (number of calls outside community) X _____ (average round-trip mileage to community hospital) = _____

(3) _____ (number of calls occurring outside community and victims taken to hospital outside community service area) X _____ (average round-trip mileage) = _____

Total mileage
 $(A_1 + A_2 + A_3 + B_1 + C_1 + C_2 + C_3) =$ _____

Round up to next thousand = _____

One way mileage for calls outside community
 $\frac{A_2 + A_3 + B_1 + C_2 + C_3}{2} =$ _____

III. Estimated receipts

A. Ambulance fee collections:
 _____ (number of calls) X \$ _____ (ambulance fee) = \$ _____

B. Mileage charge collections:
 _____ (total one way mileage for calls outside community) X \$ _____ (charge per mile) = \$ _____

C. Total potential receipts:
 \$ _____ (ambulance fee collections) + \$ _____ (mileage charge collections) = \$ _____

D. Estimated yearly receipts:
 \$ _____ (total potential receipts) X _____ (% paying bills) = \$ _____

¹ Highway patrol records indicate number of fatal and injury accidents in previous year. Use average of previous 2 years. ² Contact hospitals or operator of previous ambulance service(s) to estimate number of transfers (ambulance calls between hospitals). ³ Obtain population data from Census or from sub-State planning office. ⁴ Obtain average one-way mileage based on distribution of population outside community where

ambulance is located. ⁵ Highway patrol records indicate number of highway injury accidents occurring within and outside community where ambulance is located. ⁶ Obtain average one-way mileage based on where most of the transfers are going. ⁷ Estimate number of calls occurring within community in proportion to population residing in community where ambulance is located.

Form II. Procedure used to estimate annual costs of supplying ambulance service.

I. Capital expenditures

A. Depreciation:

(1) Vehicle depreciation [(cost of unit)/(75,000 miles ÷ yearly mileage)] (round years depreciation to nearest tenth).

Van \$ _____ Hightop van \$ _____ Auto chasis \$ _____

(2) Communication system depreciation [(cost of system)/(10 years)].

New system \$ _____ Attach to present system \$ _____

B. Interest:

[\$ _____ (cost of vehicle) + \$ _____ (cost of communication system) X _____ % (interest rate)] = \$ _____

C. Vehicle insurance (yearly rate) = \$ _____

TOTAL \$ _____

II. Operating expenses

A. Vehicle:

(1) Gasoline (yearly mileage ÷ 10 mpg) X \$ _____ (cost per gallon) = \$ _____

(2) Tires (yearly mileage ÷ 20,000) X \$ _____ (cost per tire) X 4 tires = \$ _____

(3) Oil (yearly mileage ÷ 1,500 miles) X (5 qt. capacity) X \$ _____ (cost per quart) = \$ _____

(4) Filter (yearly mileage ÷ 1,500 miles) X \$ _____ (cost per filter) = \$ _____

(5) Lubrication (yearly mileage ÷ 1,500 miles) X \$ _____ (cost of lubrication) = \$ _____

(6) Tuneup (yearly mileage ÷ 10,000) X \$ _____ (cost per tuneup) = \$ _____

(7) Miscellaneous repairs (yearly mileage ÷ 10,000) X \$ _____ = \$ _____

(8) Two-way radio service contract (\$ _____ yearly maintenance contract) = \$ _____

Vehicle subtotal = \$ _____

B. Communication system at station [base station, remote control and incoder at \$ _____ (maintenance contract)] = Communication subtotal = \$ _____

C. Medical:

(1) Linens [\$ _____ (costs per call) X _____ (number of calls)] = \$ _____

(2) Medical equipment maintenance [\$ _____ (medical equipment maintenance costs per call) X _____ (number of calls)] = \$ _____

(3) Sterile bandages and related items [\$ _____ (costs of sterile bandages and related items per call) X _____ (number of calls)] = \$ _____

Medical subtotal = \$ _____

TOTAL \$ _____

III. Labor costs

A. Fully staffed system (37% of the calls are made on weekends and weekdays between 11 p.m. and 7 a.m.):

(1) [_____ (number of EMT's) X \$ _____ (year salary) = \$ _____] X 110% for benefits = \$ _____

(2) _____ (hours overtime) X \$ _____ (overtime hourly wage rate) = \$ _____

Subtotal = \$ _____

B. Volunteer system (volunteers make all calls, paid \$5 per call or 10 cents a mile whichever is greatest):

- (1) _____ (number of calls under round-trip mileage of 50 miles) X \$10 (cost of volunteers) = \$ _____
 - (2) _____ (number of calls over round-trip mileage of 50 miles) X _____ (average mileage) X 20 cents (per mile cost of volunteers) = \$ _____
 - (3) (bookkeeping and billing charge = \$2) X _____ (number of calls) = \$ _____
- Subtotal = \$ _____

C. Volunteer system (city personnel making calls from 8 a.m. to 5 p.m. on weekdays; otherwise, volunteers make calls and are paid \$5 per call or 10 cents per mile whichever is greater; 61% of the calls are made by volunteers):

- (1) _____ (number of calls under round-trip mileage of 50 miles between 5 p.m. and 8 a.m.) X \$10 (cost of volunteers) = \$ _____
 - (2) _____ (number of calls over 50 miles between 5 p.m. and 8 a.m.) X _____ (average round-trip mileage) X 20 cents (per mile cost of volunteers) = \$ _____
 - (3) Bookkeeping and billing charge = \$2 X _____ (number of calls) = \$ _____
- Subtotal = \$ _____

D. Volunteer system (city personnel make calls from 8 a.m. to 5 p.m. on weekdays; otherwise volunteers make calls and are paid \$5 per night regardless if call made or not; 61% of the calls are made by volunteers) X (365 days per year X \$10) =

- (bookkeeping and billing charge = \$2 X _____ (number of calls) = \$ _____
- Subtotal = \$ _____

E. Hospital-based system (37% of the calls are made on weekends and weekdays between 11 p.m. and 7 a.m.):

- (1) [_____ (number of EMT's) X \$ _____ (yearly wage) = _____] X 110% for benefits = \$ _____
 - (2) _____ (hours overtime worked) X \$ _____ (hourly overtime rate) = \$ _____
- Subtotal = \$ _____

IV. Other expenses:

- A. Storage costs: \$ _____
- B. Malpractice insurance: \$ _____

TOTAL = \$ _____

Form III. Procedure used to compare estimated annual receipts and costs for alternative ambulance delivery systems

I. Estimated receipts (potential receipts) = \$ _____

Potential receipts X 60% payment rate = \$ _____

Potential receipts X 80% payment rate = \$ _____

Potential receipts X 70% payment rate = \$ _____

Potential receipts X 90% payment rate = \$ _____

II. Estimated costs

Specify vehicle, communication system and labor system:

	1st alternative	2nd alternative	3rd alternative	4th alternative
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

A. Capital expenditure:

Vehicle depreciation	\$ _____	\$ _____	\$ _____	\$ _____
Communication depreciation	\$ _____	\$ _____	\$ _____	\$ _____
Interest	\$ _____	\$ _____	\$ _____	\$ _____
Insurance	\$ _____	\$ _____	\$ _____	\$ _____
Subtotal	\$ _____	\$ _____	\$ _____	\$ _____

B. Operating expense:

Vehicle	\$ _____	\$ _____	\$ _____	\$ _____
Communication	\$ _____	\$ _____	\$ _____	\$ _____
Medical	\$ _____	\$ _____	\$ _____	\$ _____
Subtotal	\$ _____	\$ _____	\$ _____	\$ _____

C. Labor costs: Subtotal

\$ _____	\$ _____	\$ _____	\$ _____	\$ _____
----------	----------	----------	----------	----------

D. Other expenses: Subtotal

\$ _____	\$ _____	\$ _____	\$ _____	\$ _____
----------	----------	----------	----------	----------

TOTAL

\$ _____	\$ _____	\$ _____	\$ _____	\$ _____
----------	----------	----------	----------	----------

**UNITED STATES DEPARTMENT OF AGRICULTURE
WASHINGTON, D.C. 20250**

**OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, \$300**

**POSTAGE AND FEES PAID
U.S. DEPARTMENT OF
AGRICULTURE
AGR 101
FIRST CLASS**





UNIVERSITY OF ILLINOIS-URBANA

338.1UN33AE C003
AGRICULTURAL ECONOMIC REPORT WASHINGTON
308 1975



3 0112 018966850