A SYSTEMATIC APPROACH TO RURAL PHYSICIAN

SERVICE PLANNING AND DEVELOPMENT

By

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Bachelor of Science in Agriculture

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Stillwater, Oklahoma

1981

Submitted to the Faculty of the Graduate College
of the Oklahoma State University
in partial fulfillment of the requirements
for the Degree of
MASTER OF SCIENCE
May, 1983

A SYSTEMATIC APPROACH TO RURAL PHYSICIAN

SERVICE PLANNING AND DEVELOPMENT

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PREFACE

The focus of this study is rural physician health care services.
The primary objective is to develop methods which will allow community
leaders to evaluate their community's ability to support a physician(s)
or to allow a prospective physician to analyze a community's medical
economic potential.

I wish to express my appreciation to my major adviser, Dr. Gerald
A. Doeksen, who has provided guidance and assistance not only through-
out this study, but also during the last two years of my undergraduate
program. Appreciation is also expressed to the other members of my
committee, Dr. Robert L. Oehrtman and Dr. Maryls K. Nelson, for their
assistance in the preparation of the final transcript and for their
cooperation in helping me meet my time requirements for completion.

A very special thanks goes to Terry Boucher, June Parks, and Louis
Stackler, for their participation in this study. Their contributions
were the key in making this study possible. I would also like to thank
the many physicians who cooperated in this study. The time and data
they contributed to this research is deeply appreciated.

I would like to also convey my appreciation to the Agricultural
Economics Department of Oklahoma State University for affording me the
opportunity to continue my academic pursuits. Of the many benefits
realized from time in the graduate program, probably none was greater
than the opportunity to meet and work with the many fine professors and

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INTRODUCTION

Need for the Study

The most difficult problem rural community leaders face is the basic economic question of allocating limited resources among varying uses. Their resources are dollars collected from various taxes, whereas uses are the community services demanded by residents. Allocations made by public leaders vary from complete public provision of the service to the support of a private service when the marketplace fails to provide the service of the price and/or quantity demanded.

Community leaders strive to allocate their limited funds in a manner that will maximize public welfare. The goal of maximization requires that leaders compare the costs of providing the service with expectations of utility derived by consumption of that service. Several factors cause this evaluation to be very complex: (1) the subjective nature regarding the value of the various services; (2) a limited data base; (3) lack of systematic procedures for evaluation.

Of the many services provided by the public sector, among the most critical is health services. The philosophy in the United States regarding health care has evolved from one of individual responsibility to that of society sharing the responsibility for seeing that adequate health care is accessible to all. Health care has become a right, not

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a privilege (35). The primary source of health care is at the physician's office. Usually, the physician's office is the first place where a patient contact is made. Physician practices are typically private enterprises. However, community clinics do exist which receive full or partial funding from the public sector. Public funding, whether full or partial, is an attempt to resolve the failure of the market system to provide the level of physician services desired.

Rural areas over the years have had less primary care physicians per 1000 population than urban areas (35). Two primary explanations are given for this misallocation of primary care physicians: (1) the changing demographics of rural areas, and (2) increasingly urban orientation of medical training (3). The utilization of physician services is a function of not only the level of population, but also the age of distribution of the population. The outmigration of rural residents which began in the 1930s caused a relocation in the number of physicians practicing in rural locations. Since the 1940s, specialization by physicians has greatly increased. Physicians engaged in more specialized practices require greater population bases to support their practices. This specialization plus the urban location of medical schools reinforces a bias for physicians to locate in urban locations.

Leaders of many rural communities which lack primary care physician services have used public funds to financially support medical practices. Decisions by community leaders regarding the provision of primary medical services, such as financing a medical student or providing a clinic are often made without the benefit of relevant data and sound systematic procedures.

Just as community leaders are trying to attract a primary care

physician, the physician must evaluate his or her location alternatives. Many rural areas in Oklahoma have realized an increase in population over the past decade and can now support a physician or an additional physician (27). A method is needed to help a physician evaluate the feasibility of alternative locations.

Therefore, a need exists for the development of a method which community leaders or physicians can use to evaluate the feasibility of their town supporting a primary care physician practice or physicians can use to evaluate a community's ability to support a practice. Such a need has been expressed by rural community leaders, and personnel from medical schools, Health Systems Agency and Physician Manpower Placement Commission.

Objectives

The primary objective of this study is to develop procedures which can be used to evaluate the feasibility of a community supporting a primary care physician(s). More specifically, the objectives are to:

1. develop a procedure to estimate the number of primary care physician visits per year;

2. devise a method to estimate physician capital costs;

3. devise a method to estimate physician annual capital and operating costs;

4. present a method to estimate gross income and net income, and

5. estimate future need of primary care physicians in Oklahoma. The methods will be useful to both prospective physicians as they evaluate the feasibility of alternative locations and community leaders as they decide on tactics to employ to attract a physician to their

community. Achieving these objectives will require a study of recent
health service literature to determine relevant factors in the planning
and development process.

Review of Literature

Physician services are one part of the complex health care ser-
vices system. A basic understanding of this overall system is necessary
when examining rural physician health care. Williams and Torrens (35)
are co-editors of a book which presents a comprehensive discussion of
health care in the United States. Two principal ideas evolve from their
comprehensive discussion of health care. These are: (1) society's
philosophical view that health care has become a right, not a privilege;
and (2) the importance of the physician's office as a location of ini-
tial contact and routine treatment for patients.

Focusing on rural health care, Dunn and Doeksen (13) develop a
model of health care systems for nonmetropolitan areas. This model
allows analysis of multiple services including spatial and monetary con-
siderations. May, Doeksen and Green (20) discuss utilization of health
services in the Great Plains. Chaska, Krishan, Smoldt and Ilstrup (6)
look at use of medical services and satisfaction with ambulatory care
among rural Minneapolis population.

The key component of rural health care is the primary care physician.
Radtke (24) analyzed the benefits and costs of a physician to a com-
munity in the Pacific Northwest. Studies by Hassinger, Gill, Hobbs and
Hageman (18) and Cordes (8) examined the perceptions of physicians which
may bias them to locate in urban areas. These studies showed that rural
communities have the greatest success in recruiting physicians with a

rural backbround. Additionally, Cordes, Geriveck and Blair (7) analyzed the problem of physician retention in rural areas and determined that physician income is the most important factor.

Clinics are the typical delivery system for physician services. Clinics include the factors of production necessary to provide physician health care services (e.g., buildings, equipment, labor). Methods for determining the location for rural medical clinics are discussed by Hardy, Marshall and Faris (17). This study developed a model using a heuristic algorithm. Key variables were determined to be (1) geographic configuration of the area being considered; (2) percentage of patients referred to a central medical facility, and (3) distance considered as feasible for travel. Deitz and Brooks (10) used multiple regression to identify the correlates of financial self-sufficiency or rural primary health centers. The main coefficients were determined to be length of time in practice and affiliation with a hospital. Wallack and Kretz (34) used a survey of rural clinics to evaluate factors affecting self-sufficiency. They considered such factors as clinic location from hospital facilities, rate schedules, costs and repayment percentages. A study by Doeksen, Dunn, Stackler and Sheets (12) developed an applied set of procedures to analyze the feasibility of a clinic. Additionally, a study by Alford (1) concerning facility planning and construction presents a systematic approach to community participation in the physical development of a clinic.

A logical extension of these studies is to devise a concise set of procedures for determining the feasibility of a rural physician practice. These procedures should be adaptable for use by either rural community leaders or a physician. Secondary data that could be used to develop

the procedures were not available. Thus, a survey of 16 rural physi-
cians, five medical equipment dealers and four construction firms was
necessary.

Data and Study Area

The main objective of the physician survey was to obtain informa-
tion to estimate annual physician revenue, capital requirements, and
operating costs. It was also desired to measure the growth of revenue
in a new practice. For the estimation of physician revenue, questions
on the type, number, and charge for visits were included. Physicians
who had practiced a year or less were asked to give information on the
type and number of visits on a monthly basis. The amount charged for
additional treatment was also asked. Information on capital require-
ments was obtained by questions on the size of lot and building, and
equipment used in the practice. For estimation of operating costs, ques-
tions were categorized by building, office, medical and personnel.

The physician questionnaire was developed with the assistance of
personnel from medical agencies in Oklahoma. They were: Terry Boucher
with the College of Osteopathic Medicine and Surgery; June Parks with
the University of Oklahoma College of Medicine; and Louis Stackler with
the Oklahoma Health Systems Agency. These people, as well as the author,
administered the surveys in a personal interview with the physicians.

The survey of medical equipment dealers was aimed at obtaining cost
information on equipment used in a physician's practice. This survey
was developed from the responses to the physician questionnaire regard-
ing the type of equipment used. The survey of construction firms was to
determine current construction costs of buildings.

Rural communities in Oklahoma were selected on the basis of the following criteria:

1. availability of cooperating physicians;

2. size of the community (large urban areas of Oklahoma City and Tulsa were excluded);

3. geographical location (to ensure representation for all regions of the state);

4. by length of residence in a given location for the practice;

5. both solo and group practices, and

6. a hospital located in the community of a physician's practice. Figure 1 shows the locations of communities where physicians responded to the survey. Of the 16 responses, 75 percent were from communities of less than 5000 population, and 94 percent from communities of less than 8000 population. The practices surveyed were 75 percent group and 25 percent solo in structure. Responses by length of time in practice at the surveyed location were 56 percent one year or less, 25 percent two years, and 19 percent several years. Sixty-nine percent of the practices were located in communities which had hospital facilities.

Figure 1. Physician Survey Locations
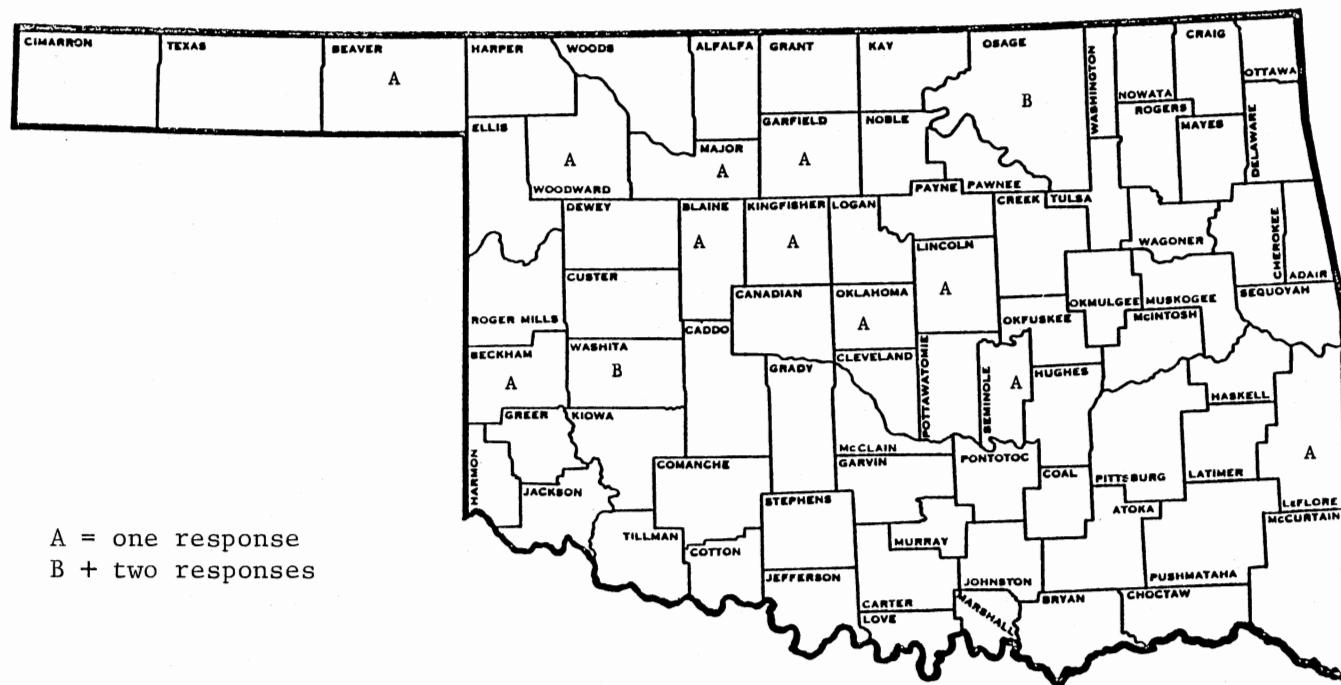
A = one response
B + two responses

CHAPTER II

THE COMMUNITY PLANNINC PROCESS

Before decisions can be made or a feasibility study initiated, it
is important that the planning process begin at the community level.
The planning process involves creating a study committee and obtaining
input and involvement of local residents. The end product of using
the planning process generally results in the smooth implementation of
desired actions.

Need for a Committee

Community leaders should organize a physician recruitment committee
to (1) discuss and analyze the health care needs of their community;
(2) assess the situation to see if a problem truly does exist; and (3)
develop and promote a plan of action to solve any identified medical
care needs or problems. Recruiting physicians for a rural community is
too often pictured as a monumental task fraught with endless obstacles
and frustrations. However, by distributing the responsibilities through-
out the community, the task will be manageable.

For a physician recruitment committee to be successful, three
essential items must be available:

1. time;

2. community support, and

3. financial support.

Time is an item that can be obtained free, but will be more difficult to get than financial donations. A great amount of time will be spent on the telephone talking to prospective physicians, keeping the local people informed, and arranging tours of a community for a prospective physician. It is generally believed that to place one physician, 100 prospects are necessary. From these, only 10 will be sufficiently interested to visit the community. And of these 10, perhaps only three will be considered acceptable for the job. It can easily be seen that a great amount of time is needed to recruit a physician.

The most important consideration of the committee is community support. Although often present, rarely is this support adequately shown to the physician during the recruitment process. A well-attended public reception and an enthusiastic welcome will have a significant impact upon a physician (and the physician's family) considering the potential for a successful practice in a community.

Financial support for the committee can be obtained in a variety of ways. Presently, the most common method is donations made by local citizens and businesses. The committee can, through proper legal channels, be incorporated as a private, non-profit corporation with tax-exempt status. By doing this, all donations made to the committee can be deducted from the contributor's income tax. If there is a civic organization or local hospital that already has tax-exempt status, that organization may be utilized as the central collection point for donations. The money obtained from donations can be used to pay the expenses of interested physicians when they visit the community.

The planning process and feasibility study in this research was developed with the philosophy that ultimately the decision regarding

health care services rests with the community and can be accomplished without special consultation. However, it does require the development of good information, a commitment among community members to listen, analyze, and discuss various ideas and options. While no guarantees are made that once these procedures are completed the committee will succeed in attracting a physician, it will provide committee members with a better understanding of the medical care system. The committee will also have an increased ability to judge whether or not their community can support additional physicians. The information developed should also help in making realistic choices about the financial feasibility of locally supported medical services.

Committee Representation

All too often when a community begins to organize and develop a physician recruitment committee, the main consideration is to get a committee that is large enough to represent all segments of the community. More important than the size of the committee is the amount of dedication and responsibility the members of the committee are willing to accept to achieve their goal of recruiting a physician.

The committee should be composed of men and women with a variety of backgrounds, ages and areas of expertise. Ideally, the recruitment committee should contain at least one person from each of the following groups:

bankers	physicians
newspaper publishers	pharmacists
business people	hospital administrators
city mayor & council	chamber of commerce president
locally elected officials	clergy
nursing home administrators	Senior Citizens Center representative

dentists	other health professionals
nurses	insurance representative
emergency medical personnel	county health department
homemakers	personnel
realtors	school superintendents
interested community residents	civic club presidents

Realistically, not all of these people will want or be willing to participate in the physician recruitment effort. Do not be discouraged if the initial group is small and unorganized. From this first group will come the commitment and leadership needed as the recruitment process develops. As interest grows within the community, the committee will slowly increase in size and status.

At this point in the recruitment planning process, outside resource people may be contacted to assist the committee with its organization and structure. The next section of this chapter contains a listing of organizations and agencies in Oklahoma that have expertise in community organization and physician recruitment. Personnel from these organizations are willing to come to a community at no cost and assist in the development of a physician recruitment committee. With their expertise, a community seeking to recruit a physician will develop and implement a plan of action allowing it to compete on an equal basis with other Oklahoma communities also recruiting physicians.

Resource People

Physician Placement Offices

Physician Placement Officer
The University of Oklahoma College of Medicine
P. O. Box 26901
Oklahoma City, OK   73190
(405) 271-2049

Physician Placement Officer
The University of Oklahoma Tulsa Medical College
2808 S. Sheridan Road
Tulsa, OK   74114
(918) 838-3464

Physician Placement Officer
Oklahoma College of Osteopathic Medicine and Surgery
P. O. Box 2280
Tulsa, OK   74101
(918) 582-1972

Physician Manpower Training Commission

Executive Director
P. O. Box 53551 - Room 710
Oklahoma City, OK   73152
(405) 271-5848

National Health Service Corps

Oklahoma Coordinator
National Health Service Corps
P. O. Box 26901
Oklahoma City, OK   73190
(405) 271-2017

Oklahoma Health Systems Agency

Executive Director
4500 Lincoln Blvd
Oklahoma City, OK   73105
(405) 424-5591 or 1-800-522-9030

Oklahoma Cooperative Extension Service

Division of Agriculture
Department of Agricultural Economics
Oklahoma State University
Stillwater, OK   74078
(405) 624-6081

CHAPTER III

PROCEDURES TO ESTIMATE PHYSICIAN VISITS AND GROSS INCOME

The initial consideration for community leaders interested in attracting a physician or physicians willing to locate in a specific community is the number of physician visits generated annually in the community service area. The number of physician visits is critical in determining the number of physicians an area can support and will provide the basis for estimating the level of physician gross income.

Procedure to Estimate the Number of Physician Visits

The process of attracting a physician to a community is a complicated one involving the availability of physicians, the utilization of their services, and the characteristics of the population of the community. Some fairly simple computations can give community leaders an estimate of potential utilization for physician services in their community. A knowledge of this utilization can also help in determining the size of a clinic. The procedure involves estimating physician visits and utilizing data on the number of patients a physician may see in a year.

Local data for Oklahoma were not available on physician office visits. The most recent information is from a 1980 study (30) for the entire United States. The study gives the average number of physician office visits annually per person by age and sex (Table I). This table

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can be used to estimate physician office vists for a given service area.
For example, each male under the age of 15 has an average of 2.3 physi-
cian office visits per year.

TABLE I

AVERAGE NUMBER OF ANNUAL PHYSICIAN OFFICE VISITS PER PERSON BY
AGE AND SEX, UNITED STATES, 1980

Age Cohort	Sex	
	Male	Female
Under 15	2.3	2.1
15-24	1.4	2.7
25-44	1.8	3.3
45-64	2.6	3.4
65 and over	4.0	4.3

Source: (30)

A visit is a direct personal exchange between an ambulatory patient
and a physician or staff member working under the physician's super-
vision, for the purpose of seeking care and rendering health services.
An ambulatory patient is defined as an individual presenting himself for
personal health services who is neither bedridden nor admitted to any
health care institution on the premises (30). To obtain the number of
physician office visits for a service area, the number of people in each
category is multiplied by the utilization rate and summed across all age

and sex categories (as illustrated in Appendix D). Some patients go directly to a specialist and their physician visits must be subtracted to arrive at primary care physician office visits.

The specialities generally considered to provide primary patient care are general and family practice, internal medicine, pediatrics, and obstetrics and gynecology. A national study shows the number and percent distribution of office visits by physician specialty for 1980 (Table II) (30). By summing the four primary patient care specialties, it was determined that 66.2 percent of all office visits are handled by physicians active in primary patient care.

The remaining 33.8 percent of the office visits are handled by other specialists. As specialists tend to locate in urban areas, the number of cases handled locally will depend on the number of specialists in the area under analysis. Thus, if no specialists are located in the area, 66.2 percent of the total office calls will be the estimated number of local physician office visits.

A study of the profile of medical practices shows the average number of physician office visits per week by location (metropolitan and non-metropolitan areas) and specialty for 1980 (Table III). Also shown is the average number of weeks practiced by specialty and census division (Oklahoma is within W. S. Central region) for 1979 (Table IV). The average number of physician office visits per week (115.1) and the average number of weeks practiced a year (47.4) were derived by summing the specialties involved in providing primary patient care (general and family practice, internal medicine, pediatrics and obstetrics and gynecology) and dividing by the number of specialties summed. The average number of physician office visits per year (5,455.7) was calculated by

TABLE II

NUMBER AND PERCENT DISTRIBUTION OF OFFICE VISITS
BY PHYSICIAN SPECIALTY, UNITED STATES, 1980

Physician Specialty	Number of Visits (thousands)	Percent Distribution
General and Family Practices	191,744	33.3
Medical Specialties	177,127	30.8
Internal Medicine	69,481	12.1
Pediatrics[1]	64,223	11.2
Other	43,423	7.5
Surgical Specialties	172,524	30.0
General Surgery	28,315	4.9
Obstetrics & Gynecology[1]	55,123	9.6
Other	89,086	15.5
Other Specialties	34,350	6.0
Psychiatry	15,856	2.8
Other	18,494	3.2
All Visits	575,745	100.0

[1]Physicians involved in primary patient care account for 66.2 percent of all office visits (derived by summing each specialty).

Source: (30).

TABLE III

AVERAGE NUMBER OF OFFICE VISITS PER WEEK BY SPECIALTY
AND LOCATION, 1980

| | | | Location | |
| | | | Metropolitan | |
Specialty	All	Non-Metropolitan	Less than 1,000,000[b]	1,000,000 and over[c]
General Practice[1]	116.5	133.5	113.6	104.5
Internal Medicine[1]	66.3	85.6	68.7	61.4
Surgery	69.9	80.4	73.7	63.9
Pediatrics[1]	125.2	132.7	133.2	118.7
Obstetrics and Gynecology[1]	96.4	108.6	101.5	89.9
Radiology	45.6	59.2	35.5	49.8
Psychiatry	33.2	35.7	33.8	32.7
Total[a]	78.7	103.1	79.8	70.5

[a]Total includes Anaesthesiology and "Other" categories. [b]Includes counties in SMSAs with 50,000 to 999,999 inhabitants and counties considered potential SMSAs. [c]Includes counties in SMSAs with 1,000,000 or more inhabitants.

[1]Physicians involved in primary patient care. Average number of weekly physician office visits in nonmetropolitan areas of the United States for physicians involved in primary patient care equalling 115.1 (derived by summing each weekly average and dividing by the number of specialties).

Source: (2).

TABLE IV

AVERAGE NUMBER OF WEEKS PRACTICED PER YEAR BY CENSUS DIVISION AND SPECIALTY, 1979

Census Division	General Practice[1]	Internal Medicine[1]	Surgery	Pediatrics[1]	Obstetrics and Gynocology	Radiology	Psychiatry	Anaestheology
				Weeks				
New England	46.5	45.8	46.5	47.3	44.7	48.3	47.8	45.5	41.2
Mid-Atlantic	46.7	47.5	46.3	46.8	46.8	47.1	44.9	46.8	46.8
E. N. Central	46.4	46.3	46.9	46.7	45.4	46.4	46.6	46.7	45.8
W. N. Central	47.3	47.3	46.6	46.6	49.2	50.3	46.8	49.0	47.1
South Atlantic	47.5	47.5	47.7	47.1	48.6	47.7	46.6	47.2	47.0
E. S. Central	47.5	48.9	45.9	47.6	49.1	47.5	45.1	47.2	46.9
W. S. Central	47.4	47.8	46.6	46.7	46.6	48.5	48.2	48.4	47.9
Mountain	47.2	46.7	47.4	46.5	49.2	48.1	47.0	47.4	47.2
Pacific	46.5	47.3	46.3	45.8	45.0	47.1	46.7	46.9	46.3
Total[a]	46.9	47.3	46.7	46.7	46.8	47.5	46.5	47.0	46.5

[a]Total includes "Other" categories.

[b]Census division containing Oklahoma.

[1]Physicians involved in primary patient care. Average number of weeks practiced in W. S. Central census division for physicians involved in primary patient care equals 47.4 (derived by summing each yearly average and dividing by number of specialties).

Source: (2).

multiplying the average number of weekly office visits (115.1) times the average number of weeks practiced a year (47.4).

Thus, once the number of local physician office visits per year is estimated for a service area, a simple division yields the number of physicians the service area can theoretically support. The procedure is demonstrated in the application section.

Supplemental Physician Utilization Data

Community leaders should be aware of additional factors involved in the development and continuity of a physician's practice. The major factor in both aspects is the ability of the physician to achieve an adequate income (7). Physician income is earned by providing health services to patients. Such services are usually categorized by the location where they occur. The most common categories are: (1) physician office visits; (2) hospital visits; (3) emergency room visits, and (4) nursing home visits. Physician office visits are typically the largest revenue source for primary patient care physicians in rural areas. However, visits to a hospital, emergency room and nursing home can be a significant part of a physician's income. Because those visits are a function of the existence of such facilities in the service area, they will be discussed in a later portion of this chapter.

Physician office visits are the key source of physician income as well as the measurement by which estimates are made on the number of physicians an area can support. Local leaders may wish to use the estimate of physician office visits to aid them in assessing their physician health service needs. The two main factors to be examined are:

1. determining the possible need of the community to subsidize a

new physician during the initial phase of developing a practice, and

2. convincing local physicians that the service area can support another physician.

For most new physician practices, it is unrealistic to expect the practice to begin with a full patient load equal to the average for all primary care physicians (5,455.7 office visits a year). In the survey of 16 physicians in rural Oklahoma, it was found that the average number of office visits for the first year of practice was 3,739 (Table V). The number of visits generally increased each month during the first year of practice. The range of office visits was from 1670 to 6619 visits a year. The average number of office visits for both the second year of practice and for an established physician practicing in rural Oklahoma is given in Table VI. The average for the second year (5615 office visits) is very close to the estimated average. The range for the second year of practice was 4000 to 8085 visits a year. The established physician had an average of 8030 office visits and the range of yearly office visits was 5400 to 10,290.

During the first few years of practice, the number of physician office visits may be below the rate necessary for the medical practice to survive on its own. Therefore, community leaders wishing to explore the establishment of a medical practice may need to consider some form of subsidy to support the practice during this time. Three examples and the form this support may take are: (1) providing the clinical space either free or at a low rental charge; (2) paying the physician on a salary basis for the period of time necessary for the practice to become self-sufficient, and (3) negotiating a low interest loan or a line of credit with the local bank.

TABLE V

AVERAGE NUMBER OF RANGE OF MONTHLY PHYSICIAN OFFICE VISITS FIRST YEAR OF PRACTICE, RURAL OKLAHOMA

| Statistic | Months in Practice | | | | | | | | | | | | Annual Total |
	1	2	3	4	5	6	7	8	9	10	11	12	
Average	190	224	254	268	299	331	333	339	332	337	420	412	3739
Range													
Low	50	79	102	118	104	103	116	163	184	165	240	248	1670
High	330	400	440	484	660	765	649	550	550	575	616	600	6619

Source: Survey Data (eight observations).

TABLE VI

AVERAGE NUMBER AND RANGE OF PHYSICIAN OFFICE VISITS, SECOND
YEAR OF PRACTICE AND SEVERAL YEARS OF PRACTICE,
RURAL OKLAHOMA

Statistic	2nd Year[1] of Practice	Several Years[2] in Practice
Average	5,615	8,030
Range		
Low	4,000	5,400
High	8,085	10,290

Source: Survey Data.

[1]Four observations.

[2]Three observations.

The survey indicated that an established physician providing primary patient care in rural Oklahoma had an average number of office visits that was significantly larger than the national data had predicted (8030 in Oklahoma vs. 5455.7 for the rural U. S. as a whole) (2). Therefore, in estimating the number of physicians an area can support, the committee should contact physicians practicing in the service area to determine the actual number of yearly office visits. It is also advisable for the committee to solicit participation, advice, and support from these physicians. Many of the physicians surveyed listed cooperation of established physicians as the key to the success of a new physician practice. Such support may take several forms, one of which is the formation or enlargement of a group practice with the new physician.

It should be noted that a possible benefit of a group practice is the increase in the average number of office visits for the first year of practice of a new physician. The average number of office visits for a new physician joining a group practice is 4652 with a range of 2304 to 7122 visits a year (Table VII). This is higher than the average for all first year practices of 3739 office visits as presented in Table V.

The major categories of other visits are hospital, emergency room, and nursing home. These types of visits are largely a function of the existence of hospitals and nursing homes in the service area. If a community has such facilities, the committee may wish to include an estimate of the number of such visits. Averages and ranges for hospital and emergency room visits for the physician's first year of practice are presented in Table VIII. Total annual visits and the ranges for these visits for established physicians are shown in Table IX. The

TABLE VII

AVERAGE NUMBER AND RANGE OF MONTHLY PHYSICIAN OFFICE VISITS, FIRST YEAR OF GROUP PRACTICE, RURAL OKLAHOMA

Statistic	Months in Practice												Annual Total
	1	2	3	4	5	6	7	8	9	10	11	12	
Average	282	310	322	333	374	425	448	443	384	427	450	454	4652
Range													
Low	77	139	156	155	198	216	214	229	193	239	240	248	2304
High	532	559	453	484	660	765	649	653	550	601	616	600	7122

Source: Survey Data (six observations).

TABLE VIII

AVERAGE NUMBER AND RANGE OF PHYSICIAN HOSPITAL AND EMERGENCY ROOM VISITS FIRST YEAR OF
PRACTICE IN A RURAL OKLAHOMA COMMUNITY WITH A HOSPITAL[1]

| Statistic | Months | | | | | | | | | | | | Annual Total |
	1	2	3	4	5	6	7	8	9	10	11	12	
						Hospital Visits							
Average	41	52	49	53	57	57	64	64	60	56	66	65	684
Range													
Low	0	6	3	11	10	12	20	30	21	18	30	30	191
High	112	143	138	141	176	169	137	132	121	99	130	127	1629
						Emergency Room Visits							
Average	52	61	65	62	66	63	57	55	54	55	57	61	708
Range													
Low	17	18	20	9	21	17	16	19	11	25	25	25	233
High	120	120	132	127	136	121	120	120	120	120	120	120	1476

[1]Insufficient data to analyze Nursing Home Visits.

Source: Survey Data (seven observations).

TABLE IX

PHYSICIAN HOSPITAL, EMERGENCY ROOM, AND NURSING HOME
VISITS FOR ESTABLISHED PHYSICIANS IN A RURAL
COMMUNITY WITH A HOSPITAL IN RURAL OKLAHOMA

Statistic	Hospital	Emergency Room	Nursing Home
Average	2305	1067	247
Range			
Low	1350	500	0
High	3840	1500	540

Source: Survey Data (three observations).

wide data variation shown in these tables indicates the need for the committee to contact local practicing physicians and hospital and nursing home administrators for a more precise estimate of new physician visits in these categories.

If such information is unavailable, an estimate of hospital, emergency room and nursing home visits can be formulated from the number of projected office visits. Data in Table X show the average, range, and the number of hospital, emergency room and nursing home visits per office visit. For each physician office visit there occurred an average of 0.25 hospital, 0.16 emergency room, and 0.04 nursing home visits. Therefore, if annual office visits are projected to be 4000, an average of 1000 hospital visits (4000 office visits x 0.25 hospital visits per office visit), 640 emergency room visits (4000 office visits x 0.16 emergency room visits per office visit) and 160 nursing home visits (4000 office visits x 0.04 nursing home visits per office visit would be estimated.

After the number of office, emergency room, hospital, and nursing home visits are estimated, the question is whether or not the community service area can support a physician. A self-sufficient practice may be defined as a practice that returns a net income adequate to sustain the average primary care physician.

A national study gives the average net income from medical practice by specialty and location (Table XI) and by age of physician and specialty (Table XII) (2). The average yearly net income of primary care physicians in nonmetropolitan locations in 1979 was $74,750, and physicians under the age of 35 for all locations was $62,500.

Given that net income is the difference between gross income and

TABLE X

AVERAGE NUMBER AND RANGE OF ANNUAL PHYSICIAN VISITS,
COMMUNITIES WITH HOSPITAL

Statistic	Office	Hospital	Emergency Room	Nursing Home[1]
Average	5260	1340	850	216
Range				
Low	2570	253	269	0
High	8400	3840	1500	720
Number of Hospital and Emergency Room Visits per Office Visit				
Average	--	0.25	0.16	0.04
Range				
Low	--	0.10	0.10	0.0
High	--	0.46	0.18	0.12

[1]Nursing Home visits include all locations.

Source: Survey Data (eleven observations).

TABLE XI

AVERAGE ANNUAL NET INCOME FROM MEDICAL PRACTICE BY
SPECIALTY AND LOCATION, 1979

| | | | Location | |
| | | | Metropolitan | |
Specialty	Total	Non-Metropolitan	Less than 1,000,000[b]	1,000,000 and over[c]
			Dollars	
General Practice[1]	62,000	69,200	69,000	57,700
Internal Medicine[1]	76,200	75,800	75,800	76,500
Surgery	96,000	91,400	96,200	97,300
Pediatrics[1]	60,400	59,200	69,900	60,200
Obstetrics and Gynecology[1]	91,800	94,800	91,400	91,400
Radiology	98,000	94,100	100,000	97,700
Psychiatry	62,600	58,400	60,300	61,900
Anaesthesiology	91,400	70,700	93,400	93,200
Total	78,400	76,400	78,700	78,800

[a]Total includes "Other" category. [b]All counties in SMSAs with 50,000 to 999,999 inhabitants and [c]all counties in SMSAs with 1,000,000 or more inhabitants.

[1]Physicians involved in primary patient care. Average net income for nonmetropolitan physicians involved in primary patient care equals $74,750 (derived by summing each yearly average and dividing by the number of specialties).

Source: (2).

TABLE XII

AVERAGE ANNUAL NET INCOME FROM MEDICAL PRACTICE BY AGE OF PHYSICIAN AND SPECIALTY, 1979

| Specialty | Age of Physician | | | | | | All Ages |
	Less than 35	36-40	41-45	46-50	51-60	61 and over	
General Practice[1]	56,200	69,500	77,200	70,500	64,700	53,500	62,000
Internal Medicine[1]	60,100	86,300	84,100	84,400	81,600	64,500	76,200
Surgery	77,800	99,700	112,400	102,600	101,900	74,200	96,000
Pediatrics[1]	45,100	58,700	71,100	69,000	65,900	49,600	60,400
Obstetrics and Gynecology[1]	88,600	103,800	94,800	109,900	94,700	65,900	91,800
Radiology	75,200	92,600	102,800	109,900	115,400	77,700	98,000
Psychiatry	51,500	64,900	69,300	65,000	65,000	53,600	62,600
Anaesthesiology	86,000	87,500	94,100	96,000	93,800	84,900	91,400

[1]Physicians involved in primary patient care. Average net income for physicians involved in primary patient care under the age of 35 equals $62,500 (derived by summing each yearly average and dividing by the number of specialties).

Source: (2).

total costs, it is necessary to develop procedures to estimate gross

income and total costs before expected net income can be determined. In

the following section, a technique to project gross income is devised,

while Chapter IV contains a method to estimate total costs and net

income.

Estimating Gross Income

Gross income is equal to the amount of physician services provided

multiplied by the price charged for such services. Consequently, the

data needed to predict gross income for a medical practice are:

1. physician health care categorized by type of services rendered,

    and

2. an estimate of rates charged for different types of health

    services.

Although there exists a multitude of services that a physician may

render, gross income can be estimated by categorizing such services by

the location of provision (i.e., office visits, hospital visits, emer-

gency room visits, and nursing home visits). The remaining data needed

to calculate gross income are estimates of the charges for services.

Average and ranges for such charges obtained in the survey of primary

care physicians in rural Oklahoma are presented in Table XIII. A more

detailed presentation of charges for physician services is given in

Appendix A. Office visit charges are usually divided into initial and

routine visits. For this reason, it will be necessary to calculate the

number of office visits that occur in each category. A national study

stated that office visits were 14.9 percent initial and 85.1 percent

routine for all U. S. physicians in 1980 (30). Medical charges are

TABLE XIII

AVERAGE RATES AND RANGES CHARGED MAJOR CATEGORIES

Statistic	Office Visit (Initial)	Office Visit (Routine)	Charge for Medication and Treatment per Office Visit	Hospital Visit[1]	Emergency Room Visit	Nursing Home Visit
			Dollars			
Average	21.19	16.13	10.00 or 15.00[2]	23.31	26.38	20.13
Range						
Low	15.00	12.00		17.00	20.00	12.00
High	30.00	21.00		30.00	40.00	40.00

Source: Survey Data (sixteen observations)

[1] A possible refinement of this procedure to estimate total income would be to segregate hospital visits into admissions and visits. Because of the lack of data on the number of admissions, it is not attempted in this study. Values for rates charged hospital admissions is given in Appendix A for comunities which are able to make this distinction.

[2] $10 if no x-ray machine, $15 if x-ray machine is available.

also a source of income. The survey of rural physicians in Oklahoma
reported that a charge for additional services were made on 41 percent
of the office visits. The average rate charged for additional services
was $10 for a practice without x-ray facilities, and $15 for clinics
with x-ray equipment.

Using the projection of physician visits and the values in Table
XIII, an estimate of gross income can be derived. Data in Table XIV
illustrate such a calculation. The projected values of physician vis-
its are shown to be 4,000 office visits comprised of 596 initial and
3,404 routine office visits, 1,000 hospital visits, 640 emergency room
visits, 1,640 office visits with additional services, and 160 nursing
home visits. Multiplying these categories of visits times the rate
schedule (Table XIII) produces a gross income estimate for low, average,
and high rate charges ($97,908.00, $127.349.04, and $167,764, respect-
ively).

These figures, when applied against an estimate of total cost will
provide a projection of the medical practice's net income. The follow-
ing chapter will detail a procedure by which costs can be projected.

TABLE XIV

ESTIMATE OF GROSS INCOME

Projected Physician Health Service Demand							Visits

A. __Estimation of Types of Physician Visits__

        __Office Visits__   4,000

                Initial   x 14.9 percent[1]   596
                Routine   x 85.1 percent[1] 3,404
                With Additional Services   x 41.0 percent[2] 1,640

        __Hospital Visits__

                4,000 Office Visits x $0_{.}25$ Hospital
                  Visits per Office Visit   1,000

        __Emergency Room Visits__

                4,000 Office Visits x 0.16 Emergency
                  Room Visits per Office Visit   640

        __Nursing Home Visits__

                4,000 Office Visits x 0.04 Nursing
                  Home Visits per Office Visit   160

B. __Estimation of Gross Revenue__

  Category of Service

	# of Visits		Average Charge	Average Revenue	Rate Schedule			High Revenue
					Low Charge	Low Revenue	High Charge	
Office Visits (initial)	596	x	$21.19	$ 12,629.24	$15	$ 8,940.00	$30	$ 17,880.00
Office Visits (routine)	3,404	x	16.13	54,906.52	12	40,848.00	21	71,484.00
Charge for Additional Services per Office Visit	1,640	x	10.00	16,400.00	10	16,400.00	10	16,400.00
Hospital Visits	1,000	x	23.31	23,310.00	17	17,000.00	30	30,000.00
Emergency Room Visits	640	x	26.38	16,883.20	20	12,800.00	40	25,600.00
Nursing Home Visits	160	x	20.13	3,220.08	12	1,920.00	40	6,400.00
Total				$127,349.04		$97,908.00		$167,764.00

[1]Source: (30).

[2]Source: Survey Data (sixteen observations).

CHAPTER IV

PROCEDURES TO ESTIMATE ANNUAL COSTS AND

NET INCOME FOR A PHYSICIAN

Total cost is composed of capital and operating costs. Capital
costs are the investments in durable assets that contribute to the
delivery of physician health services such as land, buildings, and
equipment. Operating costs are those costs incurred as heralth ser-
vices are provided.

Procedure to Estimate Capital Costs

The major capital costs in a rural medical practice are building,
land, and equipment costs. Each type of cost is discussed below.

Building Costs

Building costs are the expenditures made in the physical development
of the structure which will house the medical practice. Several possible
approaches to facility development are: (1) conventional architectural
design and competitive bid; (2) design and construction by the same firm;
(3) modular construction; (4) mobile home; (5) renovation of existing
structure; and (6) lease. [For a discussion of advantages and disadvan-
tages of different types of structures see (1)].

The most common type of structure found in the survey of rural
Oklahoma medical practices was that of conventional construction of a

permanent structure. Construction costs are usually discussed in terms of cost per square foot. The cost per square foot in November 1982 ranged from $50 to $55. (Cost of facility usually includes formation of a parking lot.) These estimates exclude the costs of land, which averaged $11,750 per acre. The typical size lot was one acre. (If local data are available, they should be used in estimating construction and land cost.)

The survey of clinics indicated that each physician had an average of four examination rooms with an average total space of 1,947 square feet. This was larger than expected and could be an indication of under-staffed facilities (clinics built for two or more physicians, with only one currently practicing). The normal square footage utilized per phy-sician ranged from 1,125 to 1,500. This space included the examination rooms, business office, reception area, laboratory, and conference room. The reception area, business office, conference room and laboratory are often shared in group practices.

Equipment

Data in Table XV present the survey results on equipment found in rural clinics by location in the clinic and the percent of respondents having such equipment. For example, in the clinics surveyed, 100 per-cent had chairs, a desk, and a phone in the physician's office, from 25 to 50 percent had a clock and credenza in their office. Using Table XV, community leaders could develop a list of equipment suitable for a clinic. As an example, community leaders could decide to investigate the cost of equipping a clinic with only the equipment found in at least 50 percent of the responses.

TABLE XV

EQUIPMENT FOUND IN CLINICS, BY ROOM AND PERCENT OF
RESPONSDENTS INDICATING ITS PRESENCE

0 to 25%	25% to 50%	50% to 75%	75% to 100%	100%
		RECEPTION ROOM		
Triple chairs Toy box	Double chairs Lamps Waste receptacle Toys	Pediatric chair	Single Chairs Magazine Rack Tables	
		BUSINESS OFFICE		
Computer Safe Stool Telephone answering service	Bulletin board Lamps Rolodex	Vertical file	Clock Dictaphone Filing cabinet Medical records filing system with pegboard	Adding machine Secretarial chairs Copying machine Desks Medical dictionary Telephone Typewriter Waste Receptacle
		PHYSICIAN OFFICE		
	Clock Credenza	Lateral desk file Dictaphone Lamps		Chairs Desk Telephone
		CONFERENCE ROOM		
Sofa	Audio/Video equipment Clock Fire extinguisher	Heating plate Vacuum sweeper	Table Coat rack/hooks Refrigerator Chairs	Cabinets Kitchen utensils

TABLE XV (Continued)

0 to 25%	25% to 50%	50% to 75%	75% to 100%	100%
	EXAMINATION/TREATMENT ROOM			

	Bulletin board
	Mirror
	Diathermy unit
	Sigmoidoscope
	Utility Cart
		Ultra Sound
		  Anascope
		Cast cutter
		Compressor/
		  suction
		Portable
		  oxygen tanks
		  mask and
		  carrier
		Trays-ear
			Gooseneck lamp
			Pediatric scale
			Table
			Side Chairs
			Soap Dispenser
			Clothes rack/
			  hooks
			Electrocardio-
			  graph
			Mayo instrument
			  stand
			Sinks
			Snellen Eye
			  chart
			Trays-eye
			Trays-surgical
				Blood pres-
				  sure Cuff
				Cabinets
				Examination
				  table
				Opthalmo-
				  scope
				Otoscope
				Scales
				Waste
				  receptacle

	LABORATORY			

	Alcohol lamp
	  or Bunsen
	  Burner
	Centrifuge
	  (urine)
	Centrifuge
	  (blood)
	Chairs
	Dop Tone
	  (minidop)
	Eye tone
	Punch
	Biopsy
	Automatic cell
	  counter
		Centrifuge
		  (blood and
		  urine)
		Flashlights
		Hemogrameter
		Incubator
		Substage lamp
		Elevated
		  counter stool
		Tape dispenser
		Urinometer
		X-Ray machine
			Autoclave
			Fetoscope
			Microscope
			Sink
			Soap dispenser
			Towel Dispenser
			X-Ray View Box
				Refrigerator

Source: Survey Data (sixteen observations)

While this procedure will identify the type of equipment it is also necessary to determine the amount of such equipment to provide. Data in Tables XVI and XVII are the average number of specific pieces of equipment found in solor and group practices (two or three physicians), respectively. These tables were derived by choosing the most frequent types and amounts of equipment that were given as a response for clinics of these sizes in the survey of rural medical practices in Oklahoma.

Once community leaders have determined the equipment needed, this information must be integrated with the price of the equipment to estimate the equipment cost. Dealers of medical equipment were interviewed in 1982 to arrive at average, low, and high price estimates (Table XVIII). Using price data and equipment needs, an estimate of equipment cost can be obtained. This is illustrated in Table XIX. The cost of equipment in solor practice with average equipment is $31,238.08. An x-ray machine was not found in a typical solo practice.

Combining an estimate of land and building cost with the value of equipment cost will provide a calculation of total capital cost. This is illustrated in Table XX. Using the survey average for a solo practice, the cost of building and land equals $82,500 and $11,750, respectively. Cost of equipment is estimated in Table XIX at $31,238.07. Total capital needs for a solo practice is $125,488.07.

Community leaders should keep in mind that land and construction costs vary among locations, and that using local data is preferred. Actual construction design and equipment selection should involve the physician at an early phase of physician recruitment. In addition, the price listed for equipment has been averaged among suppliers. A comparison among dealers in your area for final equipment selection is

TABLE XVI

TYPICAL EQUIPMENT FOUND IN SOLO PRACTICE CLINIC

RECEPTION ROOM	BUSINESS OFFICE	PHYSICIAN OFFICE
15 single chairs 1 magazine rack 2 tables 1 waste receptacle	1 bulletin board 1 calculator 3 secretarial chairs 1 clock 1 copying machine 2 desks 1 dictaphone 3 filing cabinets 1 medical dictionary 1 medical records file system with pegboard 1 rolodex 2 telephones 1 typewriter 1 vertical file 2 waste receptacles	3 chairs 1 credenza 1 desk 1 lamp 1 telephone

CONFERENCE ROOM	EXAMINATION/TREATMENT Rms	LABORATORY

1 cabinet
2 chairs
1 coat rack/hooks
1 set of kitchen utensils
1 vacuum sweeper
	4 rooms
	4 blood pressure cuffs
	4 cabinets
	4 examination tables
	3 gooseneck lamps
	4 ophthalmoscope/otoscope
	1 pediatric scale/table
	1 scale
	4 side chairs
	4 soap dispensers
	4 stools
	4 towel dispensers
	4 waste receptacles
	1 ultrasound light
	1 diathermy unit
	1 anascope
	1 cast cutter
	4 clothes rack/hooks
	1 electrocardiograph
	1 mayo instrument stand
	1 portable oxygen tank,
	  with mask & carrier
	4 sinks
	1 snellen eye chart
	1 tray-eye
	1 tray-ear
	1 tray-surgical
		1 autoclave
		1 centrifuge
		  (blood & urine)
		1 fetoscope
		1 microscope
		1 refrigerator
		1 sink
		1 soap
		  dispenser
		1 X-Ray view
		  box
		1 flashlight
		1 elevated
		  counter stool
		1 towel
		  dispenser

TABLE XVI (Continued)

EXAMINATION/TREATMENT ROOM			LABORATORY
	Two Physicians	Three Physicians	
Rooms	8	12	1 Alcohol Lamp or
Blood Pressure Cuffs	8	12	Bunsen Burner
Cabinets	8	12	1 Autoclave
Examination Tables	8	12	1 Centrifuge Unit
Gooseneck Lamps	4	6	(Blood & Urine)
Mirrors	8	12	1 Fetoscope
Ophthalmoscope-			1 Flashlight
Otoscope	8	12	1 Hemogramometer
Pediatric Scale/Table	2	3	1 Incubator
Scales	4	6	1 Microscope
Side Chairs	8	12	1 Substage Lamp
Soap Dispensers	8	12	1 Refrigerator
Stools	8	12	1 Sink
Towel Dispensers	8	12	1 Soap Dispenser
Waste Receptacles	8	12	2 Elevated Counter
Ultrasound Unit	1	1	Stools
Cast Cutter	1	1	1 Tape Dispenser
Clothes Rack/Hooks	8	12	1 Towel Dispenser
Electrocardiograph	1	1	1 Urinometer
Compressor/Suction	1	1	2 X-Ray View Boxes
Mayo Instrument Stands	2	3	1 X-Ray Machine
Portable Oxygen Tank,			
Mask and Carrier	1	1	
Sinks	8	12	
Snellen Eye Chart	2	3	
Trays-Eye	1	1	
Trays-Ear	1	1	
Trays-Surgical	1	1	

Source: Survey Data (nine observations)

TABLE XVII

TYPICAL EQUIPMENT FOUND IN GROUP PRACTICE CLINIC

Reception Room	Business Office
10 single chairs 5 double chairs 1 magazine rack 3 tables	2 calculators 3 secretarial chairs 1 clock 1 copying machine 4 desks 1 dictaphone 4 filing cabinets 2 lamps 2 medical dictionaries 1 medical records file system with pegboard 2 telephones 2 typewriters 2 vertical files 3 waste receptacles

Physician's Office	Conference Room
3 chairs 1 desk 1 lateral desk file 1 dictaphone 1 lamp 1 telephone	3 cabinets 5 chairs 1 clock 1 table 1 coat rack/hooks 1 heating plate 1 set of kitchen utensils 1 refrigerator 1 fire extinguisher

TABLE XVIII

COST OF EQUIPMENT FOUND IN TYPICAL SOLO AND GROUP PRACTICES,
1982 PRICES

Equipment Type	Average Price	Range	
		Low	High
Reception Area		Dollars	
chairs, single	19.31	50.00	125.00
chairs, double	134.35	-	-
magazine rack	48.46	10.20	82.55
tables	70.00	-	-
waste receptacle	15.50	14.00	17.50
Business Office			
adding machine/ calculator	155.75	79.00	270.00
bulletin board	27.90	13.00	55.10
clock	43.70	20.62	80.95
copying machine	186.62	129.95	249.95
desk	316.65	228.55	441.85
dictaphone[1]	313.45	-	-
filing cabinet	157.66	98.90	304.50
lamp	53.13	23.50	89.00
medical dictionary	45.00	-	-
medical records filing system with pegboard	1,500.00	-	-
Rolodex	37.12	15.00	75.86
secretarial chair	109.13	74.95	141.75
telephone	-	-	-
typewriter[2]	570.00	-	-
vertical file[1]	400.00	-	-
waste receptacle	15.50	14.00	17.50
Physician's Office			
chair	214.91	125.00	379.50
credenza	308.51	239.40	445.50
desk	321.18	185.25	489.50
telephone	-	-	-
lateral desk file[1]	200.00	-	-
lamp	53.13	23.50	89.00

TABLE XVIII (Continued)

Equipment Type		Range	
		Low	High
Conference Room		Dollars	
cabinet[1]	300.00	–	–
chairs[1]	90.00	–	–
clock	43.70	20.61	80.95
coat rack/hooks	75.00	44.20	151.70
fire extinguisher	43.20	–	–
heating plate	20.99	12.99	29.99
kitchen utensils[1]	25.00	–	–
refrigerator[2]	302.88	–	–
table	333.00	69.40	629.60
vacuum sweeper[1]	150.00	–	–
Laboratory			
alcohol lamp or Bunsen burner[2]	29.32	–	–
autoclave	858.64	169.50	1,500.00
centrifuge (blood and urine)[2]	470.00	–	–
elevated counter stool[1]	125.00	–	–
fetoscope[1]	80.00	–	–
flashlight[1]	3.00	–	–
hemogramometer[1]	150.00	–	–
incubator	150.00	–	–
microscope	2,917.00	1,200.00	5,823.00
refrigerator[2]	374.00	–	–
sink[1]	175.00	–	–
soap dispenser[2]	17.50	–	–
substage lamp[1]	40.00	–	–
tape dispenser[1]	30.00	–	–
towel dispenser	22.50	–	–
urinometer	6.25	4.25	10.00
X-ray machine with processor[1]	40,000.00	–	–
X-4ay view box	135.00		
Examination/Treatment Room			
anascope	111.00	60.00	142.50
blood pressure cuff	88.25	50.00	120.00
cabinet[2]	415.00	–	–
cast cutter[2]	255.00	–	–
clothes rack/hooks	31.00	–	–
compressor/suction	325.00	–	–
diathermy unit	2,500.00	–	–

TABLE XVIII (Continued)

Equipment Type	Average Price	Range	
		Low	High
Examination/Treatment Room		Dollars	
electrocardiograph	2,091.61	1,875.00	2,400.00
examination table	722.83	230.00	1,035.00
gooseneck lamp	60.00	–	–
mirror[1]	10.00	–	–
Mayo instrument stand	122.72	90.00	178.15
ophthalmoscope- otoscope	197.00	65.75	365.00
pediatric scale table	219.00	–	–
scales	214.68	180.00	264.00
side chairs	140.00	–	–
sink	150.00	100.00	200.00
soap dispenser[2]	17.50	–	–
Snellen eye chart	5.00	–	–
stool	22.50	–	–
towel dispenser[2]	22.50	–	–
trays - ear[1]	29.00	10.00	43.00
trays - eye[1]	10.00	–	–
trays - surgical[2]	23.55	–	–
ultrasound[2]	3,250.00	–	–
waste receptacle	128.67	40.00	175.00
portable oxygen tank mask and carrier[2]	205.00	–	–

Source: Survey Data.

[1] One observation on equipment cost.

[2] Two observations on equipment cost

[3] Telephone is usually a rental item, included directly in operational expenses.

TABLE XIX

CALCULATION OF EQUIPMENT COST FOR AVERAGE SOLO
PRACTICE, 1982 PRICES

EQUIPMENT TYPE	PRICE PER UNIT	TOTAL COST
	DOLLARS	
LABORATORY		
1 autoclave	858.64	858.64
1 centrifuge (blood & urine)	470.00	470.00
1 fetoscope	80.00	80.00
1 flashlight	3.00	3.00
1 microscope	2,917.67	2,917.67
1 refrigerator	374.00	374.00
1 sink	175.00	175.00
1 soap dispenser	17.50	17.50
1 elevated counter stool	125.00	125.00
1 towel dispenser	22.50	22.50
1 X-Ray view box	135.00	135.00
TOTAL		5,178.31
EXAMINATION/TREATMENT ROOM		
4 blood pressure cuffs	88.25	353.00
4 cabinets	415.00	1,660.00
4 exam tables	722.83	2,891.32
3 gooseneck lamps	60.00	180.00
4 ophthalmoscope-otoscopes	197.00	788.00
1 pediatric scale/table	219.00	219.00
1 scale	214.68	214.68
4 side chairs	140.00	560.00
4 soap dispensers	17.50	70.00
4 stools	203.33	813.32
4 towel dispensers	22.50	90.00
4 waste receptacles	128.67	514.68
1 ultrasound unit	3,250.00	3,250.00
1 diathermy unit	2,500.00	2,500.00
1 anascope	114.42	114.42
1 cast cutter	255.00	255.00
4 clothes rack/hooks	31.00	124.00
1 electrocardiograph	2,091.67	2,091.67
1 mayo instrument stand	122.72	122.72
1 portable oxygen tank mask and carrier	205.00	205.00
4 sinks	150.00	600.00
1 snellen eye chart	5.00	5.00
1 tray-eye	10.00	10.00
1 tray-ear	29.00	29.00
1 tray-surgical	23.55	23.55
TOTAL		17,684.36

TABLE XIX (Continued)

EQUIPMENT TYPE	PRICE PER UNIT	TOTAL COST
	DOLLARS	
RECEPTION ROOM		
15 single chairs	91.31	1,369.65
1 magazine rack	48.46	48.46
2 tables	70.00	140.00
1 waste receptacle	15.50	15.50
TABLE		$1,573.61
BUSINESS OFFICE		
1 bulletin board	27.90	27.90
1 calculator	155.75	155.75
3 secretarial chairs	109.13	327.39
1 clock	43.70	43.70
1 copy machine	186.62	186.62
2 desks	316.65	633.30
1 dictaphone	313.45	313.45
3 filing cabinets	157.66	472.98
1 medical dictionary	45.00	45.00
1 medical records file system with pegboard	1,500.00	1,500.00
1 rolodex	37.12	37.12
2 telephones (1)	---	---
1 typewriter	570.00	570.00
1 vertical file	400.00	400.00
2 waste receptacles	15.50	31.00
TOTAL		4,744.21
PHYSICIAN'S OFFICE		
3 chairs	214.92	644.76
1 credenza	308.51	308.51
1 desk	321.18	321.18
1 lamp	53.13	53.13
1 telephone (1)	---	---
TOTAL		1,327.58
CONFERENCE ROOM		
1 cabinet	300.00	300.00
2 chairs	90.00	180.00
1 coat rack/hooks	75.00	75.00
1 set of kitchen utensils	25.00	25.00
1 vacuum sweeper	150.00	150.00
TOTAL		730.00

TABLE XIX (Continued)

COST SUMMARY BY AREA	TOTAL COST
	DOLLARS
	COST
Reception Room	1,573.61
Business Office	4,744.21
Physician's Office	1,327.58
Conference Room	730.00
Laboratory	5,178.31
Examination/Treatment Room	17,684.36
TOTAL EQUIPMENT COST	31,238.07

Telephone is usually a rental item, included directly in operational expenses.

TABLE XX

CALCULATION OF CAPITAL COSTS (1982)

Building Costs	
Number of Physicians	1 Physician
times	
Square Feet per Physician	1,500 sq. ft.
times	
Cost of Construction/sq. ft. (44.87)[1]	$55.00
EQUALS	$82,500.00

Land Costs	
Size of Lot (1 acre)[1]	1 acre
times	
Price per acre ($11,750)[1]	$11,750 per acre
EQUALS	$11,750

Equipment Costs (from Table XVIII)	
Total Capital Costs	$125,488.07

[1]Survey average; if local data are available, they should be used in estimation.

advisable.

Procedure to Estimate Operating Costs

Operating costs in a medical practice are expenditures incurred in the provision of physician services. For a rural practice, such costs are grouped into building, office, medical, and personnel.

Building

The major components of building operating costs are utilities, maintenance, janitorial services, and taxes. Based on the survey of rural Oklahoma practices, the average response for such costs per year are presented in Table XXI. Electricity and gas costs were found to be a function of the size of the clinic, and averaged $0.74 and $0.17 per square foot, respectively. Insurance, at replacement cost, is given for the building and contents per $100 value and type of structure (concrete or frame). The remaining building costs are given on a per physician basis. For example, annual maintenance costs averaged $799 per physician.

Office

Office expenses are incurred in the operation of the clinic's business office. Average annual expenses, as determined in the survey of physicians, are given per physician per year in Table XXII. Expenses for office supplies are a function of the number of office visits. The survey average was $0.44 per visit, or $2,515 per physician per year.

TABLE XXI

AVERAGE ANNUAL BUILDING OPERATING COSTS (1982)

Cost Category	Annual Cost per Unit
	Dollars
Electricity	0.74 per square foot
Gas	0.17 per square foot
Water	131.00 per physician
Sewer	86.00 per physician
Trash	150.00 per physician
Maintenance	799.00 per physician
Janitor	1,968.00 per physician
Taxes	1,881.00 per physician[1]

Insurance

Type of Building	Cost per $100 Value (replacement cost)	
	Building	Contents
Concrete-Brick Veneer	1.293	1.076
Frame	1.66	1.45

Source: Survey Data (sixteen observations)

[1]If actual millage rate is known, it should be applied to value of structure to determine tax payment per year.

TABLE XXII

AVERAGE ANNUAL OFFICE OPERATING COSTS (1982)

Cost Category	Annual Cost per Physician	
	Dollars	
Telephone	2,297	
Office Supplies	2,515	($.044 per office visit)
Office Equipment	200	
Billing	941	
Retainer Fee[1]	1,086	
Auto Expenses	4,800	
Convention (CME)	1,825	
Professional Dues	715	

Source: Survey Data (sixteen observations)

[1]Lawyer, Accountant, CPA, Practice Management Consultant, etc.

Medical

Medical costs can be categorized by medical equipment maintenance, medical supplies, and malpractice insurance. Table XXIII contains average costs of such outlays per physician per year. Medical supplies, similar to office supplies, are a function of the volume of office visits and were $0.71 per visit, or $2,330 per physician per year.

Personnel

Labor in a medical practice can typically be divided into medical personnel and support personnel. There exists some variation in the types of personnel employed in these categories. Table XXIV details average salaries and their ranges by job title and/or qualifications found in the survey of rural clinics. An examination of the data in this table show that the annual salary of a registered nurse averaged $13,139 and ranged from a low $10,134 to a high of $16,800. In some categories, the number of observations was low and the resulting averages appear large. For example, there was one receptionist bookkeeper making $11,760 per year. By comparison, this salary was higher than the LPN's. Years of experience, size of practice, and so forth were not accounted for in this analysis. Local wage rates if available should be used to calculate specific annual personnel costs. Fringe benefits were found to average approximately 15 percent of total salary.

To calculate labor costs, it is first necessary to determine the type of personnel employed in a rural clinic. This information is summarized in Table XXV for solo and group practices of two to three physicians. This table was developed by choosing the most frequent

TABLE XXIII

AVERAGE MEDICAL OPERATING COSTS (1982)

Cost Category	Annual Cost per Physician	
	Dollars	
Medical Equipment Maintenance	1,033	
Medical Supplies	2,330	($0.71 per office visit)
Malpractice Insurance	2,917	

Source: Survey Data (sixteen observations)

TABLE XXIV

ANNUAL PERSONNEL COSTS FOR MEDICAL AND SUPPORT PERSONNEL (1982)[1]

Type of Employee	Average Annual Salary	Range	
		Low	High
	Dollars		
Other Medical Personnel			
Medical Assistant	9,760.00	7,800.00	10,680.00
Licensed Practical Nurse	9,630.00	7,500.00	14,400.00
Registered Nurse	13,139.00	10,314.00	16,800.00
Laboratory Technician	15,743.00	–	–
Support Personnel			
Receptionist	9,961.00	7,200.00	12,300.00
Bookkeeper	11,164.00	9,360.00	15,322.00
Receptionist/Bookkeeper	11,760.00	–	–
Medical Secretary	8,407.00	7,200.00	8,832.00
Insurance Clerk	8,160.00	–	–

Source: Survey Data (sixteen observations)

[1]Average fringe benefits were determined to be 15 percent of the employee's total salary.

TABLE XXV

MOST FREQUENT TYPES OF PERSONNEL IN SOLO AND GROUP PRACTICES
(2-3 physicians)

Type of Practice	Other Medical Personnel			Number
	Type	Number		
Solo[1]	Licensed Practical Nurse	1	Receptionist/ Bookkeeper	1
Group (2-3 Physicians)[2]	Licensed Practical Nurse	1	Receptionist/ Bookkeeper	1
	Medical Assistant	1	Receptionist	1
	Laboratory Technician	1		

Source: Survey Data.

[1]Five observations.

[2]Nine observations.

[3]It was common in the survey to find that the Laboratory Technician performed X-ray Technician duties also.

survey response from medical practices in the survey.

Using the average salary of the personnel (Table XXIV) and the most common type of personnel employed (Table XXV), labor costs for solo and group practices (2-3 physicians) were estimated. These estimates of labor costs are presented in Table XXVI. The typical solo practice is seen to have one other medical personnel besides the physician, and this person is generally a Licensed Practical Nurse (LPN). The support personnel duties of a solo practice are usually performed by one Reception-ist/Bookkeeper. Total labor costs for a solo practice are estimated at $24,598.50 per year. An average clinic of two to three physicians will have three other medical personnel (Medical Assistant, Licensed Prac-tical Nurse, and Laboratory Technician), and two support personnel (Receptionist and Receptionist/Bookkeeper), and the total annual labor costs are approximately $63,944.60.

Once estimates of building, office, medical and personal operating costs are made, total annual operating costs are determined by adding these categories together. Data in Table XXVII are an example of such calculations for a solo medical practice. Total operating costs for a solo practice ($52,785.35) were calculated by summing building ($7,772.85), office ($13,624.00), medical ($6,790.00 and personnel ($24,598.50) costs.

Procedure to Estimate Total Annual Costs

The last calculations necessary to estimate total annual costs are to (1) determine the payments per year made on the capital investment, and (2) add this to annual operating costs. Annual capital charges are determined by deriving principal and interest charges on the amount of

TABLE XXVI

CALCULATION OF ANNUAL PERSONNEL COSTS BY TYPE OF PRACTICE (1982)

Type of Practice	Number Employed	Average Annual Salary	Total Cost
		Dollars	
Solo Practice			
Other Medical Personnel			
Licensed Practical Nurse	1	9,630.00	9,630.00
Support Personnel Receptionist/Bookkeeper	1	11,760.00	11,760.00
Total	2		21,390.00
Fringe Benefits (15% of Total Salary)			3,208.50
Total			24,598.50
Group Practice (2-3 Physicians)			
Other Medical Personnel			
Medical Assistant	1	9,760.00	9,760.00
Licensed Practical Nurse	1	9,630.00	9,630.00
Laboratory Technician	1	14,493.00	14,493.00
Support Personnel			
Receptionist	1	9,961.00	9,961.00
Receptionist/Bookkeeper	1	11,760.00	11,760.00
Total	5		55,604.00
Fringe Benefits (15% of Total Salary)			8,340.00
Total			63,944.60

TABLE XXVII

CALCULATION OF ANNUAL OPERATING COSTS FOR A SOLO PRACTICE (1982)

Type of Building Cost			Total Cost

Building		Number of Physicians	Dollars
Electricity – $0.74 sq ft x 1,500 sq ft	x	1	1,100.00
Gas 0.17 sq ft x 1,500 sq ft	x	1	255.00
Water $131.00 per physician	x	1	131.00
Sewer 86.00 per physician	x	1	86.00
Trash 150.00 per physician	x	1	150.00
Maintenance 799.00 per physician	x	1	799.00
Janitor 1,968.00 per physician	x	1	1,968.00
Taxes 1,881.00 per physician	x	1	1,881.00

Insurance	Dollar Value	Cost per $100 Value	
Concrete–Brick Veneer Bldg	82,500.00	1.293	1,066.73
Equipment	31,238.07	1,076	366.12
TOTAL			7,772.85

Type of Operating Cost			Total Cost

Office	Per Physician	Number of Physicians	Dollars
Telephone	2,297.00	x 1	2,297.00
Office Supplies	1,760.00[2]	x 1	1,760.00
Office Equipment	200.00	x 1	200.00
Billing	941.00	x 1	941.00
Retainer Fee	1,086.00	x 1	1,086.00
Auto Expenses	4,800.00	x 1	4,800.00
Convention (CME)	1,825.00	x 1	1,825.00
Professional Dues	715.00	x 1	715.00
TOTAL			13,624.00

TABLE XXVII (Continued)

Type of Operating Cost				Total Cost
Medical	Per Physician		Number of Physicians	Dollars
Medical Equipment				
Maintenance	1,033.00	x	1	1,033.00
Medical Supplies	2,840.00[3]	x	1	2,840.00
Malpractice	2,917.00	x	1	2,917.00
TOTAL				6,790.00
Labor				
LPN	9,600.00	x	1	9,600.00
Receptionist/ Bookkeeper	11,760.00	x	1	11,760.00
TOTAL				21,390.00
Fringe Benefits (15% of Total Salary)				3,208.50
TOTAL				24,598.50
Total Operating Costs				
Building				7,772.85
Office				13,624.00
Medical				6,790.00
Labor				24,598.50
TOTAL				52,785.35

[1] Estimate of average square feet per physician.

[2] Four thousand office visits x $0.44 cost of office supplies per visit = $1,760.00.

[3] Four thousand office visits x $0.71 cost of medical supplies per visit = $2,840.00

borrowed for capital investment. By multiplying the amortization factor (based on interest rate and length of loan) times the amount borrowed, yearly cost can be determined. A table of amortization factors is presented in Appendix B. Calculations for building and equipment for a solo physician practice are shown in Table XXVIII. Assuming a 25-year loan at 10.625 percent interest on the building (October 1, 1982, rate for Farmers' Home Community Facility Loans) and a 10-year loan at 13 percent interest on equipment, the annual charge for capital is $16,638.42; $10,866.16 for the building and land, and $5,752.26 for the equipment.

Combining the total operating costs of $52,785.35 and annual capital costs of $16,638.42, the average total cost of a solo practice is estimated at $69,423.77.

Procedure to Estimate Net Income

The calculation of physician net income is obtained by subtracting total costs from gross income. An example of these calculations for a typical solo practice is presented in Table XXIX. Total revenue (estimated in Table XIV) averaged $127,349.04 and ranged from a low of $97,908.00 and a high of $167,764.00. Total cost as projected above equalled $69,423.77.

With a 100 percent collection rate, the solo practice physician would have to charge the high rate if a net income of at least $62,500.00 was desired. Data in Table XXIX also show the net income for alternative collection rates. Based on a study by Wallack and Kretz (34), the average collection rate was 85 percent. With this collection rate, the physician would earn $73,175.63.

TABLE XXVIII

CALCULATION OF YEARLY CAPITAL CHARGE

Solo Practice		
Building and Land Investment	$94,250.00	
Amortization Factor (25 yrs @ 10.625%)[1]	0.115503	$10,886.16
Equipment	$31,213.07	
Amortization Factor (10 yrs @ 13.0%)[1]	0.184290	5,752.26
Total		$16,638.42

[1]Amortization factors are found in Appendix B.

TABLE XXIX

ESTIMATE OF NET INCOME

	Rate Schedule		
	Low	Average	High
Gross Income (Table (100% Collection Rate)	97,908.00	127,349.04	167,764.00
Minus			
Total Cost	69,423.77	69,423.77	69,423.77
Equals			
Net Income	24,484.23	57,925.27	98,340.23

Alternative Collection Rates

Rate Schedule	95%	90%	85%	80%
Low	93,012.60	88,117.20	83,221.80	78,326.40
Average	120,981.59	114,614.14	108,246.68	101.879.23
High	159,375.80	150,987.60	142,599.40	134.211.20
Minus				
Total Cost	69,423.77	69,423.77	69,423.77	69,423.77
	23,588.83	18,693.43	13,798.03	8,902.63
Net Income	51,557.82	45,190.37	38.822.91	32,455.46
	89,952.03	81,563.83	73,175.63	64,787.43

Application of Research Findings

To aid community leaders or physicians in the evaluation procedure, several forms have been created. These forms allow community decision-makers to complete their own analyses. Computer assistance for completion of forms is available by contacting the local County Extension office. The forms simply require community decision-makers to provide local data and are quite easy to complete. Included in the calculations used in the forms are indexing methods to adjust for changing price levels. For example, if the current estimate of $55 per square foot for construction cost is used in an analysis three years from now, it could be adjusted for price level changes by multiplying $55 times the 1985 current construction cost index divided by the 1982 construction cost index. Appendix C contains the construction and consumer price indexes from 1977 to 1982. These forms were applied to Garber, Oklahoma, to illustrate their usefulness and ease of completion. The completed forms are presented in Appendix D.

Garber is a community of 12,000 people, located in north-central Oklahoma. A local civic organization explored the feasibility of recruiting a physician for their community. The community planning committee contacted Oklahoma Cooperation Extension personnel, and a study was completed for them with the help of the previously mentioned forms. The number of office visits the service area would generate was estimated on Form 1. After completing the form using local population estimates, the number of physician visits equalled 10,807. Completion of Form 2 determined that the service area could generate enough calls for 1.98 physicians. Assuming no x-ray facilities and using a $10 charge for additional services, Form 3 showed that total revenue was projected from

$178,824 to $285,747, depending upon charges per call. Form 4 identi-
fied capital equipment items, while Form 5 summarized building and equip-
ment costs. For the example, total annual capital costs were estimated
at $27,259.24. In Form 6, operating costs by item were estimated.
Forms 7 and 8 summarized total costs and revenue. Total costs equalled
$139,078.90, whereas net income per physician with a 100 percent col-
lection rate ranged from $19,872.56 to $73,334.06, depending upon fee
structure. With a collection rate of 85 percent, net income per phy-
sician ranged from $6,460.76 to $51,903.03. Form 9 can be used by com-
munity leaders if they are considering building a clinic and renting it
to a physician. For example, if the community planning committee in
Garber were to build a clinic with 1,400 square feet per physician on
city land and not equip it, pay only taxes, insurance and maintenance,
yearly annual costs would be $25,138.68. If they charged a monthly rent
of $1,100, they would net $1,261.32 per year.

Funding Sources

During the last ten years in Oklahoma, various mechanisms have been
utilized in providing initial and continuous financial support for a
health clinic. Traditional financing methods, such as bank loans, tax
levies, and community fund drives have been joined by professionally
developed grants from foundations and corporations. In addition, coop-
erative agreement among various community groups and between towns are
emerging. A discussion follows which may aid community decision-makers
in identifying the available financial resources.

One of the most used funding sources is the Farmers Home Adminis-
tration loan program called the Community Facilities Loan. These loans

are made to local governmental units with a population maximum of 20,000 people. However, a major priority of the program is providing loan monies to areas of 5,500 population or rural areas. The current loan rate, based on the market rate, is 10.625 percent and may change January 1, 1983.

The types of facilities given preference are fire stations, general purpose community buildings, and health clinics. Funds are currently being allocated on a percentage of Fiscal Year 1982 money, since the program is currently operating on a continuing resolution. This is likely to be the policy for all of Fiscal Year 1983 or until 1984. Loan applications are processed at the district office level but information can be received at the agency listed below:

> Community Program Section
> Farmers Home Administration
> Agriculture Center Building
> Stillwater, OK 74074
> Phone: (405) 624-4307

The federal government through the Department of Health and Human Services has the capacity to guarantee loans made by Farmers Home Administration. The State Farmers Home office can provide assistance to interested communities.

The Department of Housing and Urban Development may be contacted for application for funds available through a block grant program. Information is available from:

> Department of Housing & Urban Development
> 200 N.W. 5th, Oklahoma City, OK 73102
> Phone: (405) 231-4805 or (405) 231-4638

The community Development Block Grant Program is not specifically a housing program but could be used in housing rehabilitation. A community facility could be rehabilitated for use as a clinic and nearby

streets, sidewalks, water and sewer line expansion are a proper use of

the Block Grant funds. The Community Development Block Grant is a 100

percent grant. However, many cities and towns in Oklahoma cannot qualify

due to the necessity of meeting low income and poverty requirements.

Each town needs to inquire as to its eligibility.

As mentioned in this discussion, the use of foundation and corpor-

ate funding is an available alternative for communities especially if

the project is critically needed and is unique. Corporations have a lot

more to offer in support of charitable organizations than money. Match-

ing gifts by employees, released staff time volunteering in kind gifts,

and support of special programs are areas that should be strongly con-

sidered by a community.

For further information refer to:

1. The Grassroots Fundraising Book
    (How to Raise Money in Your Community)
    1977; $5.75 from:
        The Youth Project
        1555 Connecticut Avenue N.E.
        Washington, D. C.   20036

2. The Bread Game
    (How Realities of Foundation Fundraising)
    Herb Allen, Editor, 1974, $4.70 from:
        New Guide Publications
        330 Ellis Street
        San Francisco, CA   94102

3. The Foundation Directory
    $15 postpaid from:
        Columbia University Press
        Stock Department
        1367 South Broadway
        Irvington-On-Hudson, N. Y. 10533

4. Foundation News
    (Published by the Council on Foundations, Ind.)
        1828 L. Street, N. W.
        Washington, D. C.,   20036

5. Tulsa City County Library
    Grandmash Foundation Center

6. Oklahoma Metro Library System
    Grandmash Foundation Center

An additional source of funding is available to the physician

through the Small Business Administration. These loans are made through

local banks and guaranteed up to 90 percent by the Small Business Admin-

istration. Non-profit organizations are restricted from this type of

loan.

CHAPTER V

PREDICTING OFFICE AND HOSPITAL VISITS

FOR A NEW PHYSICIAN

The patient load of a new practice will typically grow over time.
This increase occurs primarily in the number of office and hospital
visits. Identification of factors influential in this growth would pro-
vide a refinement in the procedures to estimate the number of physician
office and hospital visits.

Examination of Factors Affecting the Growth

in a Physician's Practice

While there may exist a myriad of factors affecting the growth in
the number of physician office and hospital visits, most of the influ-
ence can be described by a few key factors. Probably the most important
factor in the growth of a physician's practice is time, as time is
required to develop a clientile at a new location. How fast this develop-
ment occurs is a function of the population of the service area and the
physician competition in the area. This growth would also be affected
by the amount of market development prior to beginning the practice and
the availability of facilities that are necessary or complementary to
services provided (i.e., hospital). The price charged for services would
also be expected to have some effect on the level of utilization. Finally,
there may be a complementary relationship between office and hospital

visits and vice versa.

Given these general apriori expectations, a model was constructed to measure the effect of explanatory variables on physician visits. Regression analysis, which provides a method of estimating relationships among variables was selected as the method of analysis.

A multiple linear regression equation considers the net relationship between each explanatory variable (X) and a dependent variable (Y). Specifically,

$$Y_i = B_0 + B_1 X_{i1} + B_2 X_{i2} + B_k X_{ik} + \Sigma_i$$

where

Y_i = observable dependent variable

X_{ik} = observable independent variables, K in number

Σ_i = unobservable error or disturbance term

B_k = unknown parameters to be estimated, and

i = 1,2,--- n observations on the variables

The equation states that Y_i depends linearly on the observed X_{ik} and on the unobserved disturbances Σ_i. One statistical problem is to estimate the parameters (Bs) given the observations on the variables in the equations. A commonly used estimation technique is ordinary least squares. The line of least squares is a prediction line which is located as to minimize the sum of the squares of deviation from the true line.

The basic assumptions in the model are:

1. Σ_i is a random variable with mean zero and a variance σ^2 (unknown) that is $E(\Sigma_i) = \sigma^2$.

2. Σ_i and Σ_j are uncorrelated, $i \neq j$, so that COV $(\Sigma_i, \Sigma_j) = 0$. Thus $E(Y_i) = B_0 + B_1 X_i$, $(V(Y_i) = \sigma^2$ and Y_i and Y_j, $i \neq j$, are uncorrelated.

3. Σ_i is a normally distributed random variable.

Before applying this technique, it was necessary to specify the variables which represent the general factors identified and estimate the logical relationship between independent and dependent variables. Office visits and hospital visits were the dependent variables. The expected relationship of the independent variables is given below:

1. Time – length of time in practice, by month. For a newly established practice, both office and hospital visits are expected to increase as length of time in practice increases.

2. Population – city, county, and county population per square mile. While it is anticipated that as population increases, utilization of services would also increase. Two additional factors cloud this relationship. First, rural physicians on the average have a greater patient load than do physicians in more urban areas. Second, the visibility of a new practice, a factor in attracting new patients, may decline with size of the city.

3. Competition – county population divided by the number of primary care physicians in the county and county population divided by the number of total physicians in the county. As the population per physician increases, there would be an expected positive relationship with services utilized per physician.

4. Market development – number of physicians in the clinic. Market development occurs when a new physician joins an established practice. Therefore, a physician who joins a group practice would be expected to have a higher patient load.

5. Availability of facilities – hospital in the city where the practice is located. A hospital was expected to have a positive

relationship with visits, especially with regard to hospital visits.

6. <u>Charge for services</u> - amount charged by the physician by type of visit. This includes charges for initial office visit, routine office visit, hospital admission, and hospital visits. (a) Initial and routine office visit charges were expected to have a negative relationship with the utilization of office visits. The effect, if any, of these charges on hospital visits was also expected to be negative. (b) Charges for hospital admission and visit should have no effect on office visits, but the effect on hospital visits is uncertain. Typically, hospital admissions and visits are inelastic with regard to price; they occur when patients are in need of intensive medical treatment.

7. <u>Complementary relationship between office and hospital visits</u>. A positive relationship was expected between the number of office and hospital visits, and vice versa.

These variables represent the data required for the analysis. Observations on these variables were obtained in the survey of 16 physicians in rural Oklahoma.

Model Development

Given the general relationships, the variables selected, and the data required, it was possible to define the explicit equations to be examined. The functional relationships to be examined in equational form were:

VISMTH = f (MONTH, NUPHY, CIPOP, COPOP, SQPOP, HOSP, CHGINT,

CHGRT, HPVIST, HPADCH, HPVSCH, XPCO, XTCO)

HPVIST = g (MONTH, VISMTH, NUPHY, CIPOP, COPOP, SQPOP, HOSP,

CHGINT, CHGRT, HPADCH, HPVSCH, XPCO, XTCO)

where:

VISMTH = number of patient office visits per physician per month

MONTH = length of time in practice, by months

NUPHY = number of physicians in clinic

CIPOP = population of city where practice is located

COPOP = population of county where practice is located

SQPOP = county population per square mile

HOSP = dummy variable to indicate if hospital facilities are available in the city where practice is located. HOSP = 1 if hospital is in the city or HOSP = 0 if no hospital is in the city

CHGINT = amount charged by physician for an initial office visit

CHGRT = amount charged by physician for a routine office visit

HPVIST = number of patient hospital visits per physician per month

HPADCH = amount charged by physician for a hospital admission

HPVSCH = amount charged by physician for a hospital visit

XPCO = county population divided by the number of primary care physicians in the county

XTCO = county population divided by the total number of physicians in the county

Given these equations, it was necessary to specify the type of functional relationships to examine. Apriori expectations were that these visits, especially office visits, would increase at a decreasing rate. Accordingly, both a linear and curvilinear relationship were selected for analysis. A power function was chosen to represent the curvilinear relationship. For least-squares estimation, the power function was transformed into a log linear equation.

The hypotheses for the statistical analysis were:

I.   VISMITH

H_1 : VISMTH = B_0 + B_1MONTH + B_2NUPHY + B_3CIPIP

+ B_4COPOP + B_5SQPOP + B_6HOSP

+ B_7CHGINT + B_8CHGRT + B_9HPVIST

+ B_{10}HPADCH + B_{11}HPVSCH + B_{12}XPCO

+ B_{13}XTCO + Σ

H_2:lnVISMTH = B_0 + B_1lnMONTH + B_2lnNUPHY + B_3lnCIPOP

+ B_4lnCOPOP + B_5lnSQPOP + B_6HOSP

+ B_7lnCHGINT + B_8lnCHGRT + B_9lnHPVIST

+ B_{10}lnHPADCH + B_{11}lnHPVSCH + B_{12}lnXPCO

+ B_{13}lnXTCO + Σ

H_0 : B_1 = 0, B_2 = 0, B_3 = 0, B_4 = 0, B_5 = 0, B_6 = 0, B_7 = 0,

B_9 = 0, B_{10} = 0, B_{11} = 0, B_{12} = 0, B_{13} = 0

II. HPVIST

H_1 : HPVIST = B_0 + B_1VISMTH = B_2MONTH + B_3NUPHY

+ B_4CIPOP + B_5COPOP + B_6SQPOP

+ B_7HOSP + B_8CHGINT + B_9CHGRT

+ B_{10}HPADCH + B_{11}HPVSCH + B_{12}XPCO

+ B_{13}XTCO + Σ

H_2 : HPVIST = B_0 + B_1lnVISMTH + B_2lnMONTH + B_3lnNUPHY

+ B_4lnCIPOP + B_5lnCOPOP + B_6lnSQPOP

+ B_7HOSP + B_8lnCHGINT + B_9lnCHGRT

+ B_{10}lnHPADCH + B_{11}lnHPVSCH + B_{12}lnXPCO

$$+ B_{13}\text{IMXTCO} + \Sigma$$

$$H_0 : B_1 = 0, B_2 = 0, B_3 = 0, B_4 = 0, B_5 = 0, B_6 = 0, B_7 = 0,$$

$$B_9 = 0, B_{10} = 0, B_{11} = 0, B_{12} = 0, B_{13} = 0$$

The final decision before the actual analysis was performed was to choose the criteria for model selection. Stepwise regression was selected as the method for initial variable selection. This method starts with the best one variable model, then adds and deletes independent variables according to their contribution to the model (partial F-statistic). An alpha level of 0.05 was set for all decisions regarding statistical significance. In addition to this significance level, the best model was determined to be the model with the highest R^2, anticipated signs on the parameters, and no significant multicollinearity.

Model Results

The first result of the analysis was information on the functional relationships which provided the best fit. A power function was found to have the best fit for office visits, while a linear function was preferred for hospital visits. Also, this analysis showed that several of the independent variables were significantly correlated. Data in Tables XXX and XXXI present the correlation coefficients and the degree of statistical significance for the log linear model of office visits and the linear model of hospital visits, respectively.

Given the type function, several models were presented in the stepwise analysis. Using the criteria established (0.05 alpha level, highest R^2, anticipated signs on the parameters and no significant multicollinearity), the best model for both office and hospital visits was

selected. Data in Tables XXXII and XXXIII present the models selected
for office and hospital visits, respectively. The model selected for
office visits (Table XXXII) indicates that office visits will increase
with time (MONTH) and will decline as the city (CIPOP) and the charge
for initial office visits (CHGINT) increase. Hospital visits, as indi-
cated by the model selected (Table XXXIII) are expected to increase as
time (MONTH) and the amount charged for a hospital admission (HPADCH)
increase.

<div align="center">Application of Models Selected</div>

The primary use for either model, would be for estimating the change
in the dependent variable for given changes in the independent vari-
ables. For example, it is possible to estimate the change in office
visits by length of time in practice (months) for a given size city and
initial office visit charge. Calculations for such an estimate, given a
city population of 7,500 and an initial office visit charge of $21.00,
are presented below:

$$\text{MODEL: VISMTH} = 22{,}490 \; \text{MONTH}^{0.3299} \; \text{CIPOP}^{-0.2619} \; \text{CHGINT}^{-0.9184}$$

Let

$$\text{MONTH} = (1, \; 2, \; -- \; 12)$$

$$\text{CIPOP} = 7500$$

$$\text{CGHINT} = 21.00$$

$$\text{VISMTH} = 22{,}490 \; \text{MONTH}^{0.3229} \; 7500^{-0.2619} \; 21.00^{-0.9184}$$

$$\text{VISMTH} = 133 \; \text{MONTH}^{0.3299}$$

MONTH	VISMTH
1	133
2	167

TABLE XXX

CORRELATION COEFFICIENTS AND THE DEGREE OF STATISTICAL SIGNIFICANCE
FOR THE LOG LINEAR MODEL OF OFFICE VISITS

	MONTH	NUPHY	CIPOP	COPOP	SQPOP	HOSP	CHGINT	CHGRT	HPVIST	HPADCH	HPVSCH	XPCO	XTCO
MONTH	1.0000	0.14632	-0.00529	0.32855	0.26774	-0.12744	-0.01270	-0.01691	0.12085	-0.12603	0.13167	-0.10723	-0.11991
	0.0000	0.1187	0.9552	0.0003	0.0038	0.1747	0.8928	0.8576	0.0263	0.2046	0.1607	0.2540	0.2018
NUPHY		1.0000	-0.26054	-0.18360	-0.27097	0.52803	-0.02301	-0.11439	-0.02412	0.00004	-0.24328	0.18470	0.24882
		0.0000	-0.0049	0.0495	0.0034	0.0001	0.8072	0.1237	0.8098	0.9997	0.0088	0.0481	0.0052
CIPOP			1.0000	0.60139	0.50988	0.19670	0.02949	0.09203	0.20463	0.65511	0.33534	-0.26966	-0.37663
			0.0000	0.0001	0.0001	0.0351	0.7544	0.3280	0.0391	0.0001	0.0002	0.0036	0.0001
COPOP				1.0000	0.91958	-0.11657	0.22704	0.18276	0.06010	0.50519	0.42439	-0.55909	-0.65752
				0.0000	0.0001	0.2147	0.0147	0.0506	0.4236	0.0001	0.0001	0.0001	0.0001
SQPOP					1.0000	-0.24074	0.14449	-0.04392	-0.02745	0.41870	0.52357	-0.71941	-0.76598
					0.0000	0.0096	0.1234	0.6412	0.7842	0.0001	0.0001	0.0001	0.0001
HOSP						1.0000	0.31194	0.23893	0.12945	0.31062	-0.61401	0.29614	0.22425
						0.0000	0.0007	0.0101	0.1947	0.0014	0.0001	0.0013	0.0160
CHGINT							1.0000	0.76980	0.37781	0.68718	-0.29934	0.17355	0.03911
							0.0000	0.0001	0.0001	0.0001	0.0012	0.0936	0.6732
CHGRT								1.0000	0.43319	0.49299	-0.31286	-0.18795	0.00040
								0.0000	0.0001	0.0001	0.0007	0.0443	0.9966
HPVIST									1.0000	0.47847	0.05990	-0.03764	-0.15034
									0.0000	0.0001	0.5498	0.3289	0.1315
HPADCH										1.0000	0.21929	-0.33702	-0.45596
										0.0000	0.0330	0.0005	0.0001
XPCO											1.0000	0.69275	-0.49937
											0.0000	0.0001	0.0001
XTCO												1.0000	0.56924
												0.0000	0.0001
													1.0000
													0.0000

TABLE XXXI

CORRELATION COEFFICIENTS AND THE DEGREE OF STATISTICAL SIGNIFICANCE FOR THE LINEAR MODEL OF HOSPITAL VISITS

	MONTH	VISMTH	NUPHY	CIPOP	COPOP	SQPOP	HOSP	CHGINT	CHGRT	HPADCH	HPVSCH	XPCO	XTCO
MONTH	1.0000	0.41802	0.02851	-0.06184	0.47793	0.42033	-0.15147	0.16134	-0.1840	0.15678	0.05132	-0.07645	-0.02852
	0.0000	0.0001	0.7623	0.5115	0.0001	0.0001	0.1061	·0.0650	0.8452	0.1138	0.5859	0.4168	0.3468
VISMTH		1.0000	0.13773	-0.39409	0.16159	0.22953	-0.20970	-0.35260	-0.34230	0.45949	0.00940	-0.19321	0.17960
		0.0000	0.1421	0.0001	0.0845	0.0136	0.0245	0.0001	0.0002	0.0001	0.9206	0.0396	0.0548
NUPHY			1.0000	-0.30468	-0.10241	-0.15405	0.41363	-0.13836	-0.18063	0.03160	-0.06975	-0.07451	-0.05033
			0.0000	0.0009	0.2761	0.1002	0.0001	0.1403	0.0534	0.7514	0.4589	0.4287	0.5929
CIPOP				1.0000	0.17707	0.04447	0.15084	0.23516	0.38606	0.79494	0.20265	-0.21517	-0.2740
				0.0000	0.0583	0.6370	0.1076	0.0114	0.0001	0.0001	0.0260	0.0209	0.0033
COPOP					1.0000	0.84272	-0.28964	0.29541	0.14767	0.12781	0.16562	-0.20017	-0.23397
					0.0000	0.0001	0.0017	0.0013	0.1153	0.1982	0.0769	0.0320	0.0114
SQPOP						1.0000	-0.38955	0.19882	0.01804	0.08763	0.20829	-0.19465	-0.21017
						0.0000	0.0001	0.0332	0.8483	0.3788	0.0255	0.0371	0.0242
HOSP							1.0000	0.27054	0.23702	0.29293	-0.66409	0.20750	0.17641
							0.0000	0.0035	0.0108	0.0027	0.0001	0.0299	0.6593
CHGINT								1.0000	0.80487	0.55894	-0.29759	0.10230	0.04710
								0.0000	0.0001	0.0001	0.0012	0.2766	0.6023
CHGRT									1.0000	0.52694	-0.30924	0.25247	0.17419
									0.0000	0.0001	0.0098	0.0265	0.0622
HPADCH										1.0000	0.17014	-0.35538	-0.40425
										0.0000	0.0858	0.0002	0.0067
HPVSCH											1.0000	-0.59697	-0.56652
											0.0000	0.0001	0.0001
XPCO												1.0000	0.94528
												0.0000	0.0001
XTCO													1.0000
													0.0000

TABLE XXXII

OFFICE VISITS MODEL WITH HIGHEST R^2, EXPECTED SIGNS ON THE
PARAMETERS, AND NO SIGNIFICANT MULTICOLLINEARITY

	0.3299	−0.2619	−0.9184
VISMTH = 22,490 MONTH		CIPOP	CHGINT

Independent Variable	T for H_O: Parameter = 0	PR > |T|	Standard Error of Estimate
MONTH	18.02	0.0001	0.0367
CIPOP	−6.88	0.0001	0.0381
CHGRT	−5.98	0.0001	0.1535

Degrees of freedom: Model = 3, Error = 111, Corrected Total = 114,
F Value = 56.15, PR>F − 0.0001, R^2 − .6028, Durbin-Watson = 1.9984.

TABLE XXXIII

HOSPITAL VISITS MODEL WITH HIGHEST R^2, EXPECTED SIGNS ON THE
PARAMETERS, AND NO SIGINIFICAN MULTICOLLINEARITY

HPVIST = −111.03 + 2.796 HPADH + 0.5787 MONTH

Independent Variable	T for H_O: Parameter = 0	PR > |T|	Standard Error of Estimate
INTERCEPT	−4.77	0.0001	23.2624
HPADCH	7.55	0.0001	0.3702
MONTH	4.77	0.0001	0.1295

Degree of freedom: Model − 2, Error = 100, Corrected Total = 102,
F Value 34.05, PR>F = 0.0001, R^2 = 0.4051, Dubin Watson = 2.1491.

3	191
4	210
5	226
6	240
7	253
8	264
9	275
10	284
11	293
12	302
TOTAL	2838

It can be noted from this example that the number of office visits increase at a decreasing rate and that the physician could expect to see about 2838 office visits the first twelve months.

The number of hospital visits by length of time in practice (months) for a given hospital admission charge can also be estimated. Calculations for such an estimation, given a hospital admission charge of $60, are presented below.

MODEL: HPVIST = -111.03 + 2.796 HPADCH + 0.5787 MONTH

Let

HPADCH = 60

MONTH (1, 2, -- 12)

HPVIST = -111.03 + (2.796 x 60) + 0.5787 MONTH

HPVST = 56.73 + 0.5787 MONTH

MONTH	HPVIST
1	57.3087
2	57.8874

3	58.4661
4	59.0448
5	59.6235
6	60.2022
7	60.7809
8	61.3596
9	61.9383
10	62.5170
11	63.0957
12	63.6744
TOTAL	725.8996

Results of these calculations indicate that given a hospital admission charge of $60, the physician could expect approximately 726 hospital visits the first 12 months.

Another possible use of either model is for estimating the level of any one variable given the values of all remaining variables in the equation. For example, if it is determined that 450 office visits a month are needed to achieve self sufficiency in the practice, the number of months to reach this level could be estimated. Calculations below illustrate the solution to such a problem.

$$\text{MODEL: } VISMTH = 22{,}490 \; MONTH^{0.3299} \; CIPOP^{-0.2619} \; CHGINT^{0.9184}$$

Let

VISMTH = 450

CIPOP = 21.00

so that

$$450 = 22{,}490 \ x^{0.3299} \quad 7500^{-0.2619} \quad 21.00^{-0.9184}$$

$$X^{0.3299} + 450/133 = 3.38$$

$$(x^{0.3299})^{1/0.3299} = 3.388^{1/0.3299}$$

$$X = 4024$$

It would take a physician's practice approximately 40 months to reach 450 office visits a month, given a city population of 7500 and an initial office visit charge of $21.00.

Summary

Using applied regression several equations were selected to model the growth in the number of office and hospital visits that typically occur in new physician practice. Four separate criteria were specified for model selection to provide the most useful models. Two equations were found to best satisfy all criteria. Applications of those models were presented to illustrate their use.

CHAPTER VI

ESTIMATING FUTURE PRIMARY CARE PHYSICIAN

NEEDS FOR OKLAHOMA

The method of evaluating the number of physicians a given service area can support provides the basic framework for projecting future physician needs for the entire state. Need is defined as the number of physicians necessary to provide primary care services utilized by Oklahoma residents. Total physician utilization is considered a function of population and the rate of utilization of physician services per person per year. Supply of services is a function of the number of physicians and the amount of services they provide a year. A physician is defined as a practicing licensed doctor of medicine (M.D.) or a doctor of osteopathy (D.O.). Excluded are retired or semi-retired physicians and physicians in administrative, academic or research positions. Primary care physicians are in general and family practice, internal medicine, pediatrics, and obstetrics and gynecology. Services are measured in office visits per year.

The procedures used to estimate future primary care physician needs can be broken down into five steps, as follows:

1. projecting future population;

2. determining the average number of office visits per person per year; the total number of office visits per year may be derived by multiplying this number by project population;

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3. estimating the percent of total office visits by primary care physicians; multiplying this percentage times the projected number of total office visits derives the number of primary care office visits;

4. calculating the average number of office visits per physician per year; dividing this average into the number of primary care office visits determines the number of physicians needed, and

5. estimating the number of physicians available; subtracting the projected number of physicians needed from this estimate arrives at the surplus or deficit number of physicians.

Therefore, before any calculation can be performed, the following data are needed: (1) population projections; (2) utilization rate; (3) percentage of total visits that are primary care; (4) average number of office visits per physician per year, and (5) physicians available. These data are very critical in the analysis. To assume that the user will know the data source and its importance in the model, each category is discussed below.

<div align="center">Projecting Population</div>

Population projections can be made using a population model. The model used in the analysis for Oklahoma is as follows:

$$POP_t = \sum_{j=1}^{2} \sum_{i=1}^{13} G_{ijt}$$

where

POP_t = population in time t, and

G_{ijt} = population in time t in cohort i for sex j

$G_{i,j,t} = G_{i,j.t-1} + AG_{i-1,j,t-1} + M_{i,j,t-1} - AG_{i,j.t-1} - D_{i,j,t-1}$

where

$G_{i,j,o}$ = initial population in cohort i of sex j

$AG_{i,j,t}$ = advancement from group i to group i+1 between year t and

year t+1, and

D = the deaths of members of cohort i of sex j in year t to

year t+1

$$AG_{o,j,t} = \sum_{i=1}^{13} B_i \, G_{1,2.t}$$

where

$AG_{o,j.t,}$ = births of sex j in year t, and

B_i = birth rate for women in cohort i

$$D_{ij,t} = D_{i,j,o} \, T_{i,j} \, G_{i,j,t}$$

where

$D_{i,j,o}$ = initial death rate for group i, and

$T_{i,j}$ = trend in death rate for group i,j.

Birth rates, death rates, and the trend for both are from the Statistical

Abstract of the United States (28).

The average migration rate from 1970 through 1980 in Oklahoma was

calculated at 1.2 percent per year. The low and high migration rates

were set at 0.7 and 1.7 percent per year, respectively. This allowed

for examination of the impact of such deviation on the need for

physicians.

The 1980 census of population was the base year population used

(20). The age cohorts were: (1) 0-14; (2) 15-19); (3) 20-24); (4) 25-

29; (5) 30-39; (6) 40-44; (7) 45-49; (8) 50-54; (9) 55-59; (10) 60-64;

(11) 65-69; (12) 70-79; and (13) 80 and above. Applying the model, low, average, and high population projections for Oklahoma for the years 1985, 1990, and 1995 were determined. They are presented in Table XXXIV.

TABLE XXXIV

POPULATION PROJECTIONS FOR OKLAHOMA FOR 1985, 1990, and 1995[1]

Year	Migration Rate Annual Percentage Rate	Projected Population
1985	0.7414	3,213,975
	1.2412	3,294,123
	1.7414	3,375,864
1990	0.7414	3,436,475
	1.2412	3,609,809
	1.7414	3,790,973
1995	0.7414	3,698,176
	1.2414	3,981,167
	1,7414	4,284,272

[1]Base year population (3,025,290) was taken from the 1980 Census of Population, Oklahoma.

Determining the Average Number of Office

Visits per Person per Year

Health literature usually refers to the average number of office visits per person per year as a utilization rate. Typically, utilization rates are estimated from survey data. Some variation may exist among surveys because of definitional differences. Utilization rates have been

found to change over time. Because of the critical nature of this esti-
mate in the overall projection of physician need, it was decided to
select a set of the most recent rates which would represent the range
available. A low rate of 2.7 visits per person per year for 1980 was
obtained from the National Ambulatory Medical Care Survey (30). This is
the same source that provided utilization rates by age and sex for pre-
vious sections of this study. The other rates selected were 3.4334 from
Health-United States, 1981 (32) and 4.7 from the Current Estimates From
the National Health Interview Survey; United States, 1979 (31). Both of
these estimates were from 1979 data.

Using these utilization rates and the population projections from
Table XXXIV, estimates of total office visits were obtained. These
figures are presented in Table XXXV. This table illustrates the tremen-
dous difference a small variation in the utilization rate can have in the
projection of future utilization. For example, there exists a 8,568,544
difference in total office visits for the high population projection of
1995 between the 2.7 and 4.7 utilization rates.

Estimating the Percent of Total Office Visits

by Primary Care Physicians

The percent of total office visits by primary care physicians can
be estimated by determining the proportion of total office vists that
are seen by primary care physicians each year. A complicating factor
in this estimate is the lack of local data and the functional relation-
ships this percentage has with time. Additionally, a small deviation
in this percentage can cause a large variation in the final projection
of physician need. Knowledge of the implications for a range of

TABLE XXXV

PROJECTIONS OF TOTAL OFFICE VISITS FOR OKLAHOMA IN
1985, 1990, and 1995

Year	Migration Rate	Population	Utilization Rate	Total Office Units
1985	0.7414	3,213,975	2.7	8,677,733
	1.2414	3,294,123	2.7	8,894,132
	1.7414	3,375,864	2.7	9,114,833
1990	0.7414	3,436,476	2.7	9,278,485
	1.2414	3,609,809	2.7	9,746,484
	1.7414	3,790,973	2.7	10,235,627
1995	0.7414	3,698,176	2.7	9,985,074
	1.2414	3,981,167	2.7	10,749,151
	1.7414	4,284,272	2.7	11,567,534
1985	0,7414	3,213,975	3.4334	11,034,862
	1.2414	3,294,123	3.4334	11,310,042
	1.7414	3,375,864	3.4334	11,590,691
1990	0.7414	3,436,476	3.4334	11,798,797
	1.2414	3,609,809	3.4334	12,393,918
	1.7414	3,790,973	3.4334	13,015,927
1995	0.7414	3,698,176	3.4334	12,697,317
	1.2412	3,981,167	3.4334	13,668,939
	1.7414	4,284,272	3.4334	14,709,619
1985	0.7414	3,213,975	4.7	15,105,683
	1.2414	3,294,123	4.7	15,482,378
	1.7414	3,375,864	4.7	15,866,561
1990	0.7414	3,436,476	4.7	16,151,437
	1.2414	3,609,809	4.7	16,966,102
	1.7414	3,790,973	4.7	17,817,573
1995	0.7414	3,698,176	4.7	17,381,427
	1.2414	3,981,167	4.7	18,711,485
	1.7414	4,284,272	4.7	20,136,078

percentages would, therefore, be useful to local decision-makers.

A percentage of 66.2 based on 1980 data from the National Ambulatory Medical Survey was used in Table II (30). In a 1979 study by Doeksen, Dunn, Stackler and Sheets (12), a percentage of 78.6 was presented. Both of these percentages are from national data. It is assumed that these percentages represent a low and high estimate and that Oklahoma is within this range. The mean of these two values was selected to represent an estimate of the average value for percent primary care, 72.4. These percentages when multiplied with the figures on total office visits, Table XXXV will produce an estimate of the range of primary care office visits for Oklahoma in the years 1985, 1990, and 1995.

Calculating the Average Number of Office
Visits per Physician per Year

The procedures to calculate the average number of office visits per physician per year can be performed almost identically to the procedures used previously in this study. The procedures are to estimate the number of weeks practiced during a year and the number of office visits seen in a week. These values are then multiplied to arrive at an estimate of office visits per year. Such a calculation was performed for nonmetropolitan primary care physicians in Chapter III of this study. The only adjustment necessary to derive the average for the entire state is to use both metropolitan and nonmetropolitan values. Using the figures for all primary care physicians, the average Oklahoma primary care physician had 4,792 office visits per year. This average, when divided into the projection of annual primary care office visits, will provide an estimate of the number of physicians needed.

Estimating the Number of Physicians Available

A critical step in estimating the number of physicians available in some future period is to accurately determine the number of physicians available in the base period. From this value, all other assumptions will be applied. Because of licensing requirements, data on the number of physicians (as defined as M.D.s and D.O.s) are readily available. The numbers of physicians, by specialty, were obtained from the Oklahoma Osteopathic Association (21) and the Oklahoma State Medical Association (22). The total number of primary care physicians in active practice as of October, 1982, was 2,229.

Once the value of the number of physicians available in the base year is known, the assumptions affecting the future supply of physicians can be applied. Some of the factors that would affect the supply of physicians are the (1) number of medical school graduates entering the market; (2) migration of physicians in and out of the service area; (3) the number of physicians retiring, and (4) death rate of physicians. For this analysis the supply of new physicians will be held to zero. Consequently, the values given for surplus or deficit will be void of any increase in supply. The only factor affecting the number of physicians available in the future periods will be retirement. A retirement rate of approximately one percent per year was estimated for D.O.s in the state (21). This number was assumed to be applicable to M.D.s as well. Therefore, for each year beyond the base period, the supply of primary care physicians is reduced one percent. For example, if the base year is 1982, and 2000 primary care physicians are available, then a projection of the number of these physicians practicing in 1992 would be

derived as follows:

$$2000 - \left[2000 \times (.01 \times 10) \right] = 1880$$

Application

The estimates of primary care physicians in Oklahoma for the years 1985, 1990, and 1995 are very sensitive to changes in migration rate, utilization rate, and percent of primary care office visits. Since these parameters are very critical, a low, average, and high rate is employed for each. When these multiple data are used with the estimate of the number of annual office visits per physician and the number of physicians available, 27 possible outcomes are projected for physician surplus or deficit for 1985, 1990, and 1995. Because of the lack of state data, a range of estimates is preferred to a point estimate.

Multiplying the population projections in Table XXXIV with the utilization rates resulted in a set of total office visits per year for 1985, 1990, and 1995 (Table XXXV). These values are then applied to the set of primary care percentages to arrive at the number of annual primary care office visits. The number of primary care office visits per year are then divided by the number of office visits per physician per year, resulting in an estimate of the number of physicians needed. Subtracting this value from the estimate of physicians available will give an estimate of physician surplus or deficit. An example of this calculation is:

Total Office Visits		Percent Primary Care		Primary Care Office Visits
100,000	x	66.2	=	66,200

Primary Care Office Visits	÷	Number of Office Visits per Physician per Year	=	Number of Physicians Needed
66,200	÷	4792	=	13.8 ≈ 14

Estimate of Number of Physicians Available	−	Projection of Physicians Needed	=	Surplus (+) or Deficit (−)
10	−	14	=	−4

The results of these calculations for the various scenarios defining migration rate, utilization rate and percent percent primary care office visits for the years 1985, 1990, and 1995 are shown in Tables XXXVI, XXXVII, and XXXVIII, respectively. It must be noted from these tables that the possibility exists for a surplus or deficit number of physicians in every year. For example, data in Table XXXVI show that for the year 1985, with an average migration rate there exists the possibility of having a surplus of 933 or a deficit of 377 physicians. Given this average migration rate, the results by scenario are:

Scenario 10 - With a low utilization rate (2.7) and a low percent primary care office visits of the total office visits (66.2), a surplus of 933 may occur.

Scenario 11 - A low utilization rate (2.7) and an average for the percent primary care (72.4) may result in an excess of 818 physicians.

Scenario 12 - For a low utilization rate (2.7) and a high percentage (78.6), the surplus of physicians drops to 703.

Scenario 13 - Increasing the utilization to the average (3.4334) and returning to a low percentage for primary care (66.2) results in a surplus of 600 physicians.

Scenario 14 - Given an average utilization rate (3.4334) and an average percent primary care (72.4) produces a surplus of 453.

Scenario 15 - Continuing with an average utilization rate (3.4334)

TABLE XXXVI

PROJECTION OF THE NUMBER OF PRIMARY CARE PHYSICIANS
NEEDED IN OKLAHOMA, 1985

Scenario	Migration Rate	Utilization Rate	Percent Primary Care Visits	Projection of Physicians Needed	Estimate of Physicians Available	Surplus Deficit
1	0.7414	2.7	66.2	1119	2162	963
2	0.7414	2.7	72.4	1311		851
3	0.7414	2.7	78.6	1423		739
4	0.7414	3.4334	66.2	1524		638
5	0.7414	3.433	72.4	1667		495
6	0.7414	3.4334	78.6	1810		352
7	0.7414	4.7	66.2	2086		76
8	0.7414	4.7	72.4	2283		-120
9	0.7414	4.7	78.6	2478		-316
10	1.2414	2.7	66.2	1229		933
11	1.2414	2.7	72.4	1344		818
12	1.2414	2.7	78.6	1459		703
13	1.2414	3.4334	66.2	1562		600
14	1.2414	3.4334	72.4	1709		453
15	1.2414	3.4334	78.6	1855		307
16	1.2414	4.7	66.2	2139		23
17	1.2414	4.7	72.4	2339		-177
18	1.2414	4.7	78.6	2539		-377
19	1.7414	2.7	66.2	1259		903
20	1.7414	2.7	72.4	1377		785
21	1.7414	2.7	78.6	1495		667
22	1.7414	3.4334	66.2	1601		561
23	1.7414	3.4334	72.4	1751		411
24	1.7414	3.4334	78.6	1901		261
25	1.7414	4.7	66.2	2192		-30
26	1.7414	4.7	72.4	2397		-235
27	1.7414	4.7	78.6	2602		-440

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TABLE XXXVII

PROJECTION OF THE NUMBER OF PRIMARY CARE PHYSICIANS
NEEDED IN OKLAHOMA, 1990

Scenario	Migration Rate	Utilization Rate	Percent Primary Care Visits	Projection of Physicians Needed	Estimate of Physicians Available	Surplus Deficit
1	0.7414	2.7	66.2	1282	2051	769
2	0.7414	2.7	72.4	1402		649
3	0.7414	2.7	78.6	1522		529
4	0.7414	3.4334	66.2	1630		421
5	0.7414	3.4334	72.4	1783		268
6	0.7414	3.4334	78.6	1935		116
7	0.7414	4.7	66.2	2231		−180
8	0.7414	4.7	72.4	2440		−398
9	0.7414	4.7	78.6	2649		−598
10	1.2414	2.7	66.2	1346		705
11	1.2414	2.7	72.4	1473		578
12	1.2414	2.7	78.6	1559		452
13	1.2414	3.4334	66.2	1712		339
14	1.2414	3.4334	72.4	1873		178
15	1.2414	3.4334	78.6	2032		19
16	1.2414	4.7	66.2	2344		−293
17	1.2414	4.7	72.4	2563		−512
18	1.2414	4.7	78.6	2788		−737
19	1.7414	2.7	66.2	1414		637
20	1.7414	2.7	72.4	1546		505
21	1.7414	2.7	78.6	1679		372
22	1.7414	3.4334	66.2	1798		253
23	1.7414	3.4334	72.4	1967		84
24	1.7414	3.4334	78.6	2135		−84
25	1.7414	4.7	66.2	2461		−410
26	1.7414	4.7	72.4	2692		−641
27	1.7414	4.7	78.6	2922		−871

TABLE XXXVIII

PROJECTION OF THE NUMBER OF PRIMARY CARE PHYSICIANS
NEEDED IN OKLAHOMA, 1995

Scenario	Migration Rate	Utilization Rate	Percent Primary Care Visits	Projection of Physicians Needed	Estimate of Physicians Available	Surplus Deficit
1	0.7414	2.7	66.2	1379	1939	560
2	0.7414	2.7	72.4	1509		430
3	0.7414	2.7	78.6	1638		301
4	0.7414	3.4334	66.2	1754		185
5	0.7414	3.4334	72.4	1918		21
6	0.7414	3.4334	78.6	2083		−144
7	0.7414	4.7	66.2	2401		−462
8	0.7414	4.7	72.4	2626		−687
9	0.7414	4.7	78.6	2851		−912
10	1.24.4	2.7	66.2	1485		484
11	1.2414	2.7	72.4	1624		315
12	1.2414	2.7	78.6	1763		176
13	1.2414	3.4334	66.2	1888		51
14	1.2414	3.4334	72.4	2065		−126
15	1.2414	3.4334	78.6	2242		−303
16	1.2414	3.4334	66.2	2585		−646
17	1.2414	3.4334	72.4	2827		−888
18	1.2414	3.4334	78.6	3069		−1130
19	1.7414	2.7	66.2	1598		341
20	1.7414	2.7	72.4	1784		191
21	1.7414	2.7	78.6	1897		42
22	1.7414	3.4334	66.2	2032		−93
23	1.7414	3.4334	72.4	2222		−283
24	1.7414	3.4334	78.6	2412		−473
25	1.7414	4.7	66.2	2783		−843
26	1.7414	4.7	72.4	3042		−1103
27	1.7414	4.7	78.6	3303		−1364

and increasing the percent primary care to the high value (78.6) will reduce the surplus to 307.

Scenario 16 – Raising the utilization rate to the highest value (4.7) and dropping back to the low percent primary care (66.2) will produce a projection indicating a surplus of 23 physicians.

Scenario 17 – Maintaining the high value for the utilization rate (4.7) and moving the percent primary care up to the average (72.4) will cause a deficit of 177 physicians to be projected.

Scenario 18 – Finally, with a high utilization rate (4.7) and a high percent primary care (78.6), the projected deficit climbs to 377.

Conclusions

The primary conclusion of this analysis is that additional data are needed to estimate the need for primary care physicians. It is important that state data be developed to allow computation of the utilization rate of services and the percent of total visits handled by primary care physicians.

In this study, a range of the best data available was used to construct a set of estimates of future physician surpluses or deficits given the assumptions of no increases in supply and annual retirement rate of one percent. Based on this analysis in 1985, there appears to be an adequate supply of physicians, while in 1990 and 1995, there is an anticipated need for additional physicians. Estimating an adequate supply of physicians in 1985 ignores the question of their geographical distribution. Even during periods of adequate supply there may exist areas of surplus, perhaps urban areas and deficit rural areas.

CHAPTER VII

SUMMARY, APPLICATION, AND LIMITATIONS

Summary

Many rural areas in Oklahoma are without an adequate number of
physicians to provide primary health care. National, state, and local
policy makers have created programs which provide financial aid to med-
ical students if they will practice in a rural area. Some rural com-
munities provide financial aid to medical students in return for locat-
ing in their community. The primary objective of this study was to
develop methods to aid (1) prospective physicians as they make locational
decisions, and (2) community leaders as they make decisions regarding
the provision of primary health care for their residents. The objective
was accomplished by developing methods which could be used to:

   1. determine the number of physicians an area can support;

   2. estimate annual capital and operating costs for a rural clinic,
and

   3. project gross income and net income for a physician.
In addition, estimates of the number of primary care physicians needed in
Oklahoma for 1985, 1990, and 1995 were derived.

Determining the Number of Physicians an

Area can Support

The number of physicians needed in a rural area is a direct function

of the number of physician visits the area will generate. National physician utilization data indicating the number of physician visits by age and sex were used because state or regional data were not available. The number of annual physician visits per physician was also taken from national data.

Once an area is delineated and the population is specified by age and sex, the number of annual physician visits can be projected (see Chapter III). This estimate divided by the annual number of physician visits for a typical physician will yield the number of physicians an area can support.

Estimating Annual Capital and Operating Costs

To provide data for capital and operating costs, 16 primary care physicians were interviewed. Survey results provided an inventory of equipment as well as information concerning operating items and costs. Medical equipment dealers and construction firms were interviewed to obtain costs of capital items.

From the survey results, procedures were devised to estimate:

1. capital requirements (land, building, equipment);

2. annual capital charges;

3. support personnel requirements, and

4. operating costs (building, personnel, and medical).

These procedures are shown in Chapter IV.

Projecting Total Revenue and Net Income

Rate schedules for physician services were obtained from the survey of the 16 primary care physicians. If a physician is evaluating

a potential practice, the physician can select a rate schedule and apply it to the calls specified above to derive an estimate of total annual revenue. Likewise, the physician can use the cost data to estimate total annual costs. The subtraction of costs from revenue will yield an estimate of net income

If the community leaders are considering constructing a community clinic and renting to a prospective physician, they can use capital and operating costs derived above to determine a monthly rental rate which will allow them to break even (see Chapter IV).

Application

For ease of use by prospective physicians and community leaders, several easy-to-use forms were devised. These forms allow the decision-maker to conduct the study without professional assistance. Forms are devised to:

1. estimate the number of annual physician office visits by age cohort and determine the total number of primary care office visits for a given service area;

2. estimate the number of physicians an area can support;

3. estimate the number of hospital, emergency room, and nursing home visits and project an average and range of gross income;

4. estimate equipment costs for solo and group practices;

5. estimate annual capital costs (land, building, and equipment);

6. estimate annual operating costs (building, office, medical, and personnel);

7. estimate total annual cost;

8. estimate net income and to evaluate the effect of alternative

collection rates, and

9. evaluate annual revenue and profit (loss) from renting a clinic
to a physician.

To illustrate their usefulness, the forms and research were used
to analyze the feasibility of a physician for Garber, Oklahoma. The
service area designated for Garber was projected to have approximately
16,325 annual physician office visits, of which 10,807 were expected to
be seen by primary care physicians. It was estimated that this level
of primary care office visits could theoretically support 1.98 physicians.
Equipment, building, and land costs were $44,031.78, $154,000.00, and
$11,750.00, respectively. Annual capital charges were calculated to be
$27,259.24. Total operating cost, consisting of building ($15,043.00),
office ($28,483.09), medical ($15,572.98), and personnel ($52,720.60),
was estimated to be $111,819.66. Total costs were determined to be
$139,078.90.

Annual gross income was estimated to range between $178,824.00 and
$285,747.00. Net annual income per physician at a one hundred percent
collection rate was found to range between $19,872.55 and $73,334.05.
If the city of Garber constructed a clinic and rented it to the physi-
cian, it was shown that the city would have to charge a monthly rent
of about $1,100 per physician to meet the building's yearly tax, insur-
ance, and maintenance expenses.

When the analysis of future primary care physician need in Okla-
homa was performed, the lack of state data resulted in presentation of
several possible outcomes. Multiple scenarios arise due to the many
variables included in the analysis. Using one set of variables, one
could arrive at a surplus, whereas another scenario may arrive at a

deficit. Therefore, a generalization of the possible surplus or deficit of physicians was reported.

These estimates of physician availability do not consider the geographical distribution of physicians. Hence, it is important to realize that even during periods of adequate physician numbers in the state, rural areas may continue to face a deficit, as physicians tend to locate in metropolitan areas.

The final conclusion of this research is that although there exists the possibility to meet the state's need in the short run, rural areas face greater difficulty than do urban areas in attracting and retaining physicians. The procedure developed in this study should allow community leaders the tools to evaluate their community as to whether or not it can support a physician(s). Additionally, these procedures provide physicians a tool to allow them to evaluate alternative locations.

<center>Limitations and Additional Research</center>

A major limitation of this study is the lack of state data to estimate the number of physicians needed in a defined service area. The lack of state data on the key variables of utilization rates for health services, the percent of total visits that are handled by primary care physicians and the typical patient load of physicians were an area of concern. While the use of national data provides a reasonable estimate of physician need, use of local data is preferred.

A potential for future research exists in addressing the above limitation. Developing state health service utilization rates by rural and urban areas would also be very useful.

Another area of useful research would be to adapt the procedures

developed in this study into a computer program. Speed and reduced error in computation would be the primary benefits of this research. To provide the greatest utility such a program should allow for user interaction. For example, a physician may want to explore the cost difference of establishing a practice in buildings of various sizes.

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APPENDIX A

RATE SCHEDULES FOR PHYSICIAN SERVICES (1982)

TABLE XXXIX

RATE SCHEDULES FOR PHYSICIAN SERVICES (1982)

Service	Average Price	Range Low	High
Physician		Dollars	
Office Visit (initial)	21.19	15	30
Office Visit (routine)	16.13	12	21
Nursing Home Visit	20.13	12	40
Emergency Room Visit	26.38	20	40
Hospital Aemission	54.69	0	90
Hospital Visit	23.31	17	30
Critical Care Unit/			
Intensive Care Unit	62.77	21	115
Nurse Visit	4.75	2	8
Obstetric Care	561.67	425	750
Electrocardiogram	28.67	15	45
Osteopathic Manipulative Therapy	16.78	7.50	31.50
Physical Exam	33.34	23	48
Ultra Sound	15.92	5	75
Complete Pelvic Exam	37.75	16	50
Pap Smear Only	10.58	6.50	15
X-ray	30.31	25	37.35
Lab Services			
Laboratory			
Culture & Serum	18.64	10	37
Complete Blood Count	14.00	10	21
Blood Sugar	10.43	8	18
Blooc Chemistry	33.52	15	50
Pregnancy Test	13.35	10	24
Urinalysis	8.04	6	15.50
Hemoglobin	5.39	4	10
Hematocrit	5.38	3	12
Function			
White Blood Count w/Differential	12.05	8	15
Veneral Disease Research Lab	12.09	8	29
Triiodothyronine Uptake	21.71	15	27.50
Pathology	31.50	8	66
Electrolytes	18.75	15	30
Injections			
Antibiotics	9.64	6	15
Vitamins	7.25	3	10
Hormone	8.07	5	12.50
Allergy	3.87	2	8
Cortisone	10.27	6	17.50
Tetanus	7.37	5	10
Intravenous	20.00	7	35
Diphtheria Pertussin, Tetanus	6.88	5	11
Oral Polio	6.59	5	10
Mumps, Measles, Rubella	10.65	6	20.50
Tine Test	6.50	4	10

Source: Survey (sixteen observations).

APPENDIX B

AMORTIZATION FACTORS

TABLE XXXX

AMORTIZATION FACTORS

Interest Rate Percent	Years for Repayment						
	10	15	20	25	30	35	40
8	0.149030	0.116830	0.101852	0.093679	0.088827	0.085803	0.083860
9	0.155820	0.124059	0.109546	0.101806	0.097336	0.094636	0.092960
10	0.162745	0.131474	0.117460	0.110168	0.106079	0.103690	0.102259
11	0.169801	0.139065	0.125576	0.118740	0.115025	0.112927	0.111719
12	0.176984	0.146824	0.133879	0.127500	0.124144	0.022317	0.121304
13	0.184290	0.154742	0.142354	0.136426	0.133411	0.131829	0.130986
14	0.191714	0.162809	0.150986	0.145498	0.142803	0.141442	0.140745
15	0.199252	0.171017	0.159761	0.154699	0.152300	0.151135	0.150562
16	0.206901	0.187822	0.168667	0.164013	0.161886	0.160892	0.160424
17	0.214657	0.187822	0.177690	0.173423	0.171545	0.170701	0.170319
18	0.222515	0.196403	0.186820	0.182919	0.180550	0.180550	0.180240
19	0.230471	0.205092	0.196045	0.192487	0.190432	0.190432	0.190181
20	0.238523	0.213882	0.205357	0.202119	0.200339	0.200339	0.200136

Calculated using the following formula:

$$\text{Amortization Factor} = \frac{i}{(1 - 1+i)-N)}$$

Where i = Interest Rate; N = Number of Years.

APPENDIX C

CONSTRUCTION COST AND CONSUMER PRICE INDICES

TABLE XXXXI

CONSTRUCTION COST AND CONSUMER PRICE INDICES

Period	Construction Cost Index 1977 = 0[2]	Consumer Price Index 1977 = 0[3]
1977	100.0	100.0
1978	113.0	108.4
1979	128.7	125.1
1980	143.3	140.4
1981	152.2	154.5
1982[1]	157.6	158.5

[1]June, 1982.

[2]Source: (7).

[3]Source: (8).

FORM 1. Estimated Number of Annual Physician Office Visits
by Age and Sex for Clinic Service Area

Age Cohort	Male				Female				Total Visits
	Utilization Rate		Population	Total Visits	Utilization Rate		Population	Total Visits	
Under 15	2.3	x	_____	= _____	2.1	x	_____	= _____	_____
15-24	1.4	x	_____	= _____	2.7	x	_____	= _____	_____
25-44	1.8	x	_____	= _____	3.3	x	_____	= _____	_____
45-64	2.6	x	_____	= _____	3.4	x	_____	= _____	_____
65 and Over	4.0	x	_____	= _____	4.3	x	_____	= _____	_____

Estimate of local physician office visits = 66.2 x _____ ; total visits = _____ .

FORM 2.   Estimation of Number of Physicians
an Area can Support

Estimated Total Office
Visits for Area
  (from Form 1)   _____

Subtract Office Visits to
Practicing Physicians in
Area (8,030 x ___ Physicians[1]   -   _____

Equals Office Visits made to Non-local Physician   _____

Divided by Average Number of
Physician Office Visits
  (5455.7)[2]   -   _____

Equals
Number of Additional
Physicians Area could
theoretically support   =   _____

---

[1]Use locally determined number if available.

[2]Average found in national study (2).

FORM 3. Procedure to Estimate Gross Income

		Rate Schedule					
Category of Service	Number of Visits	High	Average	Low	High	Average	Low
Office Visit (initial) .149 x Total Office Visits _____ (Form 1)	_____ x	30.00	21.19	15.00	_____	_____	_____
Office Visit (routine) .851 x Total Office Visits _____ (Form 1)	_____ x	21.00	16.13	12.00	_____	_____	_____
Charge for Additional Services per Office Visit .41 x Total Office Visits _____ (Form 1)	_____ x		15.00 with x-ray 10.00 without		_____	_____	_____
Hospital Visits[1] .25 x Total Office Visits _____ (Form 1)	_____ x	30.00	23.31	30.00	_____	_____	_____
Emergency Room Visits[1] .16 x Total Office Visits _____ (Form 1)	_____ x	40.00	26.38	20.00	_____	_____	_____
Nursing Home Visits[1] .04 x Total Office Visits _____ (Form 1)	_____ x	40.00	20.13	12.00	_____	_____	_____
TOTAL					_____	_____	_____

[1]Use locally determined number if available.

FORM 4. Procedure to Estimate Equipment Cost

Area in Clinic	Equipment	No.	Price/Unit	Total Cost
Reception Area				Dollars
	Chairs, single	___	x _____	= _____
	Chairs, double	___	x _____	= _____
	Chairs, triple	___	x _____	= _____
	Chairs, pediatirc	___	x _____	= _____
	Lamps	___	x _____	= _____
	Magazine Rack	___	x _____	= _____
	Tables	___	x _____	= _____
	Toy Box	___	x _____	= _____
	Waste Receptacle	___	x _____	= _____
	Other:	___	x _____	= _____
		___	x _____	= _____
		___	x _____	= _____
TOTAL				_____
Business Office				
	Adding Machine	___	x _____	= _____
	Bulletin Board	___	x _____	= _____
	Clock	___	x _____	= _____
	Computer	___	x _____	= _____
	Copying Machine	___	x _____	= _____
	Desk	___	x _____	= _____
	Dictaphone	___	x _____	= _____
	Filing Cabinets	___	x _____	= _____
	Lamps	___	x _____	= _____
	Med. Dictionary	___	x _____	= _____
	Filing System with Pegboard	___	x _____	= _____
	Rolodex	___	x _____	= _____
	Safe	___	x _____	= _____
	Stool	___	x _____	= _____
	Secretarial Chair	___	x _____	= _____
	Telephone	___	x _____	= _____
	Telephone Ans. Device	___	x _____	= _____
	Typewriter	___	x _____	= _____
	Vertical File	___	x _____	= _____
	Waste Receptacle	___	x _____	= _____
	Other:	___	x _____	= _____
		___	x _____	= _____
		___	x _____	= _____
TOTAL				_____

FORM 4 (Continued)

Area in Clinic	Equipment	No.	Price/Unit	Total Cost
Physician Office(s)				Dollars
	Chair	___ x	___ =	___
	Clock	___ x	___ =	___
	Credenza	___ x	___ =	___
	Desk	___ x	___ =	___
	Dictaphone[2]	___ x	___ =	___
	Lateral Desk File	___ x	___ =	___
	Lamp	___ x	___ =	___
	Telephone[1]	___ x	___ =	___
		___ x	___ =	___
		___ x	___ =	___
TOTAL				___
Conference Room				
	Audio/Visual Equipment	___ x	___ =	___
	Cabinet	___ x	___ =	___
	Chairs	___ x	___ =	___
	Clock	___ x	___ =	___
	Coat Rack/Hooks	___ x	___ =	___
	Fire Extinguisher	___ x	___ =	___
	Heating Plate	___ x	___ =	___
	Kitchen Utensils	___ x	___ =	___
	Micro-Wave	___ x	___ =	___
	Refrigerator	___ x	___ =	___
	Sofa	___ x	___ =	___
	Table	___ x	___ =	___
	Vacuum Sweeper	___ x	___ =	___
	Other:	___ x	___ =	___
		___ x	___ =	___
		___ x	___ =	___
TOTAL				___

[1]Rental, included directly into operating costs.

[2]Part of unit purchased in business office.

FORM 4 (Continued)

Area in Clinic	Equipment	No.	Price/Unit	Total Cost
			Dollars	
Laboratory	Alcohol Lamps or Bunsen Burner	___ x	_____ =	_____
	Autoclave	___ x	_____ =	_____
	Automatic Cell Counter	___ x	_____ =	_____
	Centrifuge (blood and urine)	___ x	_____ =	_____
	Centrifuge (blood)	___ x	_____ =	_____
	Centrifuge (urine)	___ x	_____ =	_____
	Chairs	___ x	_____ =	_____
	Dop Tone (Minidop)	___ x	_____ =	_____
	Elevated Counter Stool	___ x	_____ =	_____
	Eye Tone	___ x	_____ =	_____
	Fetoscope	___ x	_____ =	_____
	Flashlight	___ x	_____ =	_____
	Hemogramometer	___ x	_____ =	_____
	Incubator	___ x	_____ =	_____
	Microscope	___ x	_____ =	_____
	Punch Biopsy	___ x	_____ =	_____
	Refrigerator	___ x	_____ =	_____
	Sink	___ x	_____ =	_____
	Soap Dispenser	___ x	_____ =	_____
	Substage Lamp	___ x	_____ =	_____
	Tape Dispenser	___ x	_____ =	_____
	Towel Dispenser	___ x	_____ =	_____
	Urinometer	___ x	_____ =	_____
	X-ray View Box	___ x	_____ =	_____
	Other:	___ x	_____ =	_____
		___ x	_____ =	_____
		___ x	_____ =	_____

TOTAL (without X-ray Machine)   _____

X-ray Machine   ___ x _____ = _____

TOTAL (with X-ray Machine)   _____

FORM 4 (Continued)

Area in Clinic	Equipment	No.	Price/Unit	Total Cost
				Dollars
Examination/Treatment Room				
	Anascope	___ x	_____ =	_____
	Blood Pressure Cuff	___ x	_____ =	_____
	Bulletin Board	___ x	_____ =	_____
	Cabinet	___ x	_____ =	_____
	Cast Cutter	___ x	_____ =	_____
	Clothes Rack/ Hooks	___ x	_____ =	_____
	Compressor/ Suction	___ x	_____ =	_____
	Diathermy Unit	___ x	_____ =	_____
	Electrocardio- graph	___ x	_____ =	_____
	Examination Table	___ x	_____ =	_____
	Gooseneck Lamp	___ x	_____ =	_____
	Mirror	___ x	_____ =	_____
	May Instrument Stand	___ x	_____ =	_____
	Opthalmoscope- Otoscope	___ x	_____ =	_____
	Pediatric Scale/ Table	___ x	_____ =	_____
	Portable Oxygen Tank Mask & Carrier	___ x	_____ =	_____
	Scales	___ x	_____ =	_____
	Side Chairs	___ x	_____ =	_____
	Sigmoidoscope	___ x	_____ =	_____
	Sink	___ x	_____ =	_____
	Soap Dispenser	___ x	_____ =	_____
	Snellen Eye Chart	___ x	_____ =	_____
	Stool	___ x	_____ =	_____
	Towel Dispenser	___ x	_____ =	_____
	Trays-Ear	___ x	_____ =	_____
	Trays-Eye	___ x	_____ =	_____
	Trays-Surgical	___ x	_____ =	_____
	Ultrasound Unit	___ x	_____ =	_____
	Utility Cart	___ x	_____ =	_____
	Waste Receptacle	___ x	_____ =	_____
	Other:	___ x	_____ =	_____
		___ x	_____ =	_____
TOTAL				_____

FORM 4 (Continued)

Total Equipment Costs	Total Cost
	Dollars
Reception Area	_____
Business Office	_____
Physician's Office	_____
Conference Room	_____
Laboratory	_____
Examination/Treatment Room	_____
(with X-ray)	_____
(without X-ray)	_____

FORM 5. Procedure to Estimate Annual Costs

I. Capital Costs

    A. Building

       Number of Physicians   _____

       x sq ft per physician (1200–1500)   _____

       x construction cost per sq ft ($50–$55) $ _____

$$\left[x\frac{(\rule{1cm}{0.4pt})\ \text{current construction cost index})}{(157.6)\ 1982\ \text{construction cost index}} \right]$$ $ _____

       + land cost ($11,750 per acre)   _____

                             TOTAL   _____

    B. Equipment   _____

       Total equipment costs (Form 4) $ _____

$$\left[x\frac{(\rule{1cm}{0.4pt})\ \text{current construction cost index}}{(157.6)\ 1982\ \text{construction cost index}} \right]$$ _____

                             TOTAL   _____

II. Capital Charges

    A. Capital Cost Building $ _____

       x _____ amortization factor (no. of yrs)   _____

       x interest rate _____ (Appendix B)

                             TOTAL   _____

    B. Capital Cost Equipment $ _____

       x _____ amortization factor (no. of yrs)   _____

       x interest rate _____ (Appendix B

                             TOTAL   _____

       TOTAL CAPITAL CHARGES $ _____

FORM 6. Procedure to Estimate Annual Operating Costs

I. Building

   A. Electricity

      1982 price per square foot per physician ($0.74)

$$\left[x \; \frac{(\underline{\hspace{1cm}}) \; \text{Current Consumer Price Index}}{(158.5 \; \text{1982 Consumer Price Index}} \right]$$

      $_____ estimated current price

      $_____(cost per sq ft) x _____ number of

      sq ft) $_____

   B. Gas

      1982 price per square foot per physician $_____

$$\left[x \frac{(\underline{\hspace{1cm}}) \; \text{Current Consumer Price Index}}{(158.5) \; \text{1982 Consumer Price Index}} \right]$$

      _____ estimated current price

      $_____ (cost per sq ft) x _____ number of

      sq ft $_____

   C. Water

      1982 price per year per physician ($131.00)

$$\left[x \frac{(\underline{\hspace{1cm}}) \; \text{Current Consumer Price Index}}{(158.5) \; \text{1982 Consumer Price Index}} \right]$$

      $_____ estimated current price $_____

   D. Sewer

      1982 price per year per physician ($86.00)

$$\left[x \frac{(\underline{\hspace{1cm}}) \; \text{Current Consumer Price Index}}{(158.5) \; \text{1982 Consumer Price Index}} \right]$$

      $_____ estimatee current price $_____

   E. Trash

      1982 price per year per physician $150.00)

$$\left[x \frac{(\underline{\hspace{1cm}}) \; \text{Current Consumer Price Index}}{(158.5) \; \text{1982 Consumer Price Index}} \right]$$

      $_____ estimatee current price $_____

FORM 6 (Continued)

F. Maintenance

1982 price per year per physician ($799.00)

$$\left[x \frac{(\quad\quad) \text{ Current Consumer Price Index}}{(158.5) \text{ 1982 Consumer Price Index}} \right]$$

$_____ estimated current price $_____

G. Janitor

1982 price per year per physician ($1,968.00)

$$\left[x \frac{(\quad\quad) \text{ Current Consumer Price Index}}{(158.5) \text{ 1982 Consumer Price Index}} \right]$$

$_____ estimated current price $_____

H. Taxes

1982 price per year per physician ($1,881.00)

$$\left[x \frac{(\quad\quad) \text{ Current Consumer Price Index}}{(158.5) \text{ 1982 Consumer Price Index}} \right]$$

$_____ estimated current price $_____

I. Insurance

1. Brick Veneer Building
   a $_____ value of bldg per physician
      x 1.293   insurance cost per $1000 value

   b $_____
      x 1.076 insurance cost per $100 value

   Total insurance (a + b) $_____

2. Frame Building
   a $_____ value of bldg per physician
     x 1.660 insurance costs per $100 value

   b $_____ value of equipment per physician
     x 1.450 insurance costs per $100 value

   Total Insurance (a + b) $_____

J. Total Building Expenses per Physician
   (A + B + C + D + E + F + G + H + I $_____

K. Total Annual Building Expenses

   $_____ Total Building expenses per physician
   x _____ number of physicians $_____

II. Office

    A. Supplies

        1982 costs per office visit ($)

$$\left[x\frac{(\quad) \text{ Current Consumer Price Index}}{(1.58.5) \text{ 1982 Consumer Price Index}} \right]$$

        $_____ (estimated current price) x

        _____ (number of office visits per physician)

        $_____ estimatee current price $_____

    B. Telephone

        1982 costs per office visit $2,297.00)

$$\left[x\frac{(\quad) \text{ Current Consumer Price Index}}{(158.5) \text{ 1982 Consumer Price Index}} \right]$$

        $_____ estimated current price $_____

    C. Office Equipment

        1982 cost per office visit ($200.00

$$\left[x\frac{(\quad) \text{ Current Consumer Price Index}}{(158.5) \text{ 1982 Consumer Price Index}} \right]$$

        $_____ estimated current price $_____

    D. Billing

        1982 cost per physician ($941.00)

$$\left[x\frac{(\quad) \text{ Current Consumer Price Index}}{(158.5) \text{ 1982 Consumer Price Index}} \right]$$

        $_____ estimated current price $_____

    E. Retainer Fee

        1982 cost per physician $1,086.00)

$$\left[x\frac{(\quad) \text{ Current Consumer Price Index}}{(158.5) \text{ 1982 Consumer Price Index}} \right]$$

        $_____ estimated current price $_____

    F. Convention

        1982 cost per physician $1,825.00)

$$\left[x\frac{(\quad) \text{ Current Consumer Price Index}}{(158.5) \text{ 1982 Consumer Price Index}} \right]$$

        $_____ estimated current price $_____

FORM 6 (Continued)

G. Auto Expenses

1982 costs per physician $4,800.00)

$$\left[x\frac{(\quad)\ \text{Current Consumer Price Index}}{(158.5)\ 1982\ \text{Consumer Price Index}} \right]$$

$_____ estimatee current price $_____

H. Professional Dues

1982 costs per physician $715.00)

$$\left[x\frac{(\quad)\ \text{Current Consumer Price Index}}{(158.5)\ 1982\ \text{Consumer Price Index}} \right]$$

$_____ estimated current price $_____

I. Total Office Expenses per Physician

A + B + C + D + E + F + G + H $_____

J. Total Annual Office Expenses

$_____ expenses per physician x ____

number of physicians $_____

III. Medical

A. Medical Supplies

1982 cost per office visit ($0.71)

$$\left[x\frac{(\quad)\ \text{Current Consumer Price Index}}{(158.5)\ 1982\ \text{Consumer Price Index}} \right]$$

Estimated current price per visit x _____

Number of office visits per physician _____ $_____

B. Medical Equipment Maintenance

1982 cost per physician ($1,033.00)

$$\left[x\frac{(\quad)\ \text{Current Consumer Price Index}}{(158.5)\ 1982\ \text{Consumer Price Index}} \right]$$

$_____ estimated current price $_____

C. Malpractice

1982 cost per physician $2,917.00)

$$\left[x\frac{(\quad)\ \text{Current Consumer Price Index}}{(158.5)\ 1982\ \text{Consumer Price Index}} \right]$$

$_____ estimated current price $_____

FORM 6 (Continued)

D. Total Annual Medical Costs per Physician

(A + B + C) $_____

E. Total Annual Medical costs per physician

$_____ total annual medical costs per physician

x _____ number of physicians $_____

IV. Personnel

	Type	1982 Salary	Current[1] Salary	No. Emp.	Total Cost
A.	Medical Assistant	$9,760	_____	___	_____
B.	Licensed Practical Nurse	9,630	_____	___	_____
C.	Registered Nurxe	13,139	_____	___	_____
D.	Lab. Technician	14,493	_____	___	_____
E.	X-ray Technician	15,743	_____	___	_____
F.	Receptionist	9,961	_____	___	_____
G.	Bookkeeper	11,164	_____	___	_____
H.	Receptionist/Bkkeeper	11,760	_____	___	_____
I.	Medical Secretary	8,407	_____	___	_____
J.	Insurance Clerk	8,160	_____	___	_____

K. Total Personnel Costs Without Fringe Benefits
(A + B + C + D + E + F + G + H + I + J) $_____

L. Fringe Benefits

$_____ Personnel Costs Without Fringe Benefits x _____ %

Percent Fringe Benefits (15%) $_____

M. Total Annual Personnel Costs (K + L) $_____

---

[1]If current salary is unknown, use 1982 salary adjusted for
change in price level 1982 Salary x $\dfrac{\text{Current Consumer Price Index}}{\text{1982 Consumer Price Index}}$.

FORM 7. Procedure to Estimate Total Annual Cost

A. Capital Costs (from Form 5) $_____

B. Operating Costs

    1. Building (Form 6, I K) $_____

    2. Office (Form 6, II K) $_____

    3. Medical (Form 6, III K($_____

    4. Personnel (Form 6, IV K) $_____

C. Total Operating Costs
    (B1 + B2 + B3 + B4) $_____

D. Total Annual Capital and Operating Cost
    (A + C) $_____

FORM 8. Estimated Net Income

	Rate Schedule		
	Low	Average	High
		Dollars	
Gross Income (100% Collection Rate)	_____	_____	_____
Total Costs	_____	_____	_____
Net Income	_____	_____	_____
Number of Physicians	_____	_____	_____
Net Income per Physician	_____	_____	_____
Gross Income at Alternative Rates	_____	_____	_____
Collection Rates			
95%	_____	_____	_____
90%	_____	_____	_____
85%	_____	_____	_____
80%	_____	_____	_____
Net Income at Alternative Rates	_____	_____	_____
95%	_____	_____	_____
90%	_____	_____	_____
85%	_____	_____	_____
80%	_____	_____	_____
Number of Physicians	_____	_____	_____
Net Income per Physician	_____	_____	_____
95%	_____	_____	_____
90%	_____	_____	_____
85%	_____	_____	_____

FORM 9.   Annual Revenue and Profit (Loss) From
          Renting Clinic to Physician

I.   Annual Cost

A.   Capital Costs

Building and Land (from Form 5) $_____

Equipment (from Form 5)   _____

B.   Operating Costs

Building (Maintenance, Taxes, Insurance)
   (from Form 6)   _____

Other   _____

C.   Total Annual Costs   _____

II.   Annual Revenue Costs

Monthly
Rental
Charge
per   Number of
Physician   Physicians

_____ x 12 x _____ = _____ - _____ = -_____

_____ x 12 x _____ = _____ - _____ = -_____

_____ x 12 x _____ = _____ - _____ = -_____

_____ x 12 x _____ = _____ - _____ = -_____

_____ x 12 x _____ = _____ - _____ = -_____

_____ x 12 x _____ = _____ - _____ = -_____

VITA $^{|}$

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