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ABSTRACT

This bibliography provides background material on two general issues of how physicians are distributed geographically and how physicians choose a practice location. The report is divided into five major categories of information: overview summary of annotated articles, reference key to location decision factors, reference key to public policy alternatives, annotated articles, and a complete reference list of annotated and nonannotated materials. (MJM)

Physician Location Selection and Distribution

A Bibliography of Relevant Articles, Reports and Data Sources

by Stephen C. Crane and Juanita Reynolds

D3

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Introduction

One of the principal objectives of the Health Manpower Policy Studies Group is the provision of technical assistance to governmental agencies and private groups working on problems of health manpower policy and planning. The great majority of our work is done on the basis of requests for specific assistance. On occasion, however, work of a general and background nature is produced which, while used in response to a particular problem, does have wider applicability to other areas and problems. Such work may be as useful if not more useful than analyses of specific problems or narrow issue-oriented research which can exclude potentially relevant and important information to a policy or planning decision which cannot be adapted to meet the specific needs of the user under a variety of circumstances. An earlier paper prepared by HMPSG on state physician assistant laws is an example of the type of general technical assistance which has wide applicability in different situations and for a variety of purposes. This bibliography of articles relating to physician location and location choice represents a similar type of study.

The original purpose of this bibliography was to provide background material on the two general issues of how physicians are distributed geographically and how physicians choose a practice location. This material was to be used in several studies to be conducted by HMPSG on physician migration. Most recently the material has been used in the preparation of analyses of how Michigan might most effectively increase the stock of its physicians without necessarily increasing the production of physicians by its medical schools. Because issues of physician distribution and migration are

of general concern at all levels of government - federal state, and local - we have decided to make these materials available as part of our technical assistance program. It is hoped that the references, annotations, and summaries included will simplify and expedite further research and analytic activities particularly for government decision-makers who must work under tight deadlines on these very important problems of health manpower policy and planning.

II. Summary of the Materials Presented

The substance of this report is divided into five major categories of information:

(1) Overview Summary of Annotated Articles (Chapter III)

(2) Reference Key to Location Decision Factors (Chapter IV)

(3) Reference Key to Public Policy Alternatives (Chapter V)

(4) Annotated Articles (Chapter VI)

(5) Complete Reference List of Annotated and Non-annotated Materials (Chapter VII).

(1) Overview Summary

This first section (Chapter III) is intended to provide a brief summary of the content and purpose of the articles that appear in Chapter V. This summary should permit a researcher or analyst to match his needs quickly with the articles and information provided in the annotations. The following information is provided in the summary:

1. Year(s) to which the study applies
2. Study population
3. Study purpose
4. Study focus
5. Study methodology
6. Location focus
7. Decision focus
8. Study Difficulty.

The meaning and abbreviations used for each of these categories is explained at the beginning of Chapter III. It should be noted that our attempt was to include materials on both medical and osteopathic physicians, although very few of the studies include reference to the latter. This imbalance reflects the general research focus of the field of study until recent years.

(2) Reference Key to Location-Decision Factors

A variety of approaches to the study of physician distribution and location choice are presented in the annotations and the more complete references in the Bibliography. As with any study area, one of the major problems confronting researchers is the inconsistency in both conceptual and operational definitions of key variables used in many studies to explain physician location choice and distribution. The summary presented in Chapter IV does not purport to clarify these complicated definitional problems. Rather, an attempt has been made to list comprehensively the major class of variables used in each study without concern for how these variables were operationalized. The purpose of this presentation is only to assist the researcher or analyst in identifying those articles which use or refer to the variables in which he is interested. The important task of clarifying and composing these definitions is left to a later report. Generally the variables are classified along three dimensions:

Influences on the Physician

Physician Objectives

Specific Decision Factors or Criteria.

These classifications are explained in greater detail at the beginning of Chapter IV.

(3) Reference Key to Public Policy Alternatives

Analysts in decision-making positions often desire information relating to the operation, effectiveness or efficiency of available policy alternatives. Chapter V presents a listing of the major policy instruments used or being considered for use to improve physician distribution as well as the references where these alternatives are outlined or discussed. The list is only as

comprehensive as those alternatives discussed in the referenced articles; it is not inclusive of all alternatives ever proposed. The purpose of this section again is to assist primarily those individuals in policy or planning decision positions who know their information needs but who may not have the time to service these needs adequately themselves.

(4) Annocated Articles

While most of the articles that were annotated were chosen on the basis of their expected contribution to the issues mentioned in Chapter I, problems of availability precluded the inclusion of a number of significant works in annotated form. To compensate for this deficit, major articles and frequently cited works not included in the annotations are identified in the complete bibliography. (Chapter VII).

The annotations are intended to serve two purposes:

(1) to summarize briefly the content and methodology of a study; and

(2) to present the findings which would be most relevant in a policy or planning framework.

The annotations include the purpose for the study, the data used, the statistical or theoretical model employed if any, a description of the analytic procedures applied, and the major conclusions of the study. Those aspects of the study that fall outside a policy and planning framework are not included, or are given different emphasis in the annotation than in the original article.

(5) Bibliography

The bibliography is based on those works most frequently cited in the literature reviewed for this project. It includes source data and primary research as well as comments and reviews of these materials. The articles are indexed according to a rough measure of frequency of citation to provide the reader with a sensitivity for the direction and scope of the field of study.

III. Overview Summary of Annotated Articles

The references included in this summary comprise those articles which were annotated and the major data source documents listed in the Bibliography. An explanation and key for interpretation of the tables follows:

Column	Title	Abbreviation	Meaning
1	Reference	number	Numbers refer to index number of article in the Bibliography
2	Year of study	year	Date refers to year for which study data analyses were prepared rather than year of study
		N.A.	No specific year applicable
3-4 col. 3	Study Population	MD-DO	Indication of the type of physician included in the study
col. 4		none	Breakdown of physicians into specialties not provided
		GP-Spec.	Breakdown of physicians by general practice and specialty only
		Prim Care	Breakdown of physicians by or into primary care specialties
		Fam Pr	Breakdown by family practice
		Major Spec.	Breakdown of physicians into major specialties
		All	Breakdown of physicians by all specialties
		NA	Not applicable
5	Purpose	Des	Study is essentially descriptive and is only marginally analytic
		Exp	Study attempts to explain physician distribution and,or physician decision process

Column	Title	Abbreviation	Meaning
		Pred	Study attempts to apply explanatory model to predict future distribution or employs a prospective study design
6	Content Focus	Proc	Study seeks to identify and discuss the process of physician location decision-making
		Fact	Study identifies and discusses the factors relevant to physician location choice and physician distribution
7	Content	Bibl.	Article is a bibliography
		Lit. R.	Article is or involves an extensive review of the literature.
		SD	Article provides source data
		Res	Report represents the results of original research
		Com	Report only comments on other analyses and does not provide a literature review or present original research or data.
8	Location Focus	N/R	Study or report relates to physician distribution at the national or regional level.
		S/C	Relates to the state or county level.
		M/R	Relates to metropolitan/ rural differences

Column	Title	Abbreviation	Meaning
		M	Relates to physician location within or between metropolitan areas.
		R	Relates to physician location within or between rural areas.
9	Decision Point		Relates to time and place of decision:
		MS	medical school
		I	Internship
		R	Residency
		FP	First Practice
		CP	Change of Practice
10	Study Difficulty	Lo	Little data analysis, straightforward thesis
		Med	Uncomplicated statistical analysis, more involved interpretation of data
		Hi	Advanced data analysis techniques employed, econometric analysis.

Overview Summary of Annotated Articles

1 Reference	2 Year of Study	3-4 Population Phys.	Spec.	5 Purpose	6 Content Focus	7 Content	8 Location Focus	9 Decision Point	10 Study Difficulty
1	N.A.	MD	N.A.	Pre	Proc Fact	Res	S/C	N.A.	Med
5	N.A.	MD	None	Des	Fact	Lit.R.	all	all	Lo
15	1968	MD	GP-Spec	Des	Fact	Res	N/R	R FP CP	Lo
16	1962	MD	GP-Spec	Exp	Fact	Lit.R.	M/R	FP CP	Hi
21	1930-1960	MD DO	GP-Spec	Exp	Fact	Res	S/C	FP CP	Hi
22	1967	MD	None	Des	Proc Fact	Com	M/R R	FP CP	Lo
23	N.A.	MD	GP-Spec	Des	Fact	Com	R	FP CP	Lo
24	1967	MD	None	Exp	Fact	Res	R	FP CP	Lo
26	1966	MD	None	Exp	Fact	Res	M	FP CP	Lc
31	Late 60s	MD	None	Exp	Fact	Com	R	I R FP	Lo
33	1967-1968	MD	None	Des	Fact	Res	M/R R	R FP CP	Med

Reference	Year of Study	Population Phys.	Spec.	Purpose	Content Focus	Content	Location Focus	Decision Point	Study Difficulty
34	N.A.	MD	GP-Spec	Exp	Fact	Lit.R.	M/R	I-R FP-CP	Lo
35	1966	MD-DO	None	Des	Fact	Com	M	I-R FP-CP	Lo
39	N.A.	MD-DO	Major Spec	Exp	Proc Fact	Lit.R.	M/R M R	I R FP	Med
40	N.A.	MD	Major Spec	Exp	Proc Fact	Lit.R. Res	N/R	I R FP	Med
41	N.A.	MD	None	Des	Fact	Lit.R.	M/R R	I-R FP-CP	Lo
42	1969	MD	Prim Care	Exp	Fact	Res	M/R	FP CP	Lo
43	1960-1970	MD	None	Exp	Fact	Res	N/R M	all	Lo
44	1960-1972	MD	None	Des	Fact	Res	N/R M	all	Med
45	1970	MD	None	Exp	Fact	Res	N/R M	all	Lo
51	1936-1951	MD	None	Exp	Fact	Res	M/R	FP CP	Lo
55	1930-1980	MD	None	Pred	Fact	Res	N/R S/C	R FP CP	Hi

1	2	3-4		5	6	7	8	9	10
Reference	Year of Study	Population Phys.	Spec.	Purpose	Content Focus	Content	Location Focus	Decision Point	Study Difficul
56	N.A.	MD-DO	All	Des	Fact	Lit.R.	N/R S/C	I-R FP-CP	Med
57	1950-1960	MD	GP-Spec	Exp	Fact	Res	M/R	R FP CP	Lo
61	1961	MD	GP-Spec	Exp	Fact	Res	M	FP CP	Med
62	1910-1960	MD	None	Des	Fact	Res	N/R S/C	FP CP	Lo
63	1950-1965	MD	GP-Spec	Des	Fact	Res	S/C M/R	FP CP	Lo
65	1952	MD	None	Exp	Fact	Res	S/C	MS I-R FP-CP	Lo
68	N.A.	MD	None	Exp	Fact	Res	N/R M	FP CP	Hi
69	1972	MD	GP FamPr	Des	Fact	Com	R	I-R FP-CP	Lo
79	N.A.	MD	None	Des	Fact	Lit.R.	S/C	FP CP	Lo
84	1966	MD	GP-Spec	Exp	Fact	Lit.R. Res	S/C M/R M R	I-R FP-CP	Hi
86	N.A.	MD-DO	GP-Spec	Des	Fact	Lit.R.	All	FP CP	Hi

Reference	Year of Study	Population Phys.	Spec.	Purpose	Content Focus	Content	Location Focus	Decision Point	Study Difficulty
88	1939 1949 1956	MD	None	Des	Fact	Res	N/R S/C M/R	All	Med
91	1969	MD	Prim Care Spec	Exp	Fact	Res	M/R	FP CP	Med
92	1962	MD-DO	GP-Spec	Exp	Proc Fact	Res	M/R	FP CP	Med
94	1963- 1967	MD	GP-Spec	Exp	Fact	Res	N/R S/C M/R	I-R FP-CP	Hi
98	1949- 1950	MD	None	Exp	Fact	Res	N/R	R FP CP	Med
102	1966	MD	All	Des	Fact	Res	M	FP CP	Hi
104	1970	MD	Maj. Spec	Exp	Proc	Res	M	FP CP	Med
108	1949 1958 1970	MD	Fam Pr	Exp	Fact	Res	M/R	MS FP CP	Lo
110	1955- 1970	MD	None	Des	Fact	Com	R	FP CP	Lo
117	None	MD	None	Exp	Fact	Com	M/R	FP CP	Lo

1	2	3-4		5	6	7	8	9	10
Reference	Year of Study	Population Phys.	Spec.	Purpose	Content Focus	Content	Location Focus	Decision Point	Study Difficulty
118	1960	MD	GP-Spec	Des	Fact	Res	S/C M/R	FP CP	Med
120	1960	MD	None	Des	Fact	Res	M/R M R	FP CP	Med
121	1951-1960	MD	GP-Spec	Exp	Fact	Res	N/R S/C M/R	I-R FP-CP	Lo
122	1957-1969	MD	Fam Pr	Des	Fact	Res	M/R	I R FP	Lo
124	1935-1945	MD	Prim Care	Des	Fact	Res	N/R	FP CP	Lo
126	NA	MD	GP-Spec	Exp	Fact	Lit. R.	All	I-R FP-CP	Med
127	1967	MD	Maj. Spec	Des	Fact	Res	M	R FP CP	Lo

Reference	Year of Study	Population Phys.	Spec.	Purpose	Content Focus	Content	Location Focus	Decision Point	Study Difficulty
138	1923 1930 1938 1940	MD	None	Des	Fact	Res	M/R M	FP CP	Lo
145	NA	MD	None	Des	Fact	Lit.R.	N/R S/C M/R	FP CP	Lo
150	1940- 1950	MD	None	Des	Fact	Res	R	FP CP	Lo
151	1960	MD	GP-Spec	Exp	Fact	Res	M/R	I-R FP-CP	Med
155	1966	MD	GP-Spec	Exp	Fact	Res	I S/C	I R	Lo
156	1966	MD	GP-Spec	Des	Fact	Res	S/C	FP CP	Med
158	1961- 1975	MD-DO	NA	Pred	NA	SD	N/R	NA	Med
166	1969	MD	None	Des	Fact	Com	R	MS I R	Lo
167	NA	MD	None	Exp	Fact	Res	N/R S/C M/R	FP CP	Hi
170	NA	MD	None	Des	Fact	Com	M R	FP CP	Lo

1	2	3-4		5	6	7	8	9	10
Reference	Year of Study	Population Phys.	Spec.	Purpose	Content Focus	Content	Location Focus	Decision Point	Study Difficulty
171	1960-1965	MD	None	Exp	Fact	Res	S/C R	R FP	Lo
172	NA	MD-DO	None	Exp	Fact	Res	S/C M/R	R FP-CP	Med
173	1960	MD	None	Exp	Fact	Res	S/C	FP CP	Med
176	1956-1967	MD	GP-Spec	Exp	Fact	Lit. R. Res	N/R S/C M/R	I-R FP-CP	Hi
177	1963-1967	MD	GP-Spec	Exp	Fact	Res	S/C	I-R FP-CP	Med
181	NA	MD	GP-Spec	Des	Fact	Lit. R. Res	All	I-R FP-CP	Lo
189	1950-1959	MD	None	Exp	Fact	Res	N/R	R FP CP	Med
190	1972	MD	GP-Spec	Exp	Fact	Res	N/R M/R	MS	Med
192	1970-1971	MD	Maj. Spec	Exp	Fact	Res	S/C M/R	MS-I R-FP	Lo
197	1969	MD-DO	All	Des	Fact	Res	S/C	FP CP	Lo

Reference	Study	Population Phys.	Spec.	Purpose	Content Focus	Content	Location Focus	Decision Point	Study Difficulty
216	1950 1955 1960 1965	MD	NA	Exp	Fact	Res	S/C	MS FP CP	Lo
218	1915-1950	MD	GP-Spec	Des	Fact	Res	N/R	I-R FP-CP	Med
219	1965	MD	Maj. Spec	Exp	Fact	Res	S/C M	R FP-CP	Med
220	1915-1955	MD	GP-Spec	Exp	Fact	Res	N/R	I-R FP-CP	Lo
221	1949-1956	MD	All	Exp	Fact	Res	R	FP CP	Lo
224	1966	MD	GP-Spec	Exp	Fact	Res	N/R	FP	Hi

IV Reference Key to Location Decision Factors

General attempts have been made to organize the literature with respect to decision location factors (references 5, 39, 41, and 126). The ordering presented here attempts to reflect the social-psychological aspects of physician decision-making as well as the economic issues. The first major section, Influences, is intended to represent the various social and personal forces which shape and direct the objectives held by a physician for his personal life and practice. Objectives attempts to suggest the broad as well as the specific criteria used by a physician in choosing a practice location. Part of the classification system for objectives was developed by deVise (reference 43). The third section, Factors, lists all the variables most commonly used to describe, explain or predict physician location, and are broken down into three major categories:

Environment

Practice - Related

Demand - Related

The classification scheme here is in part based on the work of McFarland (126).

As mentioned in the introduction, one of the major problems in summarizing literature of this type is sorting out the conceptual definitions used in different studies and identifying a common base of operational meaning for each definition and variable. "Community size", for instance, can be used to indicate the environmental characteristics of a particular location or to suggest demand-related determinents of utilization or need for a physician. Many times the precise conceptual meaning of the variable "community size" is left to the imagination of the reader. In other instances, community size can be defined conceptually to refer to demand determinents but then is operationally defined in a variety of different ways across studies. These research methodology issues beg the entire question, of course, of what

geographical area should be considered as the appropriate unit of analysis. As a result of these problems, several factors such as community size (population size) are listed under several different headings. The reader is encouraged to examine <u>all</u> articles listed as discussing or using the factor in question in order to avoid misinterpretation of the meaning and intent of the variables cited.

As a final note on this summary, articles are identified with a factor for either of two reasons. First, an article is referenced if it uses a particular factor to describe, explain or predict physician location, patterns of practices. Secondly, an article is referenced even if it only discusses a factor without using it as part of the theoretical presentation. The latter classificatory strategy can be justified on the grounds that the discussions and analyses which occur concerning factors used in other studies often throw greater light on the importance and interpretation of the factors than that provided by original research incorporating this factor. This non-inclusive strategy makes for a more cumbersome list of references but by the same token creates greater access to all the literature that may be relevant for a particular decision-maker in a specific situation.

Topics are broken down into the highest level of specificity attainable. When articles cannot be so specified or deal with virtually all of the subtopics, they are listed under the more general heading.

Reference Key to Location Decision Factors

Factor	Reference
I. Influences	5
A. Family	22, 24, 92, 156
1. Wife	34, 39, 92, 117, 121, 151, 192
2. Father's occupation	24, 33, 91, 92, 117
3. Family income	33, 45
B. Social	
1. Friends	22, 24, 39, 92
2. Other physicians	24, 69
3. Community recruitment	39
C. Professional	
1. Specialization	23, 33, 34, 39, 40, 69, 84, 108, 156, 192, 218, 219
2. Medical school	
a. quality	26, 39
b. faculty	26, 31, 69, 155
c. ownership	33, 39
d. socialization	51, 166, 192
3. Placement service	22, 24, 126
D. Financial Incentives	41, 122, 156
1. loan forgiveness, scholarship, etc.	
E. Background, General	
1. Geographic: origin	15, 22, 24, 33, 39, 41, 45, 51, 65, 69, 84, 86, 91, 92, 117, 121, 126, 181, 190, 192, 216, 218, 224
2. Geographic: medical school	15, 26, 33, 39, 41, 44, 45, 69, 92, 126, 176, 177, 181, 216, 224

	Reference
3. Geographic: internship	22, 24, 39, 40, 41, 44, 45, 69, 86, 92, 121, 126, 176, 177, 181, 220, 224
4. Geographic: residency	24, 39, 40, 41, 44, 45, 69, 86, 92, 121, 126, 176, 177, 181, 218, 220, 224
5. Geographic: first practice	91
6. age, physician	24, 63, 92
7. race, physician	45
8. Academic ability	155
9. Time of location decision	92, 190
II. Objectives	
A. Income Maximization	43, 44, 68, 86, 88, 91, 121, 124, 167
B. Family-oriented Goals	22, 24, 43, 171
C. Social Prestige	43
1. Place in community	22, 24, 42
2. Friends	22, 24, 91
D. Professional Interaction	24, 33, 42, 43, 126, 156
E. Practice	
1. work-leisure	22, 24, 34, 39, 42, 68, 84, 86, 91, 92, 110, 150, 151, 156, 167, 181
2. patient case mix	24, 34, 42, 68, 91, 124, 156
a. interesting cases	
b. quality care	
c. "challenge"	22, 24, 81, 124
independence	

	Reference
3. physician/patient relationship	91, 92
F. Personal	
1. geographic area preference	22, 24, 108, 117, 124, 150, 151, 156, 176, 190, 192
2. desire to be of help	24, 33
III. Decision Factors	5
A. Environment	62, 170
1. culture	15, 22, 23, 24, 33, 34, 39, 41, 44, 45, 69, 126
2. recreation	15, 22, 23, 33, 34, 39, 41, 45, 69, 84, 86, 121, 126, 181, 189, 190
3. housing	23, 84, 86, 126
4. community security	126
5. transportation	22, 24, 69, 126
6. schools	22, 23, 24, 39, 41, 69, 84, 94, 126, 181
7. pollution	126
8. shopping	126
9. climate	22, 39, 43, 44, 121, 126, 181, 190, 224
10. population growth (change)	16, 24, 39, 55, 84, 126, 150, 176, 189
11. economic growth	41, 55, 63, 181
12. urbanization-population density	21, 24, 26, 43, 45, 55, 94, 102, 120, 121, 126, 127, 138, 156, 173, 176, 181, 189, 219
a. proportion population in agriculture	39, 41, 150
b. proportion population professional	84, 94, 171
13. racial mix	41, 181
14. wealth of area	15, 39, 41, 42, 120, 138, 156, 172, 173, 176, 181, 189, 197, 218, 224

	Reference
15. size of community	23, 34, 41, 51, 63, 92, 94, 102, 120, 124, 156, 176, 181, 218, 220, 221
16. terrain	23, 189, 190
17. religion	23
18. population mobility	39, 41, 150, 181
19. communications	69
20. relocation and search cost	84
21. welfare support	84
22. property tax	84, 86
23. zoning	104
24. public services	126
B. Practice Related	
1. Availability, quality and quantity of hospital services	22, 23, 24, 33, 34, 35, 39, 40, 41, 44, 57, 61, 69, 84, 86, 92, 94, 104, 110, 118, 120, 124, 126, 138, 150, 151, 166, 171, 173, 176, 177, 181, 190, 197, 219, 220, 224
2. Availability of ancillary services (lab, pharmacy, x-ray, office)	22, 23, 24, 33, 34, 39, 61, 84, 86, 92, 110, 124, 150, 151, 156, 166, 171, 173, 176, 181, 190, 220
3. Availability of personnel	23, 24, 61, 84, 86, 126, 156, 181, 190, 219
4. Availability of medical school	16, 21, 41, 45, 55, 94, 102, 121, 177, 181, 190, 219
5. Availability of consultations	23, 24, 69, 138, 156, 190
6. Emergency medical services	22, 23, 24, 39
7. Licensure	16, 21, 41, 44, 45, 55, 98, 126, 176
8. Group practice possibility	24, 39, 121, 126, 190
9. Contact with other professionals	24, 34, 39, 126, 156
10. Continuing education possibilities	22, 24, 44, 126, 156
11. Costs of practice	68, 84, 86, 126
12. Best available position Quick practice start	22, 24, 39, 69, 117, 15.

	Reference
13. Work with established physician	150, 189
C. Demand Related	15, 16, 21, 34, 167, 176
1. Population characteristics	
a. size	16, 23, 34, 44, 45, 55, 61, 65, 84, 86, 104, 118, 120, 126, 170.
b. age	41, 61, 84, 86, 94, 102, 104, 118, 120, 126
c. sex	86, 120, 126
d. race	41, 61, 84, 86, 94, 102, 104, 118, 126
e. income	21, 23, 34, 42, 44, 45, 55, 61, 65, 84, 86, 94, 126, 150, 181
f. education	41, 61, 65, 84, 86, 94, 102, 118, 120, 150, 171
g. morbidity and mortality	24, 120, 150, 156, 181
h. employment	84, 94
i. health insurance coverage	16, 86, 94, 181, 189, 197
j. per capita health care expenditures	45, 84
k. visits (hospital, MD)	16, 42, 94, 176
2. Physician availability	55, 84, 94, 120, 126, 127, 224
3. Physician income in area	16, 21, 33, 41, 45, 84, 94, 126, 181, 224
4. Price of area services	41, 86
5. Perceived excess demand	68, 117, 126, 220
6. Existence of federal programs - Medicare Medicaid Research	16, 43, 44, 45, 171, 172, 176

V. Reference Key to Public Policy Alternatives

A large variety of strategies for improving the distribution of physicians could be identified. Those strategies identified in the following summary are drawn principally from the annotated articles. Thus, the most recent strategies proposed as expressed in S. 3585 are only marginally referenced. Once again as with the decision location factors, any article which discusses the alternative whether in an advocacy or adversarial way is referenced.

Reference Key to Public Policy Alternatives

Alternative	Reference
I. Financial Incentives	15, 61, 145, 167, 171, 216, 224
A. Loan forgiveness	34, 39, 44, 63, 94, 117, 122, 176
B. Scholarships	39, 51, 63, 94, 117, 176
C. Practice subsidies	34, 39, 68, 84, 94, 117, 150, 216
D. Income guarantees	34, 39, 42, 44, 68, 94, 117, 176
E. Increase intern and resident stipends	177
F. Tax exemptions	39, 145, 216
G. Cash bonus	39
H. National Health Service corps	22, 34, 39, 44, 117
II. Legal Requirements, Sanctions, Controls	
A. Draft exemption for shortage area service	39, 117
B. Required service	44, 61, 94, 145, 176
C. Quotas (of training or placement opportunities)	69, 117, 176
D. Licensure laws and exams (reciprocity)	1, 21, 98, 176
E. Control distribution of federal funds - Medicare, Medicaid, medical school grants, HMO development funds	43, 44, 45, 171
III. Medical Education and Training	
A. Admission to medical school by geographic and specialty area of interest	39, 216, 224

Alternative	Reference
B. Recruitment of students from shortage areas and minorities	15, 24, 39, 41, 43, 44, 45, 51, 65, 91, 108, 117, 145, 151, 192
C. Increase family practice	34, 39, 42, 69, 94, 121, 192
D. Preceptorships in rural areas	1, 39, 94, 117, 145, 156, 166, 190, 192
E. Medical schools in shortage areas	15, 62
F. Internships and residencies in shortage areas	39, 43, 45, 55, 62, 84, 121, 177, 224
G. Alter goals and structure of medical education	31, 35, 39, 40, 42, 63, 91, 94, 155, 166
H. Decentralize medical education	39
I. State subsidy of private medical education	45
J. Increase supply of physicians	1, 21, 39, 43, 44, 55, 61, 88, 94, 167, 173
IV. Medical Environment	
A. Construction of physician's office	34, 63, 94, 156, 166, 170, 171
B. Regionalize health care services (HMO development)	35, 39, 43, 44, 61, 69, 91, 94, 150, 171, 173, 181
C. Hospital construction	24, 34, 43, 57, 84, 138, 150, 166, 173, 176, 221
D. Create emergency medical services	24, 39, 150
E. Develop group practices	23, 33, 42, 117, 121, 156, 170, 190
F. Increase continuing education opportunities (AHEC's)	24, 39, 62, 69, 91, 121, 145, 170, 171, 224
G. Increase use of allied health personnel	1, 16, 24, 34, 42, 69, 84, 94, 120, 145, 150, 173
H. Build medical schools in shortage areas	43, 45, 176

Alternative	Reference
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A. Consumer health education (utilization of services)	22, 23, 44, 170
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B. Community recruitment	22, 23, 39, 62, 121, 145, 176, 190
C. Placement services	39, 63, 145

VI. Annotated Articles

Physician Location Selection and Distribution

1. Acton, Jan and Robert Levine. State Health Manpower Planning: A Policy Overview. Santa Monica, Calif.: The RAND Corp., May 1971.

This study analyzes the policy instruments that may be useful at the state level for affecting the numbers and distribution of health personnel.. Planning is viewed in the context of manipulation of the stock of health personnel given the inability to predict manpower levels precisely.

Three types of planning approaches are summarized:

(1) Type I assumes that in the short run quantitative relationships do not change. It uses straight line prediction for forecasting and planning. A basic weakness in this method is the assumption of a static state in health care education and technology, e.g. it assumes that health care will continue to be provided in the current fashion and the number of health care personnel can be increased by increasing the inputs into education. As a result, new and possibly more effective solutions to ease the shortage problem are ignored.

(2) Type II views all relationships as changeable and looks for optimal and cost-effective solutions by varying inputs. This type of approach is good for long run planning; however, for an intermediate period of 5-10 years it is difficult to assume that complete and optimal changes can be made in the system due to time lags in the market adjustment to changes in the demand and supply of health facilities and personnel.

(3) Type III is an intermediate planning approach which examines a broad range of policy measures and, taking uncertainty into account, the feasibility of these measures. It assumes that health functions change in 5-10 years and recognizes the constraints imposed by time lags, technical changes, etc. This approach takes cognizance of the imprecision of demand estimates, predictions of medical production functions, and advance estimates of the results of policy decisions.

The remainder of the RAND discussion is an example of the application of this third type of planning to a particular state, Illinois. Few positive recommendations emerge, but it does suggest a structure for planning that can result in policy recommendations.

Physicians - The data base used in the RAND study is a list of the 1967 graduates from Illinois medical schools who have established practices. Since physicians have the greatest lead time due to their long training period, it is important to examine both the feasibility and cost of policy alternatives aimed at increasing the supply of physicians in a state.

a. Increasing the number of medical school graduates may be an ineffective and costly way to increase the number of physicians within a state. The average retention rate in Illinois ranged

from 20.4% to 45.6% with an average rate of 34%. In order to establish what the changes in retention rates might be among additional graduates, the RAND study uses recent trends of selected time periods. Overall, retention rates have been decreasing, and an increasing percentage of the physicians practicing in Illinois have received their education outside of the state. Taking these findings into consideration, it appears that state-financed expansion of medical schools is a costly and ineffective way to increase the supply of physicians within a state.

b. The discussion on the alternative of attracting and retaining medical school graduates reviews the empirical literature (Sloan, Benham, Maurizi, and Reder, etc.) and concludes that the two significant policy variables are remuneration and medical school activity (a proxy for professional opportunity.)

c. A third alternative of changing the length of clinical training, i.e. requiring an additional year to be spent in a clinical setting, is seen as having a temporary positive effect on in-state physician supply. In the long run, however, retention is still a problem.

With regard to the within state distribution of physicians, the report suggests the possibility of having rotating locations of clinical practice in both urban and rural areas and/or providing transportation alternatives such as subsidies in geographically dispersed areas.

The study goes on to review the factors that affect the supply of dentists, nurses and allied health personnel.

5. American Medical Association. Contributions to a Comprehensive Health Manpower Strategy. A report prepared for the Office of the Secretary of Health, Education and Welfare, by the Center for Health Services, Research and Development, January 1973.

The study prepared by the AMA reviews the literature and state of the art in four areas critical to a comprehensive national strategy for health manpower:
(1) measurement of the availability of medical services
(2) explanations of the geographical location of U.S. physicians
(3) distribution of physicians by specialty and practice patterns, and
(4) role of the FMG in the U.S. health delivery system.

With regard to the availability of services, the report demonstrates the fundamental problem of the lack of agreement on how to measure shortages

which complicates the task of defining and evaluating solutions to distribution problems. In regard to the factors affecting physician location choices, the report emphasizes the importance of the environmental characteristics of an area, but stresses professional factors and economic incentives as the most appropriate for policy action. Given the decreasing mobility of physicians with increasing age, measures to influence physician location choices should be aimed at the younger physician during and just after his post-graduate education.

The analysis of specialty distribution indicates that significant nonpecuniary factors may be at work to influence physicians in their choice of specialty. Leisure time, alternative employment patterns, types of practice and associated risks of practice are specifically mentioned. Income adjusted for hours worked, however, does offer a significant explanation for the decision to specialize. The final analysis focuses on the increasing number of FMGs in the U.S. health delivery systems and discusses the questions of the utilization and distribution of these resources. No original data are presented in these reports but many good references are cited.

15. Aziz, Jawed. An Analysis of the Place of Medical Education Related to The Place of Medical Practice. Prepared for the Health Manpower Planning Division, Department of National Health and Welfare, Ottawa, Canada. circa 1970.

Aziz presents an "aggregative and relatively simplified analysis" of physician distribution in Canada. Data are obtained from the listing of the distribution of Canadian medical graduates registered as active physicians (1968) in the Canadian Medical Directory Master Tape of Active Civilian Physicians.

It is assumed in this study that foreign medical graduates return to their countries upon completion of their training so the distribution statistics are adjusted by this factor. Two variables are tested which influence the location of Canadian medical graduates - place of origin and training, and the effects of economic variables. The analysis proceeds on the assumptions that students select a medical college in the province of their origin and that there are no restrictions on establishment of practice in these areas. Looking at the distribution of Canadian graduates the author concludes that economic factors have the most significant impact upon the location of physicians. Provinces with lower per capita income receive a smaller proportion of medical graduates than provinces with higher per capita income.

Aziz concludes that the establishment of medical schools in physician-short regions would improve the distribution of physicians since there is some evidence that place of training affects retention rates. In addition, the school would provide a stimulus to the local economy which might influence the economic situation of the area.

Ball, David S. and Jack W. Wilson. "Community Health Facilities and Services: The Manpower Dimension." American Journal of Agricultural Economics. Vol. 50, No. 5 (December 1968), 1208-1222.

Ball and Wilson discuss the possible explanations for the "shortage" of physicians and attempt to relate these factors to spatial variations in rates of training, practice, and quality of available service across the nation. Using county groupings as the basic unit of analysis (scale of size ranges from 1 (greater metropolitan) to 5 (isolated rural)), Ball and Wilson compare the distribution of physicians (GPs and specialists), hospital beds, and crude estimates of the quality of service (average number of beds per hospital, specialists per 100 hospital beds, physicians 100% in patient care, GPs as a proportion of total physicians, etc.).

To explore possible explanations for this phenomenon, Ball and Wilson use regression analysis to examine the relationships between a series of dependent and independent variables.

dependent	independent
GD + DO/100,000	number of counties per area
GP/100,000	population
MD+60/100,000	effective purchasing income per capita
Spec./100.000	per cent population change 1950-1960
GP/Total physicians	presence or absence of medical school in area
	presence or absence of medical school in state

No regression explained more than 60% of the variation in the dependent variable. The authors conclude that the economic variables are significant determinants of the variation in quality and availability of health manpower across the nation. Skilled practitioners tend to vary most directly with the economic characteristics of a region. Presence of a medical school in a state does not significantly affect the number of practitioners in a state, although the number of practitioners in a specific locale of a state does vary by the presence or absence of a medical school.

Bertham, L., A. Maurizi and M.W. Reder. "Migration, Location and Remuneration of Medical Personnel: Physicians and Dentists." Review of Economics and Statistics, Vol. 50, No. 3 (August 1968), 332-347.

The authors analyze the distribution of physicians and dentists between states for the decades 1930-1960. Regression analysis is used to identify the influence on this distribution of the population of the

state, total personal income of the state, number of training positions available, failure rate on licensing examinations, urbanization, and average income of medical personnel. In large part, physicians and dentists "have displayed a tropism for higher incomes that has caused them to migrate with the effective demand for their services" which has been dependent mainly on the population and the per capita income of the state. There is some evidence to suggest that physicians will sacrifice some pecuniary income for "the amenities of an urban environment."

The authors also find that the per capita number of physicians increases with the state's volume of training facilities, suggesting that increasing such facilities in a state might increase the supply of physicians. The study concludes with a brief presentation of a demand-supply model to explain the relationships among the variables considered.

22. Bible, Bond L. "Physician Distribution and Recruitment Opportunities." Paper presented at the Annual Conference on Women's Auxiliary to the Student AMA, Los Angeles, Calif., April 27, 1972.

23. _____. "Physicians for Rural Communities." Lecture at Physician Recruitment Meeting, Lovelock, Nevada. September 15, 1973.

Bible discusses incentives and recruitment practices to attract physicians to rural communities. Suggested recruitment strategies included joint community planning and sponsorship of physicians, advertising of community advantages and advantages of rural practice, and efficient use of allied health workers. Bible used a 1967 AMA survey of physicians as a basis for defining those factors critical in the decision by a physician on where to practice. He emphasized the growing complexity of medical technology which increases the operating costs of a practice, the increasing specialization of physicians and the larger population required to support a specialist as the principle current deterrents to small community practice.

24. Bible, Bond L. "Physicians' Views of Medical Practice in Non-Metropolitan Communities." Public Health Reports. Vol. 85, No. 1 (January 1970), 11-17.

Bible randomly surveyed 2500 AMA physicians in 1967 to obtain information on the distribution of physicians related to personal background, medical practice organization, and special factors associated with practice and communities of residence. Using summary statistics and chi square analysis, Bible found that the most important

influences determining location choice were best opening when ready to practice, personal geographic preference, influence of family and friends, place of internship, and assistance of a placement service. Those physicians choosing rural areas cited lack of continuing education and professional growth opportunities, hours of practice, lack of sufficient facilities, and deficiencies in cultural and social opportunities as a major problem.

A significant relationship was found between the size of the place where the physician practices and the size of the place where the physician was reared, suggesting that admitting more students with rural backgrounds might lead to an increase in supply of physicians in these areas. The influence of choice of specialty on location, however, was not considered as a possible intervening variable. The potential influence of the type and location of medical school was also not analyzed. Bible suggests that what redistribution of physicians occurs takes place at the time of choice of initial practice. The relatively high cost of moving once a physician is established in his practice is the factor significantly decreasing mobility.

26. Breisch, W.F. "Impact of Medical School Characteristics on Location of Physician Practice." Journal of Medical Education. Vol. 45, No. 12 (December 1970), 1068-1070.

Breisch analyzes the relationship between the proportion of U.S. medical school graduates in SMSA's in 1966 as the dependent variable and the quality of the medical school from which the physician graduated (as measured by per pupil operating expenditures) and various dummy measures of medical school environment (Size of county where located) as independent variables. The regression analysis performed indicates that for each $10,000 increase in per pupil expenses, there is a 2% increase in the number of graduates living in SMSA's. A direct relationship was also found between the size of the population of the county where the medical school is located and the number of graduates in SMSA's. The issue not raised is whether the findings concerning location are due more to the characteristics of the medical student himself than to the school which he attends.

31. Bynum, Gaither, Ray Sanchez and Bill Odegard. "Medical Education: A Causal Agent in Physicians' Maldistribution." Journal of Medical Education. Vol. 47 (November 1972), 922.

Referring to an unspecified analysis of New Mexico health care needs which indicated that 20% of the population were without health care, this letter to the editor sought to explain the maldistribution

of physicians by their pattern of education. The authors maintain that "students are inappropriately taught: (a) stereotyped goals (to become a specialist), (b) monocultural orientations (to treat urban, middle class populations), and (c) milieu dependence (to function in an urban office/hospital practice with a high rate of interaction with other physicians)." These students are naturally put off by the idea of practicing under any conditions but those above. The authors believe that since medical school faculty are forged out of the same mold, a cycle of inappropriate medical education is sustained. No data are presented.

33. Champion, D.J. and D.B. Olsen. "Physician Behavior in Southern Appalachia: Some Recruitment Factors." Journal of Health and Social Behavior. Vol. 12 (September 1971), 245-252.

Champion and Olsen seek to determine the factors which are characteristic of physicians in metropolitan and non-metropolitan areas that could be used to predict physician location choices in the Southern Appalachia region. Ultimately these data would suggest strategies for recruiting physicians to underserved areas. Three hypotheses are tested:

(1) the disparity in the metropolitan-nonmetropolitan distribution of physicians in Southern Appalachia is related to a simple propensity of individuals to locate in areas approximating their geographical areas of origin;

(2) specialists have higher social origins compared with general practitioners and metropolitan physicians as a group have higher social origins than non-metropolitan physicians;

(3) metropolitan physicians will reflect a greater concern for prestige among colleagues than non-metropolitan physicians which will influence their choice of rural or metropolitan areas.

Surveys of two samples of physicians were made (urban Tennessee - 57% response rate (200 people) - and rural Southern Appalachia - 41% response rate (106)). Nonparametric tests of statistical significant were employed in analysis of the data.

Hypothesis (1) was fully supported. Hypothesis (2) was only partially supported in that metropolitan and non-metropolitan physicians do not differ significantly in their social origins. Specialists did tend to have higher social origins on the whole. In relation to the third hypothesis there were several interesting findings:

(1) metropolitan and non-metropolitan physicians had similar incomes (due to federal subsidies of rural physicians);

(2) both physician groups scored the same on desire to help people;

(3) metropolitan physicians emphasized contributions to medical practice as a goal compared to non-metropolitan physician's emphasis on patient relationship.

The lack of adequate facilities (modern hospitals, equipment and "general medical paraphernalia") were cited as the chief disadvantage of rural practice. One quarter of non-metropolitan physicians said they would not choose a rural practice again compared to one-eighth of metropolitan physicians who would not again choose an urban practice setting. Group practice is seen as the way of overcoming the problems of lack of facilities and increasing specialization which make the recruitment of physicians to Southern Appalachia difficult.

Charles, Edward. "Policies to Increase the Supply of Physicians in Rural Care." The American Economist. Vol. XVI, No. 2 (Fall 1972), 37-44.

Charles reviews the current literature on physician distribution and concludes that the concentration of physicians in urban areas is due primarily to the location of major medical centers in these areas and the necessity for specialists (of which there are growing numbers) to practice near such centers. The location of medical centers is a function of population concentrations while the increasing number of specialists is the result of the influence of faculty, desire for professional status and the general medical profession socialization through which all students go in medical school. The lack of urban amenities in rural environment is also viewed as a barrier to physicians locating in these areas.

The principal reason for the failure of all efforts to improve the distribution of physicians relates to the extreme total undersupply of physicians in the nation which permits geographic and personal characteristics to predominate over purely economic factors. Charles suggests that the solution to the problem of the supply of medical care in rural areas is not in the production of more physicians but in the use of physician's assistants to substitute for the physician. Factors not considered by Charles relating to this analysis are the potential acceptance by the public of these PAs and the desire of physician assistants themselves to move to underserved areas.

35. Cherkasky, Martin. "Medical Manpower Needs in Deprived Areas." Journal of Medical Education. Vol. 44 (February 1969), 126-131.

Cherkasky discusses a 1966 Neighborhood Medical Care Demonstration project sponsored by Montefiore Hospital in the South Bronx.

A 2 census tract area was chosen as a representative "deprived area." Fifty percent of the families had incomes less than $4,000. Medical care resources had been decreasing as the population increased and the economic level of the neighborhood declined. The New York Municipal hospital system and the city health department had become the primary sources of medical care.

The project was organized to address the specific health needs of the community and to involve the community in its implementation. A central health clinic with a group practice was organized in the center of the area with two outlying satellite centers. Montefiore Hospital provided professional affiliation, back-up support, and diagnostic facilities. The basic health team was a physician, a nurse, and a family health worker, although other professionals such as lawyers were called upon as needed. A program was developed to recruit and train members of the community as family health workers. These workers would be under the supervision of a public health nurse and would be responsible for home visits and acting as a liaison between families and the community bureaucracy. The response to the training program was overwhelming, with 10-20 applicants for every available slot. Overall, the project appeared to have achieved its goals.

In closing, Cherkasky points out the real need for hospitals and medical schools to develop the concept and application of community medicine and to realize the interaction necessary between medical care providers and the communities they serve.

39. CONSAD Research Corporation. An Evaluation of the Effectiveness of Loan Forgiveness As An Incentive for Health Practitioners to Locate in Medically Underserved Areas. A report prepared for the Department of Health, Education and Welfare, Office of the Secretary, Contract HEW-OS-73-68. Washington, D.C., 1973.

This report examines the impact loan forgiveness programs have had upon remedying physician shortages in underserved areas. The study is divided into three phases:

1) Analysis of existing state and local programs to determine if participants are, in fact, locating in underserved areas.

2) Review of the literature to see what factors have an impact upon the location decisions of health professionals and comparison of the program with the observations in the literature.

3. Suggestions of alternatives to loan forgiveness programs.

For purposes of the study, 10 states were selected that had loan forgiveness programs in 1960 and 1970. Shortage areas were those defined in the National List of Designated Shortage Areas for Purposes of the Federal Loan Cancellation Benefit of the Health Professions Student Loan Program.

Current findings indicate that as a mechanism to redistribute health manpower to shortage areas, the HPEAA loan forgiveness program has had little success. It appears that HPEAA loan availability is more attractive than loan forgiveness. Only 1-4% of the loans have been forgiven. Part of the problem with the HPEAA loans are that loans and forgiveness must be applied for separately and are granted for separate reasons. Applicants are self-selecting; if they apply and qualify, they receive the benefits.

State programs differ since forgiveness benefits are an integral part of the program and a service agreement is usually required. Screening and selection are important. For example, in Illinois the Medical Student Loan Fund Board selects applicants who are from needy areas and who express an intention to return to those communities upon completion of medical school. State programs are providing an average of 10-15% of all physicians in shortage counties. It cannot be expected, however, that either state or federal loan programs be the sole mechanism to induce physicians to practice in shortage areas. It would appear that higher service repayment rates could be effected from more careful selection of loan recipients and with higher priority assigned to those students coming from small towns.

Some data which have been gathered from shortage areas where physicians have located, indicate that some areas have a comparative advantage in attracting and retaining physicians. The federally defined shortage areas with physicians have at least a hospital of medium size. It also has been found that the size of the hospital is more closely associated with the number of physicians than the size of the population. The shortage counties that had hospitals of at least 40 beds claimed 80% of the physicians who located in shortage areas. 20% of the shortage area physicians were in counties with three or more hospitals.

Before specifying a model of location decision making, the current literature on this subject is reviewed and divided into five categories of factors which affect the decision making process:

1) Physician background
2) Community characteristics
3) Practice conditions
4) Professional socialization
5) Systemic factors

The CONSAD study suggests a model to direct further research. The model involves three stages of decision making that include preference formation, location seeking, and practice selection.

In closing the analysis, a model program to attract physicians to shortage areas is proposed which includes such specifications as selectivity with respect to participants and medical schools, a regulatory function and control mechansim in the training of the participants, "socialization" of the student to predispose him/her to select a shortage area, financing the full cost of medical education, and adoption of realistic objectives. Alternatives to forgiveness programs could include modifying the current provisions and increasing the rate and amount of forgiveness, providing bonuses to medical schools according to the number of graduates who locate in rural areas, or endowing seats in medical schools subject to the condition that person must agree to serve a minimum number of years in shortage areas.

40. CONSAD Research Corporation. Factors Affecting Specialty Choice and the Interrelationship Between Specialty Choice and Geographic Location. HEW-OS-73-142, Final Report. Pittsburg, Pennsylvania. October 10, 1973.

The CONSAD report reviews the existing literature on specialty and location choice. Date are analyzed to test the effect of institutional variables on choice and to determine the process by which site selection is made by the physician.

Data for the study were provided by the American Association of Medical Colleges and are part of the AAMC Longitudinal Study Data Book which has information on 2,821 medical school graduates (1960) from 28 medical schools. Schools were chosen from a random sample of all medical schools "stratified by geographic location, ability level of entering medical students as measured by the MCAT, and tax versus private support."

To analyze the effects of institutional variables, a sample was taken of graduates from 70 medical schools over six time periods. Two-way analysis of variance was used to determine if there were differences in the production of primary care physicians between or within medical schools over time. It was found that the proportion of graduates entering primary care varied significantly over time between and within the schools. The findings imply that the external factors influencing the individual during their training such as medical school orientation and faculty, may be more important than personality and background factors.

In the next phase of analysis, a set of values was assigned to institutional variables of the medical schools attended. These variables included factors such as total faculty, Ph.D./M.D. ratio,

Flexner faculty/student ratio, percentages of graduates entering various specialties, MCAT scores, and source of support. A series of binary regressions were used to determine the combination of institutional variables which explain the most variance in specialty choice.

No institutional variable was identified which could differentiate groups of students ultimately choosing different specialties or even choosing primary vs. non-primary specialties. One explanation suggested to account for these findings is that the measures of educational environment used were poor indices of that environment.

The report concludes with several policy recommendations and suggestions for further research. Policy measures include the development of measures to evaluate the quality and influence of medical school specialty departments and intervention before the senior year of medical school or during residency to prevent sub-specialization. Further research could be carried out on the importance of specialty decision time period and the behavioral process involved in decision making.

41. Cooper, James K., Karen Heald and Michael Samuels, "The Decision for Rural Practice." Journal of Medical Education. Vol. 47 (December 1972), 939-944.

The authors briefly review the literature and discuss the principal factors found to be important in a physician's decision about where to locate his practice. Factors relating to physician background, professional considerations and community characteristics are considered.

Previous community of residence of the physician and influence of family (especially wife) and friends were determined to be the most significant background factors. Other possible influences were the location of medical schools, internships, and residencies, although these factors may be related through a third set of factors dealing either with the initial preference of students for urban areas or the requirement for medical facilities for practice of particular specialties. The most important professional consideration in location choice is the potential for group practice. Group practices are more frequent in urban than rural areas and therefore further compound the problem of identifying specific determinants of practice location. Another aspect of this issue is the fear felt by some doctors of professional isolation in a rural area as well as lack of clinical support and lack of communications among peers. In a rural area, distance from a hospital is a less significant factor than the potential workload for a physician as a factor leading to choice of urban practice.

The opportunity for developing a busy practice early is a chief reason for physicians to locate in a small rather than a large community. A low or declining rate of economic growth for a community, however, evidently deters most physicians from locating in that area. Many physicians who locate in a rural area do so because of a preference for

that particular type of life, while the scarcity of cultural activities is often cited as a principal reason for choosing an urban practice setting. The authors conclude with a table summarizing the major decision location factors and an index of references to each of these factors.

42. Crawford, Ronald L. and Regina C. McCormack. "Reasons Physicians Leave Primary Practice." Journal of Medical Education. Vol. 46 (April 1971), 263-268.

Crawford and McCormack surveyed 89 general practitioners in Virginia in 1969 who left primary practice to determine their reasons for changing areas of specialization. The most important factors identified were overwork (66%), unsystematic approaches to patient care, lower quality of care among peers, and lack of facilities, equipment and personnel for improving the quality of care. Other important factors dealt mainly with the attractiveness and availability of opportunities for careers in different specialties with higher prestige and more controlled work hours and work loads.

In response to questions concerning ways to improve practice in rural areas, the following major recommendations were suggested: group practice (96%), residency programs in primary care (81%), tax incentives for primary care physicians (69%), provision of auxiliary (e.g. PAs) personnel (66%), prepayment or guaranteed income (49%), and direct subsidy to the practice from the community (46%).

43. deVise, Pierre. "Physician Migration from Inland to Coastal States: Antipodal Examples of Illinois and California." Journal of Medical Education. Vol. 48 (February 1973), 141-151.

deVise suggests that physician location preferences are based on somewhat overlapping and conflicting sets of goals: income-maximizing objectives, family-oriented objectives, social prestige objectives and professional interaction objectives. The first set of objectives tend to equalize physician-population ratios while the latter three generate distortions in purely economic preference patterns for geographic location.

deVise reviews available national statistics and data on physician locations and migration, as well as federal outlays for Medicaid, Medicare and medical schools to explain the current redistribution of physicians away from doctor-short metropolitan areas. deVise shows that "federal dollars, which now pay a fourth of all

physician bills compared with seven percent in 1966, flow more freely to doctor-rich states than to doctor-poor states." For instance, New York, Massachusetts and California with a fifth of the nation's population receive half of all Medicaid funds and over 25% of all Medicare payments and medical school grants. Medicare and Medicaid funds in particular allow physician fees and, hence, physician incomes to remain artificially high in the doctor-rich areas where fees otherwise would fall with increases in the physician supply. Under normal operation of the market this fall in income would lead to a redistribution towards doctor-poor areas.

deVise contends that increasing the output of medical schools in doctor short areas or increasing the number of internships and residencies will not increase physician supply until federal spending among areas is equalized or until the markets in doctor-rich areas become completely saturated.

44. deVise, Pierre. "The Changing Supply of Physicians in California, Illinois, New York and Ohio: Redistribution of Physicians Since 1960 and Projections to 1990." Working Paper I.21, Chicago Regional Hospital Study, April 1974.

deVise compares the changes in the number and distribution of physicians in New York, California, Illinois and Ohio between 1960 and 1972 to identify the expected contribution of medical education and graduate training in these states to changes in the supply of physician manpower in the future. AMA, U.S. Census and Bureau of Health Manpower Education data are used in these analyses.

deVise argues that simply increasing the number of physicians educated in each state will not guarantee that the supply of physicians in that state will reach or maintain a desired level because of the migration patterns of physicians. It is hypothesized that in a seller's market the physician can determine his preferred practice location which generally is in a more populous and wealthy urban area. Concentrations of Medicaid and Medicare populations in urban centers on either coast are drawing physicians away from other locations and thus are directly contributing to imbalances in physician distribution nationally. Data are presented on the increasing dependence of the health care system on the services of the FMG. Based on these data and assuming no drastic changes in national policy with regard to medical education support, FMG licensing or number of available training positions, deVise projects physician manpower supply for the four states in question through 1990.

deVise concludes that the critical policy problem is the maldistribution of physicians and not just the absolute number of physicians available. deVise calls for but does not expect drastic

changes in the amount of health insurance coverage, method of organization and delivery of care, and methods of reimbursement as the only feasible solutions to the distribution problem.

45. deVise, Pierre. The Effect of Federal Spending on the Distribution of Physicians in the U.S. Illinois Regional Medical Program. May 1972.

Large differences in physician distribution are most commonly explained by local differences in population density, affluence, and medical school production of new doctors. An examination of the top ten states in physician-population ratios confirms the strong attraction of East and West Coast centers of glamour and good climate, and the aversion of physicians to midwest industry and climate. The top three cities showing high physician-population ratios are also coastal locations.

Concerning average physician income, projections revealed a slight tendency for average physician income to vary inversely with the physician-population ratios of the nation's major regions. (The differences do not vary proportionately.) The major metropolitan areas, however, do not consistently reflect this relationship. The distribution of physicians has become worse throughout the nation with considerable evidence pointing to the large federal subsidies of Medicaid and Medicare as contributing factors to this problem.

A cost-benefit approach to the analysis of health payments and federal programs shows that Medicaid/Medicare payments are disproportionately high for states with a physician surplus and low for states short of physicians. Research grants to medical schools constitute another important federal subsidy to doctors. This funding also favors those areas with more physicians.

It has been found that Illinois educates two to three times as many doctors as it receives in hospital-based interns, residents, and licensed practitioners. California, on the other hand, educates half as many doctors but receives twice as many interns, residents, and practitioners. Illinois has now undertaken a program to increase medical education statewide and to expand the number of first-year intern positions and residency programs in the state to attract more graduates. Another program is to enroll more rural and minority students in the belief that these students will eventually return to their home areas where an acute shortage of health services exists. The author urges that controls be placed on the geographic allocation of HMO subsidies in order not to exacerbate already severe problems of uneven geographic distribution of federal funds.

54. Diehl, Harold S. "Physicians for Rural Areas: A Factor in Their Procurement." Journal of the American Medical Association. Vol. 145, No. 2 (April 14, 1951), 134.

One suggestion to increase the number of physicians in rural areas is to increase the number of admissions of medical students from rural areas. Diehl classifies the graduates of the University of Minnesota Medical School (1936-1951) who are practicing in Minnesota by size of the community where they grew up, i.e. population less than 5000, population 5000-100,000, and population greater than 100,000. Using this data base and chi-square tests of significance, Diehl tests the effectiveness of the proposal to increase admissions of students from rural areas.

His results indicate that 58% of the graduates who grew up in communities of less than 5000 returned to practice in small communities. Only 22% of the students from large cities set up practice in rural areas. Diehl concludes that the evidence favors encouragement of preferential consideration and assistance to students from rural areas.

55. Dougharty, L.A. The Supply of Physicians in the State of Arkansas. RAND Report #RM-6365-APC. Santa Monica, California: The RAND Corp., September 1971.

The primary objective of this study was to estimate the supply of physicians in Arkansas from 1970-1980.

Three separate models employing different assumptions were used to predict the supply, and a fourth model was developed to examine the intra-state distribution of physicians. The supply models were delineated as follows:

Model I: The supply of physicians is a function of the national supply of physicians, the Arkansas population, and the ratio of the per capita income of the state to the national average.

Model II: The supply of physicians is a function of the relative income of Arkansas.

Model III: Supply is a log-diffusion process. Estimates were developed from extrapolations of historical data.

Models I and II yielded the same results--an increase of 513 physicians in the specified time period. Model III yielded a lower estimate probably due to the bias in the historical data caused by a large out-migration in the 1950's.

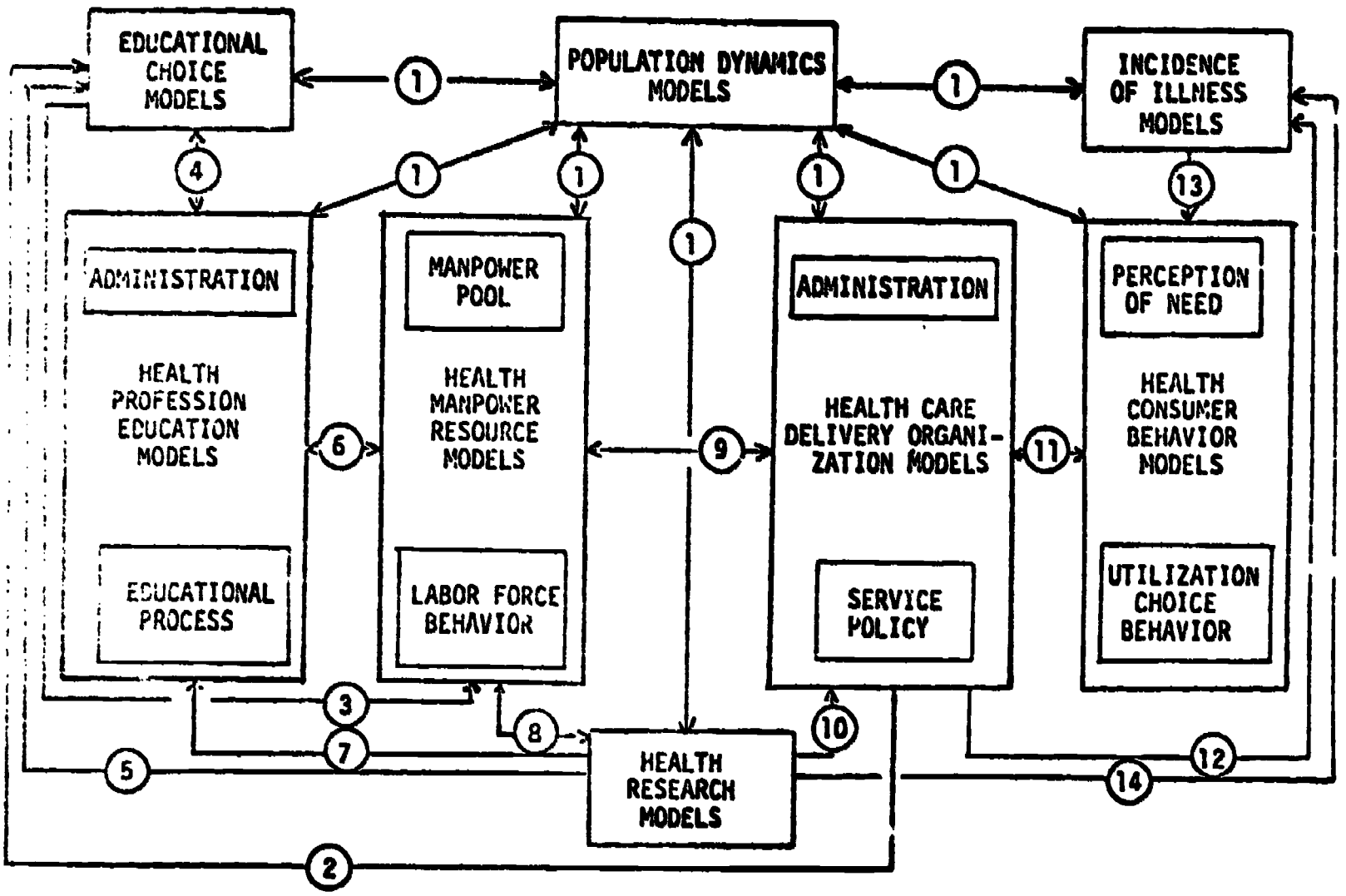
Model IV examined the variance in the number of physicians per county as a function of the population and relative income of a county and found that there are also intra-state location preferences.

In general, economic development was postulated as a principal means of solving physician supply problems in Arkansas. While income of an area was related to physician supply, it was also recognized that other factors such as medical facilities and cultural activities are also related to income and may affect physician location choice. In addition, the author believes his measure of income (average income) to be a poor measure of demand and postulates a significant time lag factor between changes in income and physician's perception of this change such that income is only a reflection and not a determinent of physician location.

The study concludes by analyzing the value of expanding the University of Arkansas School of Medicine (UASM) as a means of increasing the state supply of physicians. Despite the fact that UASM has produced 64% of the state's total stock of physicians, increasing the number of internships and residencies is viewed as the main way of attracting more physicians given the number of UASM students leaving the state for such training but with the desire to return.

56. Doyle, Timothy and Janice Enberg. Health Manpower Model Inventory. A report prepared by Vector Research, Inc., for Bureau of Health Resources Development, Health Resources Administration, D.H.E.W. (NIH-1 TR73-1), September 1973.

While not specifically focussing on issues of manpower distribution, this report summarizes and classifies a large number of economic and conceptual models related to health manpower supply and requirements problems. Topics covered in these models and in the report include factors which influence the geographic distribution of physicians, hospital demands for medical residents, supply of physicians and medical specialists and supply of and demand for nurses. Dental manpower and allied health manpower models are also presented. As this work is a practically-oriented inventory, no substantive conclusions are made. The overall classification scheme used for the models is presented below:



57. Durbin, Richard L. "Do New Hospitals Attract New Doctors?" The Modern Hospital. Vol. 100 (June 1963), 98-102.

The hypothesis that the availability of a hospital in a rural area will stimulate physicians to locate in these areas was tested by Durbin. Durbin analyzed the increase in the number of physicians in rural counties both before and after the construction of 6 Hill-Burton hospitals to determine the influence of hospital construction on physician location. In counties where there were no previous hospital facilities before Hill-Burton, the total number of physicians per capita declined 18%. In counties where some hospital facilities had previously existed, the physician population ratio declined by only 6%. As a control, Durbin analyzed counties during this same time period where no new hospitals were built and found that the physician/population ratio declined by 14%. Thus, existence of a hospital in a rural area does not necessarily lead to an increase in the supply of physicians even taking into account population changes.

61. Elesh, David and Paul T. Schollaert. "Race and Urban Medicine: Factors Affecting the Distribution of Physicians in Chicago." Journal of Health and Social Behavior. Vol. 13, No. 3 (September 1972), 236-250.

Elesh and Schollaert examine the spatial distribution of all physicians under 70 years of age in private practice in the City of Chicago in 1960. Using the distribution of physicians' offices over census tracts as the dependent variable, Elesh and Schollaert employ regression analysis to consider the effects of market area income (% of tract families with income greater than $6000), education (% of population over 25 with at least a high school education), age (% over 25), race (considered white unless 90% black), population (of census tract), number of hospitals per tract,available office space (% of tract's area devoted to commercial care) and the location of physician office within tracts on this distribution. These factors represent elements of a demand-supply model of physician location choice.

Population size (33%), percent commercial area (27%) and age (18%) explain most of the variation in distribution for all physicians. The authors find over 3 times as many physicians of all types (2.5 times as many GP's and 5 times as many specialists) in white as compared to black tracts. Demand for physicians in black areas, however, is also much lower. Controlling for the number of hospitals eliminates the otherwise large differential between black and white areas with regard to specialists. The data suggest that the distribution of specialists, who are the greatest avoiders of black areas, could be improved substantially if aggregate area income was sharply increased. On the whole, race alone explains less than 1/3 of the difference in numbers of physicians between black and white areas.

The authors did find income at or below $10,000 to be negatively related to the number of physicians, suggesting that middle income groups (middle compared to income under $2,000 per annum) share the same problems of physician availability as low income groups: physicians locate in areas comparable to their income rank. The authors conclude that financial incentives offered to physicians to locate in underserved areas are probably necessary for a market solution to the maldistribution of physicians to be achieved. The market method of assigning physicians to areas is posed as an alternative.

62. Fahs, Ivan, Kathryn Ingalls and Winston Miller. "Physician Migration: A Problem in the Upper Midwest." Journal of Medical Education. Vol. 43, No. 6, Part 1. (June 1968), 735-740.

In this study the authors analyzed the flow of physicians into and out of the four state region of Minnesota, North and South Dakota, and Montana between 1910 and 1960. The geographic location patterns of graduates of medical schools both in and outside of this

area were analyzed to determine the net loss or gain of physicians over time. The results show that the upper Midwest historically has depended on in-migration of physicians to maintain the status quo in terms of the total number of physicians per population. Since 1920, however, the net gain has been diminishing due to the large number of students who leave for other areas (West) to practice after being educated in the Upper Midwest. Under the assumption that little can be done to significantly change the professional attractiveness of the area with regard to cultural, social or economic advantages, the authors suggest a program to increase the supply of physicians through increasing the number of residencies available in these states.

63. Fahs, Ivan J. and Osler L. Peterson. "Towns Without Physicians and Towns with Only One: Study of Four States in the Upper Midwest." American Journal of Public Health. Vol. 58, No. 7 (July 1968), 1200-1211.

Fahs and Peterson identified over 1,000 towns in Minnesota, North and South Dakota, and Montana without any or with only a single physician between 1950 and 1965. Their objective was to determine the common characteristics of these "shortage" areas. On the whole the towns were "remote" (more than ten miles from a specialist), small, and declining economically, with the distribution of physicians roughly corresponding to the distribution of people. The advancing age of physicians in one-doctor towns, the declining number of general practitioners, and "the economic and population characteristics" of metropolitan areas suggest that the supply of physicians in these areas will continue to decline.

Because medical education trains physicians to work with each other rather than in isolation, finding one physician for a shortage area may not be sufficient to entice or to retain a physician in the area. Fahs and Peterson further emphasize the role to be played by medical schools and medical societies in locating physicians to work in isolated, rural areas.

65. Fein, Rashi. "Studies on Physician Supply and Distribution." American Journal of Public Health. Vol. 44 (May 1954), 615-624.

Fein focuses on the development of a methodology for evaluating and utilizing health manpower statistics for state planning purposes. Rather than a static examination of statistics, Fein proposes a dynamic analysis that examines age distribution by state and by county and uses the current supply to project future resources. Available data from North Carolina are employed to demonstrate the methodology.

An age-frequency distribution is established for North Carolina physicians. Using life expectancy tables, present resources are projected for five, ten, and fifteen years. The resulting information provides a data base to indicate replacement needs. Since the supply of manpower is diminished by both death and retirement, an arbitrary cut-off age (70 years) is established as a crude measure of the number of physicians retiring. Using this data, an annual loss can be calculated and this figure represents the number of physicians who have to be replaced if the current supply level is to be maintained. However, this measure does not account for population growth and a more sophisticated ratio has to be employed to determine the number of new physicians needed each year to maintain the physician/population ratio.

The next phase of the analysis is an examination of potential medical manpower resources. The most obvious source of physicians is the medical school. Not all of the graduates of the school remain in the state to practice, however, and retention rates - the percentage of medical school graduates who subsequently practice in the state - are a necessary calculation. The number of physicians who migrate to the state to practice and who received their medical education elsewhere should also be determined.

Finally, when intra-state distribution is examined by county a trend in location appears. The poorer counties have significantly smaller numbers of physicians and contribute fewer students to medical school. In addition, as older physicians leave the labor supply in these areas (through death or retirement) they are not being replaced.

Fein concludes with a re-statement that his intent had been to present a new approach to health manpower statistics and to increase the understanding of problems confronting states in manpower projections.

68. Feldstein, Martin S. "The Rising Price of Physicians' Services." Review of Economics and Statistics. Vol. 52 (May 1970), 121-133.

Feldstein analyzes the pricing and supply of physicians' services using the concept of utility rather than profit maximization as the analytic framework. Three explanatory variables for physician behavior are considered: (1) the cost per unit of service provided (quantity of paramedical personnel and supplies used per physician, the cost of these inputs, and time), (2) the relative significance ("marginal utility") of net income from private practice (cost of living, current income level of the physician's reference group, private physician's income from part-time government employment), and (3) the availability of "interesting cases" (number of physicians per capita, demographic factors affecting morbidity, and competing medical care).

Feldstein argues that under his assumed conditions of permanent excess demand, "physicians have discretionary power to vary both their prices and the quanity of services which they supply." The implication of this research for physician decision-making - a point which the author does not discuss but which is an extension of his argument - is that physicians may be motivated by other than purely profit objectives in choosing a location in which to practice. Indeed, the demographic characteristics of an area that produce "interesting cases" may be sufficient to influence a physician to move to an area which otherwise might not satisfy the objective of simple profit maximization. Clear specification of the relevant demographic factors remains for further research.

69. Fenderson, Douglas A. "Health Manpower Development and Rural Services." Journal of the American Medical Association. Vol. 225, No. 13 (September 24, 1973), pp. 1627-1631.

Fenderson outlines in this article the three programs initiated by the Bureau of Health Manpower Education during 1972 to increase the availability of rural health services: (1) the development of area health education centers, (2) the stimulation of the development and training of physician's assistants, and (3) other programs such as regional consortia to control the distribution of health manpower and HMO's to promote efficiency in the delivery of services. The article outlines the substance of each of these program areas. The use of computer technology and the introduction of programs in family medicine are also discussed as they relate to the problem of increasing the quantity of health services in rural areas. No data are presented nor are substantive conclusions framed.

79. Golladay, Frederick L. and Marilyn Manser. "Studies of the Determination of the Spatial Distribution of Physicians." Working Paper #4, Health Economics Research Paper, University of Wisconsin, December 1970.

Golladay and Manser present a paper describing their approach to the development of a causal model of the factors influencing the spatial distribution of physicians. The paper details the first two tasks the research has focused upon - a review of the literature on locational choice and a survey of the published data on the distribution, practices, and attitudes of practitioners.

The review of previous research indicates several areas of weakness where additional work could make the studies more applicable as causal models, i.e., more careful specification of the underlying models and

The equation "relate(s) the physician-population ratio at location i to the average net income and costs to the i physician of using nonwork time for investment and consumption..."

Hambleton used data from postal zones, census tract maps and tables. Population data were standardized and proxy measures were developed for net physician income and consumption and investment costs. Aggregate data and statistics on physician income were practically non-existent which made it difficult to construct separate equations for supply and demand. As a result a single equation was used to estimate supply and demand. This approach shifted the emphasis toward the rate of return for physicians..

The study includes a detailed discussion of variables that have an impact on physician location. These include demand and supply determinants such as preferences for physician services, ability of the population to pay for the services, and costs to the physician of delivering services such as rent, education, and the availability of other health personnel. The exact significance of these variables cannot be measured, however, without statistical testing.

The above model was expanded for both specialists and general practitioners at the state, county, and local levels and for house officers at the state and county levels. At the state level, specialists tend to give leisure (in the economic sense) a higher priority than the population's ability to pay. At the county level, however, the availability of medical facilities was more important. Within cities, the presence of large elderly populations is a variable, which along with the other factors mentioned, appears to exert an influence on location. General practitioners, both state and county levels indicate a stronger priority for income. At the postal zone level, rents and other costs of establishing a practice and the presence of an elderly population are the factors which seem to have the most impact upon practice locations. None of the variables tested for house officers were significant although there was a trend to locate in states that had state-supported charity patients.

In general, income or leisure incentives have some influence in attracting physicians at all levels. Taken alone, however, even these incentives will not effect profound nationwide distribution changes nor solve the problem of maldistribution of health manpower. As part of an overall strategy to change distribution, such policies as rent subsidization or expansion of the Hill-Burton program should be given some consideration.

86. Hambleton, John W. Main Currents in the Analysis of Physician Location. The University of Wisconsin, Health Economics Research Center, No. 8, May 1971.

This survey of the literature attempts to provide a common framework for research findings which concentrate on the question of physician location. The author presents an economic model of physician location and discusses the various strengths and weaknesses of each of the independent variables considered.

The basic model considered is:

$$Y_i = P_i MP_i WH_i - C_i + R_i LH_i$$

where:

Y_i = net return to practice in locality i

P_i = the customary fee at which medical services are rendered in locality i

MP_i = the marginal product of productivity of the average physician in locality i

$P_i MP_i$ = the wage rate of the pnysician in locality i

WH_i = the number of hours that the average doctor in locality i can expect to work

C_i = costs normally associated with establishing and maintaining a medical practice in locality i

R_i = the rate of return on leisure activities in locality i

LH_i = the r ber of leisure hours available to doctors in locality i, equivalent to a constant less WH_i

The model postulates that the physician is concerned with his gross wages minus the costs of his practice plus satisfaction gained from leisure time activities. The noneconomic incentives are not dealt with here. The author further assumes that the supply of doctors will respond fully to their economic returns and we may conclude:

$$D_i = P_i MP_i WH_i - C_i + R_i LH_i$$

where:

D_i = supply of doctors in locality i, and where all other terms are the same as those defined above.

The equation assumes perfect elasticity of supply because of the extreme mobility geographically and licensure reciprocity which exists between states.

Many of the variables for this study were difficult to study empirically. For instance, data on wages of doctors by location is scarce, and private physician fees are confidential.

Hambleton confesses that one of his most difficult variables to quantify was that of rate of return from leisure activities. However, he suggests two approaches. One method is to value the time spent in recreation, cultural enrichment, or consumption by wages foregone. The other approach is to assume that all physicians everywhere have equal access to domestic leisure activities (e.g. TV, reading, etc.) but that greater satisfaction is obtained only in those areas which offer recreational opportunities outside the home. The task then is to construct an index of ordinal utilities.

A further measurement problem with this model is that of output per manhour of physicians, not to mention that of marginal product.

The author concludes that leisure time incentives are very critical determinants in physician location decisions. The amenities which a state can offer range from a wide variety of retail goods to water recreation facilities such as campsites and beaches.

88. Hansen, W. Lee. "Shortages and Investment in Health Manpower." in The Economics of Health and Medical Care. Selma Mushkin, ed., Ann Arbor: University of Michigan, 1964, 75-91.

Hansen examines the definition and base for estimates of physician shortage and proposes a new evaluative criteria for determination of shortage based on the rate of return to the profession. The rate of return calculation used by Hansen includes both the economic return to the physician and the cost of his training by "calculating the rate of discount which equates the present value of the expected earnings stream to the present value of the expected outlay or cost stream." To illustrate his approach, Hansen calculates the rates of return to physicians, dentists and male college graduates for the years 1939, 1949, and 1956 using U.S. Census data and surveys of earnings made by private and governmental groups.

Based on these data, Hansen concludes "that since 1949 the shortage of physicians and dentists has been declining, or in other words, that the magnitude of underinvestment in training in the professions of medicine and dentistry has diminished." Hansen

argues that this fact explains the drop in number and quality of applicants to medical and dental school at the time of this study. The policy implications of these findings are that shortening of the curriculum and decreasing the costs of education (via grants or loan) will increase the rate of return to these professions and hence increase the number and quality of entrants to these professions. This approach contradicts the recommendations of the Bane Commission which would only increase the number of medical and dental school places.

91. Harvey, E.B. "The Vanishing Practitioner." Journal of Medical Education. Vol. 48 (August 1973), 718-724.

This study focuses on the identification of factors associated with the decision to leave general practice for specialty practice. The study specifically updates and improves the 1971 study done by Crawford and McCormack.

A probability sample of 500 Ontario (Canada) physicians was taken. Interviews were completed with 402. From the completed interviews, Harvey compares 109 physicians who had remained in general practice with ' who had left general practice for some other specialty.

...e study found two separate categories of factors important .he decision to leave general practice:

1. Conditions of general practice, i.e., greater hours (44%) and less autonomy.
2. Lack of medical expertise to deal adequately with large and diverse numbers of medical problems.

Most physicians held favorable or ambivalent attitudes toward their medical education. GPs and specialists alike expressed the desire for more training in common ailments and more clinical work. Specialists tended to be more oriented to group practice than GPs. Small town physicians are more likely to switch to a specialty as are physicians from professional, semi-professional or large-business family backgrounds. Multiple regression analysis showed length of general practice experience to be the most influential factor ($R = .54$, $R^2 = .29$) in explaining general practice attrition rates due to switching into a specialty with father's occupation second ($R = .28$, $R^2 = .078$) and people orientation third ($R = .23$, $R^2 = .052$).

In order to encourage physicians to enter general practice, Harvey recommends expanding the range of variables used in the selection and career counseling of medical students and a more effective regionalization program to match the availability of hospital facilities and consultants to community needs.

92. Hassinger, Edward W. Background and Community Orientation of Rural Physicians Compared with Metropolitan Physicians in Missouri. University of Missouri, College of Agriculture, Research Bulletin 822, August 1963.

Hassinger focuses on the identification of factors which are operant in the choice of non-metropolitan areas as places of practice.

Data are gathered from personal interviews with physicians in a 20 county non-metropolitan area and physicians in a metropolitan center. In the 20 county sample, 10 counties were north of the Missouri River and 10 were south. The former counties have a higher economic level and greater population density. Non-metropolitan physicians included both MDs and DOs. The names of the physicians which had been taken in 1958 and from the most recent directories of the American Medical Association and the American Osteopathic Association. Chi-square was used to test the significance of the survey results.

Comparisons of the data were made in a parallel structure for four groups - rural MDs, rural DOs, metropolitan (MD) general practitioners, and metropolitan (MD) specialists. It was found that more osteopaths were practicing in non-metropolitan areas and were in primary care specialties. Rural medical doctors were most likely to have come from rural or small town backgrounds. Metropolitan specialists were most likely to have come from urban areas and had parents with white and blue collar occupations. Rural physicians indicated little desire to change to urban practices. Those surveyed tended to perceive differences in practice in the relationships to their patients and their communities. The rural physician was usually more involved in the community and with those outside of the medical profession. Place of training also had probable influence on location since rural medical doctors were more likely to have attended central Missouri medical schools and metropolitan physicians to have attended Kansas University.

94. Hawkins, Charles A. The Econometrics of Physician Distribution. Systems Analysis Program Working Paper Series, No. S 6903, August 1969.

The study undertaken attempts to examine physician distribution as an element of social welfare, to determine the extent and causes of maldistribution, and to discuss alternatives for correction of the imbalances identified. Increasing specialization has left the ratio of primary care physicians to population in the United States unchanged even though the overall physician ratio has increased. In addition, a serious shortage has arisen in rural and ghetto areas, due to the fact that physicians are being drawn away by the professional, economic and social advantages prevalent in middle-class suburban regions.

Attaining the optimum national physician/population ratio will not guarantee sufficient nationwide care since inter-state distributions are not taken into account.

National and state (New York) ecologic and demographic data were analyzed for factors contributing to the variation in physician distribution. Four task areas were identified: an analysis of 52 New York state communities advertising for additional physicians, a statewide statistical analysis of physician distributions, a New York state county-wide statistical analysis of ecologic and demographic data, and a review of combined results and examination of remedial actions. Socio-economic data were obtained from the New York State Department of Commerce, the New York Times, and the New York State Medical Society. Three unexpected results displayed in the data were the relatively high percentage of population employed in educational institutions, the small number of non-white residents in communities (less than .1%), and the urban bias in the community sample.

Regression was used to analyze state and national data. The dependent variable was a standardized ratio of "population per physician." Independent variables included per capita income, health insurance coverage, population per hospital, population per hospital bed, percentage of the population admitted to hospitals, medical schools, and population per square mile. It was found that the general nature of the national data does not reflect the intra-state differences in the distribution of physicians. Two general conclusions were drawn from the national analysis. First, the variables used to predict physicians in patient care are not valid for general practitioners. This is due to the statistical bias caused by the decreasing numbers and age distribution of physicians since they can be considered proxy measures of a population's demand and ability to pay for physician services.

In the state analysis, it appeared that a population with a higher level of income and education prefers the services of specialists to the services of general practitioners. Also as median age decreased, population per physician increased. The state data also supported the findings of the national analysis that there is an inverse relationship between the number of general practitioners and area per capita income.

From the results of these analyses, Hawkins concludes that economic influences alone do not control physician distribution. Several alternatives are open to correct the problems of physician maldistribution and decreasing numbers of family practitioners. Educational requirements can be relaxed to attract more candidates to medical school. Paramedical personnel could be employed to act in limited diagnostic roles. Community subsidies to attract physicians and the use of computer technology to disseminate information are also mentioned as potential alternatives.

98. Holen, Arlene. "Effects of Professional Licensure on Interstate Mobility and Resource Allocation." Journal of Political Economy. (October 1965).

This discussion focuses on the effects of state licensing arrangements and practices in the professions of medicine, dentistry, and law on interstate mobility and the allocation of professional labor resources. Interstate mobility is defined as "the ability of a person trained and qualified in his profession to become licensed and to practice in a state of his choice."

Holen employs cross-sectional analysis of the differences in professional income to determine the efficiency of allocation of health professionals among geographic areas. The time period around 1949 was used for the cross-section with data from the U.S. Census of 1950 and the National Income Division (NID) Survey of medicine, dentistry, and law. Licensure practices of the professions are also reviewed. Medicine has the most flexible licensure system with a large reciprocity network between states. Dentistry has less inter-state reciprocity, and in most cases some or all of the licensure exam is required in a new state. Law has the fewest inter-state reciprocity agreements due, in part, to the variance in state laws.

A refined migration ratio was used to compare the mobility of the professions:

$$\frac{\#\text{ of a profession who moved to a different state}}{\#\text{ who moved to different counties (inter and intra state)}}$$

Physicians had the highest ratio, 68%, while dentists and lawyers both had less than 40%. Mobility is also decreased for lawyers and dentists due to exclusionary practices of licensing boards in those professions, i.e. states with higher average incomes have higher failure rates.

The result of limiting entry is to increase income for those practicing the profession within the state by limiting the supply of labor for that profession. Holen measures this phenomena by comparing income dispersions within professions and unweighted mean incomes between states. Physicians had the greatest overall standard deviations, but the smallest deviation between states. These findings were "consistent with the hypothesis that misallocation among states of dentists and law has resulted from licensing agreements and practices which serve to restrict interstate labor mobility."

102. Joroff, Sheila and Vicente Navarro. "Medical Manpower: A Multivariate Analysis of the Distribution of Physicians in Urban United States." Medical Care. Vol. IX, No. 5 (September-October 1971), 428-438.

The authors use Morgan and Sonquists's Automatic Interaction Detector program, a multivariate regression procedure, to determine the relationship between 27 different physician-population ratios in 229 SMSA-like communities in 1965 to ten community characteristics. Five of the twenty-seven ratios represent proportions of total physicians, general practitioners, medical specialists, surgical specialists, and other specialists. One ratio represents physicians in hospital-based practices. The remaining 21 ratios represent individual private-specialist practices (e.g. internal medicine, pediatrics, etc.). The ten community characteristics analyzed were: population size, population density, per capita buying power, per household buying power, existence of medical school, existence of more populous metro area within 75 miles, median years of education of population, proportion of population over 65, proportion of white population, and number of non-federal acute, general hospital beds per thousand population.

The analysis indicated that the best predictor for ratios of G.P.'s to population was the proportion of population over 65. "Medical environment" was the best overall predictor of the distribution of specialty practices, while the number of medical specialists was directly related to the existence of a medical school. The general hospital bed rate was the most useful predictor of surgical specialists and for other specialties median years of education of the population had the strongest predictive value.

An analysis was also presented of the community factors most directly related to distribution of individual specialties. Economic variables were shown to be only of secondary and tertiary importance in determining the distribution of physicians across communities.

104. Kaplan, Robert S. and Samuel Leinhardt. "Determinents of Physician Office Location." Medical Care. Vol. XI, No. 5 (September-October 1973), 406-415.

Physician offices are commonly assumed to be comparatively scarce in low income and black urban areas. To test this hypothesis, Kaplan and Leinhardt cross-tabulated the number of physician offices in each census tract in the city of Pittsburgh against median income levels. Data collected included only those offices of physicians available for primary or ambulatory care. (This excludes "institutionalized" physicians because they are not available to ambulatory patients and

it is assumed they have little impact on the delivery of preventive and health maintenance care.) Initial testing of this first hypothesis showed, contrary to conventional opinion, a negative correlation between income level and office frequency.

The hypothesis was then expended to suggest four general factors assumed to be important in office location decisions:

1) zoning regulation
2) physician conveniences
   - hospitals (in number of beds)
   - colleagues
   - residential areas
   - costs
3) patient conveniences
   - proximity to office, specialists, and facilities
4) local conditions
   - age distribution
   - population density
   - racial distribution
   - ethnicities

A series of multiple regressions were run. The dependent variable was the number of non-institutional physician offices in each census tract and the independent variables were the median income, percentage black, number of hospital beds in the census tract and in adjacent tracts, and a dummy variable describing commercial zoning. When these factors are considered, the relationship between income and physician location disappears. The important effect is that physicians choose to locate near hospitals and large areas of commercial zoning. Concentration of blacks in a particular area is of only minor importance in office location choice for the aggregate.

It is emphasized that these findings are valid only for the city of Pittsburgh. Since they contradict the conventional opinion, it is recommended to continue with this type of analysis on the data from other metropolitan areas in an attempt to validate these findings.

108. Kraus, A.S., E.H. Botterell, A.W. Einarson, M.G. Thompson. "Initial Career Plans and Subsequent Family Practice." Journal of Medical Education. Vol. 46, No. 10 (October 1971), 826-830.

The authors survey the entering class of a Canadian medical school in order to identify those characteristics which would be most useful for predicting those most likely to choose a family practice specialty. The results could ultimately be used as part of a strategy to increase the supply of physicians in family practice. The entering class of Queen's University in 1970 and

the graduates of Queen's between 1949 and 1958 were surveyed to determine location preferences and ultimate actual practice location. The data indicate that "those who expressed an initial interest in family practice were more than three times as likely to have entered family practice and more than nine times as likely to still be in family practice than those who (currently) indicate they had no initial interest in that type of practice."

Recognizing the limitations of this retrospective type of study, the authors conclude that screening applicants with regard to specialty preference before entrance to medical school does provide a valid measure of intention which can be used to choose among candidates as a way of increasing the numbers of graduates in specified specialties. The authors found no strong correlation among any initial motivations to enter family practice and the likelihood of entering or remaining in family practice.

110. Lavin, John H. "Do Those Doctor-Short Towns Really Want Help?" Medical Economics. (September 11, 1972), 119.

The Sears-Roebuck Foundation at one time provided funds for the establishment of facilities and offices in physician shortage areas to attract new physicians. After 15 years the program has been terminated. The author argues that the incentive of an office is not sufficient in a market where there are so many areas both under and over supplied competing for physicians. In addition, physicians who do locate in shortage areas tend not to remain because of being over-worked and finding it difficult to fit into a small, closely knit community. Lavin argues that physician-short areas may have to change their utilization patterns before being able to attract and retain physicians in the future.

117. Madison, Donald L. "Recruiting Physicians for Rural Practice." Health Services Reports. Vol. 88, No. 8 (October 1973), 758-762.

Madison contends that findings of previous studies by Bible, Champion, Hassinger, and others have been primarily descriptive of the problem and not suggestive of solutions to the maldistribution problem. These findings need to be linked to an effective intervention strategy. Since most policies designed to induce physicians to locate in rural areas have had only a marginal effect, it is suggested that a new approach be taken in designing policies to recruit physicians to rural areas.

Madison argues that some consideration should be given to the fact that physicians are only one part of the medical care system and they incur substantial costs in establishing a practice, i.e., rent and equipment in underserved areas. Communities that already have an organized medical care system and which subsidize or provide physicians with facilities and equipment may be more able to recruit physicians. Improving the availability of facilities and ancillary services as a recruitment strategy would help to alleviate the problem of professional isolation that physicians tend to associate with rural practice. This kind of recruitment strategy has been successful in attracting physicians to shortage areas such as Gallipolis, Ohio, and Elkins, West Virginia where the physician/population ratio is more favorable than other communities of similar size and location.

Madison concludes that no single solution will ease the distribution problem. Instead, consumers and providers will have to cooperate in achieving solutions to the problems of manpower shortages.

118. Marden, Parker G.. "A Demographic and Ecological Analysis of the Distribution of Physicians in Metropolitan America 1960." American Journal of Sociology. Vol. 72 (November 1966), 290-300.

Using multiple correlation analysis, Marden studies the influence of population size and medical practice environment on the number of licensed physicians and osteopaths in counties across the U.S. in 1960. Physicians were classified as those in direct patient care, those in general practice, and those in specialty practice. He found an extremely strong (.98 [.001 level]) correlation between increases in the size of population and the number of physicians, using 6 increments in population size (less than 50,000, 50,000-99,999, 100,000-249,999, 250,000-499,000, 500,000-999,999, 1,000,000+). Population size was directly related to physician distribution; as population size increased a greater proportion of the distribution variation was explained - R^2 ranged from .26 for small counties to .95 for large.

Medical environment was measured by age composition of the population, education level, race, and number of available short-term, non-federal hospital beds. Except for the under 50,000 groups, the variables account for more difference in variation between metropolitan areas for general practitioners than for specialists. Age and race were the two most important determinants for all physicians, but particularly for general practitioners. In small metropolitan areas, availability of hospital beds is the most important influence

on the distribution of specialists within these areas. In general, age and race are better predictors of the distribution of general practitioners, while availability of beds and educational level of the population are better predictors of the distribution of specialists.

120. Marshall, Carter, Khatab Hassanein, Ruth Hassanein and Carol Marshall. "Principal Components Analysis of the Distribution of Physicians, Dentists and Osteopaths in a Midwestern State." American Journal of Public Health. Vol. 61, No. 8 (August 1971), 1556-1564.

The authors seek to identify the demographic variables characteristic of urban and rural counties in Kansas which attract or deter physicians from locating in these areas. Principle components analysis was used to identify the major factors from among 18 individual variables describing the community. The variables were: Total pop., 1960, % of pop. rural, 1960, Income per capita, 1960, Urban-rural income ratio, 1960, % of families with incomes < $3,000, 1960, % of families with incomes > $10,000, 1960, Per capita retail auto sales, 1960, % of pop. < 5, 1960, % of pop.> 65, 1960, % of pop. > 25 with at least four years of high school, 1960, % of labor force female, 1960, % of women 15-44, 1960, Age-adjusted death rate, 1960, Median earnings of professionals, 1960, Median earnings of farmers, 1960, Cumulative fertility rate, 1960, Hospital beds per 100,000, 1966, % of physicians in general practice, 1966. Measures of physicians per capita population, average age of physicians and proportion of physicians less than 60 years old were then regressed on the two most important factors found.

Size of population was determined to be the single most important factor in determining physician location. "Rural-poor" counties had the fewest number of physicians while "urban-affluent" counties had the largest number of physicians. When separated out, affluence of a rural area was less important than the relative degree of urbanization and the size of the population as a determinant of the number of physicians in the county. Within urban or highly populated areas, however, affluence again becomes the deciding factor.

121. Martin, E.D. et al. "Where Graduates Go: The University of Kansas School of Medicine --A Study of the Profile of 959 Graduates and Factors Which Influenced Their Geographic Distribution." Journal of the Kansas Medical Society. Vol. 69, No. 3 (March 1968), 84-89.

In this study, Martin examines the practice location of University of Kansas School of Medicine graduates in order to specify those factors which had an impact upon their location decisions.

959 graduates from the period 1951-1960 were analyzed. Information was obtained from the records of the AMA, University of Kansas School of Medicine, and the Kansas Medical Society. A questionnaire was mailed to these graduates and returned by 689, approximately 69%.

The survey results indicate that less than half of the graduates remained in the state to practice (41%). The proportion of students entering general practice was also declining - from an average of 44.2% in the first five years of the study to 34.1% in the last five years.

Place of internship and residency appeared to have a significant impact on those graduates who interned in Kansas; 66.3% remained in the state to practice. 50% of those completing a residency remained.

Martin concludes that increasing the number and desirability of in-state internship and residency opportunities may be the most effective means of preventing the depletion of physician manpower.

122. Mason, Henry R. "Effectiveness of Student Aid Programs Tied to a Service Commitment." Journal of Medical Education. Vol. 46 (January 1971), 575-583.

Mason compares loan forgiveness programs as an incentive for rural practice in eleven states where programs lasted long enough to provide significant data. The report states "that only one program has had outstanding success over its 25-year history (Minnesota), while the majority of states are fortunate if 60 percent of the borrowing physicians follow through by practicing in their states. In all of these programs, one-third of the physicians chose to buy out of their obligation to practice in a small community." The principal reason found for other states to cancel loan forgiveness programs was the physician's desire not to practice in a rural area. No reasons are provided for why most programs that were in operation at the time of the study were only partially successful. State laws relating to loan forgiveness are summarized in the article. Mason concludes with several suggestions on how best to administer a loan forgiveness program in a state.

124. Mawardi, Betty Hosmer. "A Career Study of Physicians." Journal of Medical Education. Vol. 40 (July 1965), 658-666.

The general purpose of this study was to gather data on what a large segment of graduates from Case Western Reserve University found especially satisfying or dissatisfying about their careers in medicine and to gather information on the preferred styles of practice.

The data used for this study were compiled from interviews with 160 male graduates of Case Western Reserve University School of Medicine between 1935-1945. Eight fields were represented, each having 20 physicians. All of the doctors in six of the fields are primarily in private practice; the six fields consisted of general practitioners, internists, general surgeons, psychiatrists, pediatricians, and obstetrician-gynecologists. The other two groups are composed of full time hospital and medical school appointees.

Each study participant was interviewed in his own office and was asked to complete a book of additional information. Thirty non-Western Reserve graduates also participated in these preliminary stages. The doctors reported having more satisfactions than dissatisfactions. Many of them felt that their chief satisfaction was that of successful diagnosis and treatment of their patients. Pediatricians seemed to be the most dissatisfied of all the groups considered. Their most common complaint had to do with dealing with the mothers of the children they treated.

Internists felt that if they practiced in a large city, they did not have as great a chance to practice their specialty as much as they desired. They complained that they were merely taking the place of the family physician.

Those physicians who expressed greatest satisfaction with their location live in states such as Arizona, California, Texas, Colorado, and Florida.

A sample analysis of a psychological test concerning job satisfaction was compared with the answers given in the interviews. It found that for both groups good therapeutic results rated high in terms of satisfaction. Those who scored lowest on this test also included independence, financial security, and enough time to do teaching and research as requisites for satisfaction.

Overall professional satisfaction and dissatisfaction can be measured by the number of vacation days desired: those doctors who were most satisfied with their work only wanted to have one or two weeks vacation while those who were dissatisfied wanted four to five weeks vacation. There is little difference in the number of patients seen per day by either satisfied or dissatisfied physicians (X_s = 16 for most satisfied, X_d = 18 for least satisfied).

The other chief study interest, styles of practice, led to a wide variety of results. Some of the doctors say that over the years their problem solving methods have not become more efficient as they actually are more time consuming. Others suggest that better use of consultants has increased their efficiency. No definite conclusions were reached.

126. McFarland, John. "Toward an Explanation of the Geographical Location of Physicians in the United States." Center for Health Services Research and Development, American Medical Association, Chicago, December 1972.

The author reviews the current literature concerning physician location and classifies it into five major categories of variables:

(1) Environmental - quality of community life, general non-professional attractions
(2) Prior exposure - previous contact of physician with community
(3) Professional relationships - practice-related aspects of satisfying professional life
(4) Economic factors - factors directly influencing factor net income
(5) Demand determinants - factors associated with generation of demand for medical services.

The following table summarizes the key variables identified within classification and the author's perception of their amenability to policy manipulation. Suggestions for further research are made at the conclusion of the paper.

POLICY POTENTIAL OF FACTORS IN LOCATION DECISIONS

LOCATION DECISION

Environmental Factors		Prior Exposure		Professional Relationships		Economic Factors		Demand Determinants	
Cultural opportunities	1,2	Place of birth	1	Professional contacts*	4	Income*	4	Population size	1
Quality of educational system	2	Medical school*	4	Stimulation	4	Costs	3,4	Age,sex,race	1
Quality and availability of housing	2	Internship*	4	Opp'ty for continuing education	4	Excess demand*	3,4	Per capita income*	2,3,
Community security	2	Residency*	4	Opp'ty for utilization of "modern" facilities and techniques	4			Education*	2,4
Pollution	2			Hospitals*	4			Urbanization	2
Intra regional transport	2			Allied health personnel	4			Population growth	1
Provision of public services	2			Barriers to entry	4			Feedback of physician/population ratio	1,(3)
Information availability	2			Availability of group practice*	4				
Access to shopping	2								
Climate	1								
Recreational facilities	2								

Classification Code:
1. Not subject to policy manipulation
2. Inefficient policy variable
3. Infeasible variable for policy
4. Potential policy variable

* Indicates variable, in the subset of policy alternatives, which seems to be very important

127. McMillan, Alma, Marion Gornick, Ronald Rogers and Martin Gorten. "Assessing the Balance of Physician Manpower in a Metropolitan Area." Public Health Reports. Vol. 85, No. 11 (November 1970), 1001-1011.

The authors surveyed 3,400 physicians in 1967 in the Baltimore SMSA to assess the numbers and types of practices at the census tract level and to determine whether the physicians were in training. The study shows slightly more specialists in the metropolitan area than in the aggregate for the nation as a whole on a per capita basis. Most specialists (2/3) reported significant amounts of time being spent in primary care. 40% of the physicians surveyed were in hospital training. The study provides a profile of medical practice in the SMSA compared with the city and neighboring regions, but gives little analysis of the reasons for the differences found.

138. Mountin, Joseph W., Elliott H. Pennell, and Virginia Nicolay. "Location and Movement of Physicians, 1923 and 1938: Effect of Local Factors Upon Location." Public Health Reports. Vol. 57 (December 1942), 1945-1953.

This study examines the distribution of physicians in the U.S. by county according to per capita income, metropolitan character (urban-rural), largest urban place (size of towns in county), number of hospital beds, population trends, and physician migration trends. Aggregate figures for each of these categories for 1923, 1930, 1938, and 1940 were used.

Classification on the basis of income indicated that wealthy counties with expanding populations had high ratios of physicians to population. In counties where per capita income was less than $300 the ratios were low. On the other hand, counties with per capita incomes of $600 or more had relatively higher ratios. Classification by metropolitan-nonmetropolitan area in 1923 showed 152 physicians/100,000 population in metropolitan counties as compared with 110 physicians/100,000 population in the nonmetropolitan group. By 1938 ratios in these same groups of counties had increased to 164 in the metropolitan areas and had declined to 92 for the rural areas.

Wealth was also associated with physician distribution patterns within areas. In 1923 the physician/population ratio in the wealthiest metropolitan counties was more than twice that of the poorest metropolitan counties, whereas it was only 50 percent greater than the physician/population ratio of nonmetropolitan counties. By 1938 there was an increase from 159 to 176 physicians per 100,000 population in wealthy counties and a decline from 74 to 54 physicians per 100,000 population in the poor counties. Wealthy nonmetropolitan counties, however, did not change significantly.

145. National Health Council. Report on Discussions of the Task Force on the Manpower Distribution Project. New York: National Health Council, 1970.

The report summarizes the results of a task force meeting of 26 health manpower experts [Memphis, Jan. 24-26, 1973] to suggest criteria to be employed in choosing local/regional demonstration project proposals to alleviate health manpower maldistribution, in implementing demonstration projects, and in setting guidelines for national programs to involve the health professions in determining solutions to the maldistribution problem.

The conference itself focused on problems of shortage areas such as the lack of personnel and facilities, the inaccessibility of outlying health care providers, and the ineffective utilization of health services due to costs and lack of information. Such efforts to correct maldistribution and the problems involved in these programs as financial incentives and preceptorships have had only small success. No program attempted has had large enough success to justify its use on a widespread basis.

To establish demonstration programs it was determined that the following areas should be addressed: creation of educational programs for rural physicians, use of economic incentives to attract health personnel for shortage areas, development of team approaches to health care delivery, expansion of the functions of existing health care personnel, and improvements in the design of management information systems.

Communities were urged to develop projects that would be suited to its needs and to involve the local providers and citizens a voice in the development of the project. The National Health Council would assist communities by publicizing the requirements for demonstration projects and providing technical assistance to the projects.

The task force concluded with suggestions that NHC support modifications in the training of health personnel such as emphasis on the team approach in care and community training programs and that the current functions of health personnel could be expanded to provide care more efficiently.

150. Parker, R.C. and R.A. Rix and T.G. Tuxhill. "Social, Economic, and Demographic Factors Affecting Physician Population in Upstate New York." New York State Journal of Medicine. Vol. 69 (1969), 706-712.

Five population variables are tested to examine what factors exerted the greatest influence on physician location in upstate New York. The variables were:

(1) Percent of the population in agriculture.
(2) Median school years of the population.
(3) Percent of the population completing high school.
(4) Median income.
(5) Percent of the population moving to a new town during 1954-1960.

For purposes of comparison, data were tabulated and related by two methods for each town in the 11 county region -- town-by-town and physician service area (assumed to approximate the hospital service area). Both methods yielded similar results. Towns that were largely agricultural, having a low educational level, low percentage of high school graduates, low median income, and low mobility, tend to have an unfavorable position in keeping or recruiting physicians.

Policy recommendations included loan forgiveness, establishment of rural health centers visited by physicians from larger medical centers and physicians remaining in the area, and extensive use of nurse practitioners and physician's assistants.

The study confirmed the earlier findings that the idea of small community living and the opportunity to establish an early practice are important influences in attracting physicians to small communities. The study also demonstrated that physicians practicing in rural areas are apt to have originated in a small community.

151. Parker, Ralph C. and Thomas G. Tuxhill. "The Attitudes of Physicians Toward Small Community Practice." Journal of Medical Education. Vol. 42 (April 1967), 327-344.

A survey was conducted of a sample of physicians in the 11 county Rochester Regional Hospital Council area in 1960 to determine the factors influencing physician choice of a small or large community for practice. T-tests were used to identify the statistically significant findings. Physicians generally believed that the three most important factors influencing choice of a small or large community were: the idea of small community living, prospect of building a busy practice earlier, and influence of the spouse. Similarly, physicians generally believed the following to be major deterrent factors: preference for an urban environment, lack of complete facilities, prospect of a heavy workload, inadequate leisure time, influence of spouse, lack of medical support facilities, and scarcity of recreational and cultural opportunities.

Controlling for the year of graduation from medical school, the factor of the opportunity to practice with an established physician increased in importance with more recent graduates while the influence of the geographic location of the community of origin and the prospect of becoming more influential in a community declined as decision criteria

over time. Specialists were more influenced by family and by the availability of medical facilities than were generalists. Generalists, on the other hand, were more influenced by the prospect of establishing a busy practice quickly. It was generally found that early location decisions were less influenced by educational environment.

Over a 15 year period, a marked shift occurred from solo to group practice. The authors suggest that the critical decision period for most physicians as to ultimate career choice is between internship and the first few years of practice. Medical educators are seen as potentially important influences during these times on the choice of practice location by a physician. Given the propensity of physicians from small towns to return to small towns to practice, selection of students from predominantly rural or small town backgrounds is viewed by the authors as a way to increase the number of physicians locating in these areas.

155. Perlstadt, Harry. "Internship Placements and Faculty Influence." Journal of Medical Education. Vol. 47 (November 1972), 862-868.

Perlstadt examines the influence of faculty on student careers and hypothesizes that various indicators of a medical school's faculty composition (numbers in basic and clinical sciences, proportions by academic area and salary base, and various ratios of faculty to students) will be related to the proportion of students placed in rotating internships. Multiple regression and partial correlation were employed using 1966 data from the National Intern Matching Program and 78 medical schools.

Faculty influence on student decisions was found to be indirect. While the indices of faculty composition were shown to be negatively related to placement in rotating internships, the characteristics of teaching hospitals (ownership of hospital, financial base of the hospital) and the level of science knowledge among entering students (MCAT scores) were shown to be more significant determinents. Perlstadt concludes with the conjecture that the faculty function as "catalysts transmitting organization and environmental pressures from the social milieu to the students," rather than as direct influences over the location choices of students.

156. Petersen, Gary R. A Comparison of Selected Professional and Social Characteristics of Urban and Rural Physicians in Iowa. Health Care Research Series No. 8, University of Iowa, 1969.

Petersen asserts that the current stock of information related to "professional and social characteristics of urban and rural physicians [is] limited." Since this information is necessary to develop and

implement policies related to physician distribution, he suggests a two-step analytic approach to gather this information. The first is a review of the literature concerning the relevant aspects of physician distribution. The second is the use of a survey questionnaire to gather information directly from physicians.

The author develops a questionnaire and discusses the results he obtains from a survey of Iowa physicians. A sample of 2,000 physicians was chosen. Approximately 50% were classified as urban and 50% as rural. Urban areas were defined as those having populations of 20,000 or more and rural areas were those with populations less than 20,000. These categories were then sampled separately and 100 physicians were randomly selected from each.

Of the returned questionnaires, 69.5% were in forms satisfactory for analysis. Chi-square and frequency counts were used to test the significant of the findings. In general, the findings were representative of the current trends in the medical care sector. Greater numbers of physicians were leaving Iowa than were staying or migrating to the state to practice. Within the state, the problem is exacerbated since the majority of the physicians in rural areas are elderly, retiring, and not being replaced.

In concluding this study, Petersen recommends a number of areas which could warrant further research such as recruitment incentives for physicians, the strengthening and expansion of health education programs, and the use of ancillary personnel. Priority areas requiring prompt action are community planning, more efficient use of existing personnel and facilities, and improved methods of financing.

158. Peterson, Paul Q. and Maryland Pennell. "Physician-Population Projections, 1961-1975: Their Causes and Implications." American Journal of Public Health. Vol. 53 (February 1963), 163-172.

Peterson and Pennell calculated the expected number of physicians per 100,000 population in 1975 using as a base the AMA data on the current stock of physicians nationally and the total projected output of old and new medical schools during this period. The expected licentiates from foreign schools as well as the expected number of deaths of licensed physicians over the period 1961-1975 were also calculated. The number of physicians per 100,000 in 1961 was 132.8 while the projected figure for 1975 is 128.8. If the 1961 figure is taken as an acceptable level, there will be a deficit of 9,500 physicians by 1975. Calculations for both D.O.s and M.D.s show that by 1975 there will be a deficit of about 11,000 doctors at the current rate of production. The authors note that 20% of all medical care was provided

by FMGs in 1961 and question the advisability of relying on FMGs to fill expected deficits. They also feel that "better utilization of physicians' services can effect only modest savings in professional time." Specific recommendations for increasing the number of U.S. educated physicians are not given nor are the reasons for the existing geographic distribution analyzed.

166. Reynolds, Richard C. "The University and Rural Health." Journal of the American Medical Association. Vol. 214, No. 3 (October 19, 1970), 540-544.

The University of Florida medical school established a clinic in a remote rural area of north central Florida as an experiment to study and determine the health services and needs of a rural area and the problems attendent with the maintenance of such a clinic. This report describes the background to the research. A study will be conducted eventually to determine whether the presence of the clinic attracts other health care professionals or whether those trained in such a setting return to other similar rural areas. The study, however, is not yet complete or available as of 1970.

167. Rimlinger, Gaston V. and Henry B. Steele. "An Economic Interpretation of the Spatial Distribution of Physicians in the U.S." The Southern Economic Journal. Vol. 30, No. 1 (July 1963), 1-12.

Rimlinger and Steele first examine the distribution of private physicians per 100,000 population in five "county group" areas (greater metropolitan, lesser metropolitan, adjacent counties, isolated semirural counties, and isolated rural areas) to per capita effective buying power in 1959. They find that "the main determinents of physician distribution, given the regional distribution of income were (1) the relation of fees to patient income, (2) the relation of demand for physician services to patient income, and (3) the behavior of physicians with respect to price competition, income maximization, desire for leisure, and geographic mobility." The degree of inequality of physician distribution tends to be greater as fees and the demand for services increases with a rise in inter-regional income and the inclination of physicians to substitute leisure for income. Based on these conclusions, the authors suggest that increasing the number of physicians or level of fees or level of demand would only serve to increase the absolute physician-population ratio differentials between high and low income areas. Two models are proposed to summarize these relationships, one a linear model and the other a curvilinear model.

The second part of the analysis examines the available data to support or refute the above theoretical propositions. Lack of mobility is viewed as a more significant factor than either desire for more leisure or actual income in explaining the current pattern of physician distribution. The authors intimate that the reasons for the immobility

observed may relate to the qualifications of the physicians involved (the least capable locating in smaller communities) and the special cultural and professional opportunities of larger areas. Demand for physician services was defined as a function of income, age, sex, race, education, place of residence and possession of health insurance. In general, use of services rose directly with the income of an area, but demand alone was not found to be sufficient explanation for the existing disparities in physician supply. The prevailing pricing practices of physicians, which are to increase fees in proportion to the income of the area, contribute significantly to the observed differences in physician-population ratios between areas with different income levels and between urban and rural areas.

The authors conclude that simply increasing the supply of physicians may not automatically improve the distribution differentials due to the effects of prevailing economic incentives and the relative lack of mobility of physician resources. Proportionately more physicians may be expected to locate in already well-served areas than underserved areas. Rimlinger and Steele are optomistic, however, that a long run equalization of the distribution of physicians between areas may result from the trend towards regional equalization of per capita income.

170. Rourke, Anthony J., "Small Town Doctor Needs More Than an Office." Modern Hospital. Vol. 117. No. 5 (November 1971), 151.

Studies conducted by Rourke suggest that a population of 4,000-5,000 within a 10 square mile area is necessary to support one full-time practicing physician. Rourke argues that this population base plus even modest medical facilities may not be enough to attract and retain a physician. Other critical variables are community resources such as schools, churches, recreation, and acceptance into the local social life. On the whole, Rourke maintains that the professional needs of a physician--particularly colleagueship and interaction with other physicians--are the most important factor in attracting and retaining a physician. No data are supplied.

171. Royce, Paul C. "Can Rural Health Education Centers Influence Physician Distribution?" Journal of the American Medical Association. Vol. CCXX, No. 6 (May 8, 1972), 847-849.

Royce examines the records of the Robert Packer Hospital in Sayre, Pennsylvania in order to develop a case study which determines what percentage of the physicians received their graduate training at this hospital [in a primarily rural area], and subsequently established practice in the area.

Of the physicians who trained there between 1960 and 1965, a large proportion stayed in rural areas for practice. Four hundred

thirty-one (431) physicians were listed.. 183 or 42% remained in New York or Pennsylvania. Eighty (80) or 19% of the 431 were in towns within a 100 mile radius of Sayre, and of those 67% were in towns with less than 25,000. Of those physicians in New York or Pennsylvania, 108 (59%) located in towns with less than 25,000.

Royce concludes that it would be worthwhile to provide financial incentives for rural physician location and to establish health education centers in shortage areas.

172. Rushing, W.A. "Public Policy, Community Constraints and the Distribution of Medical Resources." Social Problems, Vol. 19 (1971), 21-35.

Rushing examines federal medical programs from the perspective of community constraints, that is, the characteristics of a community which influence the operation and success of federal programs. He focuses his analysis on the effects of Regional Medical Programs (RMP) and the Hill-Burton program on the distribution of medical resources in overlapping regions in Tennesse and the Tennessee Mid-South regions. In addition, he discusses the effects of Medicare and Medicaid on the inequitable distribution of health services.

Pearson-product-moment correlations are employed to determine the relation of physicians and hospitals to county socio-economic characteristics. While the variables are determined to be highly inter-related, there is little discussion of the multi-collinearity of the relationships.

From his findings, Rushing concludes that RMP and Hill-Burton have had little impact on the distribution of health care resources. In establishing RMP's the more advantaged communities have the expertise to write the grant applications and manipulate the bureaucratic red-tape. Hill-Burton programs have had small effect on health manpower distribution since they have no authority to regulate distribution. Finally, Medicare and Medicaid provide incentives to providers to locate in more attractive communities where there was previous unmet demand.

In order to remedy these situations, Rushing suggests that major organizational changes are necessary including the possibility of creating artificial distributions. No recommendations are made regarding implementation of any suggestions or incentives to change the current distribution of health care resources.

173. Rushing, William A. and George T. Wade, "Community-structure Constraints on Distribution of Physicians," Health Services Research (Winter 1973), 283-297.

Rushing and Wade use data from 1966 AMA listings of physicians by county and 1960 census information to illustrate their thesis that "the distribution of physicians is part of a macro-socioeconomic process, that other professional and technically trained personnel are part of that process, and that any attempt to modify existing inequities in the distributional pattern of physicians will be constrained by this process."

Correlation and regression techniques are used to measure the relationship between physician/population ratios by county and data on the distributions of professionals in general, nurses, allied health personnel, and hospital beds.

The authors first demonstrate that the distribution of physicians is related not just to the wealth of a community but to the overall distribution of professional persons in general. The implication is that a general set of community factors operate on physician location choices which are not unlike those operating on other professionals. Secondly, using data from Tennessee, the authors illustrate that the presence of community hospital facilities (beds) had constrained the effect of the economic and urban character of a community on the change in number of physicians in these communities. Thus, the "community-structure" of hospital facilities operates to constrain the distribution of physicians among communities.

The authors reject the policy options of increasing the supply of physicians and of utilizing physician assistants as means of improving the maldistribution of health manpower. Supply increases, they argue, will be distributed in patterns similar to those extant due to the force of community-structure constraints, while physician assistants are expected to follow the distribution pattern of physicians. The authors recommend programs that focus on services rather than manpower and which seek to improve the organization of care including the spatial distribution of facilities and improving access to these facilities.

176. Scheffler, Richard M. An Empirical Investigation Into the Geographic Distribution of Physicians and Specialists. Doctoral dissertation, New York University, New York, 1971.

Scheffler's study analyzes and describes the geographic distribution of physicians and proposes several policy alternatives for influencing this distribution.

A cross-section of state data from 1956-1967 is used to test the model. The basic model is a least squares linear regression model and has the form:

$$x_1 = a + bx_2 + cx_3 + dx_4 + ex_5 + fx_6$$

The variables are defined and measured as follows:

x_1 = Physician/population ratio
Total non-federal physicians ÷ state population.

x_2 = Demand for physician services measured by per capita income

x_3 = Production of physicians by medical schools
Number of seats in the freshman class ÷ state population

x_4 = Medical facilities in hospitals
Number of hospitals beds (long and short term) ÷ state population

x_5 = Barriers to mobility
Failure rate of licensing exam $\frac{\text{\# failures}}{\text{\# taking the exam}}$

x_6 = Degree of urbanization
Measured by per cent of the population living in urban areas as specified in the 1960 census.

According to the results of the model, the most important decision variable in physician location is the degree of urbanization of an area. Physicians evidently hold strong preference for living in urbanized areas. Potential physician income is also a significant determinent of ultimate geographic location, but the precise effect was difficult to determine because of multicollinearity problems in distinguishing the separate effects of urbanization and income. After examining the model's results Scheffler views changing the distribution of medical school facilities and particularly their recruitment practices as the policy variable most likely to have an effect upon physician location decisions. Building new hospitals are viewed as being too costly and changes in licensure laws are shown to be very uncertain.

177. Scheffler, R.M. "The Relationship Between Medical Education and the Statewide Per Capita Distribution of Physicians," Journal of Medical Education, Vol. 46 (November 1971), 995-998.

This paper analyzes some of the factors which influence statewide per capita distribution of physicians in the United States. Data for this study were collected for each of the 50 states from 1963

to 1967. The author measured the number of first year medical school places in a state (training facilities), the number of internships and residencies that each state offered, and the number of short and long term beds (hospital facilities) as the major determinents of state physician location. The relationship between these variables on a per capita basis were then measured, using a Pearson product moment correlation coefficient, with the total per capita number of physicians and specialists.

An extremely strong correlation (.91) was found between the per capita number of internships and residencies offered in each state and medical specialists per capita. When substituting surgical specialists per capita in this relationship, the correlation was .93. The correlations were .92 and .89 between residencies offered and medical and surgical specialists respectively. The correlations for general practitioners were lower, probably due to their decreasing numerical size. The author hypothesizes that a physician's choice of the location of his internship and residency strongly influences where he will eventually practice. The correlation between per capita hospital beds and the number of medical and surgical specialists per capita was .75 and .70 respectively. A high intercorrelation with availability of internships and residencies, however, makes interpretation of the significance of these relationships difficult. The number of seats in first year medical schools on a per capita basis and the number of physicians per capita were also found to be strongly correlated (.69). The data also show a strong relationship between internships and residencies offered per capita and the number of physicians per capita (.90 and .89).

The author suggests that if a state or particular area wishes to increase its per capita number of physicians, then internships and residency programs must be increased or existing ones made more attractive.

181. Shannon, Gary and G.E. Alan Dever. Health Care Delivery: Spatial Perspectives. New York: McGraw-Hill, 1974.

This book attempts a descriptive analysis of the spatial distribution of health resources from a geographer's perspective and the likely consequence of this distribution on the health of the public. The first half of the book provides an overview of the problem of spatial organization of health services by discussing select international examples, the existing pattern of health resources in the U.S., and the specific arguments that have been made to explain physician distribution by region, state, metropolitan and rural area. The second half of the book evaluates the impact of the distribution on the patient, the provider, institutional policies and the mentally ill. Models of health behavior and patient-physician relationships utilizing concepts of distance as a base are examined. The authors

conclude that our knowledge of factors determining the spatial distribution of health resources provided little substantive explanation for these phenomena. Nevertheless, distance is determined to be a critical factor in improving the effectiveness of the health delivery system which ultimately determines the health of the public.

189. Steele, Henry B., and Gaston Rimlinger. "Income Opportunities and Physician Location Trends in the U.S." Western Economic Journal. Vol. 3, No. 2 (1965), 182-194.

This paper analyzes physician location trends from 1950-1959. These trends are related to the following variables: (1) degree of urbanization, (2) the regional shift in population, (3) regional per capita disposable income at the beginning of the period, and (4) the increase in regional per capita income during the study's time interval. The data for this study were gathered from the health manpower surveys of the U.S. Public Health Service.

Using a Lorenz Curve to measure the change in the relative concentration of physicians with respect to regional income, the authors indicate a change toward a more even distribution of physicians. When only physicians in private practice were considered, the distribution in 1959 was more even than when all physicians were taken into account.

The authors also found that the top 10% of the income-ranked population suffered most in terms of lost physicians. The population with the greatest gain was that of the third lowest decile, but most physicians remain concentrated in high income areas on an absolute basis. In 1950 the bottom 25% of the population had 13.0 per cent of the nation's physicians, and the top 25% had 36.5% of the physicians. By 1959 there was a slight improvement such that the bottom quartile had 14.4% of the physicians while the top quartile had 35.5% of the physicians. A likely explanation of this phenomenon is that physicians relocated, but that people moved to higher income areas thus producing shifts in the regional income indices.

The extent to which the per capita income level in 1950 is associated with an increase in the number of physicians in a particular area is also examined. In isolated rural areas an increase of $100 in average income in 1950 is associated with a 2% increase in the number of physicians over the 1950-1959 period. However, in isolated semi-rural areas, a $100 higher per capita income is associated with a 40% increase in physicians, while adjacent areas experienced a 50% decrease. These erratic results raise questions about the significance of the observed association. Increases in per capita income in metropolitan areas were shown to be more attractive in terms of gaining more physicians than was the case in rural areas.

190. Steinwald, Bruce and Carolyn Steinwald. "The Effect of Preceptorship and Rural Training Programs on Physicians' Practice Location Decisions." Chicago: Center for Health Services Research and Development, American Medical Association, 1974.

The Steinwalds' discussion is an overview of various preceptorship programs, especially rural training programs, and their influence on practice location. The purpose of preceptorships is to expose medical students to a greater range of clinical training than would be received in medical school.

The data for this report come from a survey conducted jointly by the RAND Corporation and the American Medical Association in 1972. Questionnaires were sent to the 1965 graduating classes of U.S. medical schools. The response rate was 76.3% and the findings were supplemented with data on respondent practice characteristics which were obtained from the AMA physician masterfile.

Practice location decisions had been made by 70.9% of the respondents. These were assumed to be the first practices since the completion of formal medical training. Of those who had made location decisions, 17.8% had located in rural areas and 13.1% had participated in rural programs.

The primary relationship analyzed is the interaction between rural program participation and location of practices in rural areas. Cross-tabulations and chi-square tests are used to analyze the associations and their significance.

Most of the program participants were more likely to have entered primary care specialties than non-participants which, in large part, reflects the primary care orientation of the programs. Although twice as many program participants were raised in rural areas, it appears that, overall, the programs exerted greater influence on urban reared physicians. There tends to be a predisposition in rural reared students to practice in rural areas--36.7% of the program participants and 34.9% of the non-participants located in rural areas. Looking at urban reared physicians, the difference between program participants and non-participants were much more significant--20.7% of the urban reared participants located in rural areas in contrast to only 11.2% of the non-participants. The greatest impact seems to have been on non-primary care urban reared program participants--19.2% of the participants in this group selected rural areas as practice locations in contrast to only 9.2% of the non-participants.

In examining physician characteristics, the Steinwalds assert that the group most amenable to policy measures aimed at influencing practice location are those who responded affirmatively to the question of ever having considered rural practice (43.4% in this study). Few of the

physicians surveyed indicated that preceptorships per se had influenced them. Life style preferences and the availability of facilities and personnel were most often cited as the greatest considerations in choosing a practice site.

Before concluding the study several caveats are issued. There tends to be a preselection bias in the preceptorship programs, i.e., students may enter rural health care programs who were predisposed in that direction. The results of the questionnaires reflect the attitudes of physicians who graduated eight years ago. Changing conditions and attitudes may be changing the decision process.

Overall, the influence of preceptorship programs has been relatively slight. However, the programs do have potential as a reinforcing component in an overall strategy of incentives to affect physician distribution.

192. Taylor, Mark. William Dickman and Robert Kane. 'Medical Students' Attitudes Toward Rural Practice." Journal of Medical Education. Vol. 48 (October 1973), 885-895.

This study was designed to test six hypotheses:

1. Students with primarily rural backgrounds will show greater interest in rural medical practice than will students with urban backgrounds.
2. Wives with rural backgrounds will be more attracted to rural practice for their husbands than will wives with urban backgrounds.
3. Married students whose wives have rural backgrounds will be more interested in rural practice than students whose wives are from the city.
4. Students attending schools where they are exposed to rural practice alternatives will be more likely to plan for a rural practice than will students at schools offering no such exposure.
5. Interest in rural practice will decline progressively from the freshman year to the senior year of medical school.
6. Student interest in rural practice will be higher among medical students planning to go into general or family practice than among students planning to enter other specialties.

The authors surveyed 234 medical students being supported by WICHE in 1970-71 as well as their wives (108). These students came predominantly from states with large rural populations and a wide geographical distribution. All hypotheses were supported, except that the results for hypotheses 3 and 4 were not statistically significant. The authors found that the wife's background was particularly influential for students choosing to practice in rural areas which was not the case for urban-oriented students. Family practice as a specialty and desire to

locate in a rural area were also significantly related. The strong relationship between rural background and desire for rural practice contradicts the 1967 study by Parker and Tuxhill.

The authors recommend that students with rural backgrounds and with an expressed interest in family practice be recruited as a strategy to affect the geographic and specialty distributior of physicians.

197. Tokuhata, George K. et al. "Health Manpower Distribution in Pennsylvania." Division of Research and Biostatistics, Pennsylvania Department of Health, Harrisburg, Pennsylvania, November 1972.

The purpose of this paper was to review the overall geographic distribution of licensed health manpower in Pennsylvania. The 1969 licensure records of the state were used as the source of data. The authors utilize average professional/population ratios per county as the basic unit of analysis.

Data are presented on the total supply and statewide distribution of health personnel including physicians by specialty. In general, physicians as well as all other licensed health professionals are concentrated in metropolitan communities, particularly those with large or more hospitals, or in areas of substantial economic development. A cursory analysis is made of the distribution of manpower in relation to health needs and of all licensed health personnel. Only the distribution of physicians was significantly related (positively) in a favorable way to crude mortality rates of the population. The analysis also revealed that the ratio of supportive personnel to physicians since 1900 has increased from 1/1 to at least 1 to 13. Based on the data which shows "the distribution of health services and personnel [to be] closely related with the availability of health facilities, family income and health insurance, [t]he authors concluded that the health care markets (supply) are more sensitive to economic demand factors than to medically determined need."

216. Wechsler, Henry, Denise Thum and Allan Williams. "Choice of Practice Location: The Influence of Dental School Location and Residence at Admission." Medical Care. Vol. XI, No. 5 (September-October 1973), 401-405.

Geographic maldistribution, not an absolute shortage of dentists, is an important aspect of the current and projected dental manpower shortage. A questionnaire survey in New York State indicated that distinct areas of dentist "oversupply" and "undersupply" exist. The purpose of the study was to investigate the relationship between dentists' practice location, place of residence at time of admission to dental school, and the location of the school attended.

Three groups were studied: 1) all dentists, during a specified period of time, who were New York State residents at the time of admission and who graduated from New York State dental schools, 2) all out-of-state residents who graduated from the three New York schools, and 3) all New York residents who graduated from the five out-of-state schools most frequently attended by New York State residents. Two particularly strong associations appeared: 1) dentists who were New York State residents at the time of admission to a N.Y. dental school later located their practice in New York State (84%), 2) the majority of non-residents returned to their home state (71%), and 3) New York State dental school graduates tended to establish practice in the same area as their residence prior to enrollment or in an area with somewhat similar socioeconomic characteristics (for both rural and urban areas). Location of dental school was therefore not as significant a factor in determining actual practice location as was place of prior residence.

218. Weiskotten, Herman G., Walter S. Wiggins, Marion E. Altenderfer, Marjorie Gooch and Ann Tipner. "Trends in Medical Practice: An Analysis of the Distribution and Characteristics of Medical College Graduates, 1915-1950." Journal of Medical Education. Vol. 35, No. 12 (December 1960), 1071-1095.

This study is the sixth in a series of surveys of every fifth year graduating medical school class designed to provide information on various trends in medical practice. Data are provided for the most recent graduating year (1950) and for all years preceding this class (1915-1945).

The following trends in relation to geographic and specialty choices are cited:

- proportionately more physicians are specializing as of 1950 with the most frequent choices being internal medicine and surgery.
- low per capita income states received less than their proportionate share of 1950 graduates than high per capita income states.
- public medical colleges have contributed proportionately more practitioners to their own states than private colleges since 1930. In relation to the number of graduates whose prior residence was in the same state as the medical collage, private schools retain higher proportions of graduates than public schools.
- the proportion of medical college graduates practicing in the same city, state and division as their prior residence has declined steadily.
- the state in which residency takes place remains the most important factor associated with practice location.
- the proportion of graduates practicing in cities over 500,000 declined in recent years while the proportion choosing towns of less than 25,000 people has increased.
- more G.P.s are in small communities than anywhere else.
- the proportion of limited specialists among all physicians is increasing in cities over 500,000.

- public medical colleges draw 82% of their graduates from the same state as the school (47% for private).
- 2 out of 5 1950 graduates went to practice in a community the same size as their prior residence.

219. Weiss, James E. The Effect of Medical Centers on the Distribution of Physicians in the United States. Doctoral dissertation, University of Michigan, Ann Arbor 1968.

Weiss explores the effect which the technological capabilities and staff of medical centers have on physician distribution by specialty. Using the concept of metropolitan dominance from the field of human ecology as the framework for analysis, Weiss tests several hypotheses: "more dependent specialties are concentrated in higher order (technologically) medical centers whereas less dependent specialties are unaffected by medical centers; that this effect is independent of population; and that the more dependent specialties are located close to medical centers whereas less dependent specialties are not affected by distances to medical centers." Nonparametric statistics are used to analyze the data which were drawn from the 1960 census and a 1965 AMA survey of the distribution of physicians by specialty and county.

The data do not demonstrate a relationship between the dependence of a particular specialty and the concentration of technological resources of a medical center. Of the medical, surgical and diagnostic specialties examined, only the surgical specialties showed a dependent relationship with medical centers that was weakly independent of the effect of population size. Analyses of the data related to the third hypothesis indicated that physicians are distributed proportionally to population and not according to dependency and distance from medical centers. A second general model using the same basic hypothesis but based on the concepts of population and distance was also examined. This model was less accurate than the technologic dependence model in describing physician distribution although the data confirm the findings of the first model: the dependency hypothesis is rejected; the medical center effect is determined not to be independent of population size; and the dominance effect decreases with the square of the distance from the medical center and not proportionally. Generally, population size of medical centers does not fully explain physician distribution, but neither do the dependency hypotheses tested in this study.

220. Wiggins, Walter, Fred Green and Marion Altenderfer. Trends in Medical Practice - An Analysis of the Distribution and Characteristics of Medical College Graduates 1915-1955. Chicago: American Medical Association, 1970.

This analysis studied the practice and activity in medicine of medical school graduates 9-13 years after their graduation. In order to obtain the data, a survey questionnaire was mailed to the graduates of every fifth medical school class from 1915-1955. The overall return rate was 76%. The results give a broad overview of the changes occurring in the practice of medicine. The findings can be summarized as follows:

1. A decreasing number of physicians are in solo practice and private practice in general.
2. An increasing number of physicians are in group practice and/or teaching and research activities.
3. Specialty practices are increasing.
4. Urban areas are attracting larger numbers of physicians.
5. Graduates of public medical colleges have a higher propensity to remain in the state where the medical school was located.

General factors influencing the choice of practice location were also identified from the survey: perceived demand for medical services, location of medical school, prior residence, place of internship or residency, methods and quality of transportation and communication, accessibility of hospitals and consultation facilities, climate, availability of good schools and general cultural factors. Per capita income of a state is not strongly related to physician location and there is a decreasing trend of physicians locating in the same state as their medical school (1915-1955). Public medical schools produce more physicians for their state than do private medical schools and small city public medical schools produce fewer physicians who remain in the state of education than large city schools. Prior residence as a determinant of geographic location for state or region is increasing slightly but decreasing for cities. Cities over 500,000 continue to attract more than their share of physicians while cities under 5,000 are gaining fewer physicians than previously on a per capita basis. Redistribution of physicians generally due to the entrance of FMGs was not assessed.

221. Williams, R.C. and W.E. Uzzell. "Attracting Physicians to Smaller Communities." Hospitals. Vol. 34, No. 14 (July 1960), 49-51.

Forty-two new Hill-Burton hospitals in Georgia were surveyed between 1949 and 1956 to determine the impact of these hospitals on the supply of physicians in 3 areas: rural communities (less than 2,499 pop.), towns (2,500-4,999 population), and other (5,000-50,000 population).

The authors found an average increase of 1.33 physicians for the rural area, 1.71 for the towns and 3.69 for the cities. In proportion to population, rural communities were more successful than larger communities (9.86 physicians/population vs. 3.07 respectively). Smaller hospitals were slightly more effective in attracting physicians than larger hospitals. Before the new hospitals were constructed, 83% of the rural communities had no doctor as compared with 76% of the towns and 23% of the cities.

Rural community hospitals attracted mostly general practitioners (75%) while towns and cities attracted more specialists (50% and 70% respectively). The authors conclude that the Hill-Burton program was successful in attracting not only G.P.'s but also specialists to previously unserved and underserved areas. In a follow-up study, the authors found that these communities had retained the new physicians as well as having attracted in the second year of operation almost as many physicians as in the first year.

224. Yett, Donald and Frank A. Sloan. "Analysis of Migration Patterns of Recent Medical School Graduates." Health Services Research Conference on Factors in Health Manpower Performance and the Delivery of Health Care. Chicago, December 9, 1971. Inquiry. Vol. 11, No. 2 (June 1974), 125-142.

The authors' study is an analysis of location choices of recent medical school graduates. Data were obtained from unpublished information in a large survey conducted by Medical Economics, Inc. of physicians' incomes and expenses in 1966. From this group, physicians who made their first practice location choice that year were selected as they were (presumably) the most mobile and amenable to policy incentives. These data were supplemented with information from the AMA files on physicians who were in post-graduate training or military service in 1965, but in private practice in 1966. Multiple regression was used to test the relationships.

Quantitative schema were developed to test three hypotheses on the effects of prior contact events with a state and subsequent location within that state. For each event a probability is determined and the notation is as follows:

EVENT = EVT (Max = 4)
BIRTHPLACE = B
LOCATION OF MEDICAL SCHOOL = M
INTERNSHIP = I
RESIDENCY = R

Thus, a physician with the configuration BMIR had all four events occur in the same state where a configuration like BI or R implies that only those events took place in a state and all other events in different states. The hypotheses are stated as:

I. Greater contact with a state implies a greater probability of choosing that state for practice. Symbolically, P(4EVT) > P(3EVT) > P(2EVT) > P(1EVT)

II. More recent events have a greater impact on location decisions than earlier events. For example, in 3 EVT categories P(MIR) > P(BMI) or for 2 EVT, P(IR) > P(BM).

III. Exogenous variables such as income or environment are stronger when the number of previous contacts have been few and in the past.

Findings confirmed the first two hypotheses. For example, the probabilities in the first hypothesis were increasing functions of the number of events, i.e., P(4EVT) = .86, P(2EVT) = .48, and P(1EVT) = .06.

To test the third hypothesis, attachment events were grouped into six "event" categories such as multiple attachments with residence, multiple attachment with medical school, etc., and these were tested with retention probabilities for the 10 largest states (in population). The results agree with earlier conclusions that policies to encourage residency training are having the greatest rate of return than any other single event.

Regression analysis was employed to determine the quantitative influence of specific model variables on the initial practice decisions. The equation takes the basic form:

$$P_i = a_o + a_1 x_{i1} + \ldots + a_n x_{in} + a_{n+1} y_{i1} + \ldots + a_m y_{im} + u_i$$

where:

P_i = Probability of practice location in the i^{th} state given previous contact in the event categories.

x_{ij} = Proportion of physicians in the jth attachment category for the i^{th} state.

y_{ik} = k^{th} location influencing variables for the i^{th} state.

u_i = Stochastic disturbance term for the i^{th} state.

$a_t (t = 0,1,\ldots,n,n+1,\ldots m)$ = Parameters to be estimated.

Fifty percent (50%) of the coefficients for specialists and all of the coefficients for GPs were significant at the .05 level. The regression yielded R^2 of .75 for specialists and .44 for GPs when the proportions of physicians were combined in attachment categories indicating that previous contact with a state can influence the location decision. Overall, the other regressions tended to confirm these findings.

The authors conclude that graduates tend to establish practices in states where previous attachment is strongest and most recent. Some measures to remedy location deficiencies such as legislation are not feasible at the present time. Viable policy alternatives recommended include admission discrimination in favor of state citizens, increased financial assistance, and subsidies to expand training facilities.

VII. Bibliography

Articles are listed alphabetically by major author or source of data. The following abbreviations are used to identify studies:

@ - annotated

* - most frequently referenced.

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