AN ANALYSIS OF FACTORS TO BE CONSIDERED IN PLANNING A REGIONAL HOSPITAL SYSTEM

Thesis for the Degree of M. U. P.

MICHIGAN STATE UNIVERSITY
ROBERT ERNST SAUR

1969

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ABSTRACT

AN ANALYSIS OF FACTORS TO CONSIDER IN PLANNING
A SHORT TERM HOSPITAL SYSTEM

By

Robert Ernst Saur

The past two decades has witnessed increased private and public concern for the delivery of health services to the nation's citizenery. Piecemeal federal legislation has been largely ineffective in correcting the disparities in access to health services for particlar economic groups within one society. One major mechanism for eroding these barriers as well as improving the output of the health care system is comprehensive health planning. Such an impetus was established by P.L. 89-749.

Major deterrents to a comprehensive health planning process are: (1) lack of effective mechanisms within the political and private realms to plan and implement; and (2) the complexity and lack of clear conceptualization of the health care system. Overcoming these deficiencies is prerequisite to comprehensive health planning, and is the general concern of this thesis.

The complexity of the health care system can become more manageable through the application of a descriptive system methodology. Such a process requires that

recognizable subsystems and elements be isolated and described by input, process, and output. While subsystem identification can only be generalized and intuitive, it provides insights into how components are structured to make up the health care system. System synthesis is the innovative process whereby the health planner can restructure existing components, or develop new components in order to achieve a health objective. The use of system methodology as well as a conceptual framework is proposed within the thesis.

A major component in the delivery of medical services is the short-term hospital facility. The thesis further proposes that the short-term hospital be analysed using a system methodology. The product of such an analysis is the development of standards for a three-level hierarchical short-term hospital service system. Each level hospital prototype is described by size (using number of beds) and service structure. The structual relation between the various prototypes is based on percentage of capture of regional demand for short-term hospital services. Preliminary standards are recommended for such a structuring.

Predicting demand for short-term hospital facilities is a question which has yet to be answered. Many variables effect the "need" and "demand" for short-term hospital facilities. The thesis further suggests variables which may have a profound effect on hospital

utilization in the future. It becomes the responsibility of the planner to recognize the influence of these variables and rationally inject them into the prediction process.

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By

Robert Ernst Saur

A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

Master in Urban Planning

Department of Urban Planning
and Landscape Architecture

August 1969

ACKNOWLEDGMENTS

I would like to dedicate the work contained in the following manuscript to my parents, Marie L. Saur and Louis C. Saur, without whose financial assistance, dedication, and encouragement, the completion of my education would not have been possible.

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INTRODUCTION

The United States, in several pieces of major legislation, has made a national commitment to the health of its citizenry. Good health is a right, not a privilege. Similarly, all state planning enabling legislation makes reference to health as a basic value for justifying the use and extension of social controls. Yet the United States ranks low in health standards in relation to other less affluent nations.

The major reasons most often cited for this gap in the health care system are: (1) lack of a strong health care movement; (2) the complexity of the health care system; and, (3) the lack of techniques and standards for planning. The deficits in the system has resulted in a vague public awareness that not all is right, the movement is in its infancy, and a series of piecemeal legislation has largely been the governmental response. Yet the need to overcome the complexity of the system and develop techniques and standards for planning remain as barriers. Urban and regional planning have largely ignored health in their formal and informal activities.

The purpose of this thesis is twofold. First, and foremost, it proposes that a generalized system methodology be applied to the health care system. The benefit is to tame the complexity and allow for orderly planning and rational decisions. Because the detailed application of this technique to the overall health care system is beyond the limitations of this thesis, a single recognizable subsystem, and finally a single component, is seperated out for detailed analysis. The second purpose of the thesis is to use system methodology to develop standards for the general or short-term hospital component. Short-term hospitals represent a major and long-term community investment. Any improvement in their quality represents a major input in the total health care system.

Chapter I represents a broad overview of hospital and health planning in the United States. The purpose of this chapter is to familiarize the reader with past trends, legislation, and problems in relation to hospitals and health. The intent is to provide a background of information for the following analysis.

Chapter II begins by attacking the complex problem of applying system methodology to health care. First the entire system is broadly conceptualized, with each successive step singling out the short-term hospital component for analysis. Finally, standards are proposed for

planning a regional system of short-term hospital facilities.

Chapter III becomes still more definitive in analyzing the complex problem of prediction. A broad analysis is made of the many forces at work on the hospital system and how they can affect future patterns of hospitalization. In addition, various standards and techniques for predicting future bed needs are presented and summarized. A critical analysis of past standards and recommendations for improvement is also contained in the chapter.

The purpose of Chapter IV is one of summary and recommendation. The first section provides a brief summary of the previous chapters. Following is a list of recommendations which are broadly classified as applying to either the hospital planning process, or hospital planning techniques. In addition, recommendations are made for generalized areas which merit further study.

CHAPTER I

AN OVERVIEW OF THE HOSPITAL AND THE HEALTH PLANNING MOVEMENT

Introduction

Hospital planning is not a familiar subject to most city and regional planners. Before discussing aspects which are relevant to planning a regional hospital system, it is important to present an overview of background information which has major relevance to the topic. The presentation is not meant to be exhaustive, but this chapter attempts to set down background material on hospitals and health planning in the United States. Therefore, its contents will hopefully provide a touchstone for the following chapters.

It is important to note that much conceptual difficulty exists between "hospital planning" and "health planning"; which can be contributed largely to the historical evolution of the topic. Early interpretation of health planning dealt largely with the provision of hospital facilities. Present interpretation is "comprehensive health planning" which includes health facilities as only one component of a broader service system. For

this reason, reference is often made to "health care" and the "health system" in the following chapters. Only in the larger context is the hospital facilities component relevant.

The following presentation deals with four general areas in the health care system. Namely: The role of hospitals and health in the economic structure; the past import and future potential of major federal and state legislation; the effectiveness of administrative mechanisms for hospital planning; and, problems within the inherited hospital system.

The Economics of Hospitals and Health Care

Health as a Consumer Good

The aggregate expenditure for health and medical care in the United States was 3.6 billion in fiscal 1929, which accounted for 3.6% of the GNP. (See Table 1). Through 1940 the aggregated expenditure showed only slight variation, although as a percent of the GNP it rose slightly due to the depressed economy. By 1945 it had risen to 7.9 billion, by 1950 it reached 12.2 billion, by 1960 it reached 26.8 billion, and by 1964 it had reached 35.4 billion in aggregate expenditure. Since 1945, there has been a steady increase in the percent of the nation's GNP devoted to health and medical care.

TABLE 1.--Health and Medical Care Expenditures in Relation to GNP, United States, 1929-1964
(Billions of Dollars)

Fiscal Year	GNP	Health and Medical Care Expenditures		Average* Per Capita (Dollars) in 1960 Prices
		Amount	% GNP	
1929	$101.6	$ 3.6	3.6	
1935	68.7	3.1	4.6	
1940	95.9	3.9	4.0	
1945	212.5	7.9	3.7	100.46
1950	264.0	12.2	4.6	119.00
1955	377.5	17.9	4.7	130.07
1960	493.9	26.8	5.4	146.67
1961	504.6	28.9	5.7	
1962	539.2	30.8	5.7	
1963	568.8	32.9	5.8	
1964	603.8	35.4	5.9	

Source: Ida C. Merriom, "Social Welfare Expenditures, Social Security Bulletin, 27, No. 10 (October, 1964), 374, Tables 2 and 5.

*Source: Robert E. Coughlin, Hospital Complex Analysis: An Approach for Planning a Metropolitan System of Services (unpublished Ph.D. Dissertation, University of Pennsylvania, 1964), p. 9.

"Three sets of forces can be identified in analyzing an increase in expenditure for a commodity or service: 1) an increase in income; 2) a reduction in the price of this commodity relative to prices of other goods; and 3) a favorable shift in consumer's tastes or preferences towards this good."[1] The percent of a familiy's income devoted to health and medical care is fairly constant for all economic classes of families.[2] While the prices of medical goods and services have increased faster than other goods, the increased use of voluntary medical insurance has made it possible to reduce out-of-the-pocket expenditures. Under this condition there is a tendency to substitute medical services for other goods. The most relevant force in the changing consumption pattern of medical services is a shift in preference, including those reflecting changes in the social and demographic characteristics of the population. Given these considerations, it is plausible to conclude that there has been an increase in per-capita consumption of medical services which is reflected in aggregate expenditures and that the force behind this change is a shift in consumer preference.

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[1]National Commission on Community Health Services, Financing Community Health Services and Facilities (Washington, D. C.: Public Affairs Press, 1967), p. 27.

[2]Given the substitution of social services for lower income groups.

The proportion of our nation's resource devoted to health and medical care is likely to continue to increase as the social and demographic variables reflecting the nation's composition change, and as society increases in affluence.

A projection of past trends indicates that by 1975 health and medical expenditures will represent from 7.0 to 7.5 percent of the GNP.[3] As factors important in the past continue to operate and new ones come into play, higher expenditures can be expected. Among new variables which will affect future expenditures are: larger expenditures for the poor, for the mentally ill, and for environmental problems.

Expenditures for Hospital Construction

That part of expenditures on health and medical care which went into the construction of hospitals also shows a sharp rise from 1935 to 1964. (See Table 2). However, the rise was not steady and consistent. In dollar amounts, a peak in 1930 of $227,000,000 was followed by a drop to $35,000,000 in 1935. Between 1945 and 1950, following the passage of the Hill-Burton Act, construction expenditures jumped to an unprecedented level. Minor declines from 1950 to 1955 were followed by a steady rise

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[3]National Commission on Community Health Services, op. cit., p. 30.

TABLE 2.--Expenditures for Hospital Construction By Ownership, United States, 1930-1964
(Millions)

Year	Total	Public	Private
1930	$ 227	$118	$ 109
1935	48	38	10
1940	87	54	33
1945	122	85	37
1950	843	499	344
1955	651	300	351
1960	1,006	401	605
1961	1,140	367	771
1962	1,267	397	870
1963	1,510	454	1,056
1964	1,900	600	1,300

Source: National Commission on Community Health Services, Financing Community Health Services and Facilities (Washington, D. C.: Public Affairs Press, 1967), p. 125.

over the following nine years. Both current dollars total[4] and percent of GNP for hospital construction has been higher than any previous year since 1955.

Another remarkable fact stands out from Table 3. In 1930 the percentage of investment from public and private sources was approximately equal. From 1930 to 1950 the percentage of public funds showed a steady increase over private sources. Since 1950 this trend has reversed, with private sources representing over 68% of the construction funds by 1964. One major explanation for this change is the matching funds concept of the Hill-Burton program. Since public Hill-Burton grants are matched by private funds, the government has a direct input in hospital construction whose total value is 3 times as great as the original grant.

Another basic change has occurred since 1929. A large percentage of the public expenditures in 1930 was for the construction of government hospitals. These hospitals were for the long-term treatment of a very small fraction of the population and were administered by the federal government. By 1960, through Hill-Burton, the government was involved in providing construction funds for private short-term hospitals. The involvement of the

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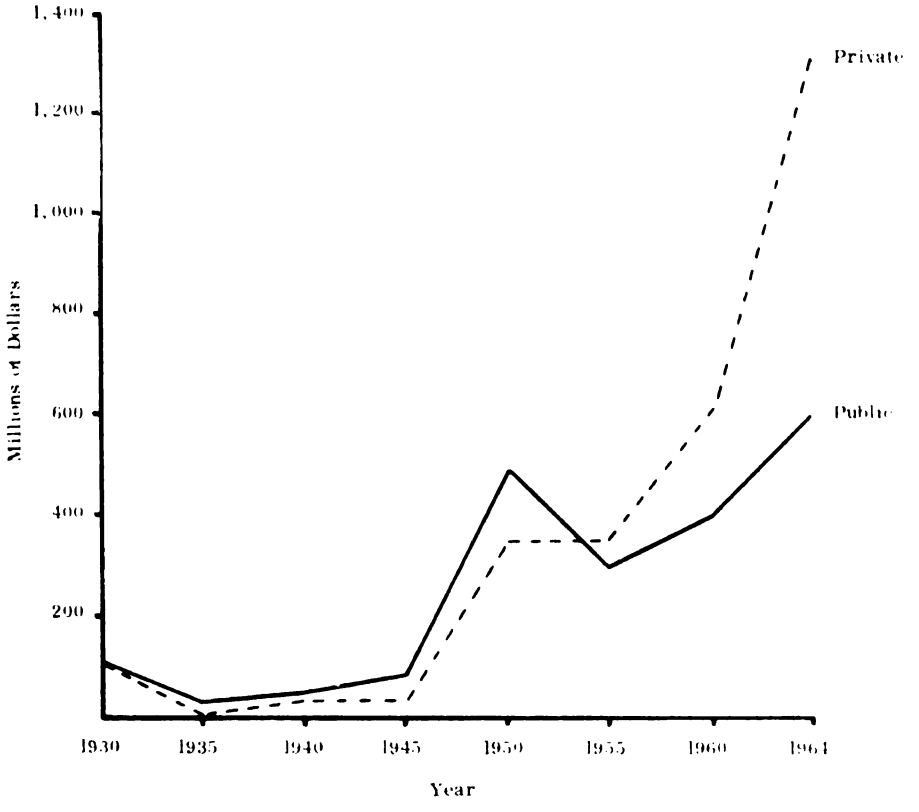
[4]For discussion of problems of using current dollars rather than constant dollars, see: ibid., p. 124.

TABLE 3 Private and Public Expenditures For Health Construction, United States, 1930-64



Source: National Commission on Community Health Services, Financing Community Health Services and Facilities, (Washington, D.C. Press, 1967), pp. 126.

federal government in hospital construction has been steady and increasing, and is likely to continue. Federal inputs and policy will have a major effect on the development of a national hospital system in the future.

Distribution of Health Expenditures by Governmental Unit

Table 4 indicates the distribution of tax funds spent for hospital care by level of government, by location of outlay, and by source of funds for the United States in 1963. It is important to note that the state-local combination provides 59.3% of the funds, and 65% of the public expenditures on hospital care. The state government expenditures for hospitals are larger than any other levels of government. In addition to this, state governments usually devote a larger proportion of their overall expenditures to hospitals than do other governmental units.

Table 5 indicates the relative distribution of state funds for health care to local units of government for 1967. The decreasing amount of expenditure paralled with the relative size of the governmental unit reflects the fact that the use of and responsibility for hospitals is an "areawide" or regional phenomenon.

Table 6 demonstrates the per-capita expenditure for hospital care relative to city size. In general, the expenditures for hospital care decrease regularly with decreasing city size. When comparing 1957 data to 1964

TABLE 4.--Distribution of Tax Funds Spent for Hospital Care By Level of Government, By Location of Outlay and Source of Funds, United States, 1963

Level of Government	Location of Outlay		Source of Funds	
	Amount (Millions)	Percent	Amount (Millions)	Percent
Total	$4,326	100.0	$4,326	100
Federal	1,513	35.0	1,763	40.7
State-Local	2,813	65.0	2,563	59.3
State	1,683	38.9	1,533	35.4
Local	1,130	26.1	1,030	23.9

Source: National Commission on Community Health Services, Financing Community Health Services and Facilities (Washington, D. C.: Public Affairs Press, 1967), p. 109.

TABLE 5.--State Distribution of Funds to Local Units of Government for Hospitals, 1967

Unit:	Amount (000)	% of State Funds
All States	115,758	100.0
Counties	86,195	74.5
Municipalities	16,498	14.2
Townships	64	.1
School Districts	--	--
Special Districts	13,001	11.2

Source: U. S. Bureau of the Census, Compendium of Government Finances, Vol. VI Topical Study No. 4 (Census of Governments, 1967), p. 8.

TABLE 6.--Per Capita Expenditures for Hospitals by City Size for 1957 and 1964

City Size	Per Capita 1957	Per Capita 1964
1,000,000 +	13.85	20.44
500,000 - 999,999	7.92	11.80
300,000 - 499,999		4.79
250,000 - 499,999	7.52	
200,000 - 299,999		4.27
100,000 - 249,999	6.93	
100,000 - 199,999		7.19
50,000 - 99,999	4.57	4.17
Less than 50,000	7.10	7.29

Source: U. S. Bureau of the Census, Local Government Finances in Standard Metropolitan Areas, Vol. III, No. 6 (Government Finance, Census of Governments, 1957).

U. S. Bureau of the Census, Compendium of Government Finances, Vol. III, No. 5 (Government Finance, Census of Governments, 1964).

data, where possible, only cities with a population larger than 1,000,000 showed a significant increase. Many smaller classed cities showed a slight decline in expenditure. This further supports the "metropolitan regional phenomenon" of hospital care. One can conclude that in cities less than 500,000 population, many of the hospital services are being provided by a larger governmental unit, usually the county or state.

Trends in Federal Legislation

A substantial number of federal programs enacted during the past three decades deal directly or indirectly with health and health-related problems. The trend in this legislation has been from the unitary approach of providing funds for hospital construction to a multi-level approach of "comprehensive" health planning.

One of the major by-products of an increased federal involvement in attacking the nation's health problems with "comprehensive" programs has been an impetus for increased interaction between health planning and urban planning functions. It will be difficult for urban planners to continue to ignore the fact that provision of adequate health care is becoming an increasingly important problem of community life.

Federal legislation can and will have a profound affect on both the supply and demand for medical facilities in the nation's future. For this reason, it becomes

essential that those involved in health program and facilities planning develop a better understanding of major past and present federal legislation and the resultant impact on planning the health care system.

Hill-Burton Act

The years following World War II witnessed a growing demand for all medical services. This was accompanied by rising levels of living and increasing pressures on existing limited facilities. Because of the depression in 1929, followed by the war, the previous two decades experienced little national investment in the nation's hospital system. As a result, a serious gap existed between the supply of and demand for health facilities.

In 1944 a Commission on Hospital Care was established under a joint action of the American Hospital Association and the U. S. Public Health Service. This group was charged with the responsibility to study the national need for medical services and particularly for hospital facilities. The recommendations of this committee were incorporated into formal legislation and filed in 1945. This legislation was enacted into law in August, 1946 as the Hospital Survey and Construction (Hill-Burton) Act.

The original law authorized grants to states for:[5]

1. A survey of existing facilities and needs and developing a state-wide plan for the construction and improvement of health facilities.
2. Providing funds to assist in construction and equipping needed public and voluntary nonprofit general, mental, tuberculosis, and cronic disease hospitals, and public health centers. The 1954 amendment to the Act broadened the program to include nursing homes, diagnostic and treatment centers, and rehabilitation facilities.

The original Act and subsequent amendments had a profound effect on hospital planning procedures and techniques, as well as increasing the rate of hospital construction. The most significant aspect of the Act was its emphasis on "comprehensive" facilities planning as a prerequisite for state eligibility for construction grants. This resulted in the establishment in each state of a single Hill-Burton agency which was responsible for coordinating the plans for allocation of funds within the state. These funds were to be allocated according to priorities which were developed in the master plan for the state. The

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[5]U. S. Department of Health, Education, and Welfare, Hill-Burton Program Progress Report July 1, 1947-June 30, 1967 (Washington, D. C.: U. S. Government Printing Office, 1967), p. 3.

priorities as established are supposedly designed to encourage equalized distribution of facilities and services within the state.

Another basic concept which emerged from the Hill-Burton program is "that the health of the Nation is a national resource and that federal leadership and financial encouragment are warranted and necessary in establishing a systematic network of facilities for hospitals and medical services."[6] Thus, the Hill-Burton Act gave rise to the federal government's commitment and involvement in the nation's health, and that planning was to establish a systematic network of facilities. This was a definite reversal of previous federal programs which gave grants-in-aid to single hospital institutions. The emphasis now switched to the interrelation between facilities as a state and federal health system.

The Hill-Burton Act is characterized not only by its impetus to hospital planning, but also by its development and use of planning and construction standards. Construction standards for the design of facilities were established that set minimum requirements for safety and efficiency. Quality standards were established for the

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[6]L. M. Abbe and A. B. Barney, The Nation's Health Facilities: Ten Years of Hill-Burton Hospital and Medical Facilities Program (Washington, D. C.: U. S. Government Printing Office, 1961), p. 15.

maintenance and operation of the hospitals. And finally, standards were established for the quantity and distribution of facilities on a national basis. It is important to note that the standard of quantity as defined in the Act is based on medical need rather than on a community's ability to pay. However, the actual procedures of governing the allocation of funds is based on demand because the local community must provide local initiative and provide matching funds, and because the responsibility of operation and maintenance remain with the local community. Therefore, construction priorities reflect demand, not need.

As of June 30, 1967, construction of 388,918 general hospital beds had been approved under the Hill-Burton program. This represented 74% of all beds approved and 73% of Hill-Burton funds allocated to date. Of this, the largest allocation of 33.2% of the funds were to communities between 10,000 and 50,000 population. The next largest allocation is 14.2% of the funds to communities with a population larger than 250,000. Table 7 indicates the percentage of total funds allocated for general hospitals by community size. A definite emphasis has been

given to communities under 50,000 population.[7] This demonstrates Hill-Burton's past emphasis on development of rural health facilities.

TABLE 7.--General Hospitals: Projects Approved by Size of Community, July 1, 1947-June 30, 1967

Total	% Hill-Burton	
Under - 2,500	8.6	--64.2% for communities less than 50,000
2,500 - 4,999	9.0	
5,000 - 9,999	13.4	
10,000 - 49,999	33.2	
50,000 - 99,999	10.4	
100,000 - 249,999	11.2	
250,000 - over	14.2	

Source: U. S. Department of Health, Education and Welfare, Hill-Burton Program Progress Report July 1, 1947-June 30, 1967 (Washington, D. C.: U. S. Government Printing Office, 1967), p. 30.

Public Law 89-749

Public Law 89-749, the Comprehensive Health Planning Act, was passed by Congress in 1966. There are four major reasons why an accelerated interest in comprehensive

[7]Above statistics were from: U. S. Department of Health, Education, and Welfare, Hill-Burton Program Progress Report July 1, 1947-June 30, 1967 (Washington, D. C.: U. S. Government Printing Office, 1967).

health planning has finally culminated in the passage of this law.[8] First, many health planners and professionals have accepted the fact that existing piecemeal and fragmented planning approaches have not attacked the problems of delivery of medical services and inefficient use of limited resources and facilities. Second, during the mid-sixties more significant health legislation was enacted than the previous two decades: heart disease, cancer and stroke, Medicare, OEO health centers, etc. This new legislation was an effort to create a mechanism for integrating and coordinating these programs. Third, the public was becoming more and more concerned and aware of the serious health problems. Fourth, planning was becoming an acceptable and desirable governmental function. Hence, there was much impetus to apply the planning process to the health field.

Public Law 89-749, the comprehensive health planning act, futher establishes a national commitment to health. The preamble of the Act states:[9]

> The Congress declares that fulfillment of our national purpose depends on promoting and assuring

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[8]U. S. Department of Health, Education, and Welfare, The Urban Planner in Health Planning (Washington, D. C.: U. S. Government Printing Office, 1968), p. 24.

[9]89th Congress, S. 3008, Public Law 89-749; The Comprehensive Health Act (Washington, D. C.: U. S. Government Printing Office, 1968).

> the highest level of health attainable for every person, in an environment which contributes positively to healthful individual and family living; that attainment of this goal depends on an effective partnership involving close intergovernmental collaboration, official and voluntary efforts, and participation of individuals and organizations, that Federal financial assistance must be directed to support the marshalling of all health resources --national, state, and local--to assure comprehensive health services of high quality for every person but without interference with existing patterms of private professional practice of medicine, dentistry, and related healing arts."

The passage of the Comprehensive Health Act is significant for three reasons. First, it provides for the establishment of state and regional health planning agencies. These agencies are to be charged with the responsibility of planning for the whole gamut of health components. Second, rather than the traditional piecemeal crisis approach, comprehensive health planning calls for greater emphasis on alternative solutions for preventive measures rather than remediation. Third, it changed Federal policy away from grants based on categories and problems towards a bloc grant approach to be used flexibly at the state and local level. The bloc grant approach to funding health planning will supposedly allow greater freedom and flexibility at the local level.

Under section 314(a) of P. L. 89-749, the Governor of each state is charged with the responsibility of designating a single agency to conduct comprehensive health planning. In order to broaden the views of this agency,

the governor is to appoint a state health planning council. The majority of the members of this council are to be lay citizens who do not make their living in the provision of health services. The legislation further recognizes that a variety of health planning is already being carried out at the state level, and it is the responsibility of the new agency to coordinate these activities. Each state agency is also required to prepare and periodically revise a "comprehensive" state health plan.

Section 314(b) of P. L. 89-749 supports the creation of "comprehensive" areawide health planning agencies subject to review and approval of the state health planning agency. Under the law, two kinds of grants are to be provided to these agencies: one for preliminary organizational development and the other for carrying out approved health programs.

While section 314(b) allows for local self determination in health planning, it spells out several important performance criteria. These are: the agency must be regional and its boundaries should correspond to other political and regional districts; the new agency must be recognized by other local agencies involved in health; it must be comprehensive; and its efforts must involve local participation. Like the state agency, the local agencies are required to perform a variety of functions: encourage

individual institutions to plan; collect and analyze data; prepare and revise a regional plan; coordinate efforts with the state agency; and review local applications for grants. An amendment to P. L. 89-749 in 1967 added a new responsibility to the state agency. It required that the State Commission develop a capital expenditure program consistent with an overall state plan for health facilities, which would meet the need for such facilities, equipment, and services without costly duplication. While this responsibility was usually assigned to the existing Hill-Burton agencies, it will be delegated to the areawide agencies as they gain competence.

P. L. 89-749 has expanded the scope of health planning beyond the efforts which have gone into health facility planning over the past few decades under Hill-Burton. Therefore, the planning of a regional system of adequate hospitals and health facilities now becomes a potential reality because of the new organization structure at the local level. The impetus provided by P. L. 89-749 has set the stage for planning a true regional system of facilities. For this reason it is important that health planners and urban planners begin to develop techniques to plan such a system.

Miscellaneous Federal Legislation

In addition to the Hill-Burton program and P. L. 89-749, a substantial number of additional federal

legislation and programs enacted during the past decade deal directly with the provision of health facilities and service. The application of these laws in the future will have a profound effect on planning a hospital and health care system.

The Demonstration Cities and Metropolitan Development Act of 1966 (Public Law 89-754) indicates further Federal impetus to the provision of health facilities. The Model Neighborhood section of the Act attempts to solve social problems by the provision of a wide range of public services and facilities within a single area. Within the content of potential facilities is a direct emphasis on the elimination of ill health by the provision of health facilities.

Section 204 of Title II of the same Act provides for a more direct participation in the provision of health facilities. As of June 30 1967, all applications for loans or grants for the purpose of hospital construction must be submitted for review to a regional agency that has been approved by the Department of Housing and Urban Development (HUD).

Section 205 of title II authorizes the Secretary of HUD to make special grants to metropolitan agencies which have developed an organizational structure which can implement the development of a regional system of health facilities. This section provides increased

impetus for public and voluntary health and hospital planning agencies to work closely with regional planning agencies. Title II gives a potential role to regional planning agencies in planning the future health facility system.

The Neighborhood Facility program established by the Housing and Urban Development Act of 1965 is another piece of Federal legislation which has a health facility component. One of the purposes of the program is to provide multi-purpose community centers within areas of need. These centers are to provide health, recreation, and social services to low- and moderate-income community residents.

The above 1965 and 1966 acts are but two of many examples of federal legislation which deal with the provision of health facilities. During 1965 alone, some 25 major pieces of health legislation were signed into law.[10] These laws will have a direct affect on the supply-demand relation of health facilities and services in the future. Examples of other legislation are: Medicare and Medicade; the Mental Health Centers program; Community Renewal program; and the Neighborhood Health Center Program sponsored by the Office of Economic Opportunity.

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[10]U. S. Department of Health, Education, and Welfare, 1965: The Year of Legislative Achievements (Washington, D. C.: U. S. Government Printing Office, 1965).

Trends in federal legislation indicate an interdisciplinary approach similar to that of the Demonstration Cities Act. History has proven that the categorical grant approach of past years has fallen short of achieving desired objectives. The movement is to a broader-based, umbrella type of legislation which provides an integrated attack on social problems. Whenever necessary, these laws will include a hospital or health facilities component.

The States Role In Hospital Planning Through Legislation

Many states have developed laws which have a direct impact on planning and developing a hospital system. These laws generally can be classified in two categories: the first group deals primarily with the administrative powers and controls to be exercised by the state in reviewing hospital plans and the development of hospital planning agencies; the second set deals primarily with the provision of financial aid for the construction, expansion, and modernization of hospitals and related facilities. The development of hospital planning laws at the state level has been sporadic and inconsistent. Laws for financing hospital construction, maintenance, and operation have followed a national pattern and can be categorized by purpose and intent.

Three types of hospital planning legislation, the Massachusetts Bill and the Maryland and New York Laws, run the gamut in principle of state legislation.[11] The major differences witnessed in these legislation is its emphasis on the degree of compulsory control over the development of the hospital system. The Maryland law enacted in 1964 is purely voluntary. Its major mechanism of control is through the issuance of state funds only on the basis of state plan review. The Massachusetts bill creates state and regional councils for regional hospital planning. Hospitals are required to file plans with the regional council and it may approve or disapprove them. The decision of the council is not a binding force upon the hospital involved. The New York law represents the most compulsory form of state legislation. It requires that in order for an institution to obtain a license it must demonstrate a "need" to a designated public agency.[12] A failure to comply with the New York law (Metcalf-McCloskey Law) is considered a misdemeanor and subject to court action.

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[11] American Medical Association, Proceedings 1st. National Conference of Areawide Planning, November 28-29, 1964 (Florida: American Medical Association, 1964), p. 88.

[12] This form of legislation has met with strong opposition from the American Medical Association.

Many states have laws or statutes which in one way or another provide a mechanism for obtaining financial aid for the construction, expansion, or improvement of hospitals and health facilities. A general classification of these laws by purpose and intent are:[13] (1) those statutes which establish hospital districts; (2) laws which deal with the provision of state funds; (3) laws which deal with the relation of facilities constructed with public funds and operated by non-profit groups; and, (4) laws which allow various governmental units to develop an administrative mechanism for the purpose of financing hospital construction.[14]

Traditionally, the state role in hospital planning through legislation has been weak and ineffective. Compulsory legislation such as exists in New York has not much opposition from the A.M.A. and other professional medical societies. Voluntary legislation has been ineffective due to lack of operational mechanisms for implementation of planning decisions. In the past, the major effort at the state level has been through State

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[13]U. S. Department of Health, Education, and Welfare, Areawide Planning for Hospitals and Related Health Facilities (Washington, D. C.: U. S. Government Printing Office, 1961), p. 32.

[14]For examples of these Laws, see: Michigan Statutes Anotated, Sections, 5.2456 (1-11); 14.1221-14.1229; 14.1181; Constitutional Act VIII, Sec. 11: 14.1221-14.1225.

Hill-Burton agencies and their control over federal funds. In the future, the role of the state in planning is to be broadened under Public Law 89-749. The state level of government offers a potential mechanism for dealing with the regional problems of hospital planning. Its potential is yet to be realized.

Many statutes which exist at the state level represent a virtually untapped source for implementing plans related to hospital construction. The urban planner and hospital planner should make it a policy to become familiar with the respective state laws and use them as effective implementing tools when possible.

Voluntary Areawide Hospital Councils

The various organizations, both voluntary and public, which are involved directly or peripherally in health planning are numerous. However, the voluntary hospital councils which have developed in major metropolitan areas throughout the country, have by their actions and decisions been the most instrumental in planning the character of the hospital system. A basic understanding of their methods, concerns, and biases is fundamental to planning for the system.

"Health facility planning councils are voluntary, non-profit associations whose primary purpose is to achieve economy through more effective use of health

facilities and personnel."[15] The first of such councils was established in New York in the mid thirties. It was followed in 1946 by the Columbus Hospital Federation. Since then, additional such groups have been established in Detroit, Kansas City, Chicago, St. Louis, etc. Currently there are about 70 such councils existing in metropolitan areas throughout the United States.[16]

The impetus for improved coordination in hospital planning was witnessed as early as 1947 in the United States. The commission on Hospital Care[17] proposed that voluntary groups working together could do much to improve the standards and quality of hospital services. In 1959, the Public Health Service and the American Hospital Association jointly sponsored four regional conferences which were assigned the task of exploring new ways to improve the health facility planning process.[18] A major recommendation of the conferences was that hospitals serve as a focal point of community health services in a

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[15] The Urban Planner in Health Planning, op. cit., p. 25.

[16] Ibid.

[17] Commission on Hospital Care, Hospital Care in the United States (New York: The Common Wealth Fund, 1947).

[18] U. S. Department of Health, Education, and Welfare, Principles for Planning the Future Hospital System (Washington, D. C.: U. S. Government Printing Office, 1959).

coordinated system to be developed by a voluntary areawide planning agency with a paid staff. The areawide planning movement won further support by the House of Delegates of the American Medical Association. In 1962, a resolution was adopted which recognized areawide planning on a voluntary basis as an effective means to reduce medical costs and improve services. Since then, the American Medical Association has traditionally supported voluntary regulations and opposed any form of compulsory control over the health system.

A great acceleration in the numbers of planning agencies occurred after establishment of the research grant program authorized by the Community Health Service and Facilities Act of 1961, which later became an amendment to the Hill-Burton Act. This program distributed federal funds in the form of demonstration grants for the purpose of developing local and regional hospital planning agencies.

The report, Areawide Planning for Hospitals and Related Health Facilities, which was developed jointly by the Public Health Service and the American Hospital Association, defines the intended focus of the hospital planning agencies. The intended role is: data collection and research of existing facilities; education of the public in health matters; coordination of services between existing and new facilities; developing health

goals; and developing and preparing a health facilities and manpower plan for the region. However, most agencies have concentrated mainly on the construction of new facilities. Only the larger and more established agencies have had any success within the above intended framework.

Most voluntary planning councils have no legal power to implement regional plans.[19] The major mechanisms of control are through regulation of private funds, publicity, and persuasion. Banks and other charitable institutions often ask the opinion of the local agency as to need before lending money for health facility construction. Often the success of a local agency in implementing its plan further depends on the dynamism of the individual directing the effort. Additional influence comes from developing a close working relationship with the state Hill-Burton Agency. The Hill-Burton offices in many states rely heavily on the judgment of local agencies in deciding the allocation of federal funds.

Much valid criticism has been voiced against voluntary agencies because of their emphasis on health institutional goals. Often the programs of such agencies reflect health interests rather than the public or consumer need. While in theory the areawide health planning

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[19]New York is an exception. See the Metcalf-McCloskey Law..

commission is supposed to have lay representation, they are often biased towards over-representation by medical interests. Because such agencies are so much a part of the hospital establishment, their effectiveness in making major changes (such as elimination of an outmoded facility) is limited. This inability of councils to clearly identify their clients has frequently handicapped their work.

In 1965, Cavanaugh undertook a survey of an existing 35 areawide health facility planning agencies.[20] Two types of agencies were considered: hospital planning associations which were devoted exclusively to planning and those agencies which were engaged in planning as well as other activities. Of the 35 agencies interviewed, 86.8% or 33 of the questionaires were returned. Some conclusions as to the status of these agencies were: 75% of the 33 agencies were organized after 1960; nearly one-third of the nation's hospitals are located within existing planning regions; and that the agencies' major source of finance was Federal funds.

The most frequent problems facing these agencies, as indicated by the survey in ranked order, were:

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[20] J. H. Cavanaugh, "The Rise of the Areawide Planning Agency: A Survey Report," Hospitals, J.A.H.A., 39 (15), 1965.

1. obtaining an understanding and acceptance of areawide planning from hospital administrators and trustees
2. education of the public
3. acceptance by physicians
4. lack of adaquate controls and influence
5. development of long-term financing of the agency
6. defining what constitutes a planning region

The future of voluntary councils is open to question as a result of the enactment of Public Law 89-749. Some of them may broaden their scope and become the regional state agency. Others may remain seperate and coordinate their efforts with the new public agencies. Still others may disband and transfer their responsibilities to the new agency entirely. In any case, their role in influencing the future hospital system is definitely subject to change and revision.

Urban Planning and Hospital Planning Interface: Present and Future

Hospitals and health planning is not presently a familiar subject for most urban planners. Historically, the hospital planning function was carried on by individual institutions or voluntary agencies, with the urban planning agency having only a minor role at best. The benefits from improved relations between these

operations is obvious. However, many barriers exist to defining the proper role of urban planning in the health field. Because urban planning and health planning are in a state of internal flux, it is unlikely that a clear definition of role and responsibility will emerge in the near future. Yet federal laws such as Public Law 89-749 are demanding improved relations and cooperation in order to qualify for funds.

Present Efforts

A recent study was undertaken by the Public Health Service to determine what urban planners are doing in support of community health planning.[21] In order to evaluate present efforts, a questionaire was sent to 259 city, county, and regional planning agencies in November of 1966. The results of the questionnaire represent a major effort to: document relationships between planning agencies and health organizations; determine what work related to health planning has been done by urban planners; and elicit the opinions of urban planners as to their role in planning for health services and facilities.

One of the major findings of the study was that urban planning agencies spend very little time on health planning problems (See Table 8). More than 80% of the

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[21] The Urban Planner in Health Planning, op. cit.

TABLE 8.--Planning Agencies Involvement in Planning for Health Services and Facilities

Extent of Involvement	Number of Agencies (n = 204)	Percent of Total
Percent of agencies time spent on health problems during the past two years:		
less than 2%	169	82.8
3 to 5%	30	14.7
6 to 15%	3	1.5
No response	2	1.0
Planning Agency has been encouraged by health organizations to take a more active role in health planning	48	23.5
Planning Agencies involvement in health has been, or would be, resisted by health organizations	38	18.7
Planning Agencies have staff members who are particularly interested in health planning	57	27.9
Planning Agency has staff members who have had training and/or experience in health care planning	8	3.9

Source: U. S. Department of Health, Education, and Welfare, The Urban Planner in Health Planning (Washington, D. C.: U. S. Government Printing Office, 1968), p. 34.

agencies spent less than 2% of their time on health services and facility planning during the period 1964-1966. More positive encouragement is witnessed by the fact that 23.5% of the agencies have been encouraged by health organizations to take a more active role in health planning. In adddition, 27.9% of the agencies interviewed had staff members who were particularly interested in health planning, although only 3.9% had staff members who had training or experience in health planning. On the negative side, 18.7% of the agencies interviewed felt their involvement in health planning would be resisted by health organizations.

Another major objective of the survey was to determine the working relations between planning agencies and health organizations. Table 9 and Table 10 indicate the results of the study relative to formal organizational contact and data sharing. Formal joint meetings between staff members are reported by almost 80% of the responding agencies. Less than 10% of the reporting agencies had technical advisory committees on health. Most of the planning agencies with such committees found them useful in providing standards for bed needs and statistics on existing conditions.[22]

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[22] Ibid., p. 35.

TABLE 9.--Organizational Relationships Between Planning Agencies and Health Organization

Organizational Relationships	Number of Agencies (n = 204)	Percent of Total
Planning agency member serves on board, commission, or committee of health organization	52	25.4
Planning agency staff members meet with staff of health organizations	162	79.0
Planning agency has technical advisory committee on health	20	9.8

Source: U. S. Department of Health, Education, and Welfare, The Urban Planner in Health Planning (Washington, D. C.: U. S. Government Printing Office, 1968), p. 35.

TABLE 10.--Exchange of Information Between Planning Agencies and Health Organization

Publication and Data	Number of Agencies (n = 204)	Percent of Total
Planning agency send its publications to health organization(s) . .	159	77.9
Health organizations send their publications to planning agency . .	154	75.5
Planning agency requests data from health organization(s)	146	71.6
Health organization(s) request data from planning agency	172	84.0

Source: U. S. Department of Health, Education, and Welfare, The Urban Planner in Health Planning (Washington, D. C.: U. S. Government Printing Office, 1968), p. 36.

The study further indicated that a primary channel of communication between planners and health organizations is the sharing of information and data (See Table 10). Almost 78% of the planning agencies send their publications to health organizations, and 75% of the health organizations send their publications to planning agencies. The percentages of agencies requesting data from the other is also high.

Although most planning agencies have developed a formal set of relations with different health organizations, a lesser number have been involved in substantive work in health planning. Only 93 agencies, of those interviewed, indicate that a section of their plan is devoted to health care facilities or services (See Table 11). Usually the plan contains a functional description of the facilities with a map showing their location, as well as locational criteria are site development standards for new facilities.[23] In 53% of the plans the health section will be based primarily on plans of one or more of the involved health organizations.

A study of attitudes and opinions of the respective agencies indicates the reasons why planning agencies have not given more attention to health planning in the past (See Table 12). Almost 80% of the responding agencies

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[23] Ibid., p. 38.

TABLE 11.--Health Care Services and Facilities and the General Plan

Health Care and the General Plan	Number of Agencies (n = 93)	Percent of Total
Items included in the health section of the plan include description of and/or recommendations for		
Public owned health care facilities	76	81.7
Privately owned health care facilities	62	66.7
Public health care services .	34	36.6
Private health care services .	16	17.2
Plan recommends creation of organization to study areawide health needs	15	16.1
Section in general plan is or will be, based primarily on plans of one or more health organizations	49	56.7

Source: U. S. Department of Health, Education, and Welfare, The Urban Planner in Health Planning (Washington, D. C.: U. S. Government Printing Office, 1968), p. 38.

TABLE 12.--Reasons Why Health Has Not Been Adequately Covered in the Planning Program

Opinions on Planning Agency Involvement	Number of Agencies (n = 204)	Percent of Total
Agency feels that the planning for health care and services has not been adequately covered in their planning program	159	78.0
Reasons planning agencies have not given more attention to health planning:		
Not enough staff	119	58.3
Other studies have higher priority	97	47.5
The health organizations are doing an adequate job	85	41.7
Lack of technical competence .	72	34.4
Planners do not have a role to play in this field	15	10.5
Other	28	13.7

Source: U. S. Department of Health, Education, and Welfare, The Urban Planner in Health Planning (Washington, D. C.: U. S. Government Printing Office, 1968), p. 38.

feel that health has not been adequately covered in their plan. The major reasons for this shortcoming are cited as: lack of staff, higher priority given to other studies, and lack of technical competence. It is important to note that only 10% of the responding agencies felt planners do not have a role to play in this field.

In summary: although evidence indicates that various degrees of interaction and communication between urban planning and health planning exists, the substantive contribution of urban planning to health has been minor. While many administrative and technical barriers exist to improved relations in the future, the need is obvious.

Barriers to Improved Relations and Future Potential

One of the obvious, yet important explanations for the lack of involvement by urban planning in the health field, is the lack of support and the absence of a strong health planning movement.[24] In most communities, there has been little or no emphasis on health planning in the past, and only recently has substantial progress through legislation been made. Hopefully, the state regional organizations created under Public Law 89-749 will provide an effective mechanism for participation by urban planners in the future.

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[24]David E. Olsson,"The Planning Official and Health Facilities Planning," Planning 1964 (Chicago: The American Society of Planning Officials, 1964), p. 197.

Klarman proposes that city planning agencies have been either unwilling or unable to assume responsibility for hospital planning for two reasons: first, the complexity of the hospital services, and second, the mixed nature of the hospital economy.[25] Because of the fragmented nature of the hospital the planner is often restricted in his capacity to make effective contributions. There is no single organization in health, such as a school board, which represents a centralized decision body. The hospital planning process is further complicated by the dichotomy between public and private economic support. The fact that major investment in the health care system is private will continue to impede the urban planners' participation in health planning. Again, the intent of Public Law 89-749 is to develop an effective mechanism for overcoming problems resulting from fragmentation.

One of the most serious barriers to effective hospital and health planning is a lack of a clear understanding and conceptualization of the health care system. While much effort has been expended on studying particular subsystems, little theory and knowledge exists as to proper subsystem interrelations, and how these compose

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[25]Herbert C. Klarman, "Economic Factors In Hospital in Urban Areas," Public Health Reports, LXXXII, 8 (August, 1967).

the overall health care system. Until urban planners and health planners improve their techniques and tools for health planning through increased knowledge, there is little hope of achieving a truly "comprehensive" health planning process. The knowledge barrier to effective planning may be the most difficult to overcome in the future.

Another major problem is that health planning is usually organized on a regional basis, and a city planning agency's boundary of influence is often political and local. Therefore, the city planners' capacity to engage in health planning is limited. The jurisdictional problem represents a very real management barrier to the health planning process. The impetus during the past decade towards regional forms of government offers much hope as a mechanism in eliminating this problem. Only on a regional basis can health facilities planning be effective and rational.

The need for improved communication between the urban planner and health planner is obvious. While major barriers exist to improved relations, the impetus and demand resulting from federal legislation is present. Only through collaborative effort can the real goal of developing an adequate functional health system be obtained.

Because of the complexity of the health system it is unlikely that urban planners will dominate the planning function. In the future, the planning agency's major area of interest will be related to the location and distribution of health facilities. This cannot be undertaken without an adequate understanding and classification of services offered, which is a medical problem. "The planning agency should undertake a comprehensive study of the total community health facilities system, including information on linkages between facilities, site planning, accessibility, and location requirements."[26] The above are areas in which the planner must begin to develop expertise and sharpen his tools if he is to fulfill his role in the future.

The Inherited Hospital System

Historically, the hospital has developed as an urban phenomenon. The great hospitals have nearly always been located in the core of major metropolitan areas. Traditionally, rural areas have been served less adequately both in quantity and quality of medical care. Emphasis under Hill-Burton was to radically improve the quality of rural medical services by increased hospital construction in rural America (See Table 7).

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[26] The Urban Planner in Health Planning, op. cit., p. 68.

In any given metropolitan area there is usually a complete gamut of Federal, State, and local voluntary profit and non-profit institutions. They have developed traditionally on an autonomus basis. In most cases they have not been required to cooperate with each other and they have not voluntarily done so.

Early emphasis on hospital development was with respect to location of industrial uses within the city. The major purpose was to provide emergency service to the urban factory worker. In the early 1920's hospital locational emphasis switched to maximation of regional accessibility. This generally meant location on high cost land on the fringe of the C. B. D., since it was the most accessible point in the region. Since this period, ecological changes in the composition of cities through growth and urbanization has resulted in an inadequate system of inherited hospital facilities.

Often industrial areas have expanded and completely engulfed hospital facilities. This has resulted in several detrimental conditions. First, the environmental conditions which accompany industrial areas are completely adverse to desirable hospital standards. Noise, dust, and pollution can affect the utilization of a hospital facility. Second, non-taxable hospitals often occupied prime land for supporting the city's tax rates. In conjunction with this, land for hospital expansion was often very

expensive, which further blocked the hospitals' growth potential. Thirdly, the need for industrial worker emergency care diminished. This was a product of safer production techniques as well as new methods for delivering emergency care. Fourthly, as the size of industrial areas grew, they further seperated the hospital facility from its major population service component. Thus, many of the original facilities have become outmoded relative to the present need.

The hospitals which have been developed near the core city have also felt the effect of the changing urban environment. Since the 1950's, a major phenomena of suburban development has been witnessed across the United States. This has resulted in a drastic change in the social and demographic characteristics of the city dweller. Often city hospitals have not been able to, or they are unwilling to, change their services to meet the new community needs. Because of city ties, often suburban dwellers travel to the city for hospital services.

Because of major changes in transportation facilities in metropolitan areas the accessibility quality of the central city has diminished. The development of mass transit systems and the National Interstate Highway system has resulted in many points of maximum regional accessibility being created in the suburban fringe.

These points offer increased regional accessibility over the traditional core hospital location.

The rapid increase in land values in the core city has presented a constraint on horizontal hospital expansion. Major expansion has been through vertical growth, which has resulted in many problems of internal hospital management, as well as external site problems. In essence, the increased role and utilization of the core hospital is very questionable in the future.

The presently inherited hospital system has severe limitations. Improved management, as well as redefined role, are necessary to increase their effectiveness in the community. In addition to this, a new system of suburban hospitals is becoming a dire need. This new system will have to be completely coordinated with the existing system as well as reflect the characteristics of the suburban fringe they are to serve.

Summary and Conclusions

The aggregate expenditure for medical care in the United States has continued to capture a larger and larger percentage of the nation's gross national product (GNP). A major factor contributing to this trend has been a change in preference on the part of the citizenry with respect to demand for medical services. All projections indicate that the demand will continue to

increase in relation to the changing patterns of affluence in American society.

A large percentage of national expenditures for health can be contributed to hospital construction. The past decade has witnessed an unprecedented increase in investments in new facilities. A major characteristic of the source of investment has been a change from large public to large private investment. The increasing resource of private funding can have a strong effect on the potential of plan implimentation in the future without new mechanisms of control. The State level of government provides the highest percentage of public funds for health care, with percentages decreasing in relation to governmental unit size. Larger cities continue to also provide a major source of public expenditure Both characteristics support the hospital as a "metropolitan regional" phenomenon.

The Hill-Burton Act of 1946 established the federal government's interest in the nation's health, and provided the impetus to fill the gap between need and demand for medical facilities which existed. Subsequent amendments further expanded this role. One major by-product of the Hill-Burton Act was the establishment of a single state agency which was responsible for developing a statewide system of hospitals. Early emphasis was on improvement of the rural system. Public-Law 89-749 offers

new hope for a "comprehensive health planning" approach. This law develops a new state agency with an expanded scope beyond facilities only to include all components of the health care system. The emphasis is now on preventive as well as traditional medical services. Many other recently enacted federal laws will have a profound effect on the supply and demand for medical services and facilities. Much of the new urban planning legislation includes a health facilities component.

The states' role in developing hospital planning legislation has been sporadic. Conceptually, legislation varies from voluntary to compulsory in format. The latter is strongly opposed by the medical professions. Other state legislation deals primarily with financing the improvement of hospitals at various levels of local government.

The effectiveness of both "voluntary areawide hospital agencies" and "urban planning agencies" in planning for medical facilities has been poor. Hospital agencies have been ineffective because of lack of public and medical acceptance, and lack of controls and influence. Urban planning traditionally has showed little interest in health planning. While they have acknowledged their role in the field, their input has been minimal. One major barrier has been lack of knowledge and techniques related to the health planning process. Public Law

89-749 establishes the impetus for a new level of coordination and cooperation on the part of urban planners. Their major area of future concern will be the distribution of medical facilities within the region.

Through the ecological change of the city, many hospitals have become inadequate. Thus, the inherited system cannot be expanded to meet future needs. A new and dispersed system of hospitals is one potential solution to fill the gap. Techniques and concepts for planning this system need to be crystalized.

Chapter II will attempt to make explicit some aspects to be considered in planning such a system.

CHAPTER II

SHORT-TERM HOSPITAL SYSTEM PLANNING

Introduction

The purpose of the previous Chapter was to present general background material which is a necessary prerequisite in planning for a hospital and health care system. The purpose of this Chapter and Chapter III is to become more definitive in planning for a particular component of the broader health care system. The method of analysis is based on a generalized system concept. Beginning at the broader level, which deals with the delivery of all forms of medical services, both formal and informal, each step will attempt to pursue the isolation of a single component of the health care system. The component selected for study in this thesis is the general or short-term hospital, which is a single element of the health facilities sub-system of the broader health service system.

The method of analysis is not meant to be analytically rigorous but generalized and descriptive. To develop rigorous analytical models of the health care

system is both beyond the scope of this thesis as well as the state of the art.

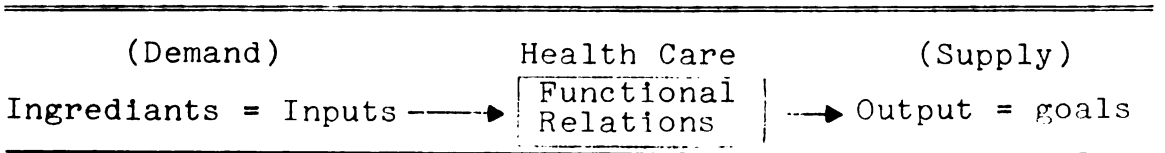
The Planning Problem and Why a System

During the past several decades the word "system" has moved to the forefront as a concept of the times. The interpretation of its meaning has been both rigorous and general. It has been used in conjunction with both the Applo Guidance System and ccntemporary Social System in today's literature. Because of the multiplicity of possible interpretations as to what constitutes a system, it is important that a common base be provided.

First, it is important to delineate between three major terms which make up the jargon of system planning: system, system theory, and system design.

A system can be defined as a set of orderly and purposefully arranged elements or components which function for an avowed purpose. Optener defines a system as being made up of inputs, functional relationships (the system), and outputs, according to the following figure:[1]

FIGURE 13.--Simplified System Concept



[1]Stanford Optner, Looking at the City as a System (Los Angeles: Stanford Optner & Assor, 1959), p. 197.

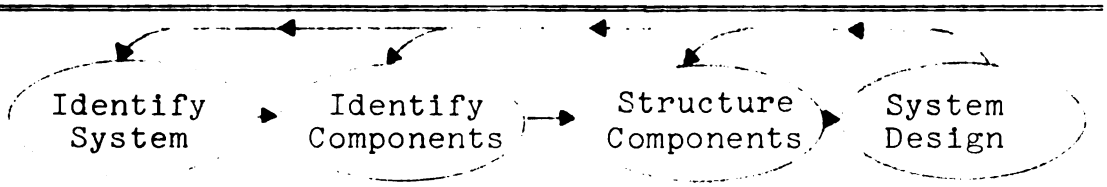
Related to the health care system, the input would be the demand for medical services, the functional relations would be the structure of the health components, and the output would be the delivery of medical services.

"Systems Theory" represents a methodological technique for problem solving which was developed many years ago within the physical design professions such as engineering. It can be adequately defined as a four step continuously recycling process of:

1. Identification of the system by input, system boundary, and output.
2. Identification of components which compose the system by input and output.
3. Structure the relation between the components.
4. Rearrange the components to achieve a new purpose, which is the concept of "System Design."

System methodology can be represented conceptually by the following figure:

FIGURE 14.--Simplified System Theory



In applying "systems theory" to a planning problem, it is important to recognize between two discrete forms

of a system. The first is a physical system, such as an airplane, which lends itself to rigorous application of system techniques. Generally, in a physical system of this type the process of applying "systems theory" may be analytically difficult but is conceptually easy. The second form of a system can be described as a "qualitative" or "social system."[2] This type of system usually defies analytical modeling and is often conceptually difficult. However, the inroads of applying "systems theory" to social planning problems is obvious. Foremost of these are:

1. It provides order and meaning to the system.
2. It improves the rationality of planning decisions.
3. It provides for consistency.

The major difficulty in applying "systems theory" to social phenomena is one of conceptualization. For the knowledge of the functional relations between the components is the basis for the design or planning of a system. It is in the functional relationships where trade-offs between the system components can be made in order to achieve a design objective. The structuring of functional relations in social systems is often conceptually intuitive and is only as good as the system designer.

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[2] Ibid., p. 198.

A further classification of systems is presented by Perloff and Wingo.[3] They described systems as decentralized or incremental in contrast with technically centralized systems. Examples of incremental systems are: schools, libraries, fire stations, hospitals, etc. The increased demand for these types of facilities resulting from metropolitan growth is met by the addition of one or more self sufficient units. Technically centralized systems are represented by the transportation network, water-sewer system, gas, etc. In this type of system, increased demand is met by expansion of the existing facility.

An important difference between incremental and centralized systems is in the interrelations between the components. Typical centralized systems have physical interrelations and connections. Incremental systems have demand or social interrelations. In this form of system, the total demand for a service is a sum of the individual demands, and the supply of a service is a sum of the outputs of the units. The interrelation between components or units is in how they combine to provide for the demand within the region. Thus, in planning for an incremental system of facilities, the problem is one of defining

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[3]H. S. Perloff and L. Wingo, "Planning and Development in Metropolitan Areas," JAIP (May, 1962), pp. 17-19.

adequate design units or components and their level of output (services).

Another major deviation is in how design units are defined. They can be flexible and designed to meet a variable demand.[4] They can be a standard unit with a standard output level which is superimposed over the region in order to meet a level of demand. Or the design unit or module can be a standard within certain flexibility ranges which allow for various levels of outputs based on conscious design decisions.

The basic problem of hospital system planning can be stated in reference to the previously discussed system framework. First, the hospital facility is an element of the health facility sub-system of the overall health care system. Any attempt to plan a regional hospital system must make reference to other sub-systems which affect the supply and demand for health services.

Because health planning must be based on the delivery of medical services, it represents a social system rather than a physical system. Therefore, the structuring of component interrelations in conformance

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[4]This is essentially the procedure developed by Coughlin. See: R. E. Coughlin, Hospital Complex Analysis: An Approach to Analysis for Planning a Metropolitan System of Services (unpublished Ph.D. dissertation, University of Pennsylvania, 1964).

with system theory is extremely complex. In the final analysis, much of the conceptualization must rest with intuitive and rational interpretation on the part of the designer. Yet, in order to effectively plan hospital facilities, a generalized or descriptive systems approach must be undertaken. Only when the system is explicitly ordered and where components are defined can the planning process be rational.

The short-term or general[5] hospital component of the health care system represents an incremental rather than a technically centralized system. Therefore, the increased demand for short-term hospital services will logically be met by the addition of one or more facilities into a metropolitan network of facilities to meet regional demand. The planning problem then becomes one of defining the hospital prototypes. This reduces to one of interpreting what is the minimum efficient size of a hospital necessary to provide an adequate level of service, what is the structural relationships between the service output of various hospital protopypes, and how these prototypes combine to meet regional demand.

Of the various techniques of defining the hospital unit, the method which is flexible in relation to

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[5]These terms are used interchangeably in the remainder of the thesis.

variable demand is the most promising. Yet the need to use rigorous data and analytical tools present real barriers to its application. Use of rigorous hospital size and service standards are too inflexible to be applied to the rapidly changing medical technology and its impact on the service role of the hospital. The use of standards within certain flexibility ranges which allow for various levels of outputs (services), presently has the most realistic application to hospital planning.

The following Chapter will pursue the problems associated with planning a hospital system within the above framework.

The Short-Term Hospital Defined as a Component of the Health Care System

Any attempt to adequately plan for the short-term hospital component of the health care system must begin conceptually by the identification of the components and sub-systems which make up the overall system structure. Because health services represent a social system, the process of system planning is extremely complex and must be based largely on a descriptive rather than an analytical approach. Until recent publications by the Federal Government in relation to Program-Planning Budgeting-Systems (PPBS) no previous work has attacked the

extremely complex problem of conceptualizing the health care system.[6]

This thesis concerns itself with an analysis of aspects to consider in planning a general short-term hospital system for a metropolitan region. However, such a process cannot be undertaken without understanding the interaction between the hospital sub-system and other sub-systems which make up the total health care system. Persons involved in hospital system planning should not overlook the possibility that such interactions may provide opportunities for improving the system design process.

The purpose of the following section is to provide a descriptive conceptualization of the health care system in order to provide a broader framework for hospital system planning. The work as presented is based on existing literature which is sparse. The presentation is therefore only meant to be general and not exhaustive. Much further study in this area is warranted. Three major aspects will be considered: medical activity system, the health care system, and the health facility sub-system.

Medical Activity Systems

The point at which a patient may receive treatment for an illness is diverse. Patients can receive medical

[6]For example, see: H. E. W., Public Health Service, Health Planning: A Programed Instruction Course (Washington, D. C.: U. S. Government Printing Office, 1968).

care in their homes, at drug stores, in doctors' offices, in specialized hospitals, in sanitaria, and a whole host of other facilities. The points of delivery for medical services are both formal and informally organized.

The type of medical activity selected by an individual depends upon such things as financial resources, type of illness, social resources, and customs and culture. Patients with higher incomes have greater flexibility in choosing the point for delivery of medical services than do lower income groups which are often forced to use clinics. Often, particular types of illness dictate what facilities are to be utilized. For example: special hospitals treat tuberculosis patients, mental disorders, physical rehabilitation, etc. The social status of a patient may determine in part what type of facility he will use. For example, a sick person may have to be hospitalized because he has no one to look after him. Also, hospitals often cater to a particular social group, such as the Jews, Catholics, Negroes, and other groups. Finally, medical customs and cultural heritage often affect the selection or need for medical services. For example, the changing pattern in the use of the hospital for childbirth in the last 50 years.

Medical services are provided by a set of both formal and informal systems which have vast areas of

common overlap. Little knowledge exists as to what drives an individual to often select or utilize a particular service. The connection or interface between the generation of demand by a particular individual and its satisfaction by a particular service is poorly understood. The recent concept of "activity systems" developed by Chapin, if applied, could go a long way in clarifying and structuring medical activity systems.[7]

Health Care System

Until recent work was undertaken by the Federal government, no conscious effort existed to conceptualize the sub-systems of the health care system. This effort was largely directed by the impetus to apply P. P. B. S. to spending at the federal level. Congress has further recognized this potential by passing Public Law 89-749 (the Comprehensive Health Planning and Public Services Act of 1966) in which it declared that: "Comprehensive Health Planning for Health Services, Health Manpower, and Health Facilities is essential at every level of government. . . ."

Public Law 89-749 provided further impetus toward structuring the health care system in its directions as to necessary categories in the state comprehensive health

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[7]Stuart Chapin, "Activity Systems and Urban Structure: A Working Schema," JAIP, January, 1968, pp. 11-18.

plan. Essentially four main categories or subsystems were recognized as minimum requirements of a federally funded state plan. These are:

1. planning programs in the State that deal with health services, facilities, and manpower, education, welfare, and rehabilitation
2. health manpower, including professional and allied personnel
3. health services and facilities
4. services and facilities for control of environmental health threats

Further impetus toward structuring the health care system is witnessed in the wording of Public Law 89-749. Requirements for identification of sub-system interrelations, and establishment of regional goals and objectives are all in the direction of establishing a structured health care system.

A recent publication by the department of Health, Education, and Welfare in relation to PPBS at the federal level provides a more functional breaking of health services into sub-systems for the purpose of budgeting.[8] The four recognized sub-systems were:

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[8]H. E. W., Public Health Service, Planning-Programing-Budgeting: Guidance for Program and Financial Plan (Washington, D. C.: U. S. Government Printing Office, 1968).

1. development of health resources which includes as an element health facilities
2. prevention and control of health problems
3. provision of health services
4. and general support.

Although various reports have recognized various spectrums of medical care sub-systems, it seems possible to seperate out three major sub-systems for the purpose of analysis and planning. These are: health services, health manpower, and health facilities. Although these sub-systems have many interdependencies, they are enough of an entity to merit individual analysis in the system planning process. Of these, this thesis is concerned with the general short-term hospital component of the health facilities sub-system.

Health Facilities Sub-system

An urban planner's initial contact and concern with community health is likely to be with the system of health care facilities. Each seperate facility needs land, acts as a traffic generator, provides a service, and must be related to other components of the total health system. Each health facility also serves as the contact point between the patient and physician. The problem of planning is in defining the service structure of various types of facilities in order to relate services to community needs.

Various attempts to classify medical facilities by function have been undertaken. One method of classification is through facility ownership, whether it be public or private. Classification by function is even more difficult than classification of ownership, as illustrated by a partial listing of some twelve types of health facilities which might be found in a metropolitan area in a recent government publication.[9]

However, a more general and usable classification was developed by the American Hospital Association for the purpose of classifying hospitals by service and length of patient stay. This classification is threefold: long-term hospitals in which patients stay longer than 30 days, short-term general hospitals, and short-term special hospitals. The general short-term hospital represents the major facility in the United States for the delivery of medical services. For this reason the short-term hospital system can be and usually is identified and planned for as an entity. The remainder of this thesis will address that problem.

The following figure represents a simplified conceptual structure of the health care system. The general

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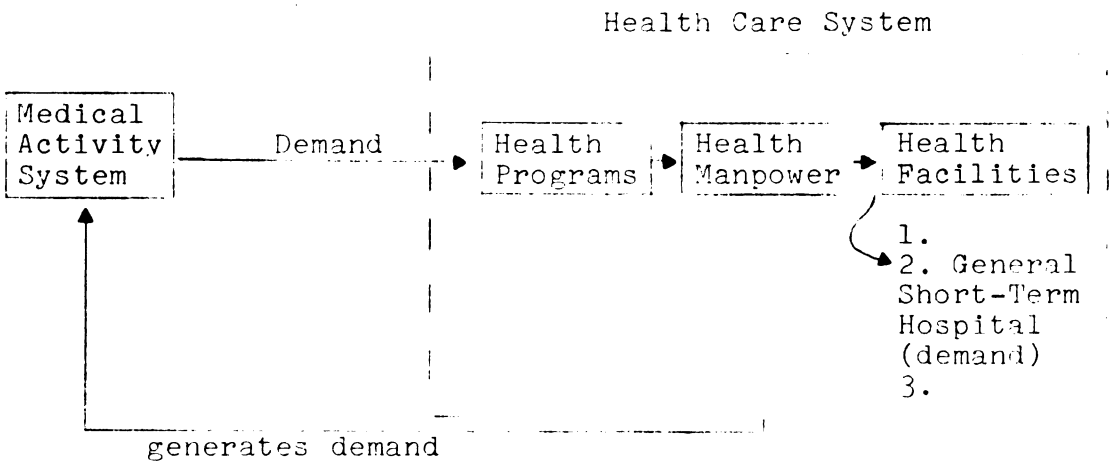
[9]National Commission on Community Health Services, Health Care Facilities: The Community Bridge to Effective Health Services (Washington, D. C.: Public Affairs Press, 1967), p. 37.

short-term hospital is a major component of the broader service system.

FIGURE 15.--Simplified Diagram of the Health Care System



Characteristics of the Short-Term Hospitals

The concern of this thesis is the planning of hospitals to serve the members of a metropolitan community. The term general short-term hospitals excludes long-term hospitals which provide service to patients whose average stay exceeds 30 days. Typical long-term hospitals are tuberculosis and psychiatric facilities. When patients enter long-term facilities, they usually cease to be active community members for some period of time. Also excluded from this definition are special short-term hospitals such as maternity hospitals, ear, eye, nose and throat hospitals, and other specialized

hospitals which provide only a few specialized services rather than a broad range of community services and needs.

A more general definition of the short-term hospital is Roy Brown's, which attempts to capture the social and economic nature of the institution:

> A hospital is the centralized facility of the community for health care. It represents a cooperative effort whereby the total community has pooled its resources in order to provide the sorts of specialized equipment and highly trained personnel that no patient or doctor could provide individually, and which no patient could afford to use and maintain by himself.[10]

A still broader view is to describe the hospital as the community health center which serves all segments of the community alike and promotes the health of the individual.

Even though the general hospital concentrates on the care of short-term acutely ill patients, it does not quite serve as the communities health center. It is the site of all major and minor surgery and almost all infants are born within its walls. Recent trends indicate the general hospital is predominant and is gaining at the expense of such speciality hospitals as maternity, orthopedic, or eye and ear hospitals. This trend is in accord

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[10]H.E.W., Public Health Service, Principles for Planning the Future Hospital System (Washington, D. C.: U.S. Government Printing Office, 1959).

with current medical thinking which favors the flexibility of the general hospital.

The nation's system of general short-term hospitals, as defined, can house 741,000 patients at any one point in time. The 6,200 hospitals which make up the system had 26,462,870 patient admissions in 1966 with an average length of stay of 7.8 days. If we ignore that some patients are admitted several times during one year, we can interpret the admission statistics to mean that about one out of eight individuals will be admitted to a general hospital during a single year. While the general short-term hospital accounts for only 49% of all medical beds, they admit 97.5 percent of the 28.8 million patients and provide almost all of the 125.1 million outpatient and emergency department visits. They also account for 68 percent of plant investment in hospitals, 72 percent of all medical assets, and 79 percent of annual medical expenditures.[11]

Another major characteristic or social phenomenon of the general short-term hospital has been the rapid increase in per unit or patient day cost. In short-term hospitals in the United States, patient day cost rose from $9.40 in 1946 to $38.90 in 1963, and to $44.48 in 1966. The highest rate of increase was 12.0% during the period

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[11]American Hospital Association, Hospitals ("Guide Issue," August, 1966).

for 1946-1952 following the war.[12] The major factors which are most significant in influencing the rapid increase in medical cost are: 1. Changing population characteristics which resulted in greater demand; 2. Higher wages for health personnel; 3. Advances in medical technology; and, 4. Greater use of health insurance. The rising costs for hospital services as well as changing patterns of medical expenditures has and will continue to have a direct effect on the need for medical services in the future.

Historically, the general short-term hospital has been developed as a city rather than as a rural phenomenon. Traditionally, major hospitals have been located in metropolitan areas and rural areas have been served less adequately both in quantity and quality of medical care. A study completed in 1953 estimated that metropolitan areas as a whole had 4.1 beds per 1,000 population; counties adjacent to cities had 2.8 beds per 1,000; semi-rural counties had 3.8 and rural counties had 1.8 beds per 1,000 population.[13] Despite both policy decisions and

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[12]National Commission on Community Health Services, Financing Community Health Services and Facilities (Washington, D. C.: Public Affairs Press, 1967).

[13]Jerry Solon and Ann Barney, "General Hospital and Nursing Home Beds in Urban and Rural Areas," Public Health Reports, Vol. 71, No. 10, October, 1956, pp. 985-992.

bed distribution standards developed federally under the Hill-Burton program which gives priority to developing a rural hospital system, hospitals have remained largely a metropolitan and city phenomenon (See Table 7).

It is also interesting to note that although metropolitan regions have significantly more hospital beds per 1,000 population, none of the metropolitan areas have as many hospitals per-capita as does the nation as a whole.[14] The explanation for this is that the hospitals in metropolitan areas are significantly larger than those in the rural system. Hence, there has developed two different types of hospital units: the rural and urban hospital, which are both different in size and service function.

Table 16 indicates the national distribution of hospitals by size and number of beds. While the largest number of hospitals are in the 50-99 bed range, the largest total number of beds are in the 100-199 hospital size with 20.8% of the nation's total. A study completed in Minnesota indicates certain trends in changing patterns of hospital sizes of less than 100 beds.[15] In studying the pattern of hospital size trends it was concluded that hospitals of less than 100 beds showed a

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[14]Coughlin, op. cit., p. 19.

[15]American Medical Association, Proceedings 1st. National Conference of Areawide Planning, November 28-29, 1964, p. 135.

TABLE 16.--Short-Term Hospitals in the United States by Number and Size

General Short-Term Hospital Size	No. Hospitals	No. Beds	Percent of Beds	% Accredited
Less 25	562	10,024	1.4	0.9
25 - 49	1,442	51,451	6.9	29.8
50 - 99	1,482	103,120	13.9	69.7
100 - 199	1,108	154,336	20.8	92.1
200 - 299	541	131,388	17.7	97.7
300 - 399	306	104,180	14.0	98.7
400 - 499	139	57,240	7.8	97.8
500 and over	163	129,553	17.5	96.6
Total	5,736	741,292	100.00	86.6

Source: Computed from Table 2, p. 442 and Table 5, p. 472, "Hospitals," Journal of the American Hospital Association (August, 1966).

marked decrease in numbers between 1959 and 1963. In reviewing national patterns, a definite trend also indicates a reduction in significance of the rural hospital of less than 100 beds. Table 16 further indicates the percent of hospitals accredited by the Joint Commission on Accreditation of Hospitals in relation to certain physical and service standards, which shows a marked decrease with smaller units. The trends further support the metropolitan phenomenon of the hospital system.

Another question related to the metropolitan characteristics of hospitals is whether hospitals export services to surrounding suburbs and rural areas. Coughlin, in his study of the export phenomena, concluded that, taken as a whole, short-term hospitals of a metropolitan area provide most of their services to residents of their own metropolitan area.[16] He further concludes that, "taken as a whole, the short-term hospitals are 'service' rather than an 'export' activity and that the main consideration in planning their locations must be service to metropolitan area residents rather than to patients who live outside the metropolitan area."[17] His data further supported the fact that a major portion of suburban metropolitan residents use central city hospitals.

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[16]Coughlin, op. cit., p. 23.

[17]Ibid.

Coughlin further studied the relative size of the hospital as an employer in relation to other urban functions. Although the analysis was obscured because of data problems, he was able to conclude that the metropolitan hospital units employed large blocks of individuals, or that a major percentage of the hospital units employed more than 100 people. Because of this, the hospital can be considered a major generator of activity in a metropolitan area and deserves considerable consideration in urban planning decisions. In addition to the decision unit being large, it also represents a major and long-lasting community investment.

Given the metropolitan characteristics of the short-term hospital and the fact that hospital planning represents an incremental system, two questions confront the urban planner. They are:

1. What is the most economical size hospital to plan in a metro-region in order to meet a standard level of service?
2. How can various hospital units be planned in a regional system to meet total community need?

Minimum, Maximum, and Scale Economies of Hospital Operation

In pursuit of the development of standards in order to plan a hospital system, hospital planners have resorted

to establishing minimum and maximum desirable sizes for hospital units. In most cases, the emphasis has been on minimum acceptable size, and only rarely has the maximum desirable unit been considered. Invariably, the minimum or maximum criteria is presented as the number of beds contained within the unit. Explicitly implied is that the number of beds is a proxy variable which is indicative of the size and service role of the hospital within a community.

Several of the more widely established size criteria for hospitals are presented in Table 17. By presenting selected standards in cronological order, it is evident that no major trend in establishing minimum hospital size standards has evolved. Strong concensus exists, and particularly since 1960, that the minimum desirable size for the short-term general hospital is from 150-200 beds. The 50-75 bed range suggested by McNeeney in his study of Michigan probably reflects the rural characteristic of his study area (See Table 17). In addition, many of the 150-200 bed standards are tempered by conditional statements. A typical statement with respect to size of hospital is:

> Can unit costs be reduced by building and operating hospitals of larger size? There is no doubt that small hospitals are relatively costly; it is likely however, that the range of optimum sizes is wide, with much also depending on the mix of services. In rural, sparsely populated areas, small hospitals may be necessary, even if operating at low rates of

TABLE 17.--Selected Minimum and Maximum Hospital Size Standards

Date	Source No.	Number of Beds	
		Minimum	Maximum
1929	[1]	200-300	600
1947	[2]	250	
1952	[3]	350	800
1960	[4]	150-200	
1961	[5]	150	
1962	[6]	300	800
1962	[7]	50-75	
1963	[8]	150-200	
1965	[9]	200	600-800
1968	[10]	200+	

Sources:

[1] H. C. Wright, "Hospital Distribution in and about New York City," Regional Plan New York and its Environs, 1929, pp. 142-143.

[2] Commission on Hospital Care, Hospital Care in the United States (New York: 1947), p. 277.

[3] J. R. McGibory, Principles of Hospital Administration (New York: 1952), p. 65.

[4] Kansas City Hospital Association, General Bed Need and Modernization Program for Hospitals in the Kansas City Metropolitan Area (Kansas City: 1960), p. 51.

[5] Roy Brown, Trustee Institute of Hospital Planning, Western Pennsylvania and Hospital Planning Association of Allegheny County, 1961, p. 51.

TABLE 17.--Seclected Minimum and Maximum Hospital Size Standards

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[6] Brian Abel-Smith, "Hospital Planning in Great Britain," Hospitals, JAHA, 36, (May 1, 1962), 33.

[7] McNerney et. al., Hospital and Medical Economics, (Chicago: 1962), I, 530.

[8] U.S. Department H.E.W., Procedures for Areawide Health Facility Planning (Washington, D. C.: 1963), p. 31.

[9] Maryland National Capitol Park and Planning Commission, Hospital Study for Prince George County Maryland (Maryland: 1965), 7.

[10] National Commission on Community Health Services, Financing Community Health Services and Facilities (Washington, D. C.: 1967), p. 99.

> occupancy and therefore extra costly. In large cities, perhaps a minimum size of 200 beds or more should be considered.[18]

The above quotation indicates a point which must be considered in establishing minimum size standards for hospitals. A 150-200 bed minimum size is only appropriate when additional demand can absorb the services of a hospital this large. Smaller hospitals should be considered in rural areas even though they may be more costly to operate. However, these hospitals should be designed to allow additional expansion as demand arises.

Another problem in application of the above standards is whether the number of beds within a unit really measures hospital size in terms of the medical role of the hospital within the community. Much controversy exists within hospital journals as to whether hospital size in terms of beds and efficiency of operation are even casually related. Coughlin further suggests that hospital size must not only be measured by the number of beds, but also by the size of the bundle of services offered.[19]

Few of the standards as presented in Table 17 make explicit analysis of the variables which were considered

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[18] Financing Community Health Services and Facilities, op. cit., p. 99.

[19] Coughlin, op. cit., p. 76.

in establishing minimum or maximum hospital size criteria. Often implied as being considered are such things as: changing patterns of occupancy rates of hospitals with respect to size; the types of members of services which can be offered in relation to size; and considerations for equipping and staffing of hospitals. The most prominent variable recognized with relation to maximum size was the maintenance of educational programs and research for the medical staff.

One major variable has lent strong support to acceptance of the 150-200 bed minimum standard. Hospitals of smaller size have statistically demonstrated lower occupancy rates which indicates less efficient utilization of potential services. Table 18 indicates a national summary of occupancy rates for various size hospitals. Formerly, an 80% occupancy rate was accepted as standard, and today 85%--at least for medical and surgical beds--is considered to be closer to optimum range. When overhead costs are high in proportion to total costs--as much as three-fourths in general hospitals--a high rate of utilization of existing capacity is imperative for efficient hospital operation. As Table 18 indicates, it is not until the 200 bed unit is reached, that an occupancy rate standard of nearly 80% is met. Hospitals of 100 beds and less continually show a sharp decline in the level of occupancy.

TABLE 18.--Occupancy of Short-Term Hospitals in the United States by Size

Short-Term Hospital By Size	No.	No. Accredited	Occupancy Rate	Expense Per Patient-Day
Under 25	562	0.9	53.0	37.56
25 - 49	1,445	27.9	62.3	36.76
50 - 99	1,482	67.5	67.9	39.30
100 - 199	1,108	91.6*	74.6	41.78
200 - 299	541	97.6	79.6*	45.62
300 - 399	306	98.7	81.2	47.62
400 - 499	126	97.7	82.2	46.76
500 +	163	96.3	80.8	48.93
Total	5,736	61.7	76.0	44.48

Source: "Hospitals," JAHA, Guide Issue (August, 1966), pp. 442 & 447.

An indirect measure of hospital quality can be related to the accreditation of hospitals by the Joint Commission on Accreditation of Hospitals. Quality considerations used are in relation to number and type of services offered as well as the physical condition of the hospital plant. As indicated by Table 18, a direct relation exists between the size of a hospital unit and the percentage of hospitals within a size range which are accredited. With decreasing size, larger and larger percentages of hospitals fail to meet the minimum established quality standards. Only at the 100-199 bed range is a level of 91.6 percent accreditation achieved, which then jumps to a relatively consistent level of about 98% for hospitals of 200 beds and larger. This further suggests that hospitals of less than 150 to 200 beds have been unable to economically achieve and maintain certain standard levels of quality of operation.

Many hospital analysts and administrators have attempted to analyze and locate "scalar economies" of hospital operation. The approach was to determine what size hospital can provide the lowest cost unit of output, which was usually measured as cost per-patient-day or cost per-hospital-bed. While all of these studies failed to provide standards for "efficient" hospital planning, several conclusions were reached with respect to the relation between hospital size and unit operating

costs. Southmayd concluded that at least for hospitals in the 50-100 bed range, fixed operating costs decline as a percentage of total operating expense with an increased number of beds. Large hospitals were seen as being more flexible in being able to adjust expenditures to changes in demand, and therefore could operate more efficiently.[20] Feldstein and MacEachern similarily concluded from their studies that in general there is a falling cost per bed with an increase in the number of beds in a hospital.[21, 22] However, unit patient day costs listed in Table 18 indicate a sporatic pattern, and show a general increase in cost with hospital size. This is in direct conflict with the findings of Feldstein and MacEachern.

Studies such as these offer some insight into efficient internal management of particular size hospitals, but require much scrutiny before being utilized as hospital planning principles or standards. Several major considerations are conspicuously absent. In the

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[20]H. J. Southmayd and R. Jordan, "A Report on Readiness to Serve," Hospitals, JAHA (August, 1948), pp. 37-40.

[21]Paul J. Feldstein, An Emperical Investigation of the Marginal Costs of Hospital Services (Chicago: Graduate Program in Hospital Administration, University of Chicago, 1961).

[22]Malcolm J. MacEachern, Hospital Organization and Management (Chicago: Physicians Record Co., 1957).

studies, the scope and quanties of services of each hospital unit is not adequately considered. For most services, output is assumed to increase with hospital size. However, the relation between the types of services offered and their effect on unit costs is not made explicit. In addition, the studies do not summarize or include all costs for particular type hospitals which are necessary in guiding a planning decision. One cost of major consideration, and conspicuously absent, is the relation between increased transportation costs and larger hospital units.

As hospital size increases, the number of patients to be served within a particular unit rises proportionately. Given a consistent density, increased hospital size results in larger hospital service areas. Resulting from this are longer and more costly travel patterns for those utilizing a particular facility. Most studies of "scalar economies" in hospital operation only consider internal costs in relation to size and ignore costs which are transfered to the user through increased transportation distances. Coughlin is the only author who proposes that transportation costs deserve consideration in planning an efficient hospital system. Balancing these two costs--internal and transportation--the problem is then one of determining if marginal saving in per-unit costs in relation to scale economies are greater or less

than marginal per-unit costs for transportation. Theoretically then, the most efficient unit becomes one where the positive slope of the transportation cost curve exceeds the negative slope of the per-unit internal hospital cost curve. However, several data factors indicate the above type of analysis may not be warranted.

First, the slope of the patient-day cost curves in relation to hospital size is not negative as often indicated. Table 18 indicates that the cost per-patient day levels off with a slight positive slope in 200-299 bed range. Following this, a slight decline in cost takes place in the 400-499 bed range, which indicates a slight point of scalar economy. This being true, then the positive transportation cost becomes the controlling economic factor. In addition to this, there are social considerations related to transportation costs, such as ability to pay, effect on hospital utilization, and emergency care, which must be considered.

While a detailed analysis of the marginal economics between hospital size and transportation cost is beyond the scope of this thesis, several conclusions seem obvious. These are:

1. Hospitals which are smaller than 150-200 beds, although indicating low patient-day costs (See Table 18) are unable to meet service and quality standards.

2. The case for larger hospitals than 200 beds based on "scaler economies" alone is weak. However, the provision of various services may justify large units.
3. Transportation costs are an important variable in planning efficient hospital units in a metropolitan region.

Because of the above analysis it is concluded that a 150-200 bed hospital represents a desirable size unit to be planned for in a metropolitan system of facilities. Such a facility is capable of efficiently providing a large percentage of the standard and frequently demanded medical services, yet minimizing transportation and accessibility problems. The problem now is one of determining what other types and classification of short-term hospital facilities unite to meet total regional demand, and make up the complete metropolitan system. Because economies are directly related to services or output, services will be used to analyze such a system.

Structuring a System of Hospitals by Services

Of major importance in planning a regional system of short-term hospitals is the functional structure of the various components which comprise the system. The problem is one of determining or establishing the level and types of services (output) of each component, and

how these services combine to meet total regional demand. Only after the analysis of the components is completed can the process of "system design" or synthesis begin.

"System design" will consist of structuring the hospital components in a regional network of facilities to meet total regional demand. The problem of structuring the hospital system has been given little attention by urban and regional planners, and therefore, standards or planning parameters for the hospital components are sorely missing. This lack of past emphasis is noted by Coughlin:

> However, concern with the structure of hospital systems does not appear to have been a major preoccupation of the city planner in this country. Perusal of standard texts by Chapin (1957), Gallion (1950), International City Managers' Association (1959), and the Planning Advisory Service Publications of the American Society of Planning Officials, and of the Journal of the Institute of Planners and its predecessor journals has failed to reveal one reference which deals with this subject.[23]

However, the concept of a system of hospitals has been given consideration in many hospital journals and medical publications. The theory most often presented is that of a hierarchial system of hospital facilities. Different authors have proposed various numbers of levels within the system; but, in concept, they all present a stepped hierarchial pattern of hospital components in

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[23]Coughlin, op. cit., p. 45.

which each higher step provides those services contained at the previous level, plus an additional bundle of services. The basic premise is that various services have a different demand frequency, and those with less demand are provided on a less frequent basis, or at a higher step within the system. The motivating force in such a system is one of economics, or balancing supply against demand. If less frequently used costly services were over-supplied at all levels, which would represent a uniform system of facilities, an inefficient system would result. Similar concepts of a hierarchial system have been developed in city planning for other areas of analysis such as, street and road networks, commercial centers, and airports.

In a major publication on hospital planning, Rosenfield conceptualized the hospital system as consisting of a three level hierarchy.[24] The highest step within the system was the metropolitan medical center. Only one such facility was usually to be contained within a medical region. The medical center was to provide all the possible gamut of medical services in relation to hospital care as well as other community and social services connected with medical care. In addition, the medical center was to have a major role in teaching and

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[24]Isodore Rosenfield, Hospital Integrated Design (New York: Reinhold, 1951).

research. The second level was classified as a health facility, which consisted of a 200-500 bed hospital. This facility was to be concerned largely with the delivery general hospital services in an urban area. The third step within the system was the health center. This was envisioned by Rosenfield as a community type of facility which was concerned largely with the delivery of outpatient medical services as well as very basic hospital services. This type of facility would be very relevant in rural areas. Davis also proposed a similar three level hierarchy.[25] He classifies the three components from the top down as: urban hospitals, county hospitals, and rural hospital-health centers located in sparsely settled areas.

The concept of a hierarchial system of hospitals was first related to planning a regional system in a Public Health report written by Mountin, Pennell, and Hoge.[26] This report undertook the task of developing a scheme for planning a nationwide network of hospital facilities, and represents a major milestone in hospital system planning. The system of facilities as originally

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[25]Graham L. Davis, "Horse and Buggy Hospitals Must Go," Modern Hospital, March, 1944.

[26]J. W. Mountin, Elliott H. Pennell, and Jane H. Hoge, Health Service Areas--Requirements for General Hospitals and Health Centers (Washington, D. C.: Federal Security Agency, 1945).

structured, consists of a four-level hierarchy. The first and highest level is the large metropolitan hospital, which is similar in concept to Rosenfield's and Davis' medical center. This study describes the metropolitan hospital as the base hospital, which is necessary as the central element of a medical region. The second level from the top consists of a smaller urban hospital, classified as the district hospital. A metropolitan area medical service is made up of a network of district hospital units, each of which has a particular geographical service area. Similarly, the third level is made up of a network of rural hospital facilities. The fourth level is envisioned as health centers, which are described as concentrated geographical areas devoted to the delivery of medical services. This element need not be devoted exclusively to hospital type services. The hierarchial structure the hospital components as related to service levels is best described by Mountin as:

> In the system the base hospital would have the most advanced equipment and specialized staff, associated, wherever practicable, with the teaching, research, and study opportunities of a medical school. This hospital would offer diagnosis and treatment to patients with conditions requiring services not available in most local hospitals. Large well-equipped district hospitals would be strategically located within the area to be served by the base hospital and would provide general and speciality services beyond the resources of smaller local hospitals; thus, only the more complex cases would have to be referred to the base hospital. Other hospitals, including those in the more built-up rural areas, should be prepared to meet ordinary demands of a community and select for transfer to

> district and base hospitals those cases requiring highly specialized care. Finally, there would be health centers equipped for diagnosis and treatment of ambulatory patients, as well as for the more traditional health department services. Probably a few of these located in sparsely populated areas would contain accommodations for limited hospital service.[27]

The concept of a hierarchial system of hospital facilities as developed by Mountin, Pennell, and Hoge in 1945 has provided the basic framework for standards used in State Hospital plans under the provision of the Hill-Burton Act. Two basic parameters as established, which have remained, are: the emphasis on the different service roles of various hospital units; and, the emphasis on the establishment of a system of medical regions. Typical State Hill-Burton plans have used a three-level classification of medical regions. The process of planning begins with the establishment of medical regions within the state. The maps show regions which are made up by being centralized around the services of a base or district hospital as a "primary" region and a rural or community service district as a "secondary" medical region. See, for example, the Hill-Burton plans for the state of Michigan.

Once medical regions are established, they become basic statewide planning units. Regional and district

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[27]Mountin, Pennell, and Hoge, op. cit., p. 1.

bed requirements are then calculated for each planning unit according to population ratios established under the Hill-Burton Act. The planning process then becomes one of providing beds within a region until standards are achieved.

The two-level classification of regions used in Hill-Burton differs from the three-level hierarchy of medical regions suggested by Mountin.[28] Primary regions are areas which are served by major medical facilities. Usually, primary centers contain several large hospitals which represent the largest concentration of general hospital facilities within the region. At the minimum, they must have 250 general hospital beds. Secondary districts are centers for smaller service areas within the region. They act as a tie between the locally served community and the primary center. Isolated districts are those remaining counties which contain no facility of 50 or more hospital beds, nor border on the districts with such facilities.

The district system, as developed by Mountin, Pennell, and Hoge, is further structured by bed standards to show how total regional demand is met by the summation

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[28]The three-level classification of medical regions is intensionally different than the four-level classification of facilities. Mountin fails to define what type of facilities belongs to a particular region.

of distributed district standards. Table 19 indicates the beds per 1000 population for the particular district levels which are proposed as planning units. For example, 4.5 beds of those required by individuals living in a primary district will be provided in that district, plus an additional 0.5 beds being supplied by secondary districts, and 0.5 beds by isolated districts. These then combined meet total primary district demand of 5.5 general hospital beds per thousand population.

A study completed by the Pennsylvania Economy League further addresses the problem of relating system level and total regional demand.[29] It suggests that 80% of the demand can be met at the community level, 10% at the regional level, and 10% in metropolitan centers which provide specialized services.

A series of recent Public Health publications have not stressed the idea of planning a regional system of hospital facilities. Areawide Planning for Hospitals and Related Health Facilities (1961) does suggest, however, that for plans to be realistic, one must deal seperately with several different types of short-term hospital facilities. It suggests a six component classification of: (1) medical-school affiliated hospitals; (2)

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[29]Pennsylvania's Economic League, Determining and Financing Pennsylvania's Need for Hospital Capital Facilities (Washington, D. C.: U.S. Government Printing Office, 1961), p. 25.

TABLE 19.--Hospital District Bed Standards
(Beds/1000 Population)

Beds Required For Patients Who Live In Hospital District	Beds Located in Hospital District			
	Primary	Secondary	Isolated	All Districts
Primary	4.5	0	0	4.5
Secondary	.5	4.0	0	4.5
Isolated	.5	1.5	2.5	4.5
Use by All Districts	5.5	5.5	2.5	

Source: Mountin, Pennell, and Hoge, Requirements for General Hospitals and Health Centers, U.S. Public Health Service Bulletin, No. 292, Washington, 1945, p. 6.

other hospitals in the central city; (3) suburban hospitals; (4) hospitals in other cities in the region; (5) hospitals in small towns in the region; and, (6) hospitals for special types of facilities. It later makes reference to the specialized services, medical training and research functions which are to be carried out in the large medical centers which serve the entire region. The more basic "community" hospitals are to provide general services to local areas.[30] A more recent publication, Health Care Facilities (1967) is even less concerned with planning a regional hospital system. It suggests a four-component classification of: (1) medical school teaching hospital; (2) urban or regional teaching hospital; (3) community multiple-service hospital; and, (4) rural basic-service hospital.[31]

The works of Rosenfield, Davis, and Mountin represent the basic contributions to hospital system planning. Each has proposed that the hospital system is hierarchial in structure. Rosenfield and Davis proposed a three-level hierarchy, and Mountin a four-level. For the purpose of planning, Mountin reduces the system to three types of

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[30] H.E.W. Public Health Service, Areawide Planning for Hospitals and Related Health Facilities (Washington, D. C.: U.S. Department Printing Office, 1961), p. 25.

[31] Health Care Facilities: The Community Bridge to Effective Health Services, op. cit., p. 23.

planning districts: primary, secondary, and isolated. All three authors propose that each level within the system plays a different medical service role to the region in terms of the types and number of services offered. Rosenfield and Davis do not present any parameters for quantifying the structural relation between the various levels within the system. Mountin proposes that the system is to be structured by developing various bed distribution standards within the different level planning districts (See Table 19). All fail to provide any consistent standards as to the relation of hospital size--by either services, beds, or both--to the various levels in their hierarchial systems.

For the purpose of planning a metropolitan system of hospitals it becomes necessary to develop hospital prototypes or standards and relate them structurally to levels within the system. It is also necessary to define the service role of the various prototypes, and how these services combine to meet total regional demand. Two alternatives for such analysis exist. The first is to study the existing system of facilities and services in search of order, and from this develop planning standards. The second is to analyze various hospital services, and develop new patterns of service mixes which may be entirely different from existing prototypes.[32] From

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[32]This is the technique used by Coughlin, op. cit.

these service mixes develop a new system of prototypes for hospital system planning. The first method assumes some order and rationality to the existing system, and offers some potential for analysis. The second method would be extremely complicated and require excessive data collection and manipulation. While it offers much potential for innovation, it is beyond the scope of this thesis.

The "Guide Issue" of Hospitals, Journal of the American Hospital Association, provides a national summary of the relation between various size hospital units and types and levels of services,in a hierarchial order, on the principle of frequency. Those which were consistently high in frequency for a large number of various size hospitals would be ranked near the top. Those services which demonstrated less frequency of prevelance in greater numbers of various size hospital units were then ranked in decreasing order. Then services were numbered in terms of their hierarchial position relative to the 26 services analyzed. Resulting is a table which lists hospital units of increasing bed numbers on the horizontal axis, which increases from left to right, and lists services in order of frequency on the vertical axis, with frequency decreasing from top to bottom. Superimposed upon the table were 90% and 80% service frequency lines.

TABLE 20.--Percent of General Short-Term Hospitals with Specified Services, by Hospital Size, 1966

Services	Service Rank S_n	(No. Beds) Under 25	25 to 49	50 to 99	100 to 199	200 to 299	300 to 399	400 to 499	500 over
X-ray diag.	1	25	98	99	100	100	100	100	100
Operating Room & EKG	2	89	97	97	99	99	100	100	100
Clinical Lab	3	87	97	99	99	100	99	99	100
Emergency Room	4	79	91	92	95	97	98	97	99
Post-Oper. Rec. Rm.	5	16	35	71	94	98	99	99	100
Obstetrical Delivery	6	86	89	87	89	93	95	97	96
Pharmacy	7	12	21	49	87	99	100	100	100
Pathology Lab	8	6	17	48	86	98	100	100	100
Physical Therapy	9	15	22	41	70	90	96	96	97
Blood Bank	10	13	37	61	78	86	90	92	95
X-ray Theraputic	11	2	5	17	56	83	95	95	100
Radio-isotope	12	1	3	9	40	75	92	96	99

TABLE 20--Continued

Premature Nursery	13	28	40	56	70	82	89	93	94	
Radium Therapy	14	2	3	13	45	75	88	89	98	
EEG	15	10	13	13	27	52	77	81	87	
Outpatient Dept.	16	42	32	25	32	56	74	85	96	
Intensive Care Unit	17	3	6	13	29	61	73	86	90	90% Ser. Line
Dental Facility	18	8	15	25	40	54	66	68	85	
Soc. Serv. Dept.	19	6	3	4	13	43	60	68	86	
Psychiatric Inpatient	20	1	2	4	10	26	42	64	83	
Occupational Therapy	21	3	2	3	8	20	35	50	80	80% Ser. Line
Cobalt Therapy	22	0	0	2	9	21	38	52	68	
Chest X-ray on Ad.	23	33	35	31	34	36	41	45	57	
Rehabilitation Unit	24	1	1	2	6	14	20	26	52	
Family Planning Unit	25	1	1	1	30	8	13	22	45	
Home Care Program	26	2	1	1	4	8	15	17	32	

Source: Hospitals, JAHA, Guide Issue (August, 1966), 466-471.

From this, a pattern of service structure and hospital size evolved.

The assumption proposed by Davis, Rosenfield, and Mountin that the system is hierarchially structured is correct. The 90% and 80% service lines indicate a direct relation between hospital size, as measured by number of beds, and the number and types of services offered. In all cases, the number of services increase relative to an increase in hospital size. The presence of a national service structure also supports the previous assumption that the system does have order.

Further attempts to superimpose 70% and 60% service line on the table failed. This suggests that there are "core," or basic, services which make up various hospital units. These can be described as being contained within the 80% service line.

Further inspection of the zig-zag 90% service line indicates two points of greatest change in the number of services offered relative to hospital size. These are located at the 200 to 300 bed and 500 + bed range. This change suggests a prototype hospital of 300-500 beds which agrees somewhat with the 200-500 bed health facility of Rosenfield. Those hospitals which are 500 beds and larger show the largest increase in service structure. This is also in agreement with the service role

of the medical center as envisioned by Davis, Rosenfield, and Mountin.

Another phenomena is evidenced from Table 20. This is in relation to the sensitivity of a service frequency with respect to hospital size. Some services show a large frequency range when transitioning from one hospital size to another. For example, see X-ray therapy; which increases 39 percentage points in transitioning from a 99 to 100 bed unit. Other services show relatively little sensitivity to size. For example, outpatient services show a rather sporatic pattern of frequency. Assuming the pattern of frequency of a service is rational and reflects both economics and demand, one can conclude that sensitive services should be considered only in conjunction with large enough hospital prototypes. Non-sensitive services can generally be added to a hospital irregardless of prototype size.

Data which indicates the intensity or magnitude of services further supports the hierarchial structure of the hospital system. McNerney, in his study of Michigan, concluded that the delivery of specialized services also increases with hospital size.[33] In other words, surgery in a 500 bed hospital includes a broader number of types of surgery than does the surgical service of a 100 bed

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[33]McNerney et. al., Hospital and Medical Economics (Chicago: Hospital Research and Economic Trust, 1962), Table 512.

unit. Similar increases in specialization of services in relation to hospital size is further evidenced in his data.

Coughlin, in a similar study of hospital service structure, was able to recognize a change in pattern by comparing 1953 and 1962 hospital service data. He recognized an increase in frequency for 6 services in smaller size hospital units over this period of time. He concluded: "There is evidence, then, that there is a trickling down over time of new technologies and standards from larger to small hospitals."[34]

From the analysis of services on Table 20, and the minimum hospital size standards in the previous section, there appears to be a basis for defining hospital prototypes. The hierarchial system proposed is three-level, and in some agreement with Davis and Rosenfield. The highest level would be the medical center, which would consist of a hospital which is larger than 500 beds, and is usually 800 beds or larger. This facility would carry out medical teaching and research as well as all the highly specialized medical services. The second level would be the "district" hospital. This would be in the 300-500 bed range. The district hospital would supply all the standard hospital services to its surrounding service area. The third level would be the community hospital, which is from 150-300 beds. It would provide all the standard and frequently used hospital services.

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[34] [34]Coughlin, op. cit., p. 73.

Another requirement in defining hospital prototypes is to specify desirable services for particular hospital units. Table 21 indicates an analysis of the 26 services which are classified in Table 20. The same order of ranking is used. The services are grouped into two major "sets." These are: medical services which are internal to the operation of a hospital, and community health services which are instrumental in the delivery of outpatient medical treatment. These two sets are further subdivided and classified as specialized and generalized services. The fifth column deals with associative services, which attempts to recognize the combination nature of various services. For example, a blood bank (S_{10}), should be provided in association with an operating room (S_2). The technique was to then intuitively classify the services into one of the four possible sets.[35] The pattern which emerged further supported the transition in service structure at the 300 bed-level which is proposed as a hospital prototype. In addition to the four-set classification, two additional variables were analyzed. This further classified the services as being "community" oriented or "regional" oriented. By

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[35]The judgement is based on analysis of the particular services as well as consultation with various medical people. Because the classifications are disputable, the results should only suggest a technique of analysis rather than rigorous service standards.

TABLE 21.--Hospital Service Analysis by Sets

Service	Ser. No. S_n	S_A Gen. Med.	S_B Gen. Ser.	S_C Spec. Med.	S_D Spec. Serv.	S_E Assoc. Serv.	S_F Comm. Serv.	S_G Reg. Ser.	Remarks
X-ray diag.	1	X					X		
Operating Rm. EKG	2	X				10	X		
Clinical Lab	3	X					X		
Emergency Rm.	4	X				10	X		
Bst. Oper. Rec. Rm.	5	X				2	X		
Obstetrical Delivery	6	X					X		
Pharmacy	7	X					X		
Pathology Lab.	8	X					X		
Physical Therapy	9			X				X	
Blood Bank	10	X				2	X		
X-ray Theraputic	11	X				1	X		
Radio-Isotope	12			X			X		
Premature Nursery	13			X			X		
Radium Therapy	14			X				X	

TABLE 21.--Continued

Premature Nursery	13		X			X		
Radium Therapy	14		X				X	
EEG	15		X				X	
Outpatient Dept.	16	X				X		
Intensive Care Unit	17		X			X		
Dental Facility	18		X			X		
Soc. Serv. Dept.	19			X			X	
Psychiatric Inpatient	20		X			X		
Occupational Therapy	21			X			X	
Cobalt Therapy	22		X				X	
Chest X-ray on Ad.	23			X	1	X		Always desirable
Rehabilitation Unit	24			X			X	
Family Planning Unit	25			X			X	
Home Care Program	26			X			X	

combination of various service "sets," certain service requirements can be established for particular hospital prototypes.

The services which are desirable for a community hospital are those which are both general and community oriented. That "set" represents the elements which are common to sets, S_A, S_B, and S_F. They are:

$$S \text{ community} = S_1 + S_2 + S_3 + S_4 + S_5 + S_6 + S_7 + S_8 + S_{10} + S_{11} + S_{16} + S_{23}.$$

Those services which are desirable for a "district" hospital are those above, plus those services which are common to both specialized and community oriented sets. These are common elements to S_C, S_D, and S_F. They are:

$$S \text{ district} = S \text{ community} + S_{12} + S_{13} + S_{17} + S_{18}.$$

Those services which are desirable for a medical center are those above, plus those services which are common to specialized and regional oriented service sets. These are common elements to S_C, S_D, and S_G. They are:

$$S \text{ medical center} = S \text{ district} + S_9 + S_{14} + S_{15} + S_{19}, S_{21} + S_{22} + S_{24} + S_{25} + S_{26}.$$

The final requirement in developing standards for planning a regional system of hospitals is in structuring the relation between the various hospital prototypes. This can be interpreted as the need to specify what percentage of the total regional demand should be met by each level in the system. Table 22 indicates the past percentage of admissions, which is indicative of demand, and that has been met by the suggested hospital prototypes. These are compared to the standards suggested by the Pennsylvania Economic League. The suggested standards for percentage of demand by the various hospital prototypes is also presented. These are given as ranges because of the flexibility of sizes within the various hospital prototypes. The percentage of demand which is to be met by the community hospital will increase towards the standard suggested due to the gradual elimination of the small, less-efficient hospital units.

Table 23 represents a summary of the standards proposed in this section.

Summary and Conclusions

"System theory" represents a methodological technique for solving complex problems. Prerequisite to its application are certain conceptual requirements. These are: (1) system identification, (2) component identification, (3) structuring the relation between components,

TABLE 22.--Percent of Demand Captured by Each Hospital Prototype

Prototype	Hospital Size	No. Admissions [1] (1966)	% Total Admissions (Present Capture)	Penn Study [2]	Suggested Planning Standards For Demand
	Under 25	332,776			
	25 - 49	1,935,707			
150 - 300	50 - 99	3,915,772			
	100 - 199	5,952,872			
	200 - 299	4,998,442			
			65.0%	80.0%	70.0-80.0%
300 - 500	300 - 399	3,786,392			
	400 - 499	2,030,075			
			23.0	10.0	10.0-20.0
500 plus	500 +	3,510,835			
			12.0	10.0	10.0%
	Total	26,462,878	100.0	100.0	

Sources: [1]Computed from, Hospitals, JAHA, Guide Issue (August, 1966), p. 442.

[2]Pennsylvania's Economy League, Determining and Financing Pennsylvania's Need for Hospitals Capital Facilities, The League, 1963, p. 3.

TABLE 23.--Summation of Proposed Hospital System Planning Standards

Prototype	Size Bed Range	Desirable[1] Service Sets	% of Regional Demand
Community	150 - 300	S comm.	70 - 80%
District	300 - 500	S district	10 - 20%
Medical Center	500 +	S med. center	10%

[1]See Table 20 and previous text.

and, (4) system design. Barring conceptual difficulties, system theory has meaningful application to a social system such as health care. However, such systems will of necessity be descriptive rather than analytically rigorous.

The hospital system, which is a sub-system of the health care system, has an incremental structure as contrasted with a technically centralized system. The demand for incremental facilities resulting from metropolitan growth is met by the addition of one or more self-sufficient units. The planning problem is one of defining these units (components) as hospital prototypes, and structure the relation between them.

The health care system can be descriptively conceptualized. Medical activity systems represent the interface between the individual and the delivery of medical services. Very little is known about what motivates an individual to select a particular service or facility. Three distinct sub-systems can be recognized in the health care system. These are: (1) health programs, (2) health manpower, and (3) health facilities. The short-term general hospital represents a major component of the health facilities sub-system.

In planning an incremental or decentralized system such as the short-term hospital, the planner requires standards or prototypes for hospital units. In pursuit

of the development of such standards, hospital planners have resorted to establishing minimum and maximum sizes for hospital units. These are invariably stated in terms of the number of beds, using beds as a proxy variable to measure size. General concensus is that a 150-200 bed general hospital is the minimum desirable unit. However, smaller units should be built in rural areas with an eye towards future expansion. No just arguments exist for "scale" economies in hospital size as a technique for defining a hospital prototype. Maximum sizes for hospitals are usually referenced to the desirability of such units to carry on teaching and research. No rigorous economic arguments exist for limiting hospital size. However, as units become excessively larger, transportation costs and travel time become important.

Urban planners have traditionally ignored the need to plan for a regional system of hospitals. Hospital planners and administrators have, however, given consideration to hospital system planning. The concept most often presented is a three-level hierarchial system of hospital units, where the hospitals are structured by the levels and types of services offered. In analyzing the service structure of the nation's hospitals, much evidence exists to support the use of three-level hierarchy as a basis for defining hospital prototypes. The

three levels proposed in the thesis are: (1) the community hospital, (2) the district hospital, and (3) the medical center.

A further analysis of the various hospital services by the use of "sets" provides some insights into standards for desirable service sets for particular hospital prototypes.

An analysis of past admission rates for various size hospitals suggests some insights into structuring the relation between the three hospital prototypes. One basis for structuring their relation is in establishing what percentage of total demand will be supplied by each prototype. Desirable percentages for demand, in terms of flexible ranges are developed as a product of weighing existing distributions of admissions against normative standards. Because of the inherent flexibility within the hospital system, the use of range's rather than exact percentages is desirable.

Chapter III will attempt to analyze those variables which effect the demand for general short-term hospital services.

CHAPTER III

PREDICTING THE FUTURE DEMAND FOR SHORT-TERM HOSPITAL FACILITIES

Introduction

In order to plan a regional system of short-term hospital facilities in the future, as proposed in the previous chapter, it is necessary to predict the demand for such facilities. The purpose of this chapter is to address this complex problem.

Conceptually, the chapter can be divided into two major sections. The first section deals with a definition of demand, national historic trends in demand, and factors which influence the demand variable. It is important that the hospital system planner be aware of these intangible factors so he can temper and make rational the prediction process.

The second section reviews the major standards historically used to predict future bed needs. When the need for measurement becomes involved, many of the factors suggested in the previous section are directly and indirectly ignored. Yet the need to predict in order to plan remains. It therefore remains the responsibility of the planner to consciously modify these standards to fit local

conditions. Because of the abundance of standards for predicting bed needs only conceptually different and major techniques are reviewed. A more exhaustive review can be found in an annotated bibliography by Palmer.[1]

Need Vs. Demand for Hospital Services

At the outset, it is necessary to differentiate between what is meant by "need" as compared to "demand" for short-term hospital facilities. Need is usually defined as: "that number of beds or services which is required, under conditions of effective and appropriate use of hospital facilities, to provide such general hospital care to the population as is needed for adequate health care."[2] The "demand" for service is largely an economic concept; it is that amount of service which a given population is willing to buy at any given cost for hospital care.

The need for service is a medical concept. It is oriented to determining what level of service is required for good health care. Planning for future need represents

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[1]Jeanne Palmer, Measuring Bed Needs for General Hospitals (Washington, D. C.: U.S. Public Health Service, U.S. Dept. of Health, Education, and Welfare, 1956), p. 33.

[2]Louis S. Reed and Helen Hollingsworth, U.S. Dept of Health, Education and Welfare, How Many General Hospital Beds are Needed?, P.H.S. Pub. No. 309 (Washington, D. C.: U.S. Government Printing Office, 1953), p. 2.

a normative approach to predicting what level and types of services will be required in the future to provide adequate medical care to the entire cross section of population. Demand for service is a resultant of need influenced or modified by many other factors. Factors which affect the gap between need and demand are: what extent people are conscious of their need for service; their ability to pay for a service; alternative arrangements for providing services; and the presence or absence of prepayment plans.

Historically, much confusion has existed in differentiating between need and demand in planning for the provision of medical services. In philosophy, the orientation has been towards meeting medical needs. In practice, the system has been one which responds to demand. However, since 1960 many medical programs sponsored by the federal government have come a long way in redirecting the system to meet medical needs. Because of the social issues related to the provision of medical services coupled with federal legislation directed towards a national policy of adequate health as a right; it is likely that in the future the short-term hospital facilities system will be further oriented towards meeting medical needs.

It is extremely important to keep this differentation between need and demand in mind when planning a future system of hospital facilities. The history of

discussions for predicting future bed needs is marked by continual confusion between these concepts. Most techniques are based on analysis of past user patterns projected in the future. These methods strongly reflect and proliferate the demand orientation of the previous system. Adequate techniques for planning to meet need are conspicuously absent. Those standards which claim to reflect need have little theoretical justification. Much research is needed in determining what level of hospital services are required to meed medical need in the future.

An analysis of past national trends in hospital utilization indicate a continually increasing service role for the short-term hospital system. However, extrapolation of these trends into the future deserves strong reservations on the part of the hospital system planner.

National Trends in Hospital Utilization

Since the passage of the Hill-Burton Act in 1946, variations in the pattern of hospital utilization have been significant. Table 24 indicates national trends in hospital utilization from 1946 to 1961. Barring a slight decline from 1946 to 1950, the pattern of utilization has been one of steady increase. The decline in hospital utilization during this period can be largely contributed to the backlog of need for hospital facilities which existed throughout the nation following the depression and

TABLE 24.--Growth of Facilities and Utilization of Non-Federal Short-Term General and Special Hospitals in the United States: 1946-1961

(1)Number of beds, patient days, and admissions in thousands

Year	Beds(1)		Patient Days(1)		Admissions(1)		
	Total	Per 1000 Population	Total	Per 1000 Population	Total	Per 1000 Population	Average Length of Stay
1946	473	3.4	124,261	888	13,655	97.5	9.5
1947	465	3.3	127,264	901	15,980	110.9	8.0
1948	472	3.2	131,126	902	15,072	103.2	8.7
1949	477	3.2	128,052	864	15,428	103.8	8.3
1950	505	3.4	134,907	897	16,663	110.2	8.1
1951	516	3.4	138,419	899	16,677	108.7	8.3
1952	531	3.4	141,045	901	17,413	111.8	8.1
1953	546	3.5	142,974	908	18,098	114.3	7.9
1954	553	3.4	142,966	890	18,392	114.1	7.8
1955	568	3.4	148,980	904	19,100	116.3	7.8
1956	586	3.5	154,824	927	20,107	120.2	7.7
1957	595	3.5	159,615	939	21,002	123.3	7.6
1958	610	3.5	164,798	951	21,684	125.2	7.6
1959	620	3.5	168,519	955	21,605	122.4	7.8
1960	639	3.5	174,572	968	22,970	127.6	7.6
1961	659	3.6	177,650	981	23,375	128.4	7.6
1965*							7.8

Sources: Hospitals, JAHA, Guide Issue, part 2 (August 1, 1963), p. 448.

*Hospitals, JAHA, Guide Issue (August 1, 1966), Table 2, p. 472.

World War II. Not until the early 1950's were the investments under Hill-Burton able to begin to fill the gap between the supply of, and demand for, medical facilities.

Table 24 shows the increase in the number of beds per 1000 population for the nation from a low of 3.2 in 1949 to 3.6 in 1961. During this same period patient days per 1000 population showed an increase from 864 to 981. This represents a 13.5% increase during a twelve year period, or an average annual increase of 1.1%. Similarly, admissions per 1000 population have increased from 103.8 in 1949 to 128.4 in 1961. This represents a 23.8% increase, or an average annual increase of almost 2.0%.

A decline in the average length of stay suggests that modern medical care has shortened the time needed for hospital treatment of many diseases and conditions. The major decline in length of stay was from 9.1 days in 1946 to 7.8 days in 1955. Between 1955 and 1965 the average length of stay has stabalized around 7.8 days. This suggests that a lower limit in the length of stay has been reached under the present service role of the nation's hospital system. However, other factors such as hospital size and ownership have a profound effect on the length of patient stay. Typically, larger hopsitals and government hospitals demonstrate the phenomenon of longer patient stay patterns.

National trends indicate a steady increase in the demand for short-term hospital services--both in patient days of service and admissions--from 1946 to 1961. The question of concern to hospital planners is if these trends indicate a medical need, or respond to other characteristics of the overall medical system. Hospital planners are now finding out what transportation planners have known for some time, that the construction of new facilities creates new demands. Up to a point, bed availability attempts to operate like Parkinson's law: demand reflects supply. Doctors tend to utilize as many beds as a community can supply. While the minimum requirement for the number of beds is usually obvious, the optimal number of beds needed cannot be easily calculated by measuring need. Need will vary greatly depending on the acceptable alternative within the system.

Many variables will affect the demand for short-term hospital facilities in the future. Entrapolation of past national trends into the future does not seem warranted. It is important for hospital planners to recognize the potential impact of other medical subsystems on the supply-demand relationship for short-term hospital facilities. While it is doubtful if these variables can be articulated into precise measurements of demand, their acknowledgement is extremely important.

Only through consideration of these variables can a planner rationally predict the demand for short-term hospital facilities.

Factors Which Affect the Demand for Hospital Facilities

There are two basic sets of factors which influence the demand for short-term hospital facilities, and indeed, for all medical services. First are those factors which fall under the general heading of sub-systems of the overall medical care system. Of primary importance in the first set is the influence of medical manpower, medical programs, and the organizational structure of the health facilities system. The second set of factors that influence the demand for short-term hospital facilities falls under the heading of the characteristics of the consumer of hospital services. This set would include cultural factors, sociodemographic factors, and economic characteristics.

Of primary importance in influencing the demand for short-term hospital facilities is the physician. It is a characteristic of the medical care system that once a consumer enters the market by visiting a physician, most decisions affecting the demand for medical services are influenced by the physician rather than by the consumer

alone.[3] In this way, the physician makes major decisions which affect the demand for particular types of medical services; and in the final analysis decisions reflect both the preference of the physician and consumer.

The past fity years has witnessed major changes in physician-patient relationships. The classic ideal of an authoritarian physician who provided total medical care to two or three family generations is no longer realistic in the present medical care system. Two major factors have influenced this idealistic concept. First is the tremendous expansion in medical knowledge. The physician can no longer hold all the necessary equipment in his black bag, just as his mind can no longer hold all the necessary medical knowledge.

The modern doctor is, and has to be, a specialist; his services are supported by the services of a host of paramedical personnel. Because of the continual shortage of doctors, he has to increase his level of productivity and, therefore, has little time for the idealistic patient-doctor relationship. Advances in medical knowledge have been coupled with advances in medical technology. This has resulted in the demand for more

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[3]This is similar to the medical activity systems discussed in Chapter II. A major factor in generating demand is the interfare relationship between the physician and the consumer.

sophisticated and costly modern equipment and facilities. Many of the new medical services require equipment and supporting personnel which is only available at the short-term hospital. Resulting from this is a trend towards the short-term hospital as a major point for the delivery of general medical services.

Another factor which has influenced the physician-patient relationship is the changing affluence of the consumer. The average middle class patient today is better educated and has a higher income. He has a higher level of medical knowledge and often questions his doctors advice. In addition, he has a higher level of mobility and no longer desires the everlasting doctor-patient relationship of previous decades. During any one particular malady, he will usually seek the service of one or several specialists.

The types and numbers of medical programs which exist also have a major impact on the demand for medical services. Medical programs can generally be classified into three major groups.[4] The first group consists of programs for the protection, preservation, and promotion of the health of the citizenry. Public health is concerned with programs for the control of communicable

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[4]U.S. Department of Health, Education, and Welfare, The Urban Planner in Health Planning (Washington, D. C.: U.S. Government Printing Office, 1968), p. 16.

disease, with research into areas such as heart disease and cancer, and in environmental health including sanitation and air and water pollution. These types of programs are carried out at local, regional, state, and national governmental levels. The major potential impact of such programs is towards the elimination of disease and illness, and thus reducing the demand for particular types of medical services.

The second major classification of medical programs are those which establish standards and regulations which affect health and medical care. Governmental agencies set minimum standards for water and air quality, restaurant sanitation, hospitals, nursing homes, and industrial safety requirements. The level and degree of such standards all affect illness and thus the demand for medical services.

The third major group of medical programs are those which are concerned with the provision of direct medical services to certain groups of people. These types of programs often include specialized hospitals such as mental institutions or tuberculosis hospitals which are generally provided by the state government. In addition, cities and major metropolitan areas often support short-term hospital institutions out of tax funds for the purpose of providing free or low-cost services to residents.

Additional programs in this group are designed to increase a person's ability to purchase medical services through economic assistance. Examples of such programs are evidenced in recent trends in federal legislation related to the provision of medical services. Medicare and Medicade are both federal programs designed to improve the delivery of medical services to the older and poorer segments of the nation's population. An entire host of other federal, state, and local programs which provide economic assistance to certain population groups both directly and indirectly affect the demand for medical services and thus short-term hospital facilities.

Another potentially significant aspect which influences demand for short-term hospital services is the organizational strucutre of the health facilities subsystem. The availability of substitutes or alternatives for hospital services can have a major impact on the demand for facilities. Areas which contain adequate nursing homes, home care programs, and other types of medical services might be quite different from areas without these services, even in the absence of other differentiating features. However, this relation is not axiomatic, since relatively little is known about the actual degree to which other facilities can substitute for short-term hospital services.

The definition of the scope and types of services provided by the general hospital affects the demand for these facilities. For example, a demand for psychiatric care would only be realized in an institution where this service is provided. In an area where psychiatric care is provided by another institution, no demand for this service would be felt by the short-term hospital system.

In addition, internal hospital management considerations indirectly affect the demand for additional facilities. When internal management decisions are able to improve the output of necessary medical services for any particular institution, that institutions capture of total regional demand is increased, and thus the need for additional facilities is reduced. For example, many expensive hospital services are only provided on an 8 hour a day, 40 hour a week basis. Management decisions to utilize such services on a 16 or 24 hour basis, and on week-ends and holidays, and during other periods of low utilization could greatly improve the output, and thus reduce the demand for additional facilities.[5]

The structural relationship and communication between the various short-term hospital units can also

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[5]National Commission on Community Health Services, Health Care Facilities the Community Bridge to Effective Health Services (Washington, D. C.: Public Affairs Press, 1967), p. 54.

be developed in order to improve the output of the entire hospital system. The use of an adequate patient referral system between various institutions can switch excessive demand from one institution to another under utilized hospital facilities. Thus the demand for the expansion of existing facilities or new units can be reduced. In addition, many hospital services can achieve maximum economies through centralization of particular functions. Through use of this technique the output of particular services can be increased. For example, centralized laboratories, centralized record systems, etc.[6]

The second major set of factors which influence the demand for short-term hospital facilities can be classified as characteristics of the consumers of hospital services. This set generally includes: (1) cultural factors, (2) sociodemographic factors, and (3) economic considerations.

A publication by Benjamin in 1955 brought together case studies on health problems around the world in order to illustrate how various facets of the community process affect the strucutre of the health care system.[7] He grouped the studies into six major categories with respect

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[6] Ibid.

[7] Paul Benjamin, ed., Health, Culture, and the Community (New York: Russell Sage Foundation, 1955).

to how culture directly affects the supply demand relationship for community health services. The categories are: re-educating the community on health matters, community reaction to health crisis, sex patterns and population problems, effects on social segmentation vehicles of health administration, and the combining of services and research.

Another host of medical studies have attempted to relate the degree and frequency of different types of medical maladies to particular cultures and sub-cultures in the United States. Although these studies can offer insight into planning medical services, their major area of application has been in medical research.

A study by the Public Health Service in 1953 indicated significant differences in demand and utilization of short-term hospital facilities for different major geographical regions within the United States.[8] While much of the variations can be contributed to other variables such as income, several inconsistancies exist. For example, a major difference in hospital utilization exists between New York and Oregon, although both have relatively equal incomes. The report suggests that various regional sub-cultures have different requirements for medical services.

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[8] How Many General Hospital Beds are Needed?, op. cit.

One of the most often cited and studied factors with respect to the demand for short-term hospital facilities has been the sociodemographic characteristics of the consumer. Rose suggests that in order to understand and deal with social service problems such as health care, one must know something of the major elements of the changing society and its structure.[9] He proposes that the demand for medical services is strongly influenced by its structure within the broader social service system. Therefore, any study of health services should begin within this broader perspective.

Both Cook and Morris suggest that an analysis of the demographic characteristics of a community is prerequisite to planning for health services.[10, 11] They propose that the demographic structure of a community, state, region, or nation gives the clue to present and future need in all phases of planning. Thus, a detailed demographic inventory is the initial step in planning a comprehensive community health program.

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[9]Albert Rose, "The Social Services in the Modern Metropolis," Social Service Review, Vol. 37, No. 4 (December, 1963),

[10]Robert C. Cook, "Demographic Factors in Community Health Planning," Population Bulletin, Vol. 17, No. 1 (February, 1961).

[11]Robert Morris, "Effect of Demographic Changes on Community Fact-Finding," Public Health Reports, Vol. 77, No. 2 (February, 1962), pp. 124-128.

The work of Rosenthal represents the most ambitious attempt to structurally relate a community's demographic characteristics to its demand for general hospital facilities.[12] He attempts to analyze the effect of ten demographic variables through multiple regression, by correlating past demand with a community's population and economic characteristics. Rosenthal suggests that no single variable can predict demand for hospital services, but only through the consideration of the interaction of many variables can adequate predictions be achieved. The ten variables used are: age distribution, marital status, sex distribution, degree of urbanization, distribution by race, educational level, population per dwelling unit, price variations, income distribution, and proportion with insurance.

The final set of factors which have been given attention in relating hospital demand to consumer characteristics are economic variables. Although these variables should theoretically be grouped with sociodemographic variables, they have continually received special attention in the literature.

In general, the relation between hospital charges and demand has been ignored except in discussions relating to insurance, which is an implicit price variable. The

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[12]Gerald D. Rosenthal, The Demand for General Hospital Facilities, American Hospital Association, 1964.

non-profit nature of most hospitals, coupled with the myth that all who need hospital care will receive it, has precluded any detailed examination of the effect of price on demand. However, economic theory would dictate that the relationship between price and utilization would be negative.[13]

The relationship between income and hospital utilization has received a great deal of attention in the literature. Income is considered by many hospital planners as the greatest single determinant of hospital demand. The basic implication is that a strong positive relationship exists between income and demand. A number of other studies have suggested that an opposite effect might be true. These studies postulate that public recipients receive more medical care than the population as a whole.[14]

No other single characteristic related to hospital demand has been studied in as much detail as health insurace. There are many studies which attribute much of the increase in hospital utilization to changes in demand generated by increasing insurance coverage.[15] Still other

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[13] Ibid., p. 29.

[14] M. I. Roemer et. al., "Medical Care for the Indigent of Saskatchewan," Canadian Journal of Public Health (November, 1964), pp. 460-470.

[15] P. M. Densen, et. al., Prepaid Medical Care and Hospital Utilization, American Hospital Association, 1958.

studies argue that insurance does not affect the utilization of hospitals. These studies basically argue that insurance is associated with other variables such as income and education, which themselves show a strong correlation with utilization,and that this fact accounts for the observed association between insurance and utilization.

As indicated from the previous section, the demand for hospital services is not something which can be measured or predicted with exactness. It is a result of the state of medical knowledge, the attitudes and customs of physcians and the public, the structure of the hospital within the medical schema of things, demographic factors of the community, economics, and a whole host of other variables.

Nevertheless, the demand or product of these intangibles must be measured and predicted in order to plan. Invariably the process of prediction involves estimating the number of beds required by the population in order to provide a necessary volume of hospital service.

Standards for Predicting Future Bed Needs Analyzed

The following discussion reviews various techniques and standards which have been developed in the past for predicting the need or demand for short-term hospital facilities. Invariably, the standards are

expressed in terms of the number of beds which will be required at a future date. The importance of predicting demand is obvious for any planning process; therefore, a brief review of the major writings on this subject is necessary.

Two conceptually different approaches can be recognized. The first puts emphasis on the derivation of a normative estimate of the beds which a planning area should have. The direction of this method is towards a measurement of medical need, from which a set of standards for beds can be developed. The second approach is to describe the demand for hospital services. The technique is to use various sociodemographic characteristics of the population as proxy variables to predict future demand, without consideration of normative standards for medical service.

Prior to the 1920's, no attempts were made to develop standards which relate hospital facilities to the requirements of the areas which they were to serve. However, as early as 1912, the president of the American Hospital association made reference to the need for adequate planning to reduce unnecessary duplication of costly facilities, a theme which continued in studies that followed. The first attempt to make a quantitive estimate of need was undertaken in 1920 by the New York Academy of Medicine in a study of 180 hospitals in the

New York Region.[16] The study concluded that there was one hospital bed available for every 200 persons, or 5.0 beds per thousand. By estimating the incidence of morbidity, the researchers further concluded that this represents a ratio of one bed to every four sick persons. The report also suggested that a centralized hospital bureau to disseminate information concerning available hospital beds could increase utilization above the average 70% occupancy rate which existed in the region.

In a report presented by the Committee on County Hospitals at the 1927 Convention of the American Hospital Association, additional quantitative standards for bed needs were presented.[17] A figure of 5.0 general hospital beds per 1,000 population was suggested as a desirable standard for general hospital services. No details of the rationale used in developing this standard were presented in the report. The study does, however, attempt to warn against blind acceptance of the standard in all communities. It suggested that a standard of 5.0 beds per 1,000 would undoubtedly be high in a community where people have not been encouraged to use hospital facilities

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[16]New York Academy of Medicine, Public Health Committee, "Summary of Findings of Hospital Study," Medical Records, 100:1136-39, December 24, 1921.

[17]Report of the Committee on County Hospitals for 1927, Transactions of the American Hospital Association (Chicago: 29th Annual Convention, 1927), pp. 214-216.

or where there has been no opportunity to do so. The committee states:

> The precise need in any community can be determined only by first-hand study of local needs, but we believe that few communities can offer adequate hospital care to all types of sick without maintaining a 5 bed per 1,000 population standard.[18]

The report fails to clarify if the standard is for the sum of short-term and long-term bed requirements. It does not make any estimates to long-term bed standards.

The Duke Endowment, in February 1928, issued a report which contained quantitative standards for bed to population ratios.[19] The ratios as presented were based on studies of authoritative literature on the subject which existed at the time. The study was the first to recognize and suggest the use of different bed to population ratios for urban and rural communities. As the report states:

> The average number of beds per 1,000 people in our larger cities is approximately 5, and hospital authorities regard that number as a normal supply. An occupancy of 75 percent of the beds is considered a normal use. This would leave a reserve of 25 percent for expected fluctuations in the prevalence of disease.[20]

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[18] Ibid., p. 214.

[19] W. S. Rankin, H. E. Hanford, and H. P. Van Arsdall, The Small General Hospital, the Duke Endowment, 1928, pp. 10-12.

[20] Ibid., p. 11.

In addition to the supply of 5 general hospital beds, authorities should consider the need of hospital beds for special conditions as follows: 0.5 beds per 1000 population for contagious diseases; 0.5 bed per 1000 population for children; 0.45 bed per 1000 population for maternity cases; and, as many tuberculosis beds as the average annual deaths in the community over the last 5-year-period. The Duke Endowment study provides some rationale for the 5.0 bed standard based on an analysis of various sickness surveys.

This report adds a provision for a lower ratio of 2.0 to 3.0 beds per 1000 population for rural areas. It justifies this assumption on two observations. First, there historically exists a lower incidence of hospitalizable morbidity in rural areas, and second, those in rural areas would continue to seek medical service elsewhere. The study also suggests that an average occupancy rate of 66 percent should be expected in rural areas.

Dr. Haven Emerson,in 1930, proposed a set of standards for the provision of adequate hospital care for the sick in urban communities of 50,000 or larger.[21] Emerson based his standards on average stay of 14 days, and on an average level of 80 percent occupancy. His estimates so

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[21]Haven Emerson, "Estimating Adequate Provision for Organized Care of the Sick," The Modern Hospital, Vol. 35, No. 3 (September, 1930), pp. 49-51.

derived are as follows: 5.0 beds per 1000 population for general medical, surgical, children, and maternity patients; 0.5 beds per 1000 for communicable diseases; 2.0 beds per 1000 for chronic sick; and 0.75 beds per 1000 for convalescent patients. Summarizing the above, Emerson estimated that 8.25 beds per 1000 was required in a community above 50,000 for adequate hospital service. The basic technique used by Emerson to develop his standards was an analysis of past utilization studies of various medical services.

Emerson, like the Duke Endowment study, also draws a dicotomy between bed standards for urban and rural hospital systems. The major reasons for lower bed ratios in rural areas suggested by Emerson are: many rural areas do not have serious occupational hazards, and they do not have the congested housing which exists in larger cities. A low rate of 2.0 beds per 1000 population is suggested as adequate in rural communities.

The Lee-Jones report of 1933 is one of early and most widely used studies of standards for planning medical needs.[22] Annual disease expectancy rates were derived from studies of morbidity surveys for various population

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[22]Rodger I. Lee and Lewis Webster Jones, The Fundamentals of Good Medical Care, Committee on the Cost of Medical Care Publication No. 22, University of Chicago Press, 1933.

groups. Through analysis of opinions and records of 125 practicing physicians, the Jones report indicates the amount of service[23] in terms of medical personnel and facilities necessary in each disease catagory. The average number of bed-days required for each disease catagory were then translated into the number of hospital beds per 1000 population based on average occupancy rate of 80%.

By this method, the following number of general beds required to serve a population of 1000 was calculated: a total of 4.62 beds, of which 0.68 beds for maternity, 2.10 beds for medical ward, 1.71 beds for surgical ward, and, 0.13 beds for psychiatric ward. A following article of Michael M. Davis suggested that the Lee-Jones Report allows for the hospitalization of a much larger proportion of communicable disease cases than is normally hospitalized in general hospitals.[24] Davis proposes that a standard of 4.0 per 1000, with an occupancy rate of 80% is more reasonable.

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[23]This is the first and most rigorous attempt to relate need and services to predicting bed requirements. In fact, many recent reports are modified forms of standards developed in this study.

[24]Michael M. Davis, "Are There Enough Beds? Or Too Many?", The Modern Hospital, Vol 48, No. 5 (May, 1937), pp. 49-52.

In 1935, the need for general hospital beds was the target of a study by Alden and Patsy Mills.[25] The procedure was to undertake a systematic analysis of all types of local or community hospitals for acute conditions, and excluding hospitals for long-term treatment. Hospital service centers, whcih were defined as hospitals within 50 miles of a city and containing more than 250 beds, were indicated on rural county maps.[26] Counties not served by the hospital centers were then to be grouped in terms of compactness, homogeneity, and natural trade patterns. To determine the number of additional beds required in poorly served rural areas, a ratio of 2 beds per 1000 population was suggested as a minimum. This was the basis of an average estimate of the ratio of 1.0 bed per 1000 suggested in the Duke Endowment study, and 3.0 beds per 1000 proposed in succeeding studies. In the study, the Mills warned that before actually using any standard, consideration must be given to a whole host of other economic and demographic factors. Factors suggested for consideration are: size of population; size of service area; density of population; number of training physicians available in the area; the impact of the hospital

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[25]Alden B. and Patsy Mills, "The Need for More Hospitals in Rural Areas," The Modern Hospital, Vol. 44, No. 3 (March, 1935), pp. 50-54.

[26]This is one of the first attempts to associate "service area" concepts to hospital planning.

on the delivery of medical services; distance to other hospitals; road conditions, summer and winter; health knowledge of the people; suitability of home conditions for medical care; financial resources of the population; and the potential impact of new methods of paying for medical services on hospital utilization.

In 1935, a report of the American Hospital Association's Committee on Hospital Planning contained quantitative recommendations concerning general hospital bed requirements.[27] The report states that for years bed quotas have been adopted on the basis of two generally accepted formulae. These are: first, that from 2 to 3 percent of the population are incompacitated by accident or illness at any one point in time, and that on the average, 10 percent of these require hospitalization in acute beds. Second, that in urban communities, 5 beds per 1000 population and in rural districts 1 to 3 beds are necessary for adequate medical care. The report suggests that the present situation in the hospital field indicates that both formulae, and the way they are used are in need of revision.

The report went on to state that a falling birth rate and the extension of good maternity home nursing

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[27]Report of the Committee on Hospital Planning and Equipment, Transactions of the American Hospital Associations, 37th. Annual Convention, Chicago, 1935, pp. 740-752.

would reduce the demand for maternity care and thus reduce the number of acute beds required for this purpose. In addition, standards should be tempered by the fact that there has been a steady decline in the average length of stay in general hospitals, as well as the impact of trends in preventive medicine in keeping people well. "To intelligently determine how many beds a given community needs," the report states, "requires that many conditions be analyzed far in advance of the first architectural sketch."[28] The report further indicates the potential impact of various social and demographic community characteristics on bed need.

In light of the above observations, the Committee made the following recommendations for acute beds per 1000 population. The rationale was based on an analysis of conditions found throughout the country. Bed ratio standards are related to a hierarchial concept of city size. Implied, is that smaller communities rely on large cities to supply additional medical services.

The standards as proposed are:[29]

(1) For large metropolitan centers having general multiple housing, extensive suburbs and

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[28] Ibid., p. 743.

[29] Ibid., p. 750.

nationwide medical prestige--5 beds per 1000 of the city's population.

(2) For cities which serve as medical centers for extensive districts and suburbs not adequately self-hospitalized--4 to 5 beds per 1000.

(3) For smaller cities--3-4 beds per 1000.

(4) For rural districts--up to 1 bed per 1000.

A Technical Committee on Medical Care of the Interdepartmental Committee to Coordinate Health and Welfare Activities proposed a professional standard of adequacy for general hospital beds a ratio of 4.6 beds per 1000 population.[30] The rationale for the standard was not given; however, it was indicated that the standard was based on the earlier Lee-Jones Study.

The Public Health Service in 1945 developed a ratio of 4.5 beds per 1000 population for use as a standard for non-Federal general hospital requirements in health service areas.[31] The technique of the PHS study was similar to previous studies in that it predicted utilization for each area from past utilization patterns. However, the

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[30]Interdepartmental Committee to Coordinate Health and Welfare Activities, The Need for A National Health Program (WAshington, D. C.: U.S. Government Printing Office, 1938).

[31]Mountin, Pennell, and Hoge, Health Service Areas--Requirements for General Hospitals and Health Centers (Washington, D. C.: Federal Security Agency, 1945).

development of the health service concept was of major significance towards developing a mechanism for treating the hospitals of the United States as a system in fact as well as in title.

Each state was to be divided into medical service regions, which were further divided into primary and secondary districts according to the types of hospitals in them. Primary districts have hospitals which offer a wider or more extensive range of services and the secondary districts having hospitals offering basic services. The concept proposes that the hospitals of the primary district subsidize the service role of secondary districts. This concept of a flow of services from the core to outlying districts marks a major transition from local orientation which characterized previous hospital studies.

The distribution of beds within each health service area was structured to the proposed hierarchial system concept. The overall ratio of 4.5 beds per 1000 population was to be maintained for the total region, but each primary district should have 4.5 beds per 1000 population in its district, plus 0.5 beds per 1000 of the population in each secondary district served. Secondary districts would maintain a ratio of 4.0 beds per 1000 population.

In the report it was stated that the 4.5 bed standard was a compromise between the theoretical ideal of earlier reports and practical achievement of bed distributions within the states. The report proposes an 80% occupancy rate as desirable.

A report of the Commission on Hospital Care in 1947 developed a new technique for estimating bed needs from utilization.[32] The method, known as the bed-death ratio, is based on the relationship between predictability of death rates and an estimation of what proportion of deaths will occur in the hospital. Using these two variables, it is possible to predict, with necessary accuracy, the general hospital bed requirement for a particular population. Using this technique, the Commission estimated that at the 1944 occupancy level of 74.8%, 4.96 general and special hospital beds would be needed per 1000 of the nation's population.

An important variation in the bed-death ratio from previous standards is that the elements from which it is composed reflects the characteristics of the area in question. This implicit acknowledgment that the characteristics of a particular area are important in estimating bed needs constitutes a significant step from

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[32]Commission on Hospital Care, Hospital Care in the United States (New York: The Commonwealth Fund, 1947).

previous ratio standards. The bed-death ratio has been used by a number of states to estimate bed needs (e.g. Michigan), but for the most part, it has not received wide acceptance.

The Commission emphasized that the bed-death formula is unique from previous standards because it is based entirely on need and vital statistics rather than the general population. This does not, however, reduce the problem of predicting to a simple analytical process, but should be used and tempered with judgement. It should be considered as a first approximation with due consideration of many other local factors.

The Hospital Survey and Construction Act and Program provided hospital bed standards to be used in developing state Hill-Burton plans for hospital construction.[33] These were set forth as ceilings on the number of beds beyond which Federal aid for construction would not be available. The standards used were sensitive to two variables. First, they varied with the classification of the hospital areas in relation to the system concept presented in the 1945 PHS study. Second, they varied in relation to the population of the perspective states

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[33]L. M. Abbe and A. B. Barney, The Nation's Health Facilities: Ten Years of Hill-Burton Hospital and Medical Facilities Program, 1946-1956 (Washington, D. C.: U.S. Government Pringting Office, 1961).

specified in the number of persons per square mile. Resulting, was a definite national emphasis on developing hospital facilities in sparsely settled areas in the United States (See Table 7). The standards thus arrived at and specified in the regulations were as follows:

TABLE 25.--Hill-Burton Bed Distribution Standards

Type of Area	Hospital Beds per 1000 population in States with specified persons per square mile.		
	12.0 or more persons	6.1 - 11.9 persons	6.0 and less persons
Base	4.5	5.0	5.5
Intermediate	4.0	4.5	5.0
Rural	2.5	3.0	3.5

The standards of bed needs set forth in Table 25 under the Hill-Burton act have greatly influenced hospital planning since 1947. These standards or estimates represented the concensus among hospital authorities at the time of their adoption and deserve strong recognition in this review of past estimates of bed needs. They, more than any other standard, have influenced the distribution of beds during the past two decades.

A study of Reed and Hollingsworth proposed that by observing the days of hospital care per 1000 population received by groups which are believed to be getting adequate health service, is the key to setting hospital bed standards.[34] They identified adequate numbers of days of hospital care by examining 5 groups--states with nearly all births in hospitals, states with highest per capita incomes, persons covered by Blue Cross insurance, persons under the Saskatchewan hospital service program, and persons under the British Columbia hospital insurance program. Using an average occupancy rate of 75%, they derived the number of beds required to achieve the desired normative level of service.

Estimation of effective demand on the amount of service people ordinarily use was the subject of an exhaustive investigation by Rosenthal.[35] He ran a multiple regression correlation of an area's economic and demographic characteristics with its history of demand for hospital services. From this, he developed demand equation for predicting patient days per 1000, admissions per 1000, and length of stay, for each state using demographic characteristics of the state as proxy variables.

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[34]Louis S. Reed and Helen Hollingsworth, How Many HOspital Beds are Needed? (Washington, D. C.: U.S. Government Printing Office, 1953).

[35]The Demand for General Hospital Facilities, op. cit.

Demanded patient days of service are then translated into bed capacity following a standard that a hospital should be completely filled no more frequently than one day out of every 100. Although Rosenthal's analysis provides insight into how various variables structurally affect demand for hospital services, no consideration is given to a normative measurement of medical need. Therefore, the demand equations are economic rather than medical.

Table 26 represents a summary of the various bed standards reviewed in the previous text. Two of the most interesting aspects of these studies are: the lack of consistency in methodology and the wide range of estimates that can be derived for similar and even identical populations. A more exhaustive summary by Palmer indicates that estimates of bed needs can run the gamut from 2.5 to 9.0 beds per 1000 population for similar groups.[36] For general hospital beds, the most common ratios range between 4.5 and 5.0 beds per 1000.

After reviewing the above studies, it becomes obvious that the basic question of how to predict future bed needs has not yet been answered. Several major inadequacies which are both explicit and implicit in the proposed standard are as follows:

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[36] Measuring Bed Needs for General Hospitals, op. cit., p. 3.

TABLE 26.--Summary of Bed Standards for Short-Term Hospital Facilities

	Study	Date	Bed Standard	Occ. Rate	Orientation	Major Variable	Remarks
(1)	New York Academy	1921	5.0/1000	70%	D	Morbidity studies	Professional estimate
(2)	Committee on County Hospitals	1927	5.0/1000	N.A.	D	Not specified	Does not specify if short-term hospital only
(3)	Duke Endowment	1928	5.0/1000 (U)	75% (U)	D	Utilization	Specifies bed need for particular services
(4)	Dr. H. Emerson	1930	5.0/1000 (U) 3.0/1000 (R)	80%	D	Utilization	Urban communities 50,000
(5)	Lee-Jones	1935	4.0/1000	80%	N	Medical records	
(6)	Davis	1937	4.0/1000	80%	N		Modified Lee-Jones Study
(7)	Alden & Patsy Mills	1935	3.0/1000 (R)	N.A.	D	Utilization	Suggest additional variables to consider
(8)	American Hospital Association	1935	(See Text)	N.A.	N	Utilization	Suggest the effect of certain national trends
(9)	Technical Committee on Hospital Care	1938	4.0/1000	80%	N	Medical records	Modified earlier Lee-Jones study
(10)	Public Health Service	1945	4.0/1000 prim. 4.0/1000 Sec.	80%	N.C.	Previous studies	Propose development of medical regions
(11)	Commission on Hospital Care	1947	4.00/1000	75%	N	Morbidity bed-death	First recognition of local variations
(12)	Hospital Survey and Construction Act	1947	See Table 25	N.A.	D	Density and service area	The most relevant standard in affecting planning to date
(13)	Reed & Hollingsworth	1953	N.A.	75%	N	Special group utilization	Normative approach to estimating need
(14)	Rosenthal	1962	Demand equation	Variable	D	Economic & demographic	Ignore measurement of medical need

Note: For references and discussion of above standards see previous text.

N = need D = demand U = urban R = rural N.A. = not applicable N.C. = not clear

(1) Invariably, the prediction is reduced to the number of beds required at some future date. However, the relation between beds and service levels is not made explicit. The need to predict the service role, such as outpatient services for particular hospitals is obvious.

(2) Many of the standards ignore the effect of how local characteristics can affect utilization. It is doubtful if uniform standards as proposed can be applied to all areas of study.

(3) Continual confusion exists between predicting "need" and "demand" for hospital services.

(4) Invariably, only one or several variables are explicitly considered in establishing proposed bed standards. While the implied effect of other variables is mentioned, they are never structurally related to the prediction technique.

While it is beyond the scope of this thesis, and possibly the state of the art, to rectify the above inadequacies, the following considerations are proposed to the hospital system planner when he attempts to predict hospital requirements:

(1) The hospital planner should only utilize uniform standards as a working guide, not as an

answer. The need to consider the potential effect of local characteristics on hospital utilization is necessary. The tempering of bed standards with additional variables will be the responsibility of the intuitive judgement and experience of the hospital planner. The prerequisite to any study will be an analysis of the local health system and its impact on hospital utilization.

(2) Prediction should be oriented to medical need rather than demand. Historical trends indicate a movement of the medical system in this direction. However, planning should be phased so that early construction of hospitals facilities will not exceed utilization and thus be costly. Therefore, long-range planning should reflect a trend towards meeting medical need.

(3) Because of the dynamic and changing pattern of the health care system, the hospital as a physical plant should be designed flexibly. This principle should guide site selection and physical design.

Summary and Conclusions

Inherent in any planning process is the need to predict into the future. Hosital system planning requires that the need for additional facilities at a future date be expressed in quantifiable and measurable terms. However, like all planning prediction methods, the problem is extremely complex. In the final analysis, the rationality of the prediction is a product of a planner's ability to intuitively and consciously adjust standards to local conditions. This assumes two requirements on the part of the planner: first, that he understands the derivation and limitations of the standards being used; and, second, he consciously knows what variables can affect the standard selected. The purpose of this chapter has been to address these two questions.

Like any service system, the hospital service system has to define its level of output in relation to consumption. Historically, confusion has existed as to how the level of consumption is to be defined. Theoretically, the service output of the hospital and the health system was responsive to medical "need." In reality, the economics of the system dictated planning to meet demand. However, trends in Federal legislation have come a long way in restructuring the economics of the health care system towards a responsiveness to need. There still exists a gap between the idealistic and reality. The planner should be aware of

this trend in the system and make long range plans with an eye towards the optimum.

Since 1946, several major trends in short-term hospital utilization have been experienced. The national system has demonstrated an increase in the number of beds per 1000 population, an increase in patient day per 1000 population, an increase in the number of admissions per 1000 population, and a decline in the average length of patient stay. Only the rate of decline in length of patient stay as demonstrated a tendancy to stabalize in the past five years. Although demand has shown a continuous increase at the national level, planners should interpret this cautiously. More important is an understanding of the forces working on the system which result in this trend.

There are many unquantifiable forces which affect the supply-demand relation in hospital system planning. These can be classified into two major categories. The first group is made up of the sub-stystems of the overall health care system. These are: medical manpower, medical programs, and the organizational structure of the health facilities sub-system. The second set of factors which influence demand for hospital facilities can be broadly classified under characteristics of the consumer of hospital services. Each of these groups of variables are undergoing rapid changes which can and will affect the demand and need for medical services in the future.

Many techniques and standards have evolved for predicting future hospital requirements. The measurements are invariably expressed in terms of the number of beds required at a future date. The standards are conceptually of two types: need oriented and demand oriented. After reviewing the development of bed planning standards, it is obvious the question of predicting bed requirements is one which has not been answered. The hospital system planner should interpret these standards with caution when applying them to any particular situation.

Chapter IV will briefly summarize the previous chapters, make recommendations for improving the hospital system planning process, and suggest areas of further needed study.

CHAPTER IV

HOSPITAL SYSTEM PLANNING: CONCLUSIONS AND RECOMMENDATIONS

Introduction

Some final comments and recommendations are in order. The purpose of this thesis has been to provide some insight into what factors should be considered in planning a system of short-term hospital facilities. Chapter I provides a broad perspective on the hospital and health planning movement in the United States. In a general sense, the contents of this Chapter could be described as factors which influence the hospital planning process. Chapter II becomes more definitive in the application of system planning to health care and finally hospital planning. This Chapter further defines the problem down to a single component; the general or short-term hospital. Chapter III provides insights into the complex problem of prediction, which is a basic input into any planning process.

The purpose of this Chapter is one of summary and recommendation. The Chapter is divided into three major sections. The first section provides a brief overview and summary of the first three Chapters. The second

section contains a generalized listing of recommendations which is a product of the previous analysis. The recommendations are broadly classified as being applicable to either the hospital system planning process, or hospital system planning techniques. The third and final section makes recommendations as to desirable areas for further study.

Factors to be Considered in Planning a Hospital System: Summary and Conclusions

Chapter I provides a broad overview of hospital and health planning in the United States. Four general areas of analysis are considered. These are: (1) the economics of hospitals and health care; (2) the role of Federal and State legislation; (3) the effectiveness of administrative techniques on hospital planning, and: (4) problems with the inherited hospital system.

The percentage of the nation's resources in terms of GNP devoted to medical care has demonstrated a relatively high rate of increase during the past 40 years (See Table 1). One of the most relevant factors contributing to this increase has been the changing pattern of preference of the population in relation to medical service as a consumer good. All indications are, that as the nation's population continues to increase in affluence, they will demand both more and higher quality medical services. Therefore the future medical service

system must not only be designed to supply the demand resulting from increased population pressures, but must also provide a higher level of services to meet changing consumption patterns.

That portion of the nation's expenditures devoted to hospital construction has also shown a continual increase. Several major trends have occurred in the pattern of these expenditures which will have a major impact on the planning and construction of hospitals in the future. First, the major source of funds for construction of hospitals now comes from private sources as opposed to public sources prior to 1955 (See Figure 3). In addition, the government has decreased its level of ownership and operation of Federal hospitals. These trends indicate a decrease in potential control over planning the hospital system due to a declining level of input from public funds.

The pattern of distribution of public expenditures for hospital construction shows a direct relation to the size of the governmental unit. The larger or higher the level of government, the greater proportion of its funds are devoted to hospital construction. In addition, the per capita expenditures for hospitals increases in direct relation to city size (See Table 6). This phenomenon supports the fact that planning hospital facilities is a metropolitan regional phenomenon. Any attempt

to plan such a system must be undertaken on a regional basis.

Three types of federal legislation have had an impact both directly and indirectly on hospital planning. The first type has been directed at improving the quality of medical care for particular social groups within the economy.[1] Medicare and Medicade programs represent the most ambitious efforts of this type of legislation. Major federal legislation during the past decade has been oriented in this direction. The second form of legislation deals with providing funds for hospital construction. The Hill-Burton Act of 1946 is characterized by its impetus towards developing a nationwide system of hospitals by controlling federal expenditures on hospital construction in relation to a statewide and national plan. The third form of federal legislation deals with establishing effective mechanisms for hospital and health planning. The recently passed Public Law 89-749 represents a major milestone in this direction. In summary, trends indicate federal legislation in the future will be largely directed at improving the delivery of medical services to particular social groups, and at improving administrative mechanisms for health planning.

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[1]In addition, there are those programs which provide funds for medical research.

The role of state governments in developing legislation to improve the health planning process has been largely ineffective. Those state laws which deal with the hospital planning process have been generally weak. Except for the review powers of State Hill-Burton Agencies, the State generally does little outside voluntary control to coordinate and direct hospital construction within its environs. Most states have, however, developed statutes which provide for the establishment of special districts to tax for the support of a public hospital. However, the use of these statutes has been the exception rather than the rule.

In response to the need to coordinate and plan hospital construction in metropolitan areas, the phenomena of the voluntary areawide hospital council has emerged. The effectiveness of these councils in planning the future hospital system has been minimal. The major reasons they have been unable to influence planning are: (1) lack of any formal power to implement their decisions; (2) no financial base to support their work, and; (3) lack of adequate tools and principles upon which to make planning decisions. The future of voluntary councils is open to question as a result of the enactment of Public Law 89-749. In any event, for voluntary councils to become effective, the above weaknesses will have to be overcome. It is unlikely if

anything less than public supported and implemented planning can be adequate in influencing the health care system.

Historically, urban planners have shown little concern with hospital and health planning. In response, hospital planning has been carried on in isolation of the urban planning process. A recent study by the Public Health Service represents a major effort in documenting the lack of cooperation and communication between these two functions (See Tables 8-12). The rationale which has led to separation of these two planning functions is more a product of historical development than necessity. The need for improved coordination and cooperation is obvious. Only through the development of mechanisms which either centralize the two planning processes or improve the communication between them, can a true system concept be applied to the health planning process.

Historically, the hospital has developed as an urban phenomenon. In any metropolitan area there is usually a complete gamut of federal, state, and local voluntary profit and non-profit hospitals. The changing ecology of the city has resulted in certain major gaps between the output of service of the existing system of facilities and services required resulting from new urban forms. Thus, the need for a new distribution network of facilities has resulted.

One major barrier to improving the health planning process has been the obvious lack of adequate planning concepts. The application of a generalized system concept offers potential to overcoming this barrier. The application of system methodology requires a four step recycling process, which is: (1) system identification; (2) component identification; (3) component structuring, and; (4) system design (See Figure 14). Chapter II addresses the problem of defining the general or short-term hospital as a component of the health facilities sub-system of the broader health care system.

In order to plan the short-term hospital component it is necessary to define the recognizable sub-systems which make up the health care system. Three such systems are to be considered. First is the medical activities system. This system represents the interaction or activities between the consumer of medical services and the point of delivery of service. Medical activity systems are the least formal or structured systems of the medical service system. The second major system is the Health Care System. The recognizable components of this system are health services, health manpower, and health facilities. The health facilities sub-system can be further broken into various types of hospitals by function. These are: long-term hospitals; short-term or general hospitals: and specialized hospitals (See

Figure 15). The short-term hospital is a major component of the health facilities system and represents the major area of concern for the remainder of the thesis.

Several characteristics support the significance of the short-term hospital as a major component in the delivery of medical services. While the general short-term hospital accounts for only 49 percent of all medical beds, they admit 97.5 percent of the 28.8 million patients and provide almost all of the 125.1 million outpatient and emergency department visits. They also account for 68 percent of plant investment in hospitals, 72 percent of all medical assets, and 79 percent of annual medical expenditures.[2] In addition, payments for short-term hospital services represent a major proportion of personal medical expenditure. By improving the delivery of short-term hospital services through system planning, a direct and major improvement in the quality of health care can be expected.

In order to plan a network of hospital facilities it is necessary to define hospital prototypes (component identification), and how these prototypes structurally relate to meet total regional demand. Most standards developed to date are presented in terms of the minimum

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[2]L. M. Abbe, and A. B. Barney, The Nations Health Facilities: Ten Years of Hill-Burton Hospital and Medical Facilities Program 1946-1956 (Washington D.C.: U.S. Government Printing Office, 1961).

and maximum number of beds desirable for a hospital unit. Although little economic justification exists for setting minimum size standards, the quality of service shows a major decline for hospitals of less than 200 beds (See Table 18). There is reasonable justification for establishing a minimum size of 150-200 beds on the quality of service alone. Smaller units should be planned with an eye for future expansion.

The next basic question relates to the structural relation between the various short-term hospital prototypes. The structure most often proposed, and supported by a service analysis (See Table 20), is that of a hierarchical short-term hospital facilities system. Under such a system it is necessary to define the service role (output) of each prototype, and how these structurally relate to meet total regional demand. Table 23 represents a summary of the standards proposed and prototype requirements suggested in this thesis.

The final requirement in hospital system planning is related to prediction. Chapter III addresses the complex problem of predicting the future demand for short-term hospital facilities. Conceptually the chapter is divided into two sections. The first section deals with a definition of demand, national patterns in short-term hospital utilization, and factors which influence the demand variable. The second section reviews

the major standards historically used to predict future bed needs.

In order to predict future hospital requirements a criteria of measurement is necessary. Historically, confusion has existed within hospital planning as to what criteria should be a basis of prediction, medical need or demand. Need is a medical concept. It represents the normative approach of planning for that level of services which is required for good health care. Demand is an economic concept. It represents planning the future system to provide that level of service the population will be able to purchase as a consumer good. In the past, the medical care system was strongly oriented towards demand. However, the increasing numbers of federal programs are in many ways restructuring the system towards having some sensitivity to need. Yet the gap is still wide. Long-range hospital planning should be done with an eye towards planning for future medical need.

Historically, national patterns in hospital utilization have been dynamic (See Table 24). There has been a steady increase in the number of beds per 1000 population, in the number of admissions per 1000 population, in the number of patient days per 1000 population, and a steady decline in the average length of stay. Only the length of stay has shown any

tendency towards stabilization in the past 15 years. However, because of the structure of the health system and its sensitivity to many forces, planners should interpret these trends with caution. More relevant to the prediction process is an analysis of the various forces at work and how they might affect hospital utilization in the future system.

These are two basic sets of factors which influence the demand for short-term hospital facilities. The first set are those factors which fall under the heading of sub-systems of the overall health care system (See Figure 15). This set includes medical manpower, medical programs, and the organizational structures of the health facilities system. The second set of factors which can influence demand can be classified as characteristics of the consumer of medical services (medical activity systems). This set would include cultural variations, sociodemographic variations, and economic variables. It is important that the prediction process include explicitly both macro and micro consideration of these variables. However, because of these many dynamic forces working on the system, the prediction process should be utilized as a flexible guide and not as an absolute figure.

Invariably, the process of prediction in hospital planning has been reduced to various standards for bed

requirements (See Table 26). These standards have been of two types. The first are those which are derived from an analysis of existing utilization of short-term hospital facilities. These reflect and extrapolate the demand orientation of the existing system into the future. The second type of standards are based on various measurements of medical need. Except for the PHS Study in 1947 all the standards are proposed for nationwide utilization. After reviewing the collection of standards to date it becomes obvious that the basic question of predicting bed requirements has not been adequately studied. First, the standards as developed only explicitly consider several of the many variables which affect the system. And, second, the short-term hospital provides a greater community service role than can be indicated by bed measurement alone.

Recommendations to Improve Hospital System Planning

The purpose of the following section is to provide a listing of recommendations which would improve hospital planning. Their derivation represents a culmination of analysis of the entire thesis. Conceptually the recommendations are divided into two broad categories. First, are recommendations to improve the hospital system planning process. This includes economics of health, legislation and governmental roles, and administrative and

planning mechanisms. The second set includes recommendations to improve hospital system planning techniques. Often included under the recommendations is a listing of additional considerations.

Recommendations to Improve the Hospital System Planning Process

Recommendation 1.--It is recommended that the federal government take a more comprehensive approach in designing legislation which is both directly and indirectly related to hospital and comprehensive health care. Major considerations in such legislation are:

> Legislation designed to improve the delivery of medical services to a particular social group should be related comprehensively to the development of facilities for improving the delivery process. For example, the construction of a particular hospital facility.
>
> That comprehensive health planning be a prerequisite to any federal participation in local health matters (Ex., P. L. 89-749).
>
> That fragmented federal programs should be consolidated into one comprehensive national health program.
>
> The federal role in funding should, when possible, require local participation through matching grants. That way, the greatest impact on the national system can be realized with a minimum of federal investment.
>
> Federal programs directly related to health care should be explicitly related to other federal programs. For example, urban planning legislation with a health facilities component should be related to other federal health programs.

Recommendation 2.--The state level of government should take a more active role, through planning and legislation, in health matters within the state.

> The states should develop state-wide comprehensive health plans, and these plans should be periodically reviewed and updated for conformance to national objectives.
>
> The state government should enact legislation which permits the development of regional planning and taxing units necessary for adequate hospital and health planning and implementation.
>
> The state central health planning function should exercise review power over regional health planning. This control should be undertaken with an eye to other planning functions at the state level.

Recommendation 3.--Essential to health-service planning is the concept of a region from which community efforts to organize comprehensive care can draw needed support.

> A region should be defined as the smallest geographic area that can be self-sufficient medically. Self-sufficient in this sense means the adequate availability of every health skill and resource. The region should be centralized around a metropolitan area.
>
> The definition of a region should give reasonable attention to the existence of established patterns of health care, as well as governmental units such as cities, counties, regions, and states.
>
> A regional comprehensive health plan should be developed which gives adequate consideration to both providers and consumers of health care.

Recommendation 4.--All urban and regional planning functions should adequately contain a health component.

> There should be both formal and informal lines of communication between the various planning operations at all levels.

> The "general or master" plan as a document should contain both a health facilities and health program section. This plan should contain an analysis of existing as well as projections for future requirements of the health care system, and these should be related to overall planning objectives.

Recommendation 5.--Hospitals, as an institution, acting individually and jointly, should explore every available modern means for improving management, raising productivity, and reducing cost, including employment of budgets, voluntary planning, operations research, and computer data processing.

> Hospitals should voluntarily organize in order to effectively improve their service role to the community.

Recommendation 6.--That academic programs be developed for the purpose of training professional planners in health matters.

> Such programs should be oriented towards applying planning methodologies to health problems.

Recommendations to Improve Hospital System Planning Techniques

Recommendation 7.--Conceptually, health care and services should be analyzed using a generalized system methodology. As a minimum, health care is made up of three recognizable sub-systems: medical programs, medical manpower, and health facilities.

> The role and scope of each sub-system should be defined along with lines of interaction as a prerequisite to any planning process.

Recommendation 8.--High priority be given to the development of a regional short-term hospital system. The short-term hospital should be considered a major component in the delivery of medical services in the future.

> The short-term hospital should be planned with an eye for an increasing community medical service role. For example, outpatient care, medical education, family planning, etc.

Recommendation 9.--The short-term hospital should be planned as a hierarchical structured service institution distributed throughout the region in order to maximize its effectiveness.

> A system of associate or satellite facilities be developed where feasible as a mechanism for delivering health services.
>
> The roles and responsibilities of each facility be clearly defined and lines of communication be well-established to assure orderly and effective use.
>
> The hierarchical system structure of the short-term hospital should conform to the standards presented in Table 23 of this thesis.

Recommendation 10.--The future hospital system should be planned to meet medical need, not demand.

Recommendation 11.--Techniques and standards for predicting future bed requirements in planning a regional hospital system should be tempered with addition factors. Factors which should be considered are:

> The rational and analysis behind the derivation of the standard being used and how it applies to the case in point.

The potential effect of local cultural, sociodemographic, and economic variables on hospital utilization.

The potential effect of the organizational structure of the local health care system on hospital utilization.

In the final analysis, much consideration should be given to local variations in predicting hospital requirements.

Recommendation 12.--Because of the inherent inability to predict future medical need accurately, the design and construction of health care facilities should be approached from the standpoint of flexibility of use.

General Areas for Further Study

Much of the hospital planning research effort completed to date has been directed along several narrow areas of interest. As a result, a gap exists between the level of knowledge represented by the state of the art, and the level of knowledge necessary to effectively plan a hospital system. During the research effort of the previous thesis, several such gaps loomed to the forefront. The purpose of this section is to suggest generalized areas which merit further study.

One area of knowledge which has received little attention in the literature is represented in the concept of "medical activity systems" of Chapter II. Few studies have attempted to document the individual family units activity patterns with respect to its needs for medical services. In the final analysis, the individual will be

the initiator of activities, both formal and informal, which result in consumption of a medical service. The motivating force which generates these activities for different people, in terms of attitudes and values, has never been studied or documented. Similarly, the formal relation between the doctor and patient has never been studied in terms of a medical activity generator. This lack of research leaves a large gap in the knowledge which is necessary to understand and thus plan the health care system.

Although many studies attack the problem of the economics of the hospital as an institution, they fail to provide standards and techniques upon which the development of hospital prototypes can be based. Most of the studies attack the economics of the hospital based solely on management. Thus, a whole group of costs, such as transportation, are ignored. In reality however, these costs are transferred to the consumer and can be a very real input in the economics of health care. It is important that future studies begin to view the hospital as a service institution and consider the community transferred costs in hospital planning. Studies should be undertaken to document transferred cost so they can become an input in hospital planning decision.

Similarly, a more structured research effort is need with respect to the internal economics of hospitals. Questions which needed to be answered are: What

are the marginal economics of various hospital services and how do these relate to various hospital sizes? What is the minimum desirable size hospital which can provide a standard level of service? And, do points of scalar economics exist in hospital size? Only when the hospital is broken into parts by services, and studied in isolation, can a new mix of services be developed into innovative hospital prototypes.

The prediction process also needs further study. Efforts should be directed at measurement of medical need based on normative standards of health, not on demand analysis. This requires the establishment of measurements of "good" health, and the relation of these measurements to medical service needs. In addition, prediction techniques should be directed at establishing service requirements, not the number of beds. The short-term hospital is becoming more and more a point of delivery of outpatient services which need to be planned in addition to bed requirements. The development of standards or techniques will be necessary before hospital system planning will become a reality. Yet the benefits of a system methodology to both the process and techniques is obvious. If this thesis does no more than support the pursuit of this concept by further research, its goal will be achieved.

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