

Requirements

INTRODUCTION

Faced with what seemed to be a straightforward question on what our country's physician supply is and will be, we have found that supply projections are not definitive and need to be revised periodically. And in somewhat circular fashion, supply projections can be substantially dependent on deliberate Federal actions at the same time that Federal actions are somewhat dependent on supply projections.

Even if there were agreement on the assumptions underlying the supply projections, what the projections mean in terms of meeting the requirements for physicians would still be unclear, as the numbers represent self-designated specialties, general estimates of physicians in actual patient care activities, and general estimates of the locational distribution of the supply of physicians. In order to compare supply with requirements, common standards of quantification (e.g., full-time-equivalents (FTEs), what counts as primary care and what types of physicians provide it, etc.) must be applied to both estimates.

The limitations imposed by definitional problems compound the problems that arise from the specific assumptions underlying the supply projections. Reaching agreement on the assumptions underlying the projections (e.g., the future prospects for cavitation and its effect on the number of domestic graduates) is a separate question from agreeing on questions such as what counts as primary care and how the volume of primary care is to be translated into specific numbers of physicians in the various specialties. In other words, the separate projections for supply and requirements and comparisons between the two have both best-guess and value-laden assumptions undergirding the methodologies.

The first task in estimating requirements for physicians is to decide what method should be adopted. A 1977 review of the literature

(USDHEW, 1977a) concluded that the approaches could be categorized into one of four groupings and pointed out that the first relates to treatment of all medical needs, as determined by disease prevalence and morbidity data, and that the other three categories deal with the demand for care, as derived from the opinions of health professionals, calculations of service requirements and manpower productivity, and observed staffing patterns in prepaid group practice settings (health maintenance organizations, or HMOS). The four categories were defined as:

- *Medical need based ratio.* —A ratio which describes the number of health professionals required to care for a given population if all disease conditions that require treatment (existing utilization plus unmet needs) are actually treated. Data on morbidity or disease incidence and prevalence must be used.
- *Professional judgment based ratio.* —A ratio which reflects the opinion of health professionals or health manpower experts regarding the number of health professionals needed to meet the expressed demands for care of a given population. This cluster encompasses "ideal," "adequate," and "minimally acceptable" ratios. The standard is derived from an aggregate assessment of the manpower situation, without detailed consideration of utilization or productivity factors.
- *Demand/productivity based ratio.* —A ratio which describes the number of health professionals needed to care for a given population, as derived from specified assumptions about services demanded and/or manpower productivity. Calculations may account for changes in technology, health insurance coverage, composition of the population, utilization of allied health personnel, and similar factors.

- *HMO based ratio.* —A ratio which directly reflects or is derived from observed staffing patterns of prepaid group practice.

This review concluded that three of the four approaches required special “leaps of faith:”

Need-based standards are appropriate for planning only if consumers are both able and willing to express all medical problems or demands for services. Acceptance of professional judgment based standards requires blind faith in the knowledge and foresight of those consulted—especially ironic in that “medical expertise” (knowledge of diagnosis and treatment requirements) is only one of many types of information needed to estimate manpower requirements. Adoption of HMO based standards (adjusted HMO staffing patterns) assumes that most care will be provided through this delivery mode which integrates both financial and delivery system variables.

The fourth approach, the calculation of requirements estimates based on explicit utilization and productivity assumptions, requires no leaps of faith, but neither does it provide unambiguous guidance. It is viewed, nevertheless, as the most valid approach available for estimating health manpower requirements. Its value to the health planner is that it focuses attention on the parameters which determine manpower requirements. In doing so, it lays the groundwork for integrating manpower with health system planning. In this broader context, policies can be formulated to influence these parameters and modify health manpower requirements in a socially desirable manner.

Another criticism frequently leveled at projections of the future requirements for physicians is that the modeling effort may be a static, snapshot picture of the health care system and does not sufficiently account for change. This criticism is most frequently raised when a single

physician-to-population ratio, as derived from a particular modeling effort, is used to project future requirements. The use of a fixed ratio represents the conclusion that physician requirements should (or would) change in direct proportion to population growth. A fixed ratio does not take into account any trends toward increasing *per capita* use of physician services. Thus, the use of a fixed physician-to-population ratio versus the use of changing ratios will lead to quite different estimates of the future requirements for physician services. If changing ratios are used: 1) the rate of change adopted will have a significant effect on the calculation of future requirements, and 2) at some point, a leveling off of the rate of change has to occur.

Table 25 compares supply with requirements using the studies in the literature review just cited (USDHEW, 1977a) that led to the *highest* estimates of requirements. Each of these studies estimated requirements for a specific year: for the HMO method, estimates were made for 1972; for the need-based method, estimates were for 1974; for professional judgment, 1975; and for demand/productivity, the year chosen was 1980. As these projections excluded osteopathic physicians, the supply column in table 25 is limited to allopathic physicians (MDs). Taken together, table 25 shows that there was an approximate balance between supply and requirements in the 1970's.

Table 26 is modified from a 1970 analysis (Hansen, 1970) of physician requirements projections for 1975, the year which is the basic starting point for current projections. Again, we see a fairly wide range of requirement estimates, with the midrange approximately in balance with the actual supply.

Table 25.—Comparisons of Aggregate Physician (MD) Supply With Requirements Using Different Models

	Rate/100,000	Target year	Total	supply
HMO.....	153.6	1972	321,000	333,000
Need-based.....	167.8	1974	355,600	351,000
Professional judgment. .	187.3	1975	400,000	366,000
Demand/productivity . . .	182.8	1980	407,000	430,000 (projected)

SOURCE: See text.

**Table 26.—1960's Projections of Physician Requirements in 1975
(actual supply in 1975 equals 378,000)**

Projection study	Requirements	supply	Deficit (-) or surplus (+)
Bane Committee Report (1959) ^a	330,000 (minimum)	312,800	- 17,200
		318,400	- 11,600
Bureau of Labor Statistics (1966) ^b	305,000	—	—
Fein (1967) ^c	340,000 to 350,000	361,700	+ 21,700 to + 11,700
	372,000 to 385,000		- 10,300 to - 23,300
National Advisory Commission on Health Manpower (1967) ^d	346,000 (minimum)	360,000	+ 14,000
Bureau of Labor Statistics (1967) ^e	390,000	360,000	- 30,000
Public Health Service (1967) ^f	400,000	360,000	- 40,000
	425,000		- 65,000

^aSurgeon General's Consultant Group on Medical Education, Frank Bane, Chairman, *Physicians for a Growing America* (Washington: Government Printing Office, 1959).

^bU.S. Bureau of Labor Statistics, "America's Industrial and Occupational Manpower Requirements, 1964-1975." In: *The Outlook for Technological Change and Employment, Appendix Volume I to Technology and the American Economy, report of the National Commission on Technology, Automation, and Economic Progress* (February 1966).

^cRashi Fein, *The Doctor Shortage: An Economic Analysis* (Washington: The Brookings Institution, 1967).

^dNational Advisory Commission on Health Manpower, *Report, vol. II* (Washington: Government Printing Office, 1967).

^eBureau of Labor Statistics, *Health Manpower 1966-1975, A Study of Requirements and Supply* (Washington: Government Printing Office, 1967).

^fPublic Health Service, *Health Manpower, Perspectives 1967*, (Washington: GPO, 1967).

SOURCE: W. L. Hansen, "An Appraisal of Physician Manpower Projections," *Inquiry* 7: 102-113, 1970.

Two other observations are of interest. Fein's estimates are provided in two sets of numbers. The first set, **340,000 to 350,000** is based on population growth alone. This would be analogous to the use of a fixed physician-to-population ratio to predict, in 1967, the demand in 1975. The second set of numbers, **372,000 to 385,000**, is based on an increase due to all factors. It would be analogous to including further increased requirements due to increasing per capita utilization of physician services. Finally, it should be noted that the estimates of "requirements" of the Bureau of Labor Statistics (BLS) were revised markedly between 1966 and 1967, increasing from 305,000 to 390,000. In essence, it was a judgment that, given rising demand for physician services, **85,000** more physicians could be employed.

In pursuit of quantifying future "appropriate demand" or "requirements," little attention has been paid on past and current balances or imbalances between the supply of and requirements for physician services. Policy has been less concerned with whether the projections were correct than with the effect of such projections on current decisionmaking. Thus, this assessment concentrates on the two modeling efforts that will have the most impact on Federal health manpower policy, the sustained modeling and projection activities of the Bureau of Health Manpower's (BHM) Division of Manpower Analysis, and the yet-to-be completed deliberations of the Graduate Medical Education National Advisory Committee (GMENAC).

ECONOMIC MODELS

The Bureau of Labor Statistics Model

The U.S. Department of Labor's BLS provides projections of demand and training needs for the major occupations every 2 years (BLS, 1979a). Thirteen occupational groupings are analyzed, including the health occupations. The

health occupations are medicine; dentistry; nursing; medical technologists, technicians, and assistants; therapy and rehabilitation; and other health occupations. These projections relate manpower to projected economic demand (ex-

penditures) as provided by the Bureau's model of the future economy, which projects the future gross national product (GNP) and its components—consumer expenditures, business investment, governmental expenditures, and net exports; industrial output and productivity; the labor force; average weekly hours of work; and employment for detailed industry groups and occupations.

Current projections are based on the following assumptions:

- the institutional framework of the U.S. economy will not change radically;
- current social, technological, and scientific trends will continue, including values placed on work, education, income, and leisure;
- the economy will gradually recover from the higher unemployment levels of the mid-1970's and reach full employment (defined as an unemployment rate of 4.7 percent in 1985 and 4.5 percent in 1990); and
- trends in the occupational structure of industries will not be altered radically by changes in relative wages, technological changes, or other factors.

Beginning with population projections by age and sex from the Bureau of the Census, projections of the total labor force are derived by using expected labor force participation rates for each group. The labor force projection is then translated into the level of GNP that would be produced by a fully employed labor force. The GNP projection is then divided among its four major components—consumer expenditures, business investment, governmental expenditures, and net exports. Each component is broken down by producing industry. Medical care falls under the consumer expenditure component. Estimates of future output per hour are derived from productivity and technological trends in each industry, and industry employment projections are derived from the output estimates. These projections are then compared with employment projections through the use of regression analysis. Comparison of the two methods is used to identify inconsistencies of one method with past trends or with the Bureau's economic model, and the projection is ad-

justed as needed. **Projections of industry employment are translated into occupational employment projections for each industry (201 industry sectors and 421 occupation sectors). The growth rate of an occupation is determined by: 1) changes in the proportion of workers in the occupation to the total work force in each industry, and 2) the growth rate of industries in which an occupation is concentrated.**

In addition to occupational employment projections, attrition from the existing work force is calculated to estimate average annual replacement needs for each occupation over the projection period.

Supply estimates assume that past trends of entry into the particular occupation will continue. These estimates are developed independently of the demand estimates; i.e., wages do not play a major role in equating supply and demand.

Table 27 summarizes these projections. 1985 projected employment (demand) of 520,000 physicians, up from 375,000 in 1976, equals the projected supply (see tables 9 and 10).

Table 27.—Bureau of Labor Statistics Projections of Physician Supply and Requirements, 1985

Employment, 1976	375,000	
Projected employment, 1985 ..,	520,000	
Percent growth, 1976-85	37.8	
Average annual openings, 1976-85	21,800	
Growth	(16,000)	
Replacement	(5,800)	
Available training data:		
	1975-76	Projected 1976-85 (annual average)
MD degree	14,163	15,997
DO degree	806	1,128

SOURCE: *Occupational Projections and Training Data*, Bureau of Labor Statistics, Department of Labor, Washington, DC., Government Printing Office, Bulletin 2020, 1979, pp. 64-65.

BLS, in its forthcoming revisions of its estimates to include 1990 projections, will adopt the midpoint of the range of projections from the BHM model for physician requirements. BLS considers the BHM model as more sophisticated for two reasons. First, while the BLS model incorporates population as a variable, no consideration is given to the varying utilization rates of the demographic components. Women

use more physician and hospital services than men, and older people require more care than the young. The BHM model does capture these aspects of demand. Second, the BHM model estimates the effects of possible price elasticity for physician services and provides a narrow range of the resultant expected demand for physician services.

BLS also points out that both its and BHM's models cannot measure and project the capacity of physicians to stimulate demand. A downward bias in the projections would result if physician-stimulated demand reflects real need for medical care. To the extent that physician-stimulated demand reflects unnecessary care, the demand estimates would introduce an upwards bias to the projections.

BLS also points out two other factors which would bias the BHM projections in an upward direction. The inclusion of data points from 1968 and 1969 for projecting utilization rates reflect the sharp growth in utilization attributable to Medicare and Medicaid startup. (As we will explain later, we agree that 1968 and 1969 data points should be excluded in determining utilization trends, but not for the reason given by BLS). Second, BLS points out that as the coinsurance (that part of fees paid by the patient) has been and is projected to continue dropping, the effective price of physician services has dropped as well. BHM's assumption of a constant price elasticity means that a percentage drop in coinsurance from 20 to 10 percent would result in the same percent increase in the demand for physician services as would a drop in coinsurance from 50 to 40 percent. A more likely effect would be that consumer demand would gradually be saturated as the percentage coinsurance decreases (BLS, 1979b).

The Bureau of Health Manpower Model

BHM uses a demographic projection method which makes certain assumptions about medical care utilization and physician productivity to arrive at its estimates for physician requirements. The general method is not specific to physicians and is applied to 29 general types of health manpower, ranging from selected MD

specialties to broad allied health groups. Although specialty-oriented estimates for physicians can be calculated from the total population's utilization of specific types of care by cross-multiplying the projected size of each population subgroup by its associated utilization rate, the method is presently not considered reliable enough to use in projecting specialty-by-specialty requirements.

The basic assumptions are:

- No major unforeseen events will occur in the projection period, including the enactment of a comprehensive program of national health insurance (NHI).
- Supply and demand were in balance in 1975. As we have seen from tables 25 and 26, past estimates are in general agreement with this assumption.
- Physician productivity does not change substantially between 1975 and 1990.
- Price elasticity, the sensitivity of demand to net price, remains constant between 1975 and 1990. (Different choices of price elasticity of demand coefficients, representing alternative rates of consumer response to price changes for a given personal health service, are used to present the range of estimates.)
- Nondollar costs of obtaining care do not change substantially during the projection period.
- No major health care or manpower substitution occurs between service categories.

The model is developed in three stages which, in practice, may be separated or combined as desired. The most rudimentary stage is termed the "framework." It estimates future demand from the anticipated impact of population growth and demographic shifts (age, sex, income distributions) on the economic demand for medical services, with physician productivity assumed to remain the same. In this first or framework stage:

- The U.S. population is projected to 1980, 1985, and 1990 by age, sex, and income subgroups in 40 components (5 age by 4 income by 2 sex groupings).

- For each of the 40 subgroups, a utilization rate for each of 20 types of health service settings (e.g., general medical office visit, inpatient hospital admission, nursing home stay, vision care, laboratory services, etc.) was estimated from recent National Health Interview Survey data and other sources for the 1975 base year and the future years.
- The percentage increase in utilization for each of the 20 types of care is obtained by summing over the population and dividing the future year utilization by the 1975 base year utilization for that type of care.

The second stage, called the “baseline” configuration, attempts to factor the effects of historical trends in per capita utilization of medical services into the general model. In this second stage:

- Utilization, by each of the 20 care types, is adjusted to account for future increases that represent continuation of recent trends. Economic and noneconomic trends are analyzed separately. Economic trends interpret the effects of price and insurance copayment charges on changes in utilization. As noted earlier, the price elasticity is assumed to be constant over the period 1975-90. The utilization projections in each of the 20 care types are then individually adjusted for the future years, based on these projections of price and coinsurance payment. After removing price effects from the past utilization trends, the remainder (representing education, consumer preference, patient-care physician supply, etc.) is the noneconomic trend. This noneconomic effect is assumed to continue in a linear fashion into the future and per capita utilization adjustments for each care type are made.
- The adjusted increases in future care utilization are then applied to the 1975 estimates of the distribution of the 29 manpower categories in each of the 20 care types to give a preliminary estimate of the future manpower required to provide the projected care utilization.
- Adjustments are then introduced to account for trends in the manpower required

to provide a given amount of care utilization. For physicians, it has been previously noted that the assumption is that productivity remains constant from 1975-90.

- Demand is then summed over the 20 types of care to arrive at the baseline forecast of future demand.

These estimates assume no major departure from historical experience. The third stage, the “contingency” modeling capability, is a separate component that has been used to explore the possible impact on the economic demand for physician services of the following contingencies:

- The impact of NHI can be estimated by adjustments to the utilization increases through new economic trend adjustments which provide for different NHI copayment possibilities.
- Expanded-function task delegation can be factored in by new adjustments to the manpower staffing trends based on alternative assumptions of midlevel practitioner employment and their productivity rates.
- Expanded use of HMOS is treated by alternative estimates of the population enrolled in HMOS in future years and separate utilization rates, trends, and staffing assumptions for this part of the population.

The Framework

To predict the impact of population growth and demographic shifts, the model starts with the basic assumption that supply and demand were in balance in 1975 and calculates per capita utilization rates for each of 40 population segments (age by sex by income categories) with respect to 20 forms of health care. Table 28 displays the population matrix utilized; table 29 indicates the various health care categories. Note that the BHM health care categories include care setting (office-based, short- and long-term hospital care, nursing homes) as well as types of care (pediatric, surgical, psychiatric). Thus, the capability of the BHM model to make distinctions among physician specialties is not very fine-grained. The basic distinctions made are between general medical, pediatric, obstetrics-gynecology, psychiatric, vision, surgical,

Table 28.—Population Matrix Used in the BHM Model

	Family income				
	Under \$5,000	\$5,000-\$9,999	\$10,000	\$14,999	\$15,000 and over
Males					
Under 14					
14-24					
25-44					
45-64					
65+					
Females					
Under 14					
14-24					
25-44					
45-64					
65+					

SOURCE. JWK International Incorporated, Evaluation of Project SOAR (Supply, Output, and Requirements), draft report, DHEW contract No. HRA 232.78-0140, 1979.

Table 29.—Health Care Categories Used in the BHM Model

Setting	Form of care	
Medical office	General care	
	Pediatric care	
	Obstetric-gynecological care	
	Psychiatric care	
	Vision care	
	Other medical office care	
Short-term hospital	Outpatient care	
	Surgical care	
Long-term hospital	Medical care	
	Psychiatric care	
Other care settings	Other long-term hospital care	
	Nursing home care	
	Dental care	
	Veterinarian services	
	Optometric care	
	Podiatric care	
	Other patient care, not elsewhere specified	
	Noncare settings	Pharmacy services
		Laboratory services
		Noncare activities, not elsewhere specified

SOURCE JWK International Incorporated, Evaluation of Project SOAR (Supply, Output, and Requirements), draft report, DHEW contract No HRA 23278-0140, 1979

podiatric care, and “all other.” Finally, it should be noted that the overall model applies to 29 categories of health manpower (including veterinary medicine). Accordingly, all 20 health care categories do not come into play in estimating physician demand.

Utilization rates are “calculated for each applicable category of health care for the 40 population subgroups (based on recent National Health Interview Survey data, etc.). Changes in

population size and in demographic distribution (age by sex by incomes) are calculated for future years. 1975 utilization rates for each category are then projected onto the future population estimates and the results are summed to obtain expected utilization of services.

Based on population and demographic shifts, physician demand is expected to increase by **9.5** percent between 1975 and 1990 (Cultice, **1979**) yielding an estimated demand of **414,336** in 1990. This corresponds to a projected increase in the population of 10.5 percent in the same period. Of the **414,336** physicians, 229,276 are expected to be in demand in office-based settings (versus 205,196 in 1975), and 126,008 in short-term hospital care (versus 117,573 in 1975). The remaining **59,052** physicians are expected to be in demand in other care settings.

The anticipated population changes between now and **1990** that are most pronounced and appear most likely to impact on utilization patterns are: 1) an aging population, and 2) strong signs of upward income mobility, measured in constant (1970) dollars.

Although the U.S. population is aging, that does not mean the 1990 population will be an elderly one. Growth in the over-65 category will, in fact, be small (from 9.5 percent of the total population to **12.3** percent). Rather, the bulk of the population will be in the prime of adulthood, **25** to 44. The percentage of Americans in this age category is projected to grow

from 23.6 to 32.9 percent. Correspondingly, the percentage of persons under 25 is projected to drop sharply (from 46.3 to 35.4 percent).

The projected shift in income distribution is more dramatic than the age shift. The percentage of individuals whose family income, measured in 1970 dollars, lies below \$10,000 is projected to shrink from 50.6 to 20.2 percent, while the percentage of those with family incomes of \$15,000 or greater is projected to grow from 23 to 58.1 percent—a complete reversal of the percentages in the below \$10,000 and above \$15,000 groups respectively.

These population changes are summarized in table 30.

Changes in the age and income composition of the population can be expected to bring about changes in patterns of utilization of medical services. Specifically, we can anticipate that those forms of care more heavily used by the elderly and by those with higher incomes will grow more rapidly than those forms used by the young and by the poor, and that physician services most closely associated with the former will also experience a higher rate of growth. Thus, the greatest growth rates are projected for nursing home and podiatric care (both utilized more heavily by the elderly) and for psychiatric, vision, and dental care (services used more by those with higher incomes). Conversely, the

lowest growth projections are for pediatric care and hospital outpatient care (more frequently used by the poor). The population shift into the 25 to 44 age bracket is also expected to increase demand for ob-gyn care somewhat, because these are the childbearing years. It is worth observing that though the U.S. population is aging, we will not be faced with providing for the medical needs of a heavily geriatric citizenry as of 1990. The major growth is going to be in the age group 25 to 44, which is traditionally a comparatively healthier age group relative to both children and the elderly.

It is also noteworthy that most of the health care areas projected to grow as a result of demographic shifts are areas in which services are not provided by physicians (dental care, podiatry) or only partially so (vision care, nursing home services).

The projected growth rates for the 20 types of health services is summarized in table 31. Note that the growth factor attributable solely to overall population growth is 110.5 percent; i.e., the population will have grown 10.5 percent between 1975 and 1990. Thus, surgical care is projected to grow at barely over the overall population growth rate (0.4 percent higher), and both general medical office-based care (108.9 percent) and medical care in short-term hospitals (103.3 percent) are projected to grow at less

Table 30.—Projected Shifts in Age and Income Distribution, 1970-90

	Percent distribution, by year ^a				
	1970	1975	1980	1985	1990
Age					
Under 14	26.8%	23.20/0	20.50/.	19.5%	19.4%
14-24	19.5	20.8	20.5	18.5	16.0
25-44	23.6	25.1	28.1	31.1	32.9
45-64	20.6	20.4	19.8	19.2	19.4
65 +	9.5	10.5	11.1	11.7	12.3
Total	100.0%	100.070	100.0%	100.0%	100.0 ^a 4
Income^b					
Under \$5,000	19.90/0	16.6 ^{"/0}	11.6%	9.9%	8.6%
\$5,000 - \$9,999	30.7	23.4	20.2	16.9	11.6
\$10,000 - \$14,999	26.4	24.1	24.3	21.2	18.7
\$15,000- and over	23.0	35.8	43.7	51.9	58.1
Total	100.0%	100.0%	100.070	100.0%	100.0%

^aColumns may not add due to rounding.

^bIn 1970 dollars.

SOURCE: JWK International Incorporated, *Evaluation of Project SOAR (Supply, Output, and Requirements)*, draft report, DHEW contract No. HRA 232-78-0140, 1979.

Table 31 .—Projected Utilization Growth Factors, 1975-90

	Projected growth 1975-90
Medical office	
General care	108.9
Pediatric care	101.1
Ob-gyn care.	120.5
Psychiatric care	124.7
Vision care.....	123.8
Other care	111.0
Short-term hospital	
Outpatient care.	95.6
Surgical care.....	110.9
Medical care	103.3
Long-term hospital	
Psychiatric care	118.9
Other care	110.5 ^a
Other care settings	
Nursing home care.	127.3
Dental care.	121.6
Veterinarian services	110.5 ^a
Optometric care	116.4
Podiatric care	127.2
Other care	110.6a
Noncare settings	
Pharmacy services	111.7
Laboratory services	110.5 ^a
Noncare activities.	110.5 ^a

^aAge-, sex-, and Income-specific utilization rates are either inappropriate or unavailable for these categories. The growth shown (110.5) is that attributable solely to the overall growth of the population.

SOURCE: JWK International incorporated, Evaluation of Project SOAR (Supply, Output, and Requirements), draft report, DHEW contract No. HRA 232.78-0140, 1979.

than the overall population growth rate of 110.5 percent.

These projections deal with utilization of medical services as an expression of economic demand, not medical need. We do know, however, that higher income has traditionally been associated with improvements in health status; i.e., less need for medical care. Tables 32 to 35 give some indication of the differential health status and utilization patterns of high- and low-income groups. Clearly, low-income groups are sicker and use more medical services, particularly hospital care, than higher income groups.

An evaluation completed under contract to BHM of its general demand model (JWK International, 1979) raises the question whether “new arrivals” in the upper income brackets would exhibit the same patterns of utilization or the same underlying patterns of medical need as long-time members of upper income categories.

Conceivably, the “new arrivals” in the upper income categories might lag in exhibiting the lower utilization rates of the higher income brackets.

We might also question whether the relationship between utilization of medical services and income is indeed constant over time, which is what is implied by projecting 1975 income utilization rate differentials to the 1990 population. If we had done such an exercise 15 years ago (that is, attempted to project 1975 utilization from a 1960 data base) we would have underestimated the actual utilization rates of low-income groups. Over this time period the utilization rates of the poor have risen more rapidly, and, in the area of physician visits, the poor now use more services than the nonpoor, whereas, previously they used less (see table 34).

These questions are raised not so much to critique the assumptions that went into the BHM framework model—which are quite plausible assumptions—but merely to point out that even the most plausible of assumptions may finesse a great deal of uncertainty.

The Baseline Configuration

The “baseline” configuration factors in the effects of historical trends in per capita utilization of medical services. Two major component trends are distinguished in the analysis. The price-related component is that portion of the change in utilization that is expected to result when changes in the price of a particular form of care or medical service affect consumer decisions to seek that care or service. The non-price-related component is a residual that measures the effects of all other possible influences combined, including such factors as changes in the accessibility of care, changes in population, changes in consumer taste and preference, changes in medical technology, environmental changes, and changes in disease prevalence and incidence. The non-price-related component is the greater of the two.

The language of the BHM model is the language of economics, which tends to treat medical care like any other “consumer product,”

Table 32.—Prevalence of Selected Chronic Conditions Reported in Health Interviews, by Family Income (United States)

Family income	Arthritis (1969)	Asthma (1970)	Chronic bronchitis (1970)	Diabetes (1973)	Heart conditions (1972)	Hyper- tension ^a (1972)	Impairment, ^b back or spine (1971)	Hearing impairment (1971)	Vision impairment (1971)
Number per 1,000 persons 17-44 years									
Under \$5,000 . . .	46.9	34.1	28.4	11.4	32.5	48.9	59.4	55.4	43.2
\$5,000-\$9,999 . . .	40.5	23.6	22.3	8.7	23.3	40.8	50.5	44.0	31.7
\$10,000-\$14,999	38.7	24.4	21.8	8.4	22.5	35.9	47.4	39.3	28.7
\$15,000 and over	35.9	26.8	23.7	8.0	24.3	29.8	42.4	35.8	30.9
Number per 1,000 persons 45-64 years									
Under \$5,000 . . .	297.8	53.5	44.2	74.1	139.3	172.7	102.8	158.9	114.1
\$5,000-\$9,999..	200.3	33.5	38.7	43.8	92.5	125.4	67.2	118.1	57.4
\$10,000-\$14,999	163.7	23.7	29.0	37.8	74.3	121.3	62.3	107.3	45.9
\$15,000 and over	159.8	22.7	30.3	30.5	66.6	105.3	52.2	85.9	48.9

^aWithout heart involvement.^bExcept paralysis.SOURCE: National Center for Health Statistics, "Selected Reports from the Health Interview Survey," *Vital and Health Statistics*, Series 10.**Table 33.—Number of Disability Days per Person per Year by Family Income (United States, 1973)**

Family income	Restricted activity days	Bed disability days	Work-loss days
Days per person ages 17-44 years			
Under \$5,000	21.1	8.3	6.5
\$5,000 " \$9,999	14.6	5.7	5.9
\$10,000 -\$14,999	11.9	4.8	4.8
\$15,000 and over	11.4	4.4	4.6
Days per person ages 45-64 years			
Under \$5,000	45.7	15.5	7.5
\$5,000 " \$9,999	25.1	8.7	7.3
\$10,000 -\$14,999	16.9	5.9	5.5
\$15,000 and over	14.0	4.5	5.3

SOURCE: National Center for Health Statistics, "Current Estimates from the Health Interview Survey, 1973," *Vital and Health Statistics*, Series 10, No. 95; and unpublished data.

with the assumption that utilization is generated by consumer demand. It has frequently been argued, however, that much utilization of medical care is physician generated. The model does take such factors into account. What it does not do is differentiate between consumer- versus provider-generated changes in per capita utilization of medical care.

The price-related utilization trend is calculated through out-of-pocket costs to the consumer. Over the years, the price of health care relative to the Consumer Price Index (CPI) will have risen for some forms of care and declined for others. In all (or almost all) instances, however, the actual out-of-pocket expenses to the consumer will have declined due to the increasing use of private and public health insur-

ance. For those forms of care for which the net price to the consumer has declined, per capita utilization would be expected to increase.

We will not describe in any detail the technical aspects of utilization trend analysis. Conceptually, however, the process involves the following steps:

- The observed utilization trend over the baseline time period (1968-76) is factored into its price- and non-price-related components.
- A linear least squares regression equation is fitted to the non-price-related utilization trend and the resulting straight line is extrapolated forward in time to 1990.

Table 34.—Number of Physician Visits per Year by Poor and Not Poor Status and for Whites and Others (United States, 1964 and 1973)

Age and year	Total		Whites		All others	
	Poor	Not Poor	Poor	Not poor	Poor	Not poor
Number of physician visits per person per year						
17-44 years						
1964	4.1	4.7	4.5	4.8	3.3	4.2
1973	5.7	5.0	5.8	5.0	5.6	4.8
45-64 years						
1964	5.1	5.1	5.2	5.1	4.9	4.6
1973	6.3	5.4	6.1	5.4	7.1	5.3
Percent with no physician visits in past 2 years						
17-44 years						
1964	24.2	18.1	23.2	17.7	26.6	22.9
1973	13.4	12.8	13.1	12.7	14.5	13.5
45-64 years						
1964	29.2	21.7	28.0	21.3	33.1	29.0
1973	20.6	16.9	21.4	16.9	17.0	16.9

Definition of poor is based on family income. Under \$3,000 in 1964.
Under \$6,000 in 1973

In each case, this included about one-fifth of the population.

SOURCE National Center for Health Statistics, unpublished data from the Health Interview Survey

Table 35.—Number of Discharges From and Average Length of Stay in Short-Stay Hospitals, by Income and Color (United States, 1964 and 1973)

Age and year	Total		Whites		All others	
	Poor	Not poor	Poor	Not poor	Poor	Not poor
Number of discharges per 1,000 population						
17-44 years						
1964	181	161	188	164	163	132
1973	198	148	190	148	223	149
45-64 years						
1964	146	148	159	151	102	111
1973	225	152	238	153	174	133
Average length of stay in days						
17-44 years						
1964	6.9	6.3	6.8	6.2	7.1	8.0
1973	6.4	6.0	6.0	5.9	7.2	7.0
45-64 years						
1964	14.4	9.7	12.8	9.5	22.6	13.5
1973	12.8	9.3	12.3	9.0	15.3	13.0

Definition of poor is based on family income. Under \$3,000 in 1964.
Under \$6,000 in 1973

In each case, this included about one-fifth of the population

SOURCE National Center for Health Statistics, unpublished data from the Health Interview Survey

- In a separate process, the historical values of coinsurance and price, defined as the ratio of CPI for health care to CPI for all items combined, are calculated. These values are then multiplied to yield the projected net price (out-of-pocket costs) to the consumer for the year or years in question.
- The projected net price to the consumer is then applied to a demand curve with an assumed elasticity. This demand curve relates the price (to the consumer) of a given form of care to the demand for that care. Based on that relationship, the extrapolated non-price-related utilization is adjusted upward

or downward to reflect the estimated impact of price changes during the years ahead.

Current trend analysis employs “high” and “low” assumptions of price elasticity. Thus, two alternative price-adjusted utilization growth trends are projected. Table 36 shows alternative utilization growth rates based on high- and low-elasticity assumptions for four types of medical care.

The utilization trend analysis is an extremely important element in the BHM general demand model. 1990 demand is projected to be 596,217 as compared to a 1975 demand of 378,376. of the 217,841 additional physicians, 181,881, or 83 percent of the difference, is attributable to the assumptions made about rising per capita utilization. Table 37 summarizes the projected rise in physician demand between 1975 and 1990, separated into population/demographic and per capita utilization trend components.

The projection of the per capita utilization trend is perhaps the most problematic aspect of

the BHM general modeling effort because of the difficult philosophical and methodological issues involved in identifying and projecting trends.

Methodologically, one problem is that the non-price-related utilization trend includes changes in per capita utilization that occur as a result of demographic changes, including age and income shifts. Thus, the BHM model double counts the effects of age and income, and the estimates are inflated accordingly.

While this problem is relatively easy to correct (and the model is in the process of being adjusted so that age- and income-related trends will be counted only once), the sensitivity of the estimates to alternative starting dates for trend projection is more difficult to remedy.

The first task in trend analysis is to identify a time period for which data will be collected and analyzed. Until recently, the time period covered began in 1966 and extended through the latest year for which suitable data were available (currently 1976). The starting date was moved forward to 1968 because of concern that the increases in utilization of medical services that occurred during the startup period of Medicare-Medicaid tend to misleadingly inflate the trend data when 1966 is used as a starting point. If the desire is to remove the unique historical impact of Medicare-Medicaid startup from the projection of a longer term societal trend in utilization, it is questionable whether moving the starting date of the trend analysis from 1966 to 1968 is sufficient. With respect to Medicaid, many States did not yet have their Medicaid programs fully in operation in 1968, and important amendments to the original legislation were also passed during this period, most notably, expanded nursing home coverage.

The choice of starting date is extremely important because, for most kinds of medical care (short-term hospital care excepted), the slope and even the direction of the trend line changes rather dramatically if the starting date is moved from the late 1960’s to the early 1970’s.

Figures 6 to 9 summarize unadjusted per capita utilization and high and low elasticity, non-price-related utilization for the years 1966

Table 36.—Estimated Growth in Per Capita Utilization, Four Forms of Health Care

	Projected per capita utilization in 1990 relative to baseline utilization in 1975	
	High elasticity	Low elasticity
Medical office services	1.45	1.37
Short-term hospital services.	1.38	1.29
Dental office services	1.28	1.29
Community pharmacy services	1.58	1.50

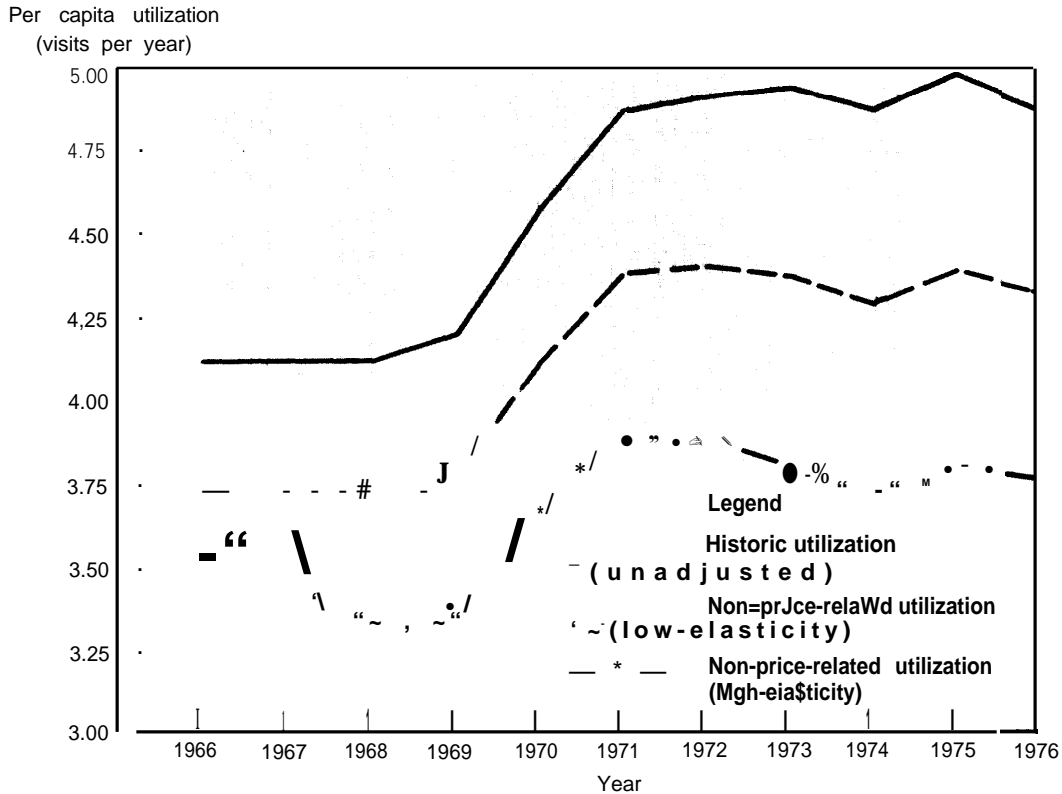
SOURCE: JWK International Incorporated, Evaluation of Project SOAR (Supply, Output, and Requirements), draft report, DHEW contract No. HRA 232-78-0140, 1979.

Table 37.—Increase in Demand From Population and Per Capita Utilization Changes, 1975 to 1990, BHM Model

	1975	1990
Demand	378,376	596,217
	(assumed equal (projected) to supply)	
Increase.	—	217,841
		(projected)
Population effect		(35,960)
Per capita utilization effect		(181,881)

SOURCE: See text.

Figure 6.—Per Capita Utilization of Physician Office Services, 1966-76



SOURCE JWK International, Inc., Evaluation of Project SOAR (Supply, Output, and Requirements), draft report, DHEW contract No HRA 232.780140, 1979

to 1976. Only one set of data points (utilization of short-term hospital services) displays a consistent, natural linear trend. In the case of the other services (physician office visits, dental care, community pharmacy), the utilization data being extrapolated do not consistently display a pattern for which linear extrapolation can be justified.

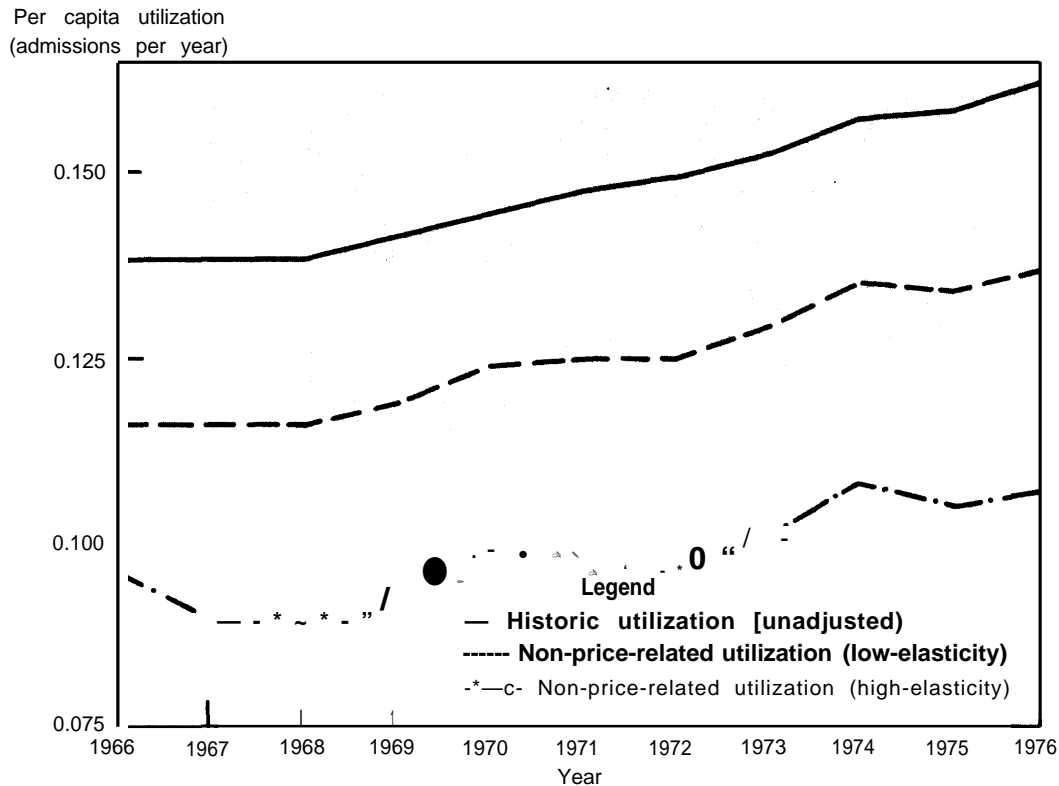
The mathematics of trend projection (linear regression analysis) involves fitting a straight line to the data points. Clearly, such a conceptual simplification of reality is less distorting of the world's true complexity when the data points themselves tend naturally to conform to a straight line pattern when graphically portrayed. Philosophically, the issue is one of consistency. Trend projection in general and the methodology of linear regression in particular assume that reality—in this instance per capita utilization of medical care—exhibits a reason-

ably consistent pattern; whether it be one of increasing, decreasing, or remaining steady.

Figures 10 to 13 take the high-elasticity data points of figures 6 to 9 and fit straight lines to the data points for the years 1966-76, 1968-76, and 1971-76. Except for short-term hospital services, distinctly different trends can be projected, depending on the starting date. For physician office services, a start date of either 1966 or 1968 is seen to yield a distinctly upward trend, whereas a start date of 1971 shows a downward slope. In the case of dental office visits, starting the trend analysis in 1968 produces a flat projection; starting in 1971 produces a decline. For community pharmacy services, the trend lines started in 1966 and 1968 show a sharp upward rise even though per capita utilization has been declining since 1973.

The magnitude of the disparities in per capita utilization growth produced by different start dates is quantified in table 38.

Figure 7.— Per Capita Utilization of Short-Term Hospital Services, 1966-76



SOURCE JWK International Inc Evaluation of Project SOaff (Supply, Output, and Requirements), draft report. DHEW contract No HRA.232.78-0140, 1979

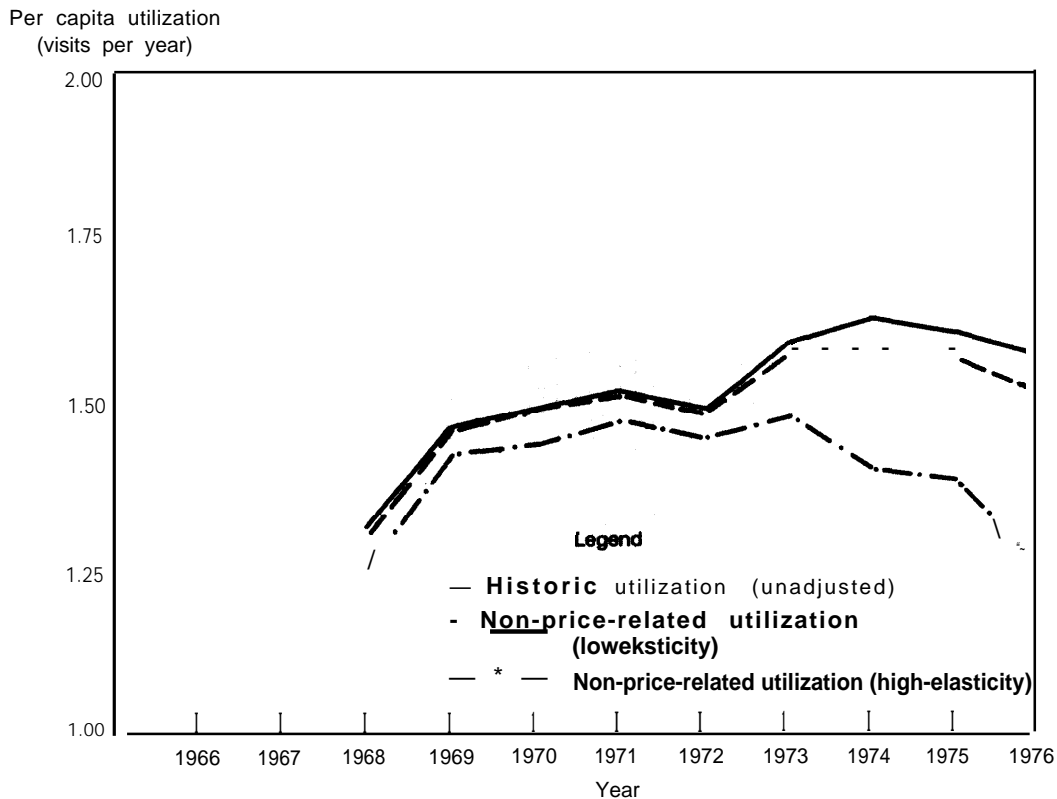
Clearly, the considerable variability of these results (except in the case of short-term hospital services) points to the need for caution in extrapolating utilization trends to project future physician demand. A slight change of 1 or 2 years in the time period covered in the trend analysis can produce enormous differences in the projections. It is evident, however, that the choice of a pre-1970 start date followed by linear trend extrapolation is bound to result in drastically different estimates from estimates which use a post-1970 start date.

BHM's review of its general demand model (JWK International, 1979) suggested that instead of linear extrapolation, a logarithmic fit would produce a somewhat better trend extrapolation (for all but short-term hospital services), less sensitive to the Medicare-Medicaid startup years. Table 39 shows the difference in the non-

price-related per capita utilization trend between 1975-90 produced by employing logarithmic versus linear extrapolation.

The review concluded, however, that, while it is possible to reduce the disparities produced by selecting different start dates for trend analysis by using an alternative form of extrapolation, it was difficult to rationalize the use of a particular functional form of trend fitting, and that there was simply no reason a priori to expect the data to follow a logarithmic as opposed to a linear (or any other) pattern. In addition to mathematical retooling, the evaluation suggested more use of human judgment rather than mechanistic methods, perhaps through projections of what would be "most likely," based on classic Delphi techniques or simply averaging the response of a suitably selected group of knowledgeable individuals.

Figure 8.— Per Capita Utilization of Dental Office Services, 1968-76



SOURCE JWK International, Inc. *Evaluation of Project SOAR (Supply, Out-Patient and Recruitment)*, draft report, DHEW contract No. HRA.232.78.0140, 1979

BHM states that the reasons it continues to use the 1968 start date are: 1) the historical observation of rising per capita use of physician services, 2) the more base years used to establish the trend, the sounder the methodology of trend extrapolation, and 3) its conclusion that the 1968 and 1969 data points do not reflect Medicare and Medicaid startup activities (Cole, 1980).

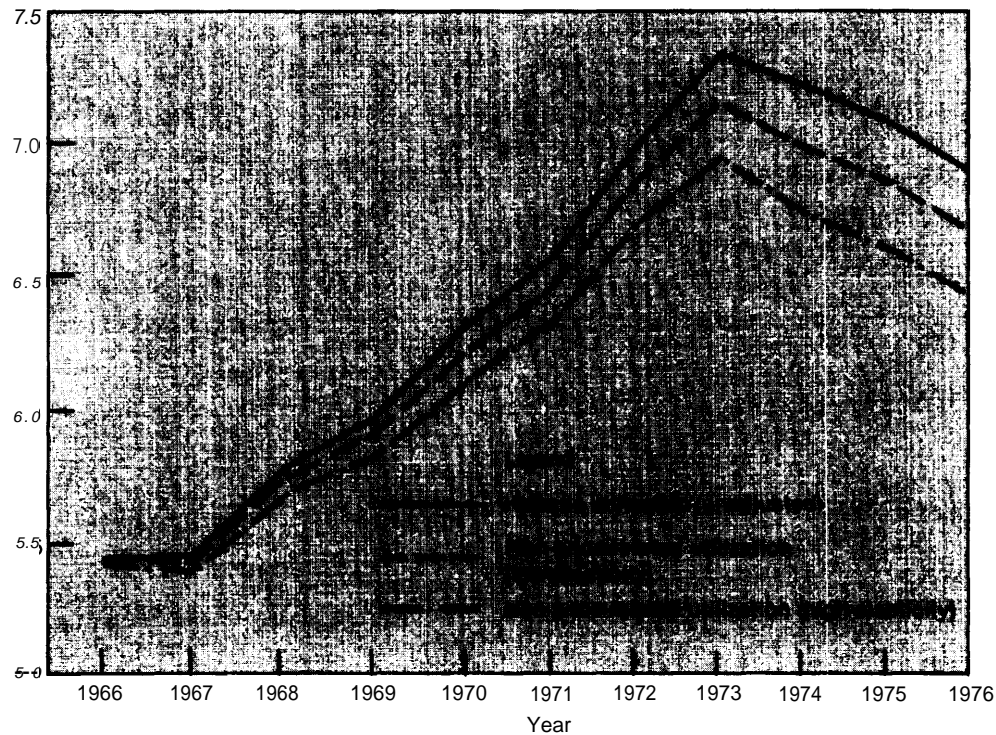
The problem, however, is not whether these statements are correct or not. Instead, the problem stems from the specific rate of increase in per capita utilization of physician services that were used to calculate physician demand in addition to that derived from demographic changes. We have simply pointed out that BHM's use of 1968 as the starting point results in a trend line radically different from actual utilization data from 1971 to 1976 (see figure 10). It is necessary to point this out, because the projections of physician demand issued by BHM

combine the estimates of demand due to demographic changes with that due to increasing per capita use of physician services without an indication of the very different results that occur if the starting date for trend projections is changed by just 2 or 3 years. Even BHM's *internal evaluation* has suggested that more human judgment, rather than mechanistic methods, be used.

Contingency Modeling

The contingency modeling capability has been used to explore the possible impact on economic demand for physician services from: 1) alternative forms of NHI, 2) various rates of growth of the HMO movement, and 3) increased use of midlevel practitioners or "task delegation."

The effects of NHI on utilization are assumed to be mediated through a lowering of the out-of-

Figure 9.—Per Capita Utilization of Community Pharmacy Services, 1966-76Per capita utilization
(prescriptions per year)

SOURCE JWK International, Inc., *Evaluation of Project SOAR (Supply, Output, and Requirements)*, draft report, DHEW contract No HRA-232-78-0140, 1979.

pocket costs to consumers for medical services of various types. It is assumed that coinsurance under NHI would be lower than it would be without NHI. Clearly, the greater the gap between the average coinsurance rates projected for future years in the absence of NHI and seems likely under NHI, the more utilization would be expected to rise under NHI.

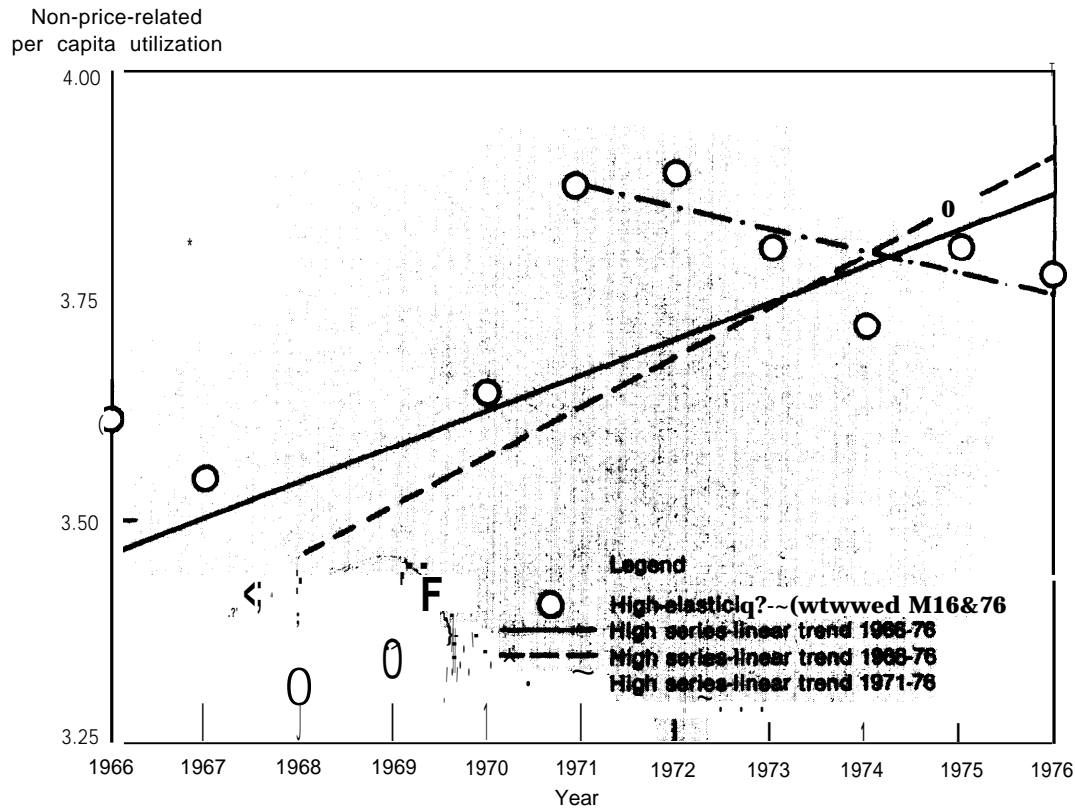
Three NHI plans have been modeled, assuming rates of coinsurance of 5, 10, and 15 percent. A recent rough estimate of the impact of NHI in 1990 assuming a 10-percent coinsurance rate with and a 25-percent coinsurance rate without NHI, employing a log linear fit, results in a 13-percent upward demand shift.

Trend estimates suggest, however, that overall, as coinsurance falls, the gap between out-of-pocket costs to the consumer with or without NHI is narrowing. This means that while those

portions of the population who currently have little or no medical insurance would surely experience a great drop in out-of-pocket expenses and would increase their utilization of medical services accordingly, *in the aggregate*, most Americans would not experience such a major drop in out-of-pocket costs. Thus, *if* the coinsurance rate continues to decline without NHI, the expectation would be for the eventual impact of NHI on utilization and physician demand to be less, the longer the delay in enacting an NHI plan, particularly if the plan enacted had a comparatively high coinsurance rate (e.g., 15 percent rather than 5 percent).

With respect to the impact of HMO growth on utilization, currently available data on HMO growth suggest that only 6 percent of the population can be expected to belong to HMOs in 1990. This is not enough to appreciably lower utilization or physician demand.

Figure 10.—Non-Price-Related per Capita Utilization Trends, Physician Office Services, 1966-76



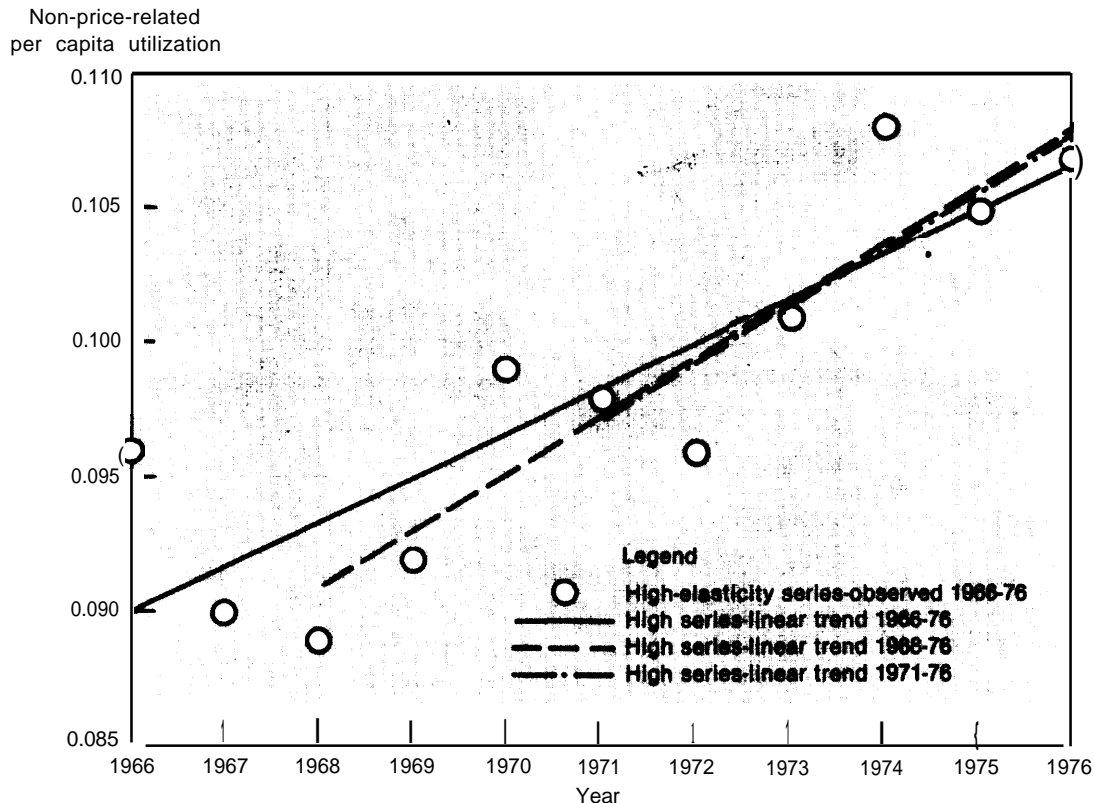
SOURCE JWK International, Inc., Evaluation of Project SOAR (Supply, Output, and Requirements), draft report, DHEW contract No HRA.232. 78-0140, 1979.

In the case of task delegation to midlevel practitioners, the productivity enhancement factor is estimated at 30 percent. Here again, however, the effect of expanded task delegation is projected to be negligible in 1990—on the order of 2 to 3 percent. This minor effect is due to the projected limited supply of nurse practitioners and physicians' assistants, based on current training levels.

Productivity

Finally, productivity of physicians in 1990 is assumed to remain the same as productivity of physicians in the base year 1975. Productivity in the base year is addressed indirectly in the form of a staffing matrix which shows the number of units of manpower engaged in each separate form of health care activity during that year. Because productivity is assumed to be constant,

the ratio of services to manpower will be the same in 1990 as in 1975, and it is on this basis that manpower estimates are generated. The total number of estimated active physicians as of 1975 was obtained from the American Medical Association (AMA), with the various specialties regrouped to provide a more compact typology. Physicians were then allocated to particular specialties and care settings based on care profiles. As a result, the numbers used are not head counts of physicians claiming particular specialties, but are estimated FTE physicians providing a particular type of care. For example, the percentage of time the average general practitioner (GP) devotes to providing ob-gyn care is assigned to the ob-gyn category, while the estimated percentage of GP practice devoted to pediatric care is assigned to pediatric care. Thus, physician demand is calculated in terms of the nature of the services provided, as well as

Figure 11.- Non-Price-Related per Capita Utilization Trends, Short-Term Hospital Services, 1966-76

SOURCE: JWK International, Inc. *Evaluation of Project SOAR (Supply, Output, and Requirements)*, draft report, DHEW contract No HRA-232-78-0140, 1979

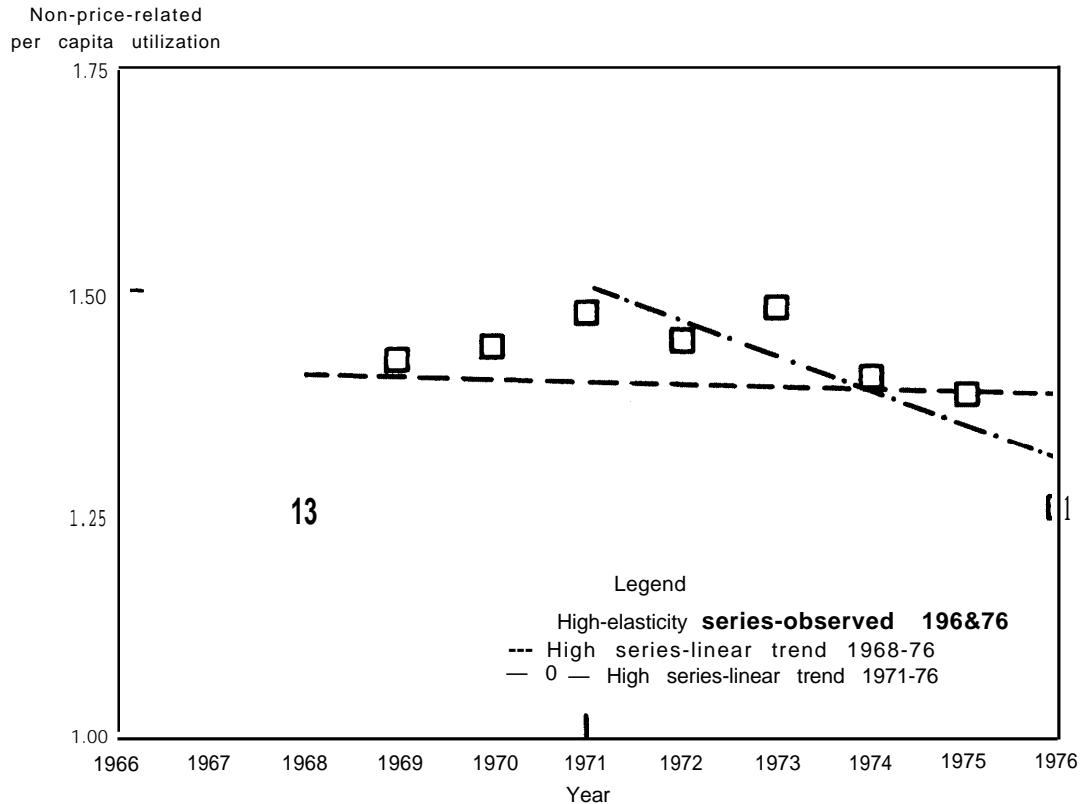
in terms of physician specialty categories. Table 40 shows the allocation of physicians by type and setting of care in the 1975 base year. Table 41 is an illustrative computation of the 1990 manpower demand for pediatricians. These

figures are derived from the “framework” model; i.e., the projected growth in utilization in table 41 is based only on anticipated population growth and demographic shifts.

THE GRADUATE MEDICAL EDUCATION NATIONAL ADVISORY COMMITTEE MODEL

As we have seen, the BHM estimates are products of a market-oriented approach that tries to predict the future economic demand for medical services if current trends in utilization continue without major disruption. In contrast, GMENAC seeks to define physician requirements in terms of the type and amount of care that medical professionals believe should be utilized in 1990, in light of available data and medical judgment as to the prevalence of bio-

logic conditions and the ability of the medical profession to provide useful therapeutic and preventive care. The main aim of the GMENAC modeling effort is to generate estimates of physicians trained in particular specialties so that graduate medical education programs can be revamped accordingly. Table 42 summarizes the specialties and subspecialties for which estimates are being planned or considered by GMENAC. Of these categories 14 to 26 are ex-

Figure 12.—Non-Price Related per Capita Utilization Trends, Dental Office Services, 1968-76

SOURCE JWK International, Inc. *Evaluation of Project SOAR (Sum/Y. Output. and Requirements)*, draft report, DHEW contract No HRA-232-78.01 40, 1979

pected to be completed (McNutt, 1979). While an aggregate estimate of physicians required in 1990 is not the principal objective of GMENAC, such a number can readily be generated simply by adding the estimates for each specialty, once those numbers are available and if all specialties are covered.

As of this time, no estimates for any specialty group are available from GMENAC. The estimates should be released in 1980, provided GMENAC undergoes no further delays and meets its scheduled date for publication of the final report.

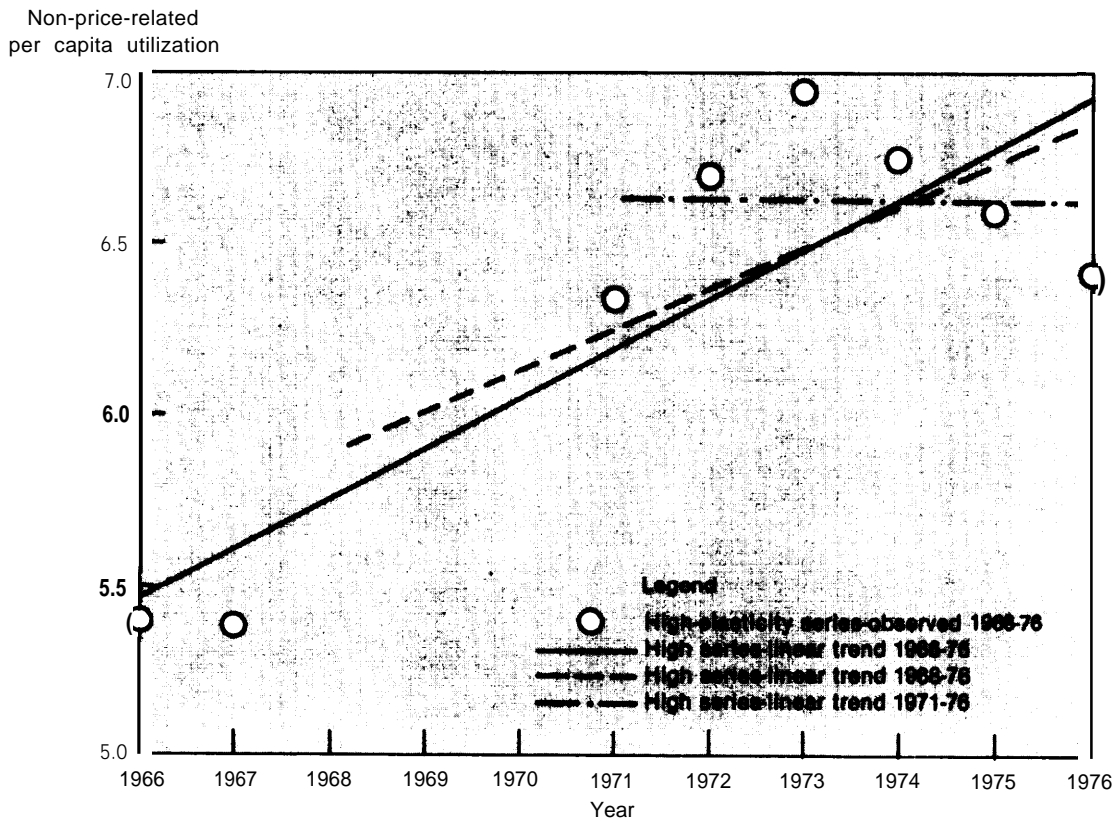
The formal definition of "need for care" employed by GMENAC is as follows:

An individual is said to need medical care if a pathologic finding exists or if the individual will benefit from such care. Need for care thus refers to: 1) persons with a given morbidity for whom

intervention by a physician is appropriate for diagnosis and treatment, and 2) persons without morbidity for whom preventive services are appropriate.

Thus, in the GMENAC model, population-based estimates of morbidity (biological need) are adjusted to determine the proportion of persons with a given morbidity who are in need of physician intervention. In addition, the quantity and type of preventive services appropriate for certain population subgroups are normatively estimated. Further, the model takes into account other uses such as insurance physical examinations and visits by the "worried well." The result is what GMENAC terms an "adjusted-needs" model which is used in conjunction with U.S. Census population projections to estimate the need for physician care in 1990. Figure 14 illustrates the procedure of arriving at an adjusted needs estimate for one particular type of biological condition, varicose veins.

Figure 13.—Non-Price-Related per Capita Utilization Trends, Community Pharmacy Services, 1966-76



SOURCE JWK International, Inc., *Evaluation of Project SOAR (Supply, Output, and Requirements)*, draft report, DHEW contract NO. HRA-232-78-0140, 1979

Table 38.—Dependence of Trend Projections on Alternative Starting Dates in the Baseline Data

	Elasticity	Projected growth in non-price-related per capita utilization, 1975-90 (1975 = 100)		
		Start date		
		1966	1968	1971
Physician office services	High	116.3	123.0	89.9
	Low	123.1	127.3	95.4
Short-term hospital services . .	High	123.8	131.4	123.4
	Low	123.9	129.9	129.9
Dental office services.	High	NA	97.5	56.3
	Low	NA	123.3	106.9
Community pharmacy services	High	135.6	129.4	100.1
	Low	140.1	134.1	105.6

SOURCE: JWK International Incorporated, *Evaluation of Project SOAR (Supply, Output, and Requirements)*, draft report, DHEW contract No. HRA 232-78-0140, 1979,

Table 39.—Comparison of Linear Versus Logarithmic Extrapolation of Utilization Data

Form of services and price elasticity	R ² (percentage of variance explained by regression)		Projected growth in non-price-related per capita utilization, 1975-90 (1975 = 100)	
	Linear extrapolation	Logarithmic extrapolation	Linear extrapolation	Logarithmic extrapolation
Physician office				
High	43.20/0	43.50/0	116.3	103.1
Low	65.7	66.2	123.1	104.4
Short-term hospital				
High	75.7	73.5	123.8	104.4
Low	90.1	88.5	123.9	104.3
Dental office				
High	00.7	00.4	97.5	101.7
Low	59.1	60.3	123.3	106.5
Community pharmacy				
High	76.4	77.6	135.6	110.6
Low	81.1	82.3	140.1	111.3

SOURCE: JWK International Incorporated, Evaluation of Project SOAR (Supply, Output, and Requirements), draft report, DHEW contract No. HRA 232.78-0140, 1979

Use of such adjusted needs estimates has important implications. If, for example, we compare estimates of physician requirements based on biological need and appropriateness of medical intervention with estimates based on projecting current patterns of utilization of physician services into the future, we can anticipate some differences in the types of physician services on which the estimates of overall physician requirements would be based. The GMENAC model, for example, implies that patients will not receive physician services merely because they want such services and can pay for them; i.e., factors that translate into “effective economic demand” in a market-oriented model. Using the GMENAC model, a proportion of the current and future economic demand for care might be discounted, because the persons seeking physician services might lack sufficient biological need for services or might be seeking services inappropriate to their biological condition, or might be seeking care for biological conditions for which no useful physician interventions are presently available. From what is known about current patterns of utilization, such a downward adjustment of “economic demand” to meet standards of true biological need and appropriate, useful physician intervention would have the greatest impact on primary care (defined as “first contact” **physicians**). The reason is that a high volume of complaints seen by primary care practitioners are nonserious, self-limiting conditions for which no effective medical treatment currently exists (e. g., “colds,”

nonbacterial sore throats, and similar conditions). However, the adjusted needs approach does take into account some proportion of the demand for care that is generated by the so-called “worried well” and persons with vague symptoms, probably psychological in origin, for which the patient seeks a physical cause and medical cure.

Conversely, there are also medical conditions for which beneficial interventions are available which do not, however, generate demand. The would-be patient may be unaware of the condition or of the availability of effective treatment or preventive cure, or, for whatever reason, has chosen not to seek it. On this dimension, a need-based model would tend to overestimate physician requirements.

The GMENAC model accordingly provides for some downward adjustment of medical need estimates to conform to patterns of future utilization that can *realistically* be anticipated, even though such adjustments imply an acceptance that the true medical need for physician services will never be wholly met. Finally, much has been written in recent years concerning *over* and unnecessary utilization of medical services that is physician rather than consumer generated. To the degree that over and inappropriate utilization are factors in current patterns of utilization and ongoing trends in utilization, economic demand models include such unnecessary services in projecting physician requirements. In contrast, an adjusted need-based mod-

Table 40.—Allocation of Physicians by Type and Setting of Care for the 1975 Base Year, BHM Model

	Medical office								
	Total	General care	Pediatric care	Ob-gyn care	Psch. care	Vision care	Other care		
Physicians (MD)	340,280	46,493	21,453	16,255	15,080	8,820	76,406		
General	116,430	36,476	9,932	2,895	1,081	—	26,995		
Pediatric	21,746	568	12,061	—	—	—	271		
Obstetrics-gynecology	21,731	2,634	—	12,964	79	—	—		
Ophthalmology	11,129	—	—	—	—	8,820	—		
Psychiatry	26,502	—	—	—	13,837	—	—		
Surgeryb	76,017	3,516	—	396	63	—	24,003		
Secondary specialist	48,322	3,299	—	—	—	—	25,137		
Noncare specialist	18,403	—	—	—	—	—	—		
Physicians (DO)	14,532	11,072	47	47	35	24	464		
	Short-term hospital			Long-term hospital					
	Out pt. care	Surgical care	Medical care	Psychiatric care	Other care				
Physicians (MD)	8,481	63,701	35,680	9,334	3,314				
General	5,660	1,351	21,292	3,103	1,476				
Pediatric	638	49	6,179	—	131				
Obstetrics-gynecology	—	5,156	—	—	—				
Ophthalmology	—	1,991	—	—	—				
Psychiatry	1,746	—	1,392	6,231	—				
Surgeryb	—	45,289	—	—	—				
Secondary specialist	437	4,374	6,124	—	1,707				
Noncare specialist	—	5,491	693	—	—				
Physicians (DO)	312	254	1,210	—	166				
	Other care settings					Noncare settings			
	Nursing home	Dental care	Vet. care	opt. care	Pod. care	Other care	Lab service	Pharm. service	Non care activities
Physicians (MD)	594	—	—	—	—	2,611	4,309	—	27,749
General	594	—	—	—	—	—	—	—	6,115
Pediatric	—	—	—	—	—	—	—	—	1,849
Obstetrics-gynecology	—	—	—	—	—	—	—	—	898
Ophthalmology	—	—	—	—	—	—	—	—	318
Psychiatry	—	—	—	—	—	—	—	—	3,276
Surgeryb	—	—	—	—	—	—	—	—	2,750
Secondary specialist	—	—	—	—	—	—	—	—	7,244
Noncare specialist	—	—	—	—	—	—	4,309	—	5,299
Physicians (DO)	—	—	—	—	—	—	—	—	901

^aIncludes — and family practice, internal medicine, and "specialty un- specified" (presumed to be predominantly in primary care)

^bIncludes general surgery, neurological surgery, orthopedic surgery, otolaryngology, plastic surgery, colon and rectal surgery, thoracic surgery, urology, and anesthesiology.

^cIncludes allergy, cardiovascular diseases, dermatology, gastroenterology, pe-

diatric allergy, pediatric cardiology, pulmonary diseases, radiology, diagnostic radiology, therapeutic radiology, neurology, physical medicine and rehabilitation, and "other specialties."

^dIncludes occupational medicine, general preventive medicine, public health, aerospace medicine, pathology, and forensic pathology

SOURCE: JWK International Incorporated, *Evaluation of Project SOAR (Supply, Output, and Requirements)*, draft report, DHEW contract No. HRA 232.78-0140, 1979.

cling effort such as GMENAC's tries to factor out some unnecessary services from its estimates.

There is controversy over the definition of "unnecessary" services. The GMENAC model would presumably reflect expert opinion in respect to whether particular conditions require a physician visit, and whether these conditions could benefit or not from further treatment. Figure 15 summarizes the component processes

that are involved in translating adjusted medical need estimates into projections of physician requirements by specialty. Epidemiological data on the frequency of specific biological conditions in the population are used as the starting point. Data on conditions that are known to be treated by physicians in a given specialty or specialty groups are selected based on analyses of current practice content by self-designated specialists and estimates of the training content in each specialty.

Table 41.—Illustrative Computation of Manpower Requirements

1. According to table 40, the Nation's pediatricians were involved in 1975 in the following forms of health care activity, in the numbers shown:

	Number of pediatricians engaged in this activity (1975)
Medical office	
General care	568
Pediatric care	12,061
Other care	271
Short-term hospital	
Outpatient care	638
Surgical care	49
Medical care	6,179
Long-term hospital	
Other care	131
Other settings	
Noncare activities, not elsewhere specified	<u>1,849</u>
Total	21,746

2. Runs conducted by the Division of Manpower Analysis indicate that between 1975 and 1990, utilization of each of the foregoing forms of care will have undergone the following growth (or reduction):

	Projected utilization growth factor (1975-90)
Medical office	
General care	108.9
Pediatric care	101.1
Other care	111.0
Short-term hospital	
Outpatient care	95.6
Surgical care	110.9
Medical care	103.3
Long-term hospital	
Othercare	110.5
Other settings	
Noncare activities, not elsewhere specified	110.5

3. Applying these projected growth factors to the corresponding 1975 supply of pediatricians, the following table of projected 1990 manpower requirements is produced:

	Number of pediatricians engaged in this activity(1975)	Projected utilization growth, 1975-90	Projected 1990 manpower requirements (column 1times column2)
Medical office			
General care	568	108.9	619
Pediatric care	12,061	101.1	12,194
Other care	271	111.0	301
Short-term hospital			
Outpatient care	638	95.6	610
Surgical care	49	110.9	54
Medical care	6,179	103.3	6,383
Long-term hospital			
Other care	131	110.5	145
Other settings			
Noncare activities, not elsewhere specified	1,849	110.5	<u>2,043</u>
Total			22,349

SOURCE JWK International Incorporated. *Evaluation of Project SOAR (SuPPY Output and Requirements) draft report.* DHEWcontract No HRA232.78-OI@. 1979

Table 42.—Specialty Areas and Subspecialties for Which Requirements Estimates Are Being Planned or Considered by GMENAC

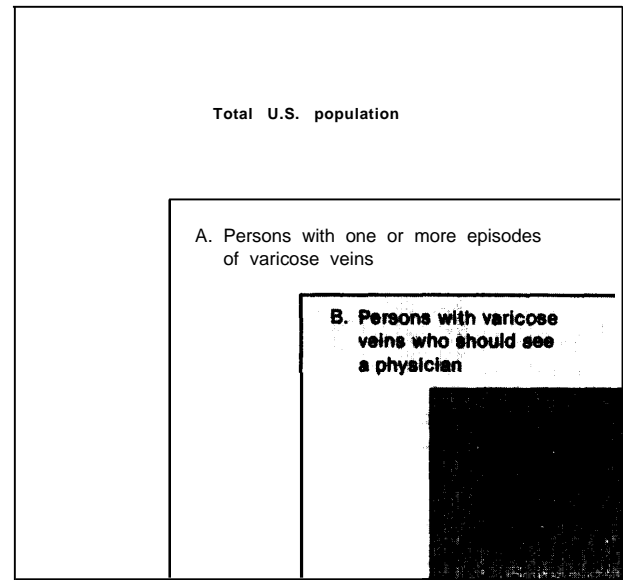
Obstetrics-gynecology
Dermatology
Adult medical care
Family practice
General internal medicine
Allergy and immunology
Hematology
Cardiovascular disease
Infectious disease
Endocrinology and metabolism
Nephrology
Pulmonary disease
Gastroenterology
Rheumatology
Medical oncology
Pediatric medical care
Family practice
General pediatrics
Allergy and immunology
Pediatric hematology-oncology
Pediatric nephrology
Pediatric endocrinology
Pediatric cardiology
Neonatal-perinatal medicine
Otolaryngology
General surgery
Colon and rectal surgery
Orthopedic surgery
Thoracic surgery
Ophthalmology
Urology
Neurosurgery
Plastic surgery
Pathology
Radiology
Psychiatry and neurology
Anesthesiology
Preventive medicine
Nuclear medicine

SOURCE *Interim Report of the Graduate Medical Education National Advisory Committee to the Secretary, Department of Health, Education, and Welfare, Washington, D.C. Health Resources Administration, DHEW publication No (HRA) 79-633, p 206*

These data on current incidence and prevalence of conditions, it is important to note, are subject to various limitations in terms of validity and reliability. The following quote, taken from the workbook prepared for the general surgery advisory panel, is illustrative:

There is a general problem in the national data sets with coverage of conditions treated by general surgeons. Population based clinical examination data provide the best source of data for estimates of incidence and prevalence of disease and injury. Such data for general surgery conditions are limited, however. The data set that

Figure 14.—Illustrative Procedure for Arriving at Adjusted Needs Estimates

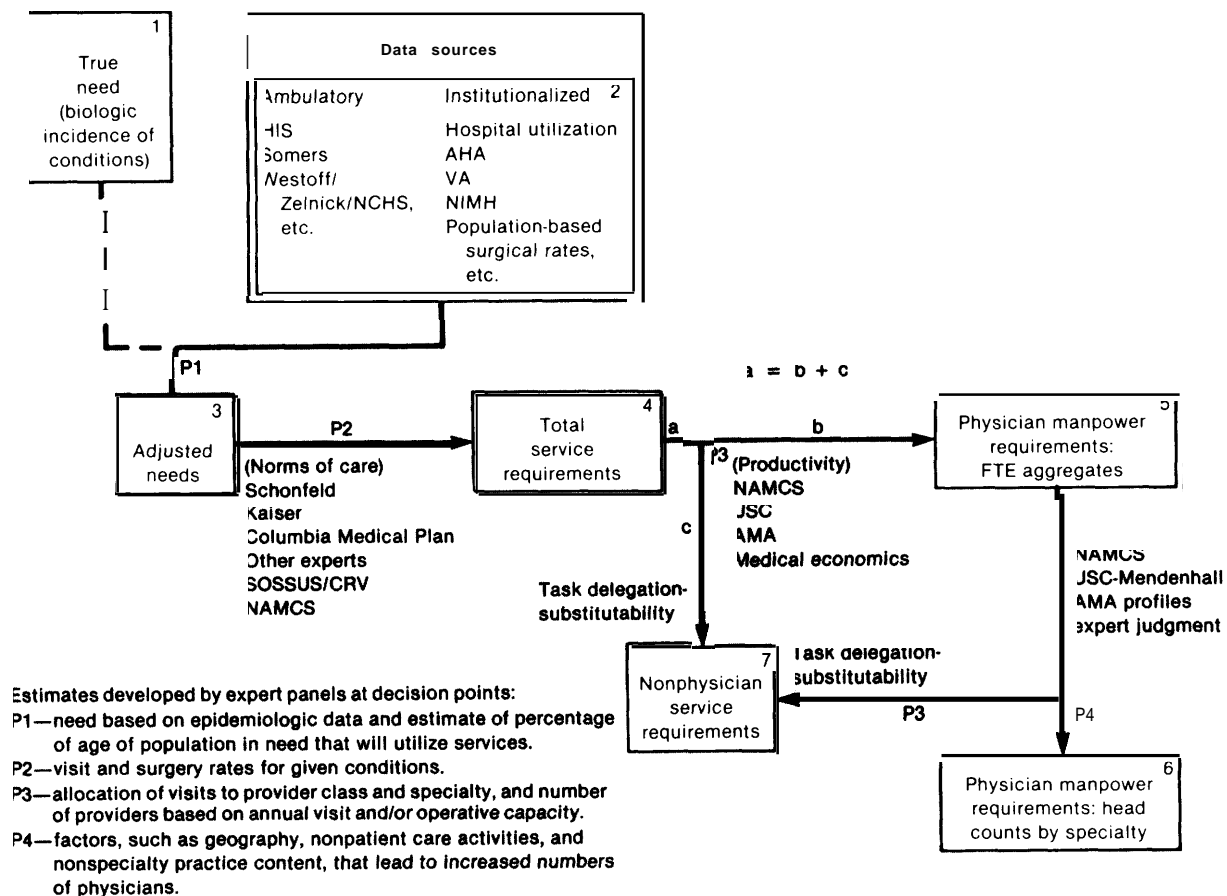


SOURCE GMENAC Workbook for General Surgery Panel, 1979.

contains the most extensive coverage of conditions is the Health Interview Survey (HIS). However, conditions in HIS are self-reported and thus represent an individual's knowledge and perception of a condition, and not necessarily an accurate measure of disease or injury. In addition, in HIS, reporting of morbidity is contingent upon a person's taking one or more of various actions, such as restriction of usual activities, bed disability, work loss, or seeking medical advice. A further problem exists in obtaining reliable estimates for low-prevalence conditions (less than 1 to 2 percent of the population). The sample of persons with rare conditions is usually small, and thus these estimates tend to be unreliable. Since many of the general surgery conditions occur with low frequency in the total population, they are difficult to estimate accurately. In general, the available morbidity estimates presented for the general surgery conditions are thought to be underestimates of actual morbidities in the U.S. population. Given the limitations of the national morbidity data, the estimates of the proportions of persons with general surgery conditions is presented to the panel for review and revision.

Accordingly, the GMENAC advisory panels of experts for each specialty area use their professional judgment to take account of possible

Figure 15.—GMENAC Model for Estimating Physician Requirements



SOURCE: Interim Report of the Graduate Medical Education National Advisory Committee to the Secretary, Department of Health, Education, and Welfare, Washington, D.C.: Health Resources Administration, DHEW publication No. (HRA) 79%33, p. 195.

over, under, or misreporting of conditions. For example, estimates of the frequency of venereal disease would be adjusted upwards, since the frequency of these diseases is known to be under-reported.

In the next phase the advisory panels of experts are asked to estimate the probable frequency of these same conditions in 1990, based on the data on current frequency adjusted by their judgments concerning changing disease patterns, host responses and technology, efficacy of preventive strategies, and any other factors they might believe to have an important impact. The specialty panel of experts also estimates what proportion of episodes of a given

condition should receive a physician's care in 1990 and what proportion of these should be seen by the panel's medical specialty (e. g., general surgery, general pediatrics, psychiatry) versus some other specialty. Here the panel members again employ their own intuitive judgments concerning the frequency of self-limited conditions, the availability of effective therapeutic or preventive care, and any other such factors that might be expected to influence the degree of benefit persons with particular conditions might be expected to derive from receiving care from a physician and from a particular type of specialist. In making these and other similar kinds of judgments, specialty panels are instructed to think in terms of the *average patient*. A modi-

fied Delphi process is used to achieve consensus. The final product emerging from the deliberations of the expert panel at this phase is a list of diseases, diagnoses, preventive activities, operations, and counseling requirements expressed in terms of population rates and disease or diagnostic categories.

GMENAC staff then apply these estimates of medical need to census projections of the size, age, and sex distribution of the U.S. population in 1990. The GMENAC model apparently does not consider future changes in income distribution and the impact these changes might be expected to have on population health needs. Adjustments for the unusual needs of some groups of people as well as those previously excluded from the health care system are introduced at this phase of the model.

In the next phase, the panels of experts determine norms of care for each disease or diagnostic category. Here again, the panels will have available to them data on actual utilization rates from a variety of sources such as HMOS and the National Ambulatory Medical Care Survey's published research studies. Each panel may recommend increases or decreases in the prevailing rates of utilization, based on its perceptions of what constitutes good medical care and what technology is likely to be available in the future. The norms of care maybe expressed as visits per episode of illness or annual encounter rate per chronic condition or some other unit of service. During this phase of the study the panels also consider which conditions can be treated in the office, which require hospitalization, and what is the appropriate length of hospital stay. Again, each panel examines existing data on utilization (e.g., Hospital Discharge Survey) and adjusts it up or down for its estimates of appropriate care for the average case. Finally, the panels estimate the proportion of inpatients and office visits that can be delegated to physicians' assistants or nurse practitioners. Although actual figures are not available, GMENAC staff report that the panels have been willing to delegate significant amounts to paraprofessionals compared to what is currently delegated. GMENAC staff predict that the specialty panels will recommend increased task delegation and

will specify where increased task delegation to paraprofessionals is most appropriate.

Perhaps the single most problematic aspect of the GMENAC modeling effort occurs in the next phase. This is the reconciliation of conflicting estimates by the various specialties as to what proportion of a given disease or diagnostic category "belongs" to each specialty. The extent of the problem is likely to be mitigated somewhat because each specialty panel contains a few representatives from other specialties. In particular, generalists (general practitioners, family practitioners, and general pediatricians) are represented on the specialty panels (surgery, dermatology, etc.) and vice versa. This is important because it is essential that a specialty's estimate of the conditions it should handle match those of the generalists who make the referrals. At this point, it is difficult to determine how many problems there will be in mediating disputes between specialties. An indication of the complexity of the task facing these panels is that only 14 to 26 of the 37 specialties listed in table 42 are expected to be completed by the end of 1980.

Among the difficult questions that must be mediated during this phase is the issue of how much primary care should be provided by secondary and tertiary care specialists. The issue is a knotty one that cannot be easily settled. One reason is that wider geographic distribution of subspecialists, outside major cities, virtually requires a part-time practice of the subspecialty for some percentage of these physicians, because the conditions treated by subspecialists are comparatively rare,

The final task in the modeling process is to translate estimates of the volume of physician services into FTE physicians and then into actual head counts. FTEs are arrived at by dividing service estimates allotted to each specialty by the expected productivity for each physician in that specialty. Productivity may be expressed in terms of encounters, operations, or some other unit, depending on which is most appropriate.

As in the BHM model, it is generally assumed that physician productivity will be the same in

1990 as it is now, although this depends on each specialty panel. GMENAC staff review the available data on the typical physician practice profile and arrive at estimates of productivity for the various kinds of services the specialty provides. Table 43 displays the average practice profile of general surgeons and the preliminary productivity estimates to be used to calculate FTE general surgeons. It should be noted that, in addition to the estimate of 43 office visits per week, alternative numbers of 77.2, 58, and 51 were also cited from the data. Finally, some estimates are also made of the productivity enhancement for physicians of employing physicians' assistants and nurse practitioners and the productivity gains from organizational arrangements such as group practice and the interaction between these two factors.

Overall, the productivity estimates used in the GMENAC model are somewhat problematic for two reasons: 1) the data sources on which productivity estimates are based often exhibit considerable disagreement (in part because the definitions of service units vary; for example, some measures of time allotted to surgical operations may count operating room time only, while other measures may include all the care associated with a procedure including pre-operative and postoperative office and hospital visits) and 2) little information is available about trends in productivity over time, particularly by specialty.

Table 43.—The Average Practice Profile of General Surgeons

	Hours
Hours worked	
Average number of weeks worked per year	47.0
Average number of hours worked per week	52.0
Time allocation within week	
Hours in hospital	31.3
Hours in operating room	11.5
Hours in inpatient v/slts.	19.8
Hours in office	13.4
Other professional time	7.3
Total professional time	52.0
Weekly productivity	
Office visits per week	43
Inpatient v/slts per week	45
Operations per week	3.4
Operations per week (CRV units)	34.4 CRV

SO-JRCE GMENAC General Surgery Workbook

The final step in the GMENAC model is the conversion of FTE physicians into actual head counts. In essence, this involves making some additional allocation to cover those physicians who do not practice full time but are instead involved in full- or part-time research, teaching, or administration or have taken some time out from practice for continuing education or other activities.

As a complement to the modeling effort, GMENAC commissioned a study of selected elements of consumer dissatisfaction with health care. The study, based on a scientifically designed opinion survey, was carried out by researchers at the Center for Health Administration Studies of the University of Chicago (USDHEW, 1979c). It is not known how GMENAC plans to incorporate the report's findings into its final estimates, if indeed it plans to do so at all. The report does, however, contain some interesting findings with potential implications for manpower policy.

Broadly speaking, the report suggests that there is a tradeoff relationship between physician productivity and consumer satisfaction, and that a decrease in current productivity levels might result in greater patient satisfaction. The assumption here is that if physicians saw fewer patients, they would be able to spend more time with patients. Presumably, with more time, they would be better able to express concern, courtesy, and consideration; improvements in the quality of the doctor/patient relationship that the data indicate some patients believe are needed.

Tables 44 and 45 and figures 16 and 17 summarize the findings of the consumer study in respect to levels of consumer satisfaction/dissatisfaction with various aspects of care. Note that the single major source of consumer dissatisfaction, high out-of-pocket costs (figure 16), is not particularly amenable to solution via manpower policy. Table 45 indicates that ethnic minorities are more dissatisfied with all aspects of care than the majority white population.

Finally, the study found that consumer perceptions of the availability of care correlated highly with actual data on physician availability.

ty. In other words, people were more likely to report that their area lacked sufficient doctors in areas where there actually were lower physi-

cian-to-population ratios. Consumer perceptions of physician shortages were particularly sensitive in the case of medical specialists.

Table 44.—Proportion of Persons Whose Experience With Physician Visits Is Beyond the Critical Threshold

Aspect of visit	Critical threshold	Percent of persons beyond critical threshold	Number of patients beyond critical threshold (in millions)
Travel time	30 minutes or more	1170	1.5
Appointment time	Over 2 weeks	10	14
Waiting time	30 minutes or more	27	37
Time with doctor	Less than 10 minutes	28	39
Information from doctor	A little or nothing	27	37
Out-of-pocket costs	\$10 or more	38	52

SOURCE *The Consumer Viewpoint: What is Health Care and What do We Want? A Response*, prepared for the Graduate Medical Education National Advisory Committee, Washington, D.C. Health Resources Administration, DHEW publication No. (HRA) 79.632, p. 13.

Table 45.—Percent of Ethnic Groups Dissatisfied With Aspects of the Medical Care System

Ethnic group	Aspects of the medical care system			Humaneness and quality of the visit
	Waiting time for an appointment	Office waiting time to see the doctor	Out-of-pocket cost of the medical visit	
Majority white	15/0	27/0	36/0	10%
Urban black	27	38	43	15
Rural southern black	26	39	45	12
Spanish heritage, Southwest	33	32	39	16

SOURCE *The Consumer Viewpoint: What is Health Care and What do We Want? A Response*, prepared for the Graduate Medical Education National Advisory Committee, Washington, D.C. Health Resources Administration, DHEW publication No. (HRA) 79.632, p. 19.

COMPARISON OF THE BHM AND GMENAC MODELS

The two major modeling efforts currently underway, those of BHM and GMENAC, exemplify two quite different philosophical approaches to the task of estimating future physician requirements. The GMENAC approach is to estimate how many physicians would be needed to provide appropriate services to meet the population's medical need for care. Estimates of medical need and appropriate services are in turn based on a combination of the frequency of particular illnesses and conditions and of medical judgment as to which of these conditions can benefit from medical services, by amount and type. In contrast the BHM approach is an economic modeling effort that treats medical care as it would any other market commodity. The aim is to predict the economic demand for medical services and the number of physicians

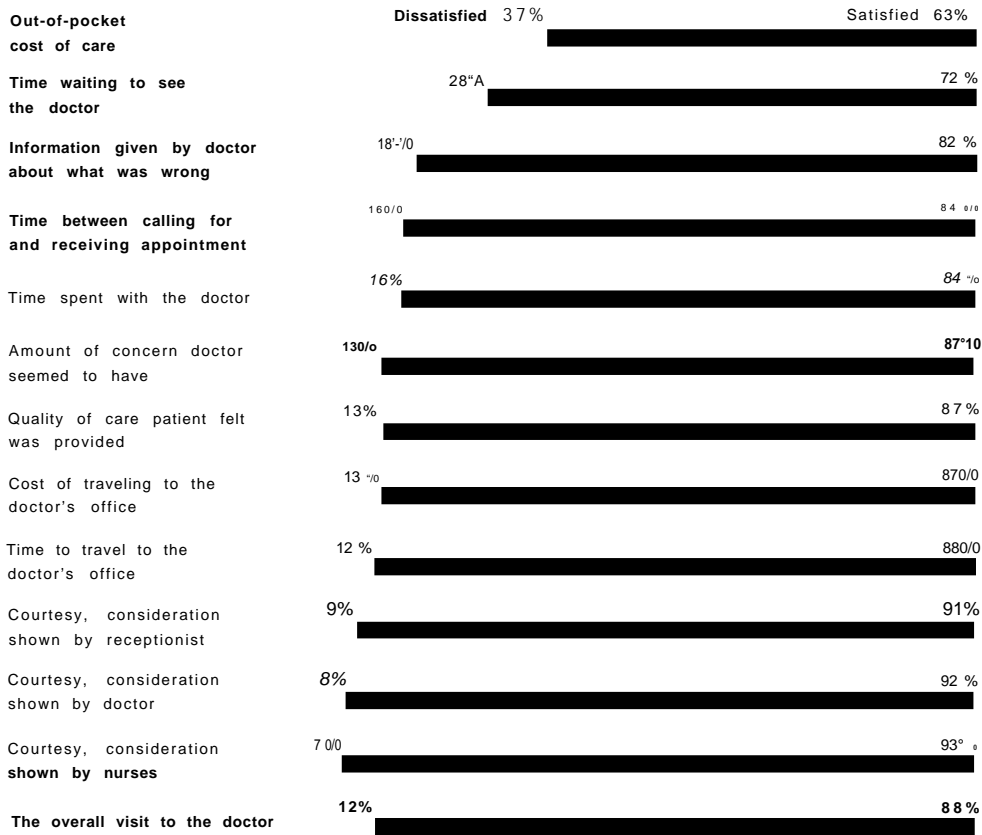
that would provide those services based on currently observable patterns and trends in medical care consumption.

Second, the GMENAC approach is a deliberate goal-setting effort based on the Committee's estimates of the numbers and types of physicians' services that should be provided or at least be available to the American citizen in 1990. Thus, the estimates GMENAC arrives at will be "target numbers," goals GMENAC will be recommending that governmental and private sector activities be directed toward realizing.

In contrast, the BHM projects current behavior trends into the future. It is not a goal-oriented modeling effort, and its estimates are therefore not intended to be target numbers for

Figure 16.—Consumer Satisfaction With Physician Services

Among those who saw a physician in a 12-month period, percentage dissatisfied/satisfied with various aspects of the visit.



To determine whether people are satisfied or dissatisfied with their medical care, the research group asked questions of all persons who had visited a doctor during the past year. The questions probed impressions of specific aspects of the visit. "Responses were very skewed toward the positive end of the scale," the group reports. For the total population, cost is the greatest cause of dissatisfaction. Overall, the chart reveals the U.S. population is generally satisfied.

NOTE Because of the large sample size, the true percentages of satisfied and dissatisfied consumers in the population are unlikely to vary by more than 1 percent

SOURCE The Consumer Viewpoint: "What is Health Care and What do We Want?" & A Response, prepared for the Graduate Medical Education National Advisory Committee, Washington, D.C. Health Resources Administration, DHEW publication No. (HRA) 79-632

policymaking purposes. The BHM modeling effort is probably best understood as an ongoing process of monitoring factors and trends that are or presently seem most likely to affect the future economic demand for medical services. Thus, BHM physician estimates represent the numbers of physicians that would satisfy specified levels of future economic demand for physician services.

To say that the BHM modeling effort is not goal-directed is to say that the model itself does not recommend or even assume that it is desir-

able or should be a policy goal to satisfy any particular level of economic demand for physician services in 1990. The model simply generates an estimate of how many physicians it would likely take to provide the medical services that are likely to be utilized by the American population in 1990, if particular conditions and trends existing now are assumed to continue on into the future.

The assumption that conditions and trends that characterize the present and recent past will continue on into the future is probably the single

Figure 17.—Consumer Satisfaction With Physician Services, by Nature of the Experience

Among those who saw a physician in a 12-month period, percentage dissatisfied with various aspects of the visit classified by the nature of the experience.

Aspect of the visit	Percentage dissatisfied	
Time to travel to the doctor's office	Less than 15 minutes	4% ⁰
	15 to 30 minutes	13% ⁰
	30 minutes to 1 hour	37% ⁰
	More than 1 hour	35% ⁰
Time between calling for an appointment and the appointment	Up to 2 days	9%
	3 days to 2 weeks	21%
	More than 2 weeks	43%
Time waiting to see the doctor	Up to 30 minutes	13% ⁰
	30 minutes to 1 hour	59% ⁰
	More than 1 hour	85% ⁰

While people generally express satisfaction with most aspects of their medical experiences, there comes a time for most when they cross a threshold of tolerance. At that point, satisfaction turns to dissatisfaction. Each variable—travel time, cost, amount of time spent with the doctor, appointment waiting time—has its special threshold. This chart matches a range of experiences with a set of variables and shows levels of dissatisfaction. Overall, it captures some sense of the dynamics of the doctor-patient relationship.

NOTE Because of the small number of people sampled in these categories, the true percents may likely vary by as much as 10 percent for this subgroup in the population. Other figures in the table are unlikely to vary more than 3 points.

SOURCE *The Consumer Viewpoint: "What is Health Care and What do We Want?" & A Response*, prepared for the Graduate Medical Education National Advisory Committee, Washington, D. C. Health Resources Administration. DHEW publication No. (HRA) 79632.

most important assumption made by the BHM model. This assumption might be characterized as a sort of "law of societal inertia" which states that the future is going to look a lot like the present and that any major differences between the present and the future are going to be the outcome of changes *already* underway that are observable as ongoing trends. The major problem is that unforeseen events, developments, interventions, decisions, etc., are quite common and are therefore quite likely to cause the future to deviate from both present conditions and from the outcome of currently ongoing trends.

Taken together, the uncertainty factors that affect modeling efforts make it advisable to view the results generated as "benchmark" estimates rather than hard predictions. Another way of viewing these estimates is to think of them as "if-then" numbers, as in "if Americans continued to utilize medical services in the cur-

rent per capita amounts, how many physicians would be in demand in 1990?" It would also be accurate to characterize the BHM projections as providing a baseline or yardstick against which the comparative size and impact of particular sorts of changes—especially deliberate policy interventions—can be measured.

The BHM model also includes separate "contingency" estimates. These are intended to gauge the probable impact on future demand for physician services of major changes that appear either likely or quite possible. Current contingency modeling efforts focus mainly on predicting the impact of alternative NHI plans. This points out that the political process and its policy outcomes are among the major uncertainty factors affecting predictive modeling. The fact that the accuracy of current predictive modeling efforts is highly dependent on the unknowable outcomes of political decisions yet to be made

simply underscores the point made earlier that these estimates should be viewed as “benchmark” or baseline estimates.

As a goal-directed modeling effort, GMENAC’S most important core assumptions are that reasonable estimates of appropriate utilization of medical services and the numbers and types of physicians needed to provide those services can be derived from a combination of empirical data and professional judgment concerning “medical need.” The standard of medical need being applied to the determination of appropriate utilization of services requires a somewhat stronger presumption of linkage between medical service and improvements in health outcome than a standard based on a volume of services provided, not because they are expected to produce beneficial effects in most instances, but because in some instances they might yield improvements and in the rest of cases are believed to do no harm. The standard being used would tend to be more conservative in estimating the medical need for such marginally beneficial services, especially where the medical problem or illness is a nonserious condition.

An illustration of how this theoretical difference translates into practice can be seen in the deliberations of GMENAC’S dermatology panel on the treatment of acne. In its first round, the panel’s initial estimate of medical need assumed that every case of acne should be seen by a dermatologist, and that a typical case would require six visits annually (which assumes medication and the need to monitor its effects). In subsequent rounds of discussion, however, the panel determined that this number was excessive and revised their initial estimate downward to reflect a more conservative definition of need. In lowering their original estimate of need for dermatologists to treat acne, the panel took into account such factors as the nonserious, self-limiting character of a high proportion of acne cases, the fact that medical treatment is most likely to produce improvement in severe cases and, finally, the fact that nonserious cases of acne can be treated as safely and efficaciously by appropriately trained generalists as by specialists in dermatology.

As a goal-directed model more concerned with defining what should be rather than forecasting what is likely to be, the GMENAC effort need not be as concerned with the problems posed by uncertainty factors as the BHM trend projection and contingency models must be. It is also relevant that the goals being formulated are for the comparative near-term future. Thus, GMENAC’S definitions of medical need are based on the assumptions: 1) that Americans will continue to have the same medical problems at the same demographic (e.g., age, sex, social class) rates in 1990 as they do now, and 2) that there will be no major breakthroughs in medical knowledge or technology that will seriously alter current medical practice. While these assumptions are probably reasonable for a period covering little over a decade, they might well become more doubtful if the time span were expanded.

More problematic for a near-term, goal-directed model than the uncertainties of the future are the reality constraints of the past and present. What we mean by this is that societies are not like marching bands: policy makers cannot blow the whistle and expect society (or one of its major subunits such as the health system) to execute a 90-degree turn in formation. Yet in a sense that is what efforts to establish and achieve collective goals frequently assume can be accomplished. Clearly, the more greatly a goal-directed estimate differs from anticipated supply and the shorter the time period available, the more we must implicitly assume that 90-degree societal pivots are possible; at least if the goal is taken seriously as one we ought to try to achieve.

A much more serious reality constraint is that there may be insufficient “play” or “slack” in the system to permit actual attainment of a physician “requirements” estimate that deviates drastically from the currently projected 1990 supply. At issue is what policy researchers term the relative “malleability” of key variables. The possibility of attaining a goal within a given period of time is dependent on the malleability of supply factors. Supply factors, however, are not highly malleable. The reason for this is, that, as 1990 is only 10 years away and physician training re-

quires a long leadtime, most of the 1990 supply is already locked in. And even though 40 percent of the physicians in practice in 1990 will have completed training since 1979 (Jacoby, 1980), major changes in graduate medical education cannot be expected to take place and have a significant impact on the specialty distribution of the 1990 physician supply. Perhaps future goal-oriented modeling efforts should pay explicit attention to the relative "malleability" of key variables. In so doing, they might provide alternative estimates, signaling, on the one hand, goals that are capable of attainment within the allotted time span and, on the other hand, goals that are considered desirable but would require a longer time frame and are thus best considered as signaling the appropriate direction for deliberate change but not taken as immediate targets.

So far we have discussed only one set of reality constraints (i.e., limitations on the malleability of the health manpower supply) that impinges on the feasibility of a goal-oriented model of physician requirements. There are other factors as well. One is the difference between the types of conditions that ought to be seen by particular types of physicians and actual patterns of physician use. For example, a non-trivial portion of the current caseload of generalist physicians is composed of nonserious, self-limiting conditions that medical treatment can do little to cure or ameliorate (e.g., "colds"). These cases would tend to be discounted based strictly on medical need. There is little reason to expect however, that, in reality, patients would rapidly be reoriented to stop bringing such complaints to physicians or that physicians would refuse to see patients with such complaints. Thus, GMENAC'S normative model accounts for some need to provide services to the "worried well," and the BHM estimates include present use of medical services by the "worried well" in its projections.

The need to pay attention to both goals and reality leads naturally to a consideration of the complementarity of goal-driven and trend projection modeling. Because each of these two major modeling efforts is oriented toward different purposes and focuses on rather different vari-

ables, they are, in truth, more complementary than competing. As such, each model's results can aid our interpretation of the other's.

The GMENAC model focuses on translating a normative definition of medical need into appropriate rates of utilization of medical services, while the BHM model looks on medical care as a "consumer good" and treats empirical trends in utilization of medical services as a proxy for economic demand. If the BHM demand estimates should prove significantly greater than the GMENAC estimates, this would suggest that there are powerful factors at work that are pushing utilization of medical services beyond the level medically necessary and appropriate for "good" care. This would then raise the policy question of what percentage—if any—of the projected future economic demand for medical services over and above the professional judgment-based estimates of medical need should be considered legitimate. Conversely, if the BHM demand estimates should prove significantly less than the GMENAC estimates, this would suggest that there remain and will remain in the near future significant barriers to obtaining medically necessary care. Finally, if the BHM and GMENAC demand estimates prove to be in rough parity, this would suggest that the economic demand for services is more or less in line with professional estimates of the medical need for physician services.

Obviously, since the GMENAC model has yet to generate any numbers, it is impossible to say at the present time which of these three alternatives will prove to be the case. We can say, however, that the most likely occurrence would appear to be rough parity or a BHM demand estimate that is significantly greater than the GMENAC aggregate estimate. The major reason for anticipating that the BHM estimate will most likely prove greater than or at least equal to the GMENAC estimate is that one of the major variables in the BHM model is a projected trend toward rising *per capita* utilization rates for medical services, independent of demographic changes and projected changes in price. In contrast, the GMENAC model assumes no major changes in medical need apart from changes in medical need induced by demograph-

ic shifts (e. g., an aging population), between now and 1990; hence no medical rationale for steadily rising per capita utilization of services. Thus, in order for the GMENAC estimate to logically come out larger than the BHM estimate, one would need to assume that there is *curreztlly* such a large unmet medical need for services, that, despite the trend of rising per capita utilization rates, assumed in the BHM model, considerable unmet medical need will remain in 1990.

What is a reasonable estimate of requirements from the BHM economic model which might approximate aggregate adjusted need from the GMENAC modeling effort? Recall that BHM now projects demand at approximately 600,000 physicians in 1990, or what the supply will be. We saw (table 37) that this represented an increase of 217,841 over the 1975 figure of 378,376; 35,960 was due to an increasing and changing population, and 181,881 due to projected increases in per capita utilization trends. That is, without increasing per capita utilization, demand in 1990 would be roughly 415,000.

We also saw (figures 10 through 13) that the large increase attributed to rising per capita utilization would nearly disappear if pre-1970's data were deleted from the trend base. But we would not want to discount this increase entirely for several reasons: 1) the possibility of NHI, 2) possible decreases in the average physician's

workweek, and 3) increasing the time physicians spend with patients.

The possible effects of an NHI program have previously been summarized. Physicians currently average longer workweeks than most of the rest of the working population. Bringing the physician workweek more into line with the present patterns of work productivity of the labor force in general would lower productivity. Alternatively, the cushion of excess physicians might enable physicians to see fewer patients and spend more time with each one. According to the National Center for Health Statistics, about half of all office visits to physicians in both 1973 and 1977 lasted 10 minutes or less. With smaller patient loads, doctors might be able to use the additional time to provide patients with more information, education, and counseling.

For these reasons, it is difficult to estimate physician requirements. If one takes projected population changes alone, requirements in this model would be for 415,000 physicians. Some contingency is necessary to account for such factors as NHI, decreased working hours for physicians, and more time spent with patients per visit. How much of a contingency is necessary is a matter of judgment, and the reader can come to his or her *own* conclusion on what it should be over and above the increase in requirements due to population growth.

PRODUCTIVITY

Both BHM's and GMENAC'S modeling efforts emphasize the amount of medical services that either will (based on predictions of trends) or should (based on normative determinations of medical need) be used in the future. However, estimates of the number of physicians required are derived by dividing projected use by physician *productivity*. With the exception of task delegation to physicians' assistants and nurse practitioners, which would enhance physician productivity and thereby reduce aggregate physician requirements, neither modeling effort explores possible changes in productivity and their effects on requirements estimates. Rather, both

models basically assume that physician productivity will remain constant through 1990. The BHM model does this by assuming that the ratio of practicing physicians to total output of physician services will be the same in 1990 as it was in 197.s. In the case of GMENAC, the main effort has been toward choosing the most reliable and accurate measures of current productivity as reflected in various empirical studies. Its modeling effort makes explicit assumptions about the average workweek, patient visit rates, etc., by each medical specialty.

But physician requirements estimates are highly sensitive to changes in productivity

(Reinhardt, 1975). As an illustration of this sensitivity, if we were to postulate that the appropriate ratio of physicians-to-population in 1970 was 185 per 100,000 (the actual ratio in the best-endowed areas) and percent growth in productivity kept pace with percent growth in per capita use of physician services, then the physician-to-population ratio would remain constant indefinitely. However, as Reinhardt points out:

If in 1970 a set of policies could have been implemented such that average annual growth in physician productivity during the following two decades were one percentage point higher than the annual growth in the per capita utilization of physician services, then the required ratio at the end of the forecast horizon would have been only 151 physicians per 100,000. Relative to a forecast based on maintenance of the base-year ratio of 185 per 100,000 and for a population of roughly 250 million in 1990, this turn of events would have led to a reduction of about 85,000 in the number of MDs that would otherwise have been "required." The corresponding number for 1980, based on a projected population of 225 million, is 40,500. These figures must surely strike one as significant, especially if held up against the annual number of medical graduates (between 15,000 and 16,000) likely to be produced during the next several decades (Reinhardt, 1975).

Reinhardt's analysis was primarily concerned with the impact of substantial gains in productivity that might occur as a result of organizational changes in physicians' practices and of task delegation to nurse practitioners and physicians' assistants. His research also provides some data suggestive of a possible relationship between growth in physician supply and decreases in physician productivity. Table 46 (reproduced from Reinhardt, 1975) provides some data on relationships between physician supply, physician productivity, and financial factors such as average visit fee and average annual physician income. If physician supply increases (item #1) but demand for services (per capita use) remains constant (item W), then productivity (measured in patient visits per MD) will drop (item #3). The data suggest that physicians then may charge more per visit (item #7), though not necessarily enough for physicians' incomes to reach the same level as in areas with

fewer physicians and/or greater demand for services (item #8).

A different approach to the question of physician productivity and its relationship to requirements estimates is to examine trends in physician productivity. According to *Medical Economics* magazine's Continuing Survey, comparing workweeks in 1965 versus 1976, office-based physicians spent 2 hours less with office patients, 2 hours less on housecalls, and 1 hour less on hospital rounds and consultations in 1976. Median time spent on all professional activities (including activities other than patient care) in a typical workweek fell from 64 hours in 1965 to 60 hours in 1976 (Owens, 1977).

More recently, *Medical Economics* reported that the number of office visits has continued to decline. Over the period 1974-78, office-based physicians were seeing 8 fewer patients per week in 1978 as compared to 1974, a median weekly number of 126 rather than 134 (Owens, 1979).

Generally, two hypotheses are given to explain recent decreases in productivity and to predict further decreases. One hypothesis is that physicians, as most other Americans, would prefer to work less and enjoy more leisure time. The other hypothesis is if growth in physician supply outpaces growth in the demand for physician services, then declines in physician productivity may occur as a means of bringing supply and demand into balance.

In the latest survey (Owens, 1979) 57 percent of the office-based physicians stated that they believed they were practicing at full capacity. Of this 57 percent, a minority (amounting to 12 percent of the entire sample of physicians surveyed) said they would prefer not to practice at peak productivity. Of those surveyed 43 percent said that they were not practicing at peak productivity. Of these, a majority said they did not want to practice at full capacity. Of the entire sample 18 percent, however, stated that they were not practicing at full capacity but would prefer to do so. Among the specialties, 31 percent of urologists, 24 percent of general surgeons, and 24 percent of otolaryngologists said that they were not practicing at peak productivity and would prefer to do so.

Table 46.—Regional Differences in Certain Health-Care Statistics, United States, 1969-70

Item No.	Year	Census divisions		
		New England	East-North Central	East-South Central
1. Number of active MDs involved in patient care as their primary activity, per 100,000 population	1970	161 (1.00) ^a	115 (0.71)	95 (0.59)
2. Average annual number of hours worked per MD				
a) Total practice hours	1969	2,504	2,495	2,568
b) Hours of direct patient care	1969	2,128	2,151	2,303
3. Average annual number of patient visits per MD				
a) Total patient visits	1969	4,808 (1.00) ^a	6,611 (1.38)	8,408 (1.75)
b) Office visits only	1969	3,384 (1.00) ^a	4,799 (1.42)	6,052 (1.79)
4. Total visits per hour				
a) Total visits per practice hour	1969	1.92	2.65	3.27
b) Total visits per hour of patient care	1969	2.25	3.07	3.65
5. Average number of auxiliary personnel employed per physician	1967	1.3	1.8	2.1
5. Percentage of physicians in group practice	1969	9.3 %	17.4 0/0	19.4 0/0
7. Average fee for a routine followup office visit:				
a) General practice	1969	\$6.79	\$6.29	\$5.21
b) Internal medicine		9.40	8.05	7.20
c) Pediatrics		7.53	6.94	5.40
d) General surgery		9.76	7.76	6.85
e) Obstetrics/gynecology		9.77	9.32	7.60
8. Average net income (all specialties)	1970	\$38,019.00	\$47,000.00	\$41,963.00
9. Reported no. of physician-patient visits per capita:				
a) Based on survey of physicians	1969			
— total patient visits		7.7	7.6	8.0
— office visits only		5.4	5.5	5.8
b) Based on household surveys	1970	4.4	4.0	4.1
10. Infant mortality rate:				
a) White	1968	19.2	19.4	20.9
b) Nonwhite		31.8	35.4	40.5
11. Personal per capita income	1970	\$4,469.00	\$4,306.00	\$3,146.00

^aFigures in parentheses are indexes with New England set at 1.0

SOURCE: U. Reinhardt, *Physician Productivity and the Demand for Health Manpower, An Economic Analysis*, Cambridge, Mass.: Ballinger, 1975 (table 2-5, revised)

According to *Medical Economics*, the finding that almost one-fifth of the physicians surveyed felt that they were not practicing at full capacity but would prefer to do so “suggests that maldistribution of medical manpower plus the growing number of new doctors—nearly 35,000 have joined the ranks of office-based MDs over the past 5 years—may already have left physicians short of patients in some areas” (Owens, 1979).

In sum, the available evidence suggests that both physician preferences and the increasing number of physicians are contributing to declining productivity. Yet, some physicians still feel overworked, which suggests that maldistribution remains.

Decreased physician productivity, it is important to note, is not necessarily undesirable. If a

physician is practicing in an underserved area, then high productivity is likely to reflect overwork. Under these conditions of chronic overwork, decreased productivity would probably represent increased quality. As the physician supply increases and unmet demand slackens, then decreases in productivity would, at some point, begin to represent not better quality care, but inefficiency. Table 47 summarizes one effort to quantify this relationship for primary care physicians' services (Walker and Armondino, 1977). Additional research that would increase our understanding of this relationship would be important because of the cost implications.

The possibility of further decreases in physician productivity has important, though largely unexplored, implications for the problem of the

Table 47.—Shortage, Adequate, and Surplus Levels of Primary Care' Physicians

Average primary care visits per hour	Workload evaluation	Office visits in 5.5 patient contact hours per day	Visits per 240-day year (supply)	Average annual primary care visits per person (need)	Population potentially served per full-time equivalent physician	Criteria designation
6	Too high	33	7,920	2.5	3,200	Shortage
4	Ideal	22	5,280	2.5	2,100	Adequate
2	Too low	11	2,640	2.5	1,100	Surplus

^aGeneral and family practice, internal medicine, and pediatrics

SOURCE J. E. C. Walker and N. L. Armondino. *The Primary Care Physician Issues (in Discussion)*, Lawrence, Kan.: Connecticut Health Services Research Series, No. 7, 1977.

locational maldistribution of physicians. Arguments about the likely effects on physician shortage areas of increasing the aggregate supply of physicians have tended to focus on two alternative hypotheses. One hypothesis is that, ultimately, the law of supply and demand will force physicians to move into what are currently shortage areas as long as growth in supply outpaces growth in demand for services in areas that already have high physician-to-population ratios. The alternative hypothesis is that physicians have the capability to generate demand for their services, and, if exercised to any significant degree, this capability would decrease the pressure on physicians to move out into less attrac-

tive areas as aggregate physician supply increased. Whatever the case, enormous increases in the aggregate physician supply cannot be assumed to guarantee that an eventual solution to the problem of locational shortages will “naturally” occur. An attractive metropolitan area where the physician-to-population ratio is high enough to satisfy the highest reasonable levels of medical need or consumer demand for care can nevertheless continue to absorb many additional physicians if individual productivity decreases. Otherwise stated, it is quite likely that we could have a large “oversupply” of physicians in the aggregate in future years and still have shortages in particular locations.

LOCATIONAL REQUIREMENTS

The application of both the BHM and GMENAC models has relevance primarily at the national level. Shortages will always remain in specific service areas no matter how “correct” the balance between national supply and requirements are and even if supply exceeded requirements substantially. Yet locational estimates must be made at the national level: 1) to plan for the National Health Service Corps (NHSC) to meet some part of this requirement and 2) to provide guidelines and eligibility criteria for Health Manpower Shortage Area (HMSA) designations. Consequently, estimates of the requirements for physicians are used to determine need and serve as the starting point for shortage area designations, augmented by other criteria that represent barriers between the physician and the population he/she is expected to serve.

We have seen that future supply for locational distribution is estimated in similar fashion as national supply. Subtraction of the estimated supply from estimated requirements equals total unmet need.

Need in 1990 has been estimated at 16,400 primary care physicians and psychiatrists (USDHEW, 1979d). Primary care is defined as non-Federal MDs and DOS providing direct patient care who practice principally in general or family practice, general internal medicine, general pediatrics, and obstetrics-gynecology. At current budget levels, NHSC scholarship recipients now in the pipeline will result in **3,950** NHSC physicians in the field by 1990. Through NHSC scholarships and combining 1,150 physicians expected to volunteer with 900 midlevel practitioners (assumed to each equal 0.5 physi-

cians), 34 percent of need will be met. Assuming a 10-percent conversion rate from NHSC to private practice in underserved areas, 1,000 physicians, or 6 percent of need, will be met. Finally, assuming current levels of 2,000 physicians in federally funded health centers, another 12 percent of need will be met in 1990. Together, these sources are expected to provide 52 percent of the projected need of 16,400 in 1990. These projections are summarized in table 48.

“Need” as defined for purposes of projecting future HMSAS should not be confused with the need for physicians based on estimates of a given population’s economic demand or medical need for services, as described in the analysis of the BHM and GMENAC modeling efforts. In the case of shortage area projections, two physician-to-population ratios are used as criteria to determine the level of need for primary care physicians in an area:

- **Designation ratio.**—The actual minimum ratio of active, non-Federal, patient care physicians engaged in primary care to the civilian population of an area below which an area is considered to have a shortage of health manpower sufficient to justify its being counted as a shortage area in the model.
- **Staffing ratio.**—The theoretical maximum ratio of active non-Federal, patient care physicians engaged in primary care to the civilian population of an area used as a standard above which an area is considered to have adequate health manpower so that additional Federal intervention with NHSC staffing is no longer necessary (USDHEW, 1978a).

“Need” is the number of physicians required to reach the staffing ratio for all designated areas. The designation ratio is based on equity considerations and reflects that quarter of the United States having the least number of primary care physicians. It has been set at 1:3,500. The staffing ratio establishes a limitation upon the extent of Federal involvement and specifies the relationship between the service demands of the population and the primary care physicians available to provide those services. It has been set at 1:2,000.

The designation ratio of 1:3,500 means that areas with smaller ratios would not be included, including areas with ratios between 1:3,500 and 1:2,000.

However, because criteria for making HMSA designations were expanded under the 1976 Act to include, in addition to manpower-to-population ratios, other indicators of need such as infant mortality rates, access to health services, health status, income level, and the number of foreign medical graduates practicing in the area, the method for projecting future shortage areas and their physician needs has been adjusted in the following way:

Comparison of projected areas with actually designated areas showed that the projection model missed part-county areas designated upon factors other than strict physician to population ratios. The physician to population ratios, strictly determined, fell within a range from 1:2,000 to 1:3,500. Therefore, the unmet need for counties with ratios between 1:2,000 to 1:3,500 is used as a proxy for part-county rural areas. (USDHIW, 1978a).

Table 48.—Need for Primary Care’ Physicians and Psychiatrists in 1990

Total need	Current NHSC scholarship recipients	Volunteers	Conversion from NHSC to private practice in underserved areas	‘Current level of physicians [n federally funded centers	Unmet need
16,400	3,950	1,600 ^b	1,000	2,000	7,850
1,000/0	4		8.550 (520/0)		480/0

^aGeneral & family Practice, general internal medicine, general pediatrics, and obstetrics-gynecology

^bIncludes 1300 midlevel practitioners, each equal to 0.5 physician

SOURCE: Outyear Size of the National Health Service Corps (NHSC)—**DECISION MEMORANDUM**, from the Assistant Secretary for Health and the Acting Assistant Secretary for Planning and Evaluation to the Secretary for Planning and Evaluation to the Secretary, Washington, D.C., Spring 1979

The result is that, taking the year 1980, unmet need from reducing the ratio from 1 :3,500 (or more) to 1:2,000 would be 5,659 primary care physicians, with an additional 3,037 from the proxy measure for part-county rural areas.

These designation and staffing ratios are applied to metropolitan and nonmetropolitan areas. The staffing criteria for correctional institutions were partly based on the needs identified by the Federal Bureau of Prison's Medical Director's office. DHHS'S Alcohol, Drug Abuse, and Mental Health Administration provided the 600 workload unit estimates and the 1:20,000-30,000 ratio. The Indian Health Service estimates were based on an expected increase for primary care and psychiatric physician needs of 3 percent yearly. These criteria are summarized in table 49.

These designation and staffing ratios were used to arrive at the estimated need in 1990 for 16,400 primary care and psychiatric physicians. These projections have been used to plan for future staffing of NHSC. The great majority of future NHSC physicians will come from medical school scholarship recipients obligated to serve year-for-year in the Corps. The emphasis is therefore on recruiting first-year medical students, as the total obligation will be 4 years.

Table 49.—Criteria for Unmet Need Calculation by Area

Area	Designation ratio	Staffing ratio
Nonmetropolitan	1 :3,500	1 :2,000
Metropolitan	1 :3,500	1 :2,000
Correctional institutions		
Primary care	1:1,000	1 :500
Psychiatry	1 :2,000	1:1,000
State mental hospitals (psychiatrists).	600 workload units/a/FTE	600 workload units/FTE
Community mental health centers (psychiatrists). . .	1 :30,000	1 :30,000
Indian Health Service	all officially recognized tribes	3-percent yearly increase

^aTotal workload units = average daily inpatient census + 2x (number of inpatient admissions per year) + 0.5x (number of admissions to day care and out patient services per year)

SOURCES Memorandum from the Chairman, NHSC Needs Task Force A, to the Director, Bureau of Community Health Services, Health Services Administration; the Deputy Director, Bureau of Health Manpower Health Resources Administration, and the Chairman, NHSC Needs Task Force, Washington, D C , May 26, 1978, and 42 CFR sec 5

Currently, an option has been adopted whereby the Corps will consist of 8,300 physicians and 2,800 physician extenders in 1990, with the understanding that the target could be readjusted to 15,000 physicians and 2,800 physicians' assistants and nurse practitioners after a 3-year study. The latter would meet almost all projected need, but not until 1995. The 8,300-physician target would require about 13 percent of each medical school class through 1983. The 15,000 physician target would require recruiting 25 percent of each class by 1986 (USDHEW, 1979d).

The primary care physician-to-population designation ratio of 1 to 3,500 is employed as a major criterion in the process of determining whether a particular area qualifies for official designation as an HMSA and thus eligible for NHSC placements and other aid. It is not, however, the only criterion employed, and areas with lower physician-to-population ratios may qualify for designation under certain conditions.

This is best illustrated by the criteria for geographic areas. A sample of the specific methodologies for meeting these criteria should illustrate the point. Detailed criteria can be found in the Code of Federal Regulations, title 42, section 5, appendix A.

Three criteria must be met for designation:

1. The area is a rational area for the delivery of primary medical care services.
2. One of the following conditions prevails within the area:

(the **area** has a population-to-primary care physician ratio of at least 3,500:1,

(The area has a population-to-primary care physician ratio of less than 3,500:1 but greater than 3,000:1 and has either unusually high needs for primary medical care services or insufficient capacity of existing primary care providers.

3. Primary medical care manpower in contiguous areas is overutilized, excessively distant, or inaccessible to the population of the area under consideration (42 CFR sec. 5, app. A).

“Rational area for the delivery of primary care” includes:

- i. A county, or a group of contiguous counties whose population centers are within 30 minutes travel time of each other.
- ii. A portion of a county, or an area made up of portions of more than one county, whose population, because of topography, market or transportation patterns, distinctive population characteristics, or other factors, has limited access to contiguous area resources, as measured generally by a travel time greater than 30 minutes to such resources (42 CFR sec. 5, app. A).

“Insufficient capacity of existing primary care providers” will be met if at least two of the following criteria are documented:

- a. More than 8,000 office or outpatient visits per year per FTE primary care physician serving the area.
- b. Unusually long waits for appointments for routine medical services (i. e., more than 7 days for established patients and 14 days for new patients).
- c. Excessive average waiting time at primary care providers (longer than 1 hour where patients have appointments or 2 hours where patients are treated on a first-come, first-served basis).
- d. Evidence of excessive use of emergency room facilities for routine primary care.
- e. A substantial portion (two-thirds or more) of the area’s physicians do not accept new patients.
- f. Abnormally low utilization of health services, as indicated by an average of 2.0 or less visits per year on the part of the area’s population (42 CFR sec. 5, app. A).

Several points should be noted in comparing the actual criteria used for HMSA designation with the methods and assumptions used to model and project the number of shortage areas anticipated in future years. First, the model for predicting future shortages uses the county as the geographic base to calculate physician-to-population ratios. The HMSA designation process uses a “rational service area” as the geographic base. A “rational service area,” as we

have seen from the regulations, could be a county or it could be an area larger or smaller than a county. In sum, the definition of a “rational service area” contains considerable flexibility to permit responsiveness to local conditions in making the actual HMSA designations.

Additional flexibility to respond to local conditions is introduced by permitting areas to qualify as HMSAS if they have a physician-to-population ratio lower than **1:3,500** but greater than **1:3,000** as long as they can show either unusually high needs for primary medical care services or insufficient capacity of existing primary care providers.

One final factor that differentiates the methods used in projection of future shortage areas from those used in the actual official designation process is that, in order for an area to actually receive official designation as an HMSA, a request for designation must come from the local level. Thus, a request for HMSA designation serves as a preliminary indicator that there is interest at the local level in obtaining NHSC physicians. However, remember that HMSA designation is necessary not only for assignment of NHSC physicians, but also that such designated areas: would be areas in which students who borrowed money under health professions student loan programs could practice in lieu of repaying the loans in money; would be eligible for grants in various health manpower training programs; would be eligible or given preference for grant funds for several Bureau of Community Health Services programs such as the urban and rural health initiatives; and would be the only areas in which rural health clinics could be certified for reimbursement of nurse practitioner and physicians’ assistant services under Medicare and Medicaid. So HMSA designation does not necessarily mean that NHSC physicians will be recruited to provide services in these areas.

The model had predicted a need for **14,033** primary care physicians in 1979, 8,839 in non-metropolitan areas, and 5,194 in metropolitan areas (USDHEW, 1978a). The actual number of HMSAS designated in **1979** was 1,711, with a total primary care physician need of 11,336. Of the HMSAS, 1,226 were in nonmetropolitan

areas, with a need for 5,368 physicians, and 485 were in metropolitan areas, with a need for 5,968 physicians (Reid, 1980). Thus, there was an overestimate of physician need in nonmetropolitan areas and an underestimate of need in metropolitan areas. However, a request for designation must come from the local level, so the difference between the predicted need for 14,033 primary care physicians and the actual need for 11,336 is not surprising.

How well do the HMSA designation and staffing criteria relate to the use of primary care physician services? Some physician capacity utilization surveys have recently been made available. Salient findings from the surveys are:

The analysis also examined the influences of exogenous factors on practice characteristics of HEW-designated physician shortage area counties—defined primarily in terms of physician-population ratios. In practical terms, none of the fully or partially designated shortage counties studied gave evidence of excess demand in the traditional economic sense. Physicians' office hours in these shortage areas were about the same as those of physicians in nonshortage areas. Nor were patient waiting times, for appointment and in the office, significantly different from those in nonshortage areas. However, a decreasing waiting time to appointment

as the supply of general practice physicians increases is some indication of excess demand in shortage areas. It was found, in fact, that shortage area physicians had slightly fewer patient visits than physicians at large. (This result is substantiated by a recent study of the Health Service Administration that reported similar observations of productivity from NHSC physicians placed in shortage areas.) A control for population density (used as a proxy for travel distance to see a physician) made little difference in these results (reference and footnotes omitted) (USDHEW, 1978b).

The NHSC experience, however, could be reversed over time. Table 50 disaggregates physician encounters/physician by: 1) self-support ratio categories, 2) initial staffing years, and 3) sites with and without midlevel practitioners. Bearing in mind that the NHSC experience was only 5 years old at the time of the study, the table shows that: 1) patronage of NHSC sites builds over time, patient demand being positively and significantly related to the number of years the sites have been in operation, 2) the more mature sites tended to have higher productivity per provider, and 3) sites that were approaching the capability to be financially self-supporting showed higher productivity levels per provider.

Table 50.—Physician Encounters per Physician and Physician and Physician Encounters per Physician Hour by Selected Cohorts, National Health Service Corps (FY 1976)

	Sample sites	Self-support ratio categories			Initial staffing year				
		1	2	3	1972	1973	1974	1975	1976
Physician encounters/physician (all sites)	4,664 (130)	7,092 (30)	4,568 (52)	3,524 (48)	6,144 (25)	5,164 (25)	5,140 (27)	3,912 (64)	2,804 (2)
Physician encounters/physician (sites with no PEs)	4,428 (94)	6,420 (23)	4,048 (40)	3,440 (31)	5,544 (12)	5,780 (6)	5,392 (18)	3,792 (56)	2,804 (2)
Physician encounters/physician (sites with PEs)	5,272 (36)	9,304 (7)	6,296 (12)	2,888 (17)	6,700 (13)	4,420 (5)	4,644 (9)	4,772 (8)	—
Physician encounters/physician hour (all sites)	(:3;)	; ;)	&	1.8 (48)	2.8 ; " :)	2.8 (11)	(&)	(% :)	2.1 (2)
Physician encounters/physician hour (sites with PEs)	2.6 (36)	5.2 (7)	2.9 (12)	1.4 (17)	3.3 (13)	2.6 (5)	2.8 (9)	1.1 (8)	—
Physicians encounters/physician hour (sites with no PEs)	2.2 (94)	(%)	2.1 (40)	2.0 (31)	2.7 (12)	2.9 (6)	2.4 (18)	1.0 (56)	2.0 (2)

^aSelf-support ratios measure the relation between the total revenues from all sources and total costs experienced at sites at a given time. Category 1 Sites are the most self-supporting, diminishing to category 3.

^bPhysician extenders, or midlevel practitioners