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Summary

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INTRODUCTION

Reauthorization of the Health Professions Educational Assistance Act (Public Law 94-484) is scheduled for 1980. Essentially, the **Act reflects Congress'** policies toward medical and other health professions educational support and toward identifying and addressing the problems of medically underserved areas and populations.

The request for this assessment originated with the Senate Committee on Labor and Human Resources, supported by the House Committee on Interstate and Foreign Commerce. The Senate Committee's letter pointed out that there have been wide variations in the numbers and types of physicians "required," and that as Congress begins to deal with the more difficult issues of specialty and geographic maldistribution, legislative policy will have to rely on such forecasting results and related forecasting technologies for estimating the adequacy of specialty and geographic distribution. It would therefore be helpful to Congress that an analysis be undertaken of the assumptions underlying the different forecasts, as well as the methods and conclusions of the forecasts themselves, in order to determine which forecasting technologies are most reasonable.

Projections of physician supply and requirements have influenced Federal policy toward and legislation on health professions education and the problem of medically underserved areas, and play an important role in existing Federal programs whose purposes are to build up area medical resources or to provide medical services directly.

Until the 1976 **Act,** Federal policy was to in**crease the** supply of physicians and other health professionals, because the perception was that of acute shortages. Although **the** expiring legislation contains incentives to continue to accelerate the supply of physicians, the general consensus now is that the aggregate supply **of physicians is at least adequate and perhaps even in excess. Hence, attention has turned toward the problems of specialty and geographical, or locational, maldistribution.**

Efforts at correcting specialty maldistribution have concentrated on the primary care specialties, which are usually identifed as general practitioners, family practitioners, general internists, and general pediatricians. All osteopathic physicians are also included, although this profession is becoming more specialized (about 40 **percent are now specialists). Psychiatrists, obstetrician-gynecologists, and general surgeons have sometimes been included.**

Definitional problems are obvious, and they are important in determining the requirements for primary care physicians. For example, primary care physicians may include only those categories identified as primary care; i.e., different combinations of the categories identified above. The underlying rationale is that the way in which medical care is provided is crucial. This approach sees primary care as requiring a change in attitude toward patient care, a holistic approach to patients and their families, and as providing the appropriate entry point into the medical care system. Others may concentrate on office-based ambulatory care regardless of the specialty designation of the physician providing such services and estimate requirements on that basis.

In addition to definitional problems, approaches toward primary care have been reminiscent of past approaches to aggregate physician supply; the emphasis has been on simply increasing the supply rather than simultaneously being concerned over what is an appropriate supply. Usually, this has meant that primary care objectives have been phrased in terms of the percent of the aggregate physician supply that should be in primary care. Such objectives

would be inappropriate if aggregate supply were excessive.

Geographical or locational maldistribution is generally a problem where health personnel and services are found inadequate, by some defined standard, to meet the health needs of the population of the identified communities, areas, or institutional settings. Locational maldistribution is by definition a relative concept, where some of our people are determined to be at a disadvantage relative to the rest of the United States. Once these are identified, then the gap between health personnel and services and that population's needs for them is quantified to determine: 1) how many personnel are needed to bridge the gap, and 2) of the identified deficiency, how much of it will be addressed through a specific program.

Quantifying locational maldistribution serves two purposes. First, it is used as part of the eligibility criteria for the Health Manpower Shortage Area (HMSA) designation for: 1) National Health Service Corps (NHSC) sites; 2) designation as service areas in which students who borrow money under health professions student loan programs can practice in lieu of repaying the loans in money; 3) grants for various health manpower training programs; 4) eligibility or preference for grant funds for several Bureau of Community Health Services programs, such as the urban and rural health initiatives; and 5) certification of rural health clinics for nurse practitioner's and physicians' assistant's services reimbursement through Medicare and Medicaid.

Second, these methods to quantify locational maldistribution are used to plan for the future size of NHSC. That is, given the estimated universe of existing and future HMSAS, plans must be made for determining how many of those medical manpower shortage areas will be staffed by NHSC physicians. Currently, the major source for those future NHSC positions are students who will be obligated to NHSC in exchange for scholarship support.

CURRENT ACTIVITIES

Under the Health Professions Educational Assistance Act of 1976, the Department of Health and Human Services (DHHS) is required to provide annual reports to the President and Congress on the status of health personnel in the United States. Estimating the present and future supply of and requirements for physicians and other health professions is the responsibility of the Health Resources Administration through its Manpower Analysis Branch of the Bureau of Health Manpower (BHM). DHHS has produced its first report (dated August 1978 and reprinted in March 1979) and is in the final stages of review for its next report.

In addition, DHHS chartered a Graduate Medical Education National Advisory Committee (GMENAC) on April 20, 1976, to make recommendations in 3 years to the Secretary on the present and future supply of and requirements for physicians, their specialty and geographic distribution, and methods for financing graduate medical education. Its most immediate impact will come from its recommendations on how graduate medical education (residency programs) should (could) be changed to meet these stated goals. GMENAC was given a l-year requested extension of its charter to April 20, 1980, at which time its final report must be submitted. An interim report was published in April 1979.

Finally, the Bureau of Labor Statistics of the U.S. Department of Labor includes physicians and other health occupations in its projections of occupational requirements and training needs. These projections relate manpower to projected economic demand (expenditures) 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.

The Bureau of Labor Statistics considers the BHM's modeling efforts to be a more sophisticated effort than its own, and in its forthcoming revision of its estimates, will adopt the midpoint of the range of projections from the BHM model for its physician demand projections. Thus, there are essentially two major efforts currently underway, which will have immediate impacts on Federal health manpower policy; the sustained modeling activities of BHM and the nearly completed deliberations of DHHS'S GMENAC. These two activities also illustrate well the different approaches through which physician supply and requirements projections can be made.

FINDINGS AND CONCLUSIONS

supply

Forecasts of the future supply of physicians consist of:

- current Supply, adjusted for attrition from deaths and retirements, and
- additions to supply from:
  - —graduates of U.S. medical and osteopathic schools and
  - —immigration of physicians educated in other countries plus U.S. citizens educated in foreign medical schools.

The supply of active physicians is projected to be approximately 450,000 in 1980, 525,000 in 1985, and 600,000 in 1990. Compared to a 1975 supply of 378,000, the net increase will average 75,000 every 5 years.

BHM estimates of additions to supply from graduates of U.S. medical and osteopathic schools take first-year enrollment projections, adjusted for attrition, to arrive at the number of graduates per year. Estimates of first-year enrollments are based on trends in: 1) Federal cavitation support, 2) Federal construction grants activity, 3) new schools already planned, and 4) potential State and local support of new schools.

Estimates of additions to supply from immigration of physicians educated in other countries are currently based on the presumed impact of the Health Professions Educational Assistance Act of 1976, which was designed to sharply curtail the immigration of physicians into the United States.

GMENAC'S approach to estimating supply (not yet completed) uses a different way of disaggregating the U.S. medical school graduate source. They will project graduates for each school, based on information provided by the Association of American Medical Colleges.

Although predictions of the future supply have been consistent in the aggregate over the past 5 years, the additions—domestic and foreign graduates—have changed considerably. Current projections may overestimate the number of future domestic graduates because of the assumption of full cavitation funding. In contrast, the addition to supply from foreign medical graduates, projected to be 1,000 to 2,000 in the 1980's, could be unrealistically low. U.S. students studying abroad (currently under study by the General Accounting Office) may not be adequately accounted for and could double the 1,000 to 2,000 additions per year from foreign medical schools in the 1980's.

The net effect of overestimating domestic sources and underestimating foreign sources could "wash" each other out.

Supply projections leave the impression that 600,000 physicians in 1990 is a fixed number. But the assumptions currently in use explicitly recognize the influence of policy on supply. Estimates based on different sets of assumptions could provide better indications of the variability of the projected supply and of the influence of deliberate policy decisions on the ultimate numbers.

For foreign graduates, the presumed full impact of Public Law 94-484 is deliberately factored into the model. For domestic sources, full cavitation and continued development of new medical schools in the 1980's are also assumed. The latter also reflects a presumed full impact of existing Federal law, but past experience and current consensus would deny the real possibility of ever gaining authorized cavitation levels, although private medical schools continue to be developed. And the impact of Public Law 94-484 on dampening foreign medical graduate sources may be circumvented by the increasing number of U.S. citizens studying medicine abroad and eventually returning to the United States to practice.

The specialty distribution of the projected supply is estimated by taking the number of active practitioners by (self-designated) specialty, adjusted for death and retirement, and distributing graduates among the specialties through projections of first-year residency trends.

Trends in first-year residency positions are used to predict future specialty distribution because of lack of data on final-year residency positions. However, first-year residency positions are often used for general clinical experience prior to concentration in a particular subspecialty or in another specialty and therefore do not necessarily represent final specialty choices; i.e., first-year residency counts are duplicative for particular specialties in that a proportion move on to subspecialization or to another specialty altogether. BHM's current projections assume that the first-year residency distribution trends for 1968, 1970-74, and 1976, also apply through 1980-81. After 1980-81, the residency distribution is held constant for the statistical reason that the base years chosen to establish the trend cover 6 years, so BHM has chosen not to extend the extrapolation beyond 6 years. Downward adjustments are made to minimize double-counting; the greatest adjustments occur in general surgery (62 percent) and internal medicine (32 percent).

As a percent of the total projected supply, physicians in general practice, family practice, internal medicine, and pediatrics (those usually counted as primary care specialties) are projected to comprise 39 percent in 1980,41 percent in 1985, and 42 percent in 1990. The largest specialty among these, as well as among all the specialties, will be internal medicine, which will have more than twice "as many physicians than any one of the other specialties.

The locational distribution of the projected supply, by specialty, is estimated by similar methods as for aggregate and specialty supply; i.e., current supply plus additions. These locational projections can be disaggregate in a variety of ways; e.g., by geographic criteria such as by States, counties, Census-Defined State Economic Areas, or Health Service Areas, or by special populations such as institutional care (mental hospitals, prisons), the indigent, and Native Americans.

Locational projections are used to identify those locations with the least number of physicians for programs which intend to place physicians (e.g., NHSC) or for which shortage designation is necessary to qualify for Government funds.

The process of designating and staffing HMSAS presently includes estimating the future supply of physicians for: 1) rural counties; 2) urban areas; 3) Federal, State, and local prisons; 4) State mental hospitals and community mental health centers; and s) the Indian Health Service.

Projections of specialty and locational supply depend on the standard method of relying on historical data to predict future events, and in particular, on most recent experience to predict the most immediate future. This can be seen in the use of mid- to late 1960's to mid-1970's data to predict 1980-90 patterns. Aside from the inevitable finding of "inadequate data" which, for one of the most important marker specialties (internal medicine), contains an error factor of at least 32 and perhaps as high as 62 percent in the first-year residency count, the use of historical data has two other limitations in these projections of specialty and locational distribution. The late 1960's and 1970's have witnessed: 1) Medicare and Medicaid and greater third-party private insurance coverage, 2) unprecedented increases in medical school enrollments and a large influx of foreign medical graduates,

and 3) major changes in graduate medical education, including abolition of the free-standing internship and its selective replacement by the first year of some residency programs. Second, legislation in this area has purposely tried to affect physician specialty and location choices, and, given the lag time between physician education and eventual practice, late 1960's and early to mid-1970's data reflect past policies, not current ones.

Requirements

Estimates of the numbers of physicians required in the future are derived by dividing the amount of services that it is anticipated physicians will or should provide a given population in a given year, by physician productivity. Estimates of a population's economic demand for services measure the capacity of the population to use physician services and are not limited to physician care that is essential to the patient's health. In general, physician productivity is assumed to remain constant. Thus, the difference between forecasting models is essentially one of differences in the estimates of use.

Although productivity is generally assumed constant, the particular measure chosen will directly influence the estimates of physician requirements. For example, GMENAC'S workbook for estimating general surgeon requirements lists alternative estimates of average weekly office visits that could be used as productivity measures as 77.2,58,51, and 43.

BHM's estimates of economic demand for physician services in 1990 are derived first from current per capita use rates projected onto the 1990 population. These figures are then adjusted for what the Bureau identifies as a long-term trend toward rising use of services, based on analysis of historical changes in per capita utilization during the period 1968-76. Thus, projections of future use can be separated into: 1) effects due simply to population growth and changes in the population's age, sex, and income distribution; and 2) effects due to a projected long-term trend toward increased per capita use apart from demographic considerations.

The BHM model projects the U.S. population by age, sex, and income subgroups, and use rates for each of these (40) subgroups are estimated for 20 types of health services settings. The historical trend in per capita use is separated into price- and non-price-related components. The price-related component interprets the effects of trends in out-of-pocket costs to consumers on changes in use. Projections of increased demand for physician services in 1990 calculated on the basis of a presumed trend toward rising per capita use of services are, however, highly sensitive to the particular start date chosen for the trend analysis. Stated another way, the assumption that there is a currently ongoing strong historical trend toward rising per capita use that can be projected to continue to 1990 is highly dependent on using the particular historical period 1968-76 as the basis for calculating the trend factor. If a more recent period were used to calculate the trend, the projected growth rate in per capita use would be considerably more moderate.

The BHM model assumes that supply and demand were in balance in 1975. This is a mathematical convenience to provide a constant base against which the relative magnitude of projected future changes can be referenced. However, prior estimates on aggregate demand have generally reached this conclusion (see table below). Using current use rates, demographic

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.

changes (population increases plus changes in age, sex, and income distribution) are projected to lead to a lo-percent increase by 1990 over 1975 demand, or 415,000 physicians in 1990 versus 378,000 in 1975.

Using a trend factor of increasing use based on 1968-76 data, an additional increase of 185,000 in physician demand is projected.

Thus, the total projected demand for physicians in 1990 is 600,000 (415,000 PIUS 185,000).a

Increases in demand attributable to a historical trend toward increased per capita use are overestimated, particularly for office services. The period 1968-76 is used to establish the trend, but whereas a start date of 1968 yields a distinctly upward trend for physician office services, a start date of 1971 yields a downward trend (see figure on p. 9).

Based on the BHM model, an alternative approximation of the demand for physician services in 1990, adjusting only for demographic changes, and assuming no long-term trend toward increases in per capita use, would be 415,00 physicians, an increase of 37,000 from 378,000 in 1975. But use could change, as could productivity. To some extent, these are policy choices to be made. If it is considered desirable for use to rise, for physicians to spend a few extra minutes with each patient, or for physicians to have shorter workweeks, much of the projected supply of 600,000 physicians in 1990 could be appropriate.

As supply is estimated to be 600,000 in 1990, there is a difference of 185,000 physicians between predicted supply and estimated demand in a static situation.

Some flexibility in the model is necessary, for several reasons. The enactment of national health insurance should lead to some increase in the demand for physician services. Second, physicians currently average longer workweeks than most of the rest of the labor force. Current projections are based on the assumption that physician productivity will remain constant to 1990, which, in specific terms, means that it is assumed that general surgeons will continue to average 52-hour patient care workweeks, pediatricians so hours, etc. If physicians continued to see patients at the same rate but shortened their workweek, this would have the effect of raising the number of physicians required to meet a specific level of demand for physician services. Alternatively, physicians might work the same number of hours, but see fewer patients and spend more time with each one. This would also raise the number of physicians required to meet a specific level of demand for services. According to the National Center for Health Statistics, almost half of all office visits to physicians in 1973 and 1977 lasted 10 minutes or less. With smaller patient loads, physicians might be able to use the additional time to provide patients with more information, education, and counseling and lead to greater patient satisfaction with the quality of medical care.

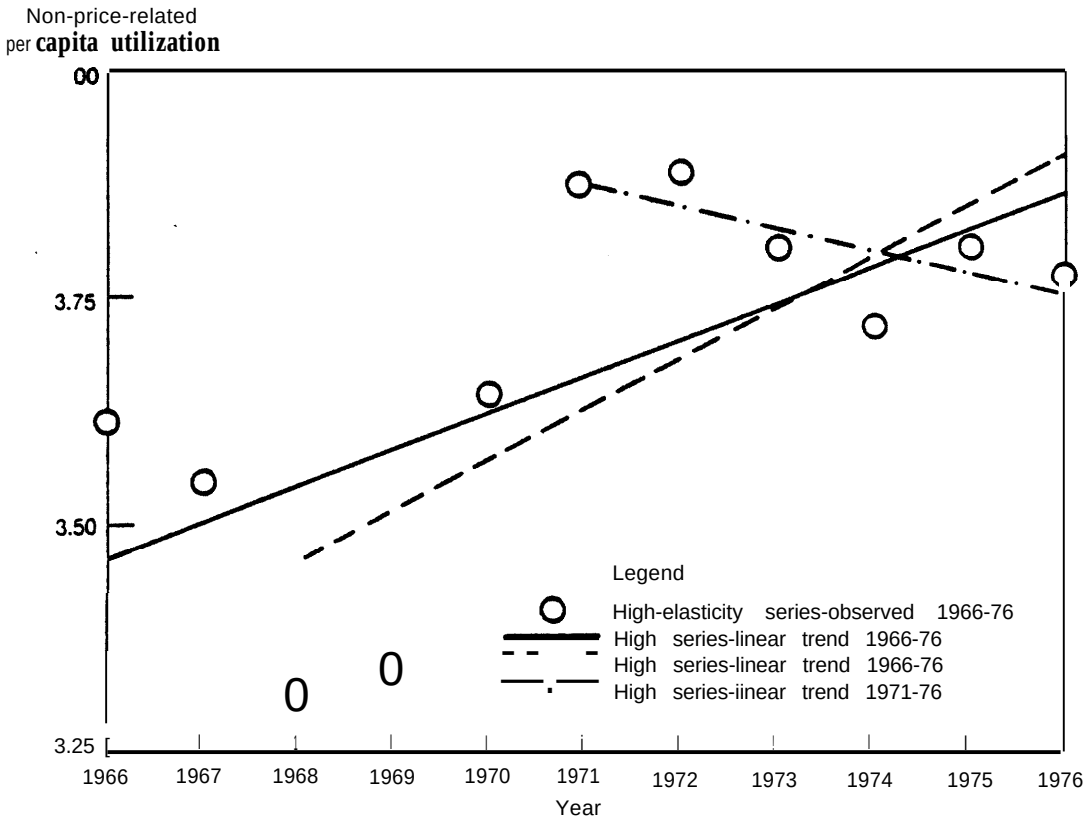
It is therefore necessary to decide how much of these changes are desirable at the cost that will be borne by the society.

The GMENAC normative, medical opinion model estimates all diseases and conditions (on demographic bases such as age and sex) that should be treated by physicians and the amount of physician services, on a disease-by-disease or condition-by-condition basis, that should be provided.

The theoretical level of use is usually adjusted downwards to real-world estimates through consensus formation techniques. Instead of quantifying use by health care setting, these estimates quantify use on a specialty-by-specialty basis.

Unlike the BHM model, which can project demand year to year (projections now exist up to ZOO(I), GMENAC'S current future target is 1990, although its model is capable of providing year-to-year projections. GMENAC'S modeling effort, because its ultimate aim is to provide recommendations on graduate medical education, professes to be less concerned with aggregate requirements. When addressed, aggregate requirements will be more of a byproduct of the parent GMENAC panel's consolidating the work of the individual specialty panels.

Non-Price-Related per Capita Utilization Trens, Physician Office Services, 1968-76



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

On the other hand, the BHM model, as presently constructed, can only provide aggregate, and not specialty-specific physician requirements, because demand is grouped by health care setting, not by specialty care.

The normative, medical opinion model is thus, better capable of estimating specialty-by-specialty requirements but could overestimate aggregate physician requirements because of the difficulty of reconciling overlapping patient care responsibilities. This task is to be undertaken by the GMENAC panel after the work of its specialty panels is completed.

An unresolved issue, however, is the requirements for the primary care specialties. There are basic differences on what is primary care, disagreement over what specialties constitute the primary care ones, and the pragmatic problem that other specialists will continue to provide similar services even if there were agreement on what primary care is. The models cannot be expected to resolve these issues. Resolution of these issues is a precondition to projecting the requirements for primary care specialties.

The BHM trend projection model and GMENAC'S medical opinion, goal-driven model are complementary, and not competing, models of estimating future physician requirements. As such, each model's results can aid in the interpretation of the other. Comparison of the models can shed some light on the relationship between medical need for physician services and trends in the actual use of those services. Ideally, the medical opinion model could be used to estimate the distribution of physicians by specialty within the aggregate requirements estimates provided by the BHM model.

The GMENAC model focuses on translating a normative definition of medical need into appropriate rates of use of medical services, while the BHM model looks on medical care as a "consumer good" and treats empirical trends in the use 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 the use of medical services beyond the level medically necessary and appropriate for "good" care. This would then raise the policy question of what percentage 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 remains and will remain in the near future significant barriers to obtaining medically necessary care for large segments of the American population rather than for a few discrete areas and populations. Presumably, these barriers could be financial, geographic, cultural, or involve ignorance about when to seek care—most likely some mixture of these variables that would need to be investigated. Finally, if the BHM and GMENAC estimates prove to be in rough parity-what could be viewed as the most desirable outcome—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.

As the GMENAC model has yet to generate any numbers, we cannot say 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 use of 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 demographic shifts (e.g., an aging population) between now and 1990; hence, no medical rationale for large *per capita* increases in the use of physician services.

Estimates of locational requirements are used to address different problems than aggregate and specialty estimates. Such estimates are used in operating programs designed to provide physicians and other medical care resources to targeted populations. Thus, locational requirements are based not only on assumptions about what are appropriate types and quantities of medical services, but also on: 1) how medical services should be redistributed, and 2) the amount of care that the Federal Government should provide or finance compared to other public and private sources.

These additional assumptions are clearly reflected in the designation and staffing ratios that were used to estimate the numbers of additional primary care physicians "needed" in shortage areas, and which, with additional criteria, provide the basis by which specific areas qualify as HMSAS.

- *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.
- *Staffing ratio.* —The theoretical maximum ratio if 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.

The designation ratio 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 on the extent of Federal involvement by specifying an "appropriate" relationship between the service demands of the population and the primary care physicians available to provide these services. It has been set at 1:2,000.

Estimates of shortage areas in 1990 must be considered weak for a number of reasons. First, data on patterns of distribution of physicians aged 32 to 40 in 1974 are used as the base from which projections are made. These data are currently the most recent available. They reflect, however, the conditions and policies of the 1960's. To assume that physicians will continue to follow the same distributional patterns in 1990 is to discount the large increases in aggregate physician supply and deliberate policy efforts to *increase* the physician supply in shortage areas that have occurred since the 1960's. Second, future estimates are based almost entirely on county physician-to-population ratios, again due to limitations in available national data. Actual HMSA designation, however, often involves smaller areas that have lower physician-to-population ratios than the county as a whole. Thus, methods for estimating future urban shortages are especially weak.

In such estimates, potential use divided by expected productivity (ultimately expressed in physician-to-population ratios) is an inadequate indicator of the targeted population's use of physician services, because average use and productivity calculated on a national basis can be expected to deviate from a specific population's use of specific physician services, and access problems (physical, financial, social) aIso determine whether use and productivity estimates are realized.

Thus, physician-to-population ratios comprise only part of the eligibility criteria that must be met to be designated an HMSA. Additional criteria include meeting specific definitions of "a rational area for the delivery of primary care services, " and when "primary medical care manpower in contiguous areas are overutilized, excessively distant, or inaccessible to the population of the area under consideration."

Consequently, even if national aggregate and specialty requirements were satisfied, it would be unlikely that physicians would be evenly distributed in all geographic areas or equally accessible to all population groups. Thus, some areas would always be underserved as measured against the average national physician-to-population ratio.

Projections of supply and requirements depend on historical data to predict future events, but legislation in this area has purposely tried to affect physician specialty and location choices. Given the lag time between medical education and eventual practice, even recent historical data reflect past policies, not current ones.

As currently published, the projections of aggregate requirements from BHM give no indication of the very different results that could be obtained by simply shifting the first years of the historical period used to establish the trend in per capita use from 1968 to 1971. Assumptions such as these are now hidden in the methodology, yet it is clear that they are crucial to the results.

Second, these estimates may be given in basic, high, and low projections or encompass a range of numbers, but they all revolve around the same set of assumptions. They are techniques that represent the degree of statistical confidence the methodologists have in their calculations, which is an entirely different question from projecting alternate estimates based on fundamentally different sets of assumptions about the factors that influence future supply and requirements.

The final and most important observation is that the forecasting process has remained too technical a process, where statistical techniques, economic knowledge, and medical expertise greatly influence the process. Yet, more often than not, the basic assumptions adopted in the methodologies are policy ones. This is particularly true for projections of the future supply of physicians and decisions on specialty distribution requirements. Further, policies that have been made and are under consideration directly impact on the projections, yet the reliance on historical data can systematically underestimate the effects of such policies. Methodologists themselves, in the absence of specific policy direction, are having to make decisions on which policies will most directly influence their

projections. The result is that current forecasting techniques may influence policy decisions to a greater extent than called for.

Greater awareness of the limits of forecasting and less preoccupation with a particular set of numbers would be possible if the assumptions underlying the projections are made more explicit; alternative forecasts are projected, based on different sets of assumptions; and participation in the forecasting process is expanded to include policymakers as well as technicians.