COUNCIL ON GRADUATE MEDICAL EDUCATION

Sixteenth Report

Physician Workforce Policy Guidelines for the United States, 2000-2020

January 2005

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Health Resources and Services Administration

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The Council on Graduate Medical Education

The Council on Graduate Medical Education (COGME) was first authorized by Congress in 1986 to provide an ongoing assessment of physician workforce trends, training issues, and financing policies and to recommend appropriate Federal and private-sector efforts to address identified needs. The legislation calls for COGME to advise and make recommendations to the Secretary of the Department of Health and Human Services (DHHS); the Senate Committee on Health, Education, Labor, and Pensions; and the House of Representatives Committee on Commerce. Section 219 of the Department of Labor, Health and Human Services, and Education and Related Agencies' Appropriations Act, 2004, Public Law 102-394, 106 Stat. 1825, resulted in the Secretary of DHHS extending COGME through the end of the fiscal year.

The legislation specifies 17 members for the Council. Appointed individuals are to include representatives of practicing primary care physicians, national and specialty physician organizations, international medical graduates, medical student and house staff associations, schools of medicine and osteopathy, public and private teaching hospitals, health insurers, business, and labor. Federal representation includes the Assistant Secretary for Health, DHHS; the Administrator of the Centers for Medicare and Medicaid Services, DHHS; and the Chief Medical Director of the Veterans Administration.

CHARGE TO THE COUNCIL

The charge to COGME is broader than the name would imply. Title VII of the Public Health Service Act, as amended, requires COGME to provide advice and recommendations to the Secretary of DHHS and Congress on the following issues:

1. The supply and distribution of physicians in the United States;

2. Current and future shortages or excesses of physicians in medical and surgical specialties and subspecialties;

3. Issues relating to international medical school graduates;

4. Appropriate Federal policies with respect to the matters specified in items 1-3, including policies concerning changes in the financing of undergraduate and graduate medical education (GME) programs and changes in the types of medical education training in GME programs.

5. Appropriate efforts to be carried out by hospitals, schools of medicine, schools of osteopathy, and accrediting bodies with respect to the matters specified in items 1-3, including efforts for changes in undergraduate and GME programs; and

6. Deficiencies and needs for improvement in databases concerning the supply and distribution of, and postgraduate training programs for, physicians in the United States and steps that should be taken to eliminate those deficiencies.

In addition, the Council is to encourage entities providing GME to conduct activities to achieve voluntarily the recommendations of the Council specified in item 5.

COGME PUBLICATIONS

Since its establishment, COGME has submitted the following reports to the Secretary of DHHS and Congress:

Reports

- First Report of the Council (1988);
- Second Report: The Financial Status of Teaching Hospitals and the Underrepresentation of Minorities in Medicine (1990);
- Third Report: Improving Access to Health Care Through Physician Workforce Reform: Directions for the 21st Century (1992);
- Fourth Report: Recommendations to Improve Access to Health Care Through Physician Workforce Reform (1994);
- Fifth Report: Women and Medicine (1995);
- Sixth Report: Managed Health Care: Implications for the Physician Workforce and Medical Education (1995);
- Seventh Report: Physician Workforce Funding Recommendations for Department of Health and Human Services' Programs (1995);
- Eighth Report: Patient Care Physician Supply and Requirements: Testing COGME Recommendations (1996);
- Ninth Report: Graduate Medical Education Consortia: Changing the Governance of Graduate Medical Education to Achieve Physician Workforce Objectives (1997);

- Tenth Report: Physician Distribution and Health Care Challenges in Rural and Inner-City Areas (1998);
- Eleventh Report: International Medical Graduates, The Physician Workforce and GME Payment Reform (1998);
- Twelfth Report: Minorities in Medicine (1998);
- Thirteenth Report: Physician Education for a Changing Health Care Environment (1999);
- Fourteenth Report: COGME Physician Workforce Policies: Recent Developments and Remaining Challenges in Meeting National Goals (1999); and
- Fifteenth Report: Financing Graduate Medical Education in a Changing Health Care Environment (2000).

OTHER COGME PUBLICATIONS

- Scholar in Residence Report: Reform in Medical Education and Medical Education in the Ambulatory Setting (1991);
- Process by which International Medical Graduates are Licensed to Practice in the United States (September 1995);
- Proceeding of the GME Financing Stakeholders Meeting (April 11, 2001) Bethesda, Maryland;
- Public Response to COGME's Fifteenth Report (September 2001);
- Council on Graduate Medical Education & National Advisory Council on Nurse Education and Practice: Collaborative Education to Ensure Patient Safety (February 2001);
- Council on Graduate Medical Education: What is it? What has it done? Where is it going? 2nd Edition (2001); and
- 2002 Summary Report (2002).

COGME RESOURCE PAPERS

- Preparing Learners for Practice in a Managed Care Environment (1997);
- International Medical Graduates: Immigration Law and Policy and the U.S. Physician Workforce (1998);
- The Effects of the Balanced Budget Act of 1997 on Graduate Medical Education (2000);
- Update on the Physician Workforce (2000);
- Evaluation of Specialty Physician Workforce Methodologies (2000); and
- State and Managed Care Support for Graduate Medical Education: Innovations and Implications for Federal Policy (2004).

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Preface

A central charge of the Council on Graduate Medical Education (COGME) is to make policy recommendations to the Nation with respect to the adequacy of the supply and distribution of physicians in the United States (U.S.). This mandate includes recommendations on current and future shortages or excesses of physicians in the medical and surgical specialties and subspecialties. Beginning in 1992, with its *Third Report,* COGME issued a series of reports expressing concern with potential surpluses of physicians and recommending an increase in the percent of physicians trained and practicing as generalists. These concerns led the Council to develop a recommendation that 110 percent of the number of U.S. medical graduates in 1993 should enter residency training each year (or about 19,750 physicians) and that half of these physicians should be generalists. This recommendation became known as the "110/50-50" goal for the physician workforce in the U.S.

In response to changes in the health care delivery system, demographic changes in the Nation's population, changes in the practice of medicine, and other developments, the Council concluded in 2002 that it was appropriate and timely to re-assess the current and future supply, demand, and need for physician services in America. The following report is the result of this most recent re-assessment. In light of limited resources, this study primarily used existing models to forecast physician supply and demand, but also used more current data unavailable for prior assessments.

The Nation's physician workforce is critical to the delivery of health care to Americans. In consideration of this role and the high cost of educating and training the physician workforce, ongoing tracking of workforce needs and periodic comprehensive assessments are essential to guiding decisions by the medical education community, prospective physicians, policy makers, and others concerned with Americans' health. The Council hopes that this report will provide this guidance.

Summary and Recommendations

The Council on Graduate Medical Education (COGME) assessed the likely future supply, demand, and need for physicians in the United States (U.S.) through 2020 for both generalist and non-generalist physicians. The models used for the projections are based on historical patterns of use of services and physician practice patterns applied to the expected U.S. population and the physician workforce through 2020. Where changes are occurring or have occurred in the historic patterns, this report incorporates the best available information and discusses their likely implications. The models used build on the physician forecasting models of the Health Resources and Services Administration (HRSA)/Bureau of Health Professions (BHPr).[1] The use of these models helps to ensure some consistency with prior work and facilitates comparisons of the new forecasts with prior forecasts.

Scenarios have been constructed around the best understanding of changes occurring in health care and in medicine. For each scenario, the report presents a sensitivity analysis indicating what the impact might be if that factor were to change to a lesser or greater extent than current understanding portends.

The report forecasts future *supply* based on the age, gender, specialty distribution, and educational background of the existing supply and current trends in new entrants into residency training from U.S. allopathic and osteopathic schools, from Canadian medical schools, and from foreign medical schools. The report also forecasts future *demand* and *need* for physician services based on the historical patterns of use of services by age, gender, insurance status, type of area (urban or rural), and managed care penetration. Estimates of future need are based primarily on the assumption that the use of physician services by the uninsured would increase to the level of those with health insurance if resources were available to meet their needs. It is also assumed that the removal of other barriers to use would also contribute to some increase in service use. Further, the report presents an analysis of supply, demand, and need for generalist and non-generalist specialties.[2]

This report includes the results of the data analysis and describes methodologies used to forecast supply, demand, and need and the potential impact of changes in the factors that influence each of those. The report also includes recommendations to better assure that the future supply meets future demand and need.

KEY FINDINGS

1. Under current production and practice patterns, the ***supply*** of practicing physicians in the U.S. is expected to rise from 781,200 full-time equivalent (FTE) physicians[3] in 2000 to 971,800 in 2020, a 24 percent increase. However, growth is expected to slow considerably after 2010, reflecting increased rates of physician separation due to the aging of the current physician workforce and the relatively level annual number of new physician entrants since 1980. After 2015, the rate of population growth will exceed the rate of growth in the number of physicians. The per capita number of physicians is forecasted to rise from 283 per 100,000 Americans in 2000 to 301 in 2015 but then drop to 298 in 2020. Under alternative assumptions regarding physician lifestyle changes (such as hours worked) and increased productivity, the effective supply of physicians (FTEs) may grow to nearly 1.08 million physicians in 2020. The most probable aggregate projection suggests that the supply of physicians will number approximately 1.02 million FTEs in 2020.

2. At the same time, for a number of reasons and under a number of scenarios and models, the ***demand*** for physicians is likely to grow even more rapidly over this period than the supply. It is likely that the demand for physician services will grow to between 1.03 million and 1.24 million physicians in 2020. The three major factors driving the increase in demand will be: a) the projected U.S. population growth of 50 million persons (18 percent) between 2000 and 2020; b) the aging of the population, as the number of Americans over 65 increases from 35 million in 2000 to 54 million in 2020; and c) the changing age-specific per capita physician utilization rates, with those under age 45 using fewer services and those over age 45 using more services.

3. The ***need*** for services, reflecting primarily the use of services under universal insurance and increased utilization review processes, is also expected to increase over the period. Need is projected to grow to between 1.09 and 1.17 million physicians in 2020

[1] They include the Physician Supply Model (PSM) and the Physician Demand Model (PDM), previously known as the Integrated Requirements Model (IRM).

[2] For purposes of this report, generalists are defined as family physicians, general internists, pediatricians, physicians trained in combined internal medicine and pediatrics programs, and general practitioners. Non-generalists are defined as all other physicians.

[3] Unless otherwise indicated, the physician counts in this report for supply, demand, and need refer to FTE physicians. FTEs are based on the number of hours physicians are or are expected to be working and are adjusted to account for the demographics of the physician population. The physician figures also include all active physicians and all time spent in medical activities, including non-patient care activities, and all physicians in training.

4. If the Nation's population continues to use services in the future as it has in the past, and if physicians practice in the future as they have in the past, then the Nation is likely to face a shortage of physicians in the coming years.

    a. When the midpoint of the projected range of future supply and demand is used, the Nation is projected to face a shortage of about 85,000 physicians in 2020.
    b. When the midpoint of the projected range of supply and need is used, the Nation is projected to face a shortage of about 96,000 physicians in 2020.

5. The models and alternative scenarios used to make the predictions included a number of factors that could have a major impact on supply, demand, and need and, consequently, on a potential gap in the physician supply.

    a. *Many of these factors are likely to add to the shortage of physicians*. Some of these have been included in the report as scenarios that could have an impact on the supply or demand for physicians. These include the following:

        - Changing lifestyles for the newest generation of physicians, with the possibility that new physicians will work fewer hours than their predecessors;
        - Continuation of the rate of increase in the use of physician services by those over 45, which has been increasing for the past 20 years, and increased use of services by the baby-boom generation compared to prior generations; and
        - Expected increases in the Nation's wealth that would contribute to continued increases in the use of medical services.

    Other factors could also lead to larger shortages and are **not included in the baseline projections or alternative scenarios.** These include the following:

        - A potential increase in non-patient care activities by physicians, including research and administrative activities;
        - A potential change in practice patterns for physicians over 50, including a reduction in hours worked before retirement and earlier retirement patterns;
        - Possible increases in departures from practice due to liability concerns of physicians;
        - Decreases in hours worked by physicians in training;
        - Possible decreases in immigration of graduates of foreign medical schools;
        - Possible increases in the number of physicians limiting the number of patients on their panel (sometimes referred to as "boutique medicine");
        - Advances in genetic testing that could lead to increases in the use of services as individuals learn they are at risk for certain illnesses or conditions; and
        - Additional medical advances likely to keep individuals with chronic illnesses alive longer without curing their illnesses.

    b. *A number of factors also may limit future shortages*. These include factors for which estimates of their impact are presented in the report under different scenarios. These include the following:

        - Increases in productivity, such as through improved technologies and information systems; and
        - More effective utilization review and quality assurance efforts to weed out inappropriate or unnecessary services.

Other factors **not included in the supply, demand, and need projections** with the potential to reduce projected shortages include the following:

- Increases in the supply and use of nurse practitioners, physician assistants, and other non-physician clinicians;
- Increases in costs and cost sharing; and
- Medical breakthroughs that decrease service use.

6. There are already a growing number of reports of, and concerns with, shortages in specific specialties. These include such specialties as radiology (Sunshine 2001), anesthesiology (Schubert et al 2001; Miller and Lanier 2001; Schubert et al 2003), cardiology (Foot et al 2000), rheumatology (Boyce 2003), nephrology (Neilson et al 2001), pulmonary disease/critical care (Angus et al 2000; Pronovost et al 2002), and child psychiatry (Kim et al 2001).

7. Although the percentage of the Nation's physicians who are generalists has increased slightly over the past decade, it is currently about 38 percent, well below the 50 percent target recommended in COGME's *Third Report.* Even in the Kaiser Health Plans, only about 40 percent of their physicians in 2001 and 2002 (Weiner 2004) were generalists. Results of surveys of new physicians completing training in New York and California indicate that demand for generalists is less than demand for most non-generalists, further weakening the case for the 50 percent generalist goal (Nolan et al 2003a, 2003b).

RECOMMENDATIONS

Preamble

The State of the Nation's health care workforce directly affects both the health of the American public and the economics of health care. It is not our intent to codify or explicitly endorse the current health care system. Given the constraints and confines of the available data, these recommendations are a feasible and realistic approach to physician workforce planning.

In light of the likely gap between the expected supply, demand, and need for physicians in the future, COGME recommends that the Nation undertake a multi-pronged strategy that includes: a modest increase in medical education and training capacity over the next decade; efforts to increase physician productivity; and increased tracking and assessments of the supply, demand, and need for physicians. In addition, because underserved communities are most likely to be affected by shortages, COGME recommends that the National Health Service Corps (NHSC) and other Federal programs designed to address geographic and specialty maldistribution and to increase diversity be expanded. Specific recommendations are presented below.

1. ***To meet the future physician workforce demand and need in the U.S., COGME recommends that:***

- ***a. The number of physicians entering residency training each year be increased from approximately 24,000 in 2002 to 27,000 in 2015; and***
- ***b. The distribution between generalists and non-generalists should reflect ongoing assessments of demand; therefore, COGME does not recommend a rigid national numerical target.***

The analysis presented in this report indicates that the Nation is likely to be facing a shortage of physicians in the coming years, particularly in non-generalist specialties. To begin to address this likely shortage, COGME recommends that the total number of physicians entering residency training in the U.S. be increased to 27,000 per year over the next decade. This action would lead to an increase in the Nation's physician workforce by about 3 percent (30,000 physicians) by 2020. Although this level of new entrants into medicine will be insufficient to meet future needs, it is an important step.

This physician workforce goal is presented as an absolute number rather than as a percentage of the number of U.S. medical graduates in a specific year. This absolute number is easier to understand and track, and therefore should be a more useful target for the Nation. When presented as a percentage of medical school graduates, the recommended number of entrants into residency training is equal to 158 percent of the number of 1993 U.S. medical graduates and 150 percent of the 2000 U.S. medical school graduates.

Currently, approximately 37 percent of new physicians are entering generalist specialties, and 63 percent are entering non-generalist specialties. COGME recommends below that the Nation undertake studies to track overall specialty-specific need, demand, and distribution and to share this information with the medical education and training community. Specialty-specific need and demand for physicians are likely to vary over time and by region. Therefore, a single national goal is inappropriate. Physicians should be encouraged to select specific specialties with shortages. This selection could be facilitated by providing physicians information on practice opportunities by specialties and, where appropriate, should be offered such fiscal incentives as loan repayment opportunities.

2. ***Increase total enrollment in U.S. medical schools by 15 percent from their 2002 levels over the next decade.***

To assure reasonable access to care for Americans in coming years, COGME recommends that total U.S. allopathic and osteopathic medical school enrollment be increased by 15 percent by 2015. This step will require a combination of increased enrollment at existing medical schools and, potentially, the establishment of a number of new medical schools.

A modest increase in medical school enrollment over the next decade will have only a limited impact on the total supply of physicians in 2020 but would provide a base for responding to future needs. Decisions on medical school capacity need to be made now if the Nation is going to be able to produce more U.S. medical school graduates in 2015 and beyond.

Between 1982 and 2001, the number of medical students in the U.S. increased 7 percent while the U.S. population grew 23 percent, leading to a 13 percent net decrease in medical school students per capita in the U.S. Between 2000 and 2020, the U.S. population is projected to increase by 18 percent while medical school capacity is scheduled to increase by only about 4 percent, leading to a further decrease in per capita medical students. The recommended 15 percent increase would still leave the number of medical students per capita well below the 1980 level.

If the actual shortage is not as significant as predicted in this report, the modest increase of about 3,000 new U.S. graduates per year by 2015 would allow the U.S. to reduce its current reliance on the approximately 5,200 international medical school graduates (IMGs) who enter residency training each year. This policy would be consistent with those advocated by many observers (Mullan 2000). Most IMGs come from countries that have far fewer physicians per capita than the U.S. has.

Given the uncertainty inherent in long-term forecasting of supply, demand, and need, and the cost of a major expansion in medical school capacity, COGME does *not* recommend that the Nation attempt to address all the possible shortages through a dramatic increase in medical education capacity at the present time. Rather, COGME recommends that the medical education community increase enrollment moderately now and that the Nation take other steps that have the potential to reduce future shortages. Although it may be necessary to increase enrollment more than 15 percent in the coming years, the decision should be made based on further study over the next few years, as discussed in recommendation five below.

At this time, the Council is not recommending a new Federal program to encourage new medical schools or increased enrollment at existing medical schools. It is hoped that the medical education community and States will respond to the recommendations in this report and to the growing evidence of unmet physician workforce needs.

3. ***Phase in an increase in the number of residency and fellowship positions eligible for funding from Medicare to parallel the increase in U.S. medical school graduates recommended above.***

Over the next decade, teaching hospitals will need to increase the number of training positions to accommodate the increasing number of U.S. medical school graduates. The current cap on the number of residents and fellows eligible for Medicare reimbursement strongly discourages teaching hospitals from increasing the number of residents. To encourage a modest increase in residents, COGME recommends that the cap be increased slowly over the next decade.

The current cap was intended to discourage increases in the number of physicians trained in the U.S. It was conceived and approved when there was a period of concern with potential surpluses of physicians and when it appeared that managed care would reduce the use of health care services. As the Nation now looks at its physician needs for 2015 and beyond, the far greater likelihood is a physician shortage. The Medicare policy should be adjusted to help meet future physician needs that will be driven in large part by the growing number of elderly covered by the Medicare program. In light of the growth in graduates of osteopathic schools over the past decade and the increasing number of entrants to allopathic schools, it is important to begin to increase the GME cap as soon as possible.

4. ***Develop systems to track the supply, demand, need, and distribution of physicians, and undertake a comprehensive re-assessment within the next 4 years to guide future decisions on medical education capacity.***

Given the costs of increasing medical education and training capacity and the uncertainty inherent in any effort to forecast physician workforce many years into the future, it is strongly recommended that the Nation develop systems to track physician workforce supply, demand, need, and distribution on a regular and consistent basis. This recommendation is especially important in light of the many years needed to make changes in the supply of physicians.

In addition to ongoing tracking, COGME recommends that the Nation undertake a comprehensive re-assessment within the next 4 years that would consider the many factors that could have an impact on the physician workforce in the future in greater depth than the current re-assessment. Major industries, especially those in which changes in production require both substantial investments and many years to implement, exemplify this point. The leaders in these industries recognize the critical role of regular assessments of the current and future marketplace. The current study considers available data, but important gaps exist in these data as well as in our understanding of physician practice patterns. In addition, some information (e.g., retirement patterns of the baby-boom generation of physicians) cannot be known at this time.

5. ***Additional specialty-specific studies are needed to better understand the physician workforce needs and to inform the medical education community and policy makers of the Nation's specialty-specific needs.***

On the basis of available data, the Nation appears to have a ratio of 38 percent generalist specialties and 62 percent non-generalist specialties. This greater demand for non-generalist specialties is borne out by surveys of new physicians completing residency training in the U.S. and the growing number of reports of shortages in non-generalist specialties (Schubert et al 2003; Miller and Lanier 2001; Schubert et al 2001; Foot et al 2000; Kim et al 2001; Suneja et al 2001; Neilson et al 2001; Angus et al 2000; Pronovost et al 2002; Sunshine 2001; Organ 2002; Etzoni et al 2003; Fleming et al 2003).

Experience over the past decade has demonstrated that medical students, physicians in training, residency programs, and teaching hospitals respond to marketplace signals on supply and demand for different specialties. Unfortunately, specialty-specific studies have been conducted only sporadically in the past and often used questionable research methods and data. The Federal Government should take a leadership role in developing and encouraging common methodologies for specialty-specific studies.

Providing the medical education community and policy makers with better information on current and future needs and on gaps in physician supply by specialty should contribute to a specialty mix more consistent with national needs. Accurate and timely information and data are a prerequisite for an effective market of any type. This information should help guide Federal policies related to the physician workforce.

6. ***Promote efforts to increase the productivity of physicians.***

The Nation should consider several steps to promote productivity improvements. These steps include:

- Funding to evaluate the effectiveness and efficiency of alternative models of care, and practice and organizational arrangements;
- Evaluation of specific new technologies;
- Dissemination of information to physicians on the effectiveness of alternative models of care, new technologies, and other strategies to improve productivity; and
- Introduction of reimbursement policies to support implementation of productivity enhancements.

A modest annual rate of increase in physician productivity would have a major long-term impact on the number of new physicians needed by the Nation. These steps could also encourage physicians to practice longer rather than retire or leave medical practice, thus effectively increasing the supply of physicians.

New technologies and improvements in existing technologies have the potential to increase productivity, improve quality, and increase physician satisfaction. Particularly promising is the potential for the electronic medical record and other advances in information technology. These advances have the potential to increase efficiency and effectiveness, to reduce the time needed for documentation, and to speed the retrieval of needed information. Remote patient monitoring systems, telecommunications advances, and Internet access to the latest medical knowledge and technologies have the potential to increase the number of patients who can be cared for by a physician.

There are a number of barriers to the expansion of effective new technologies. First, many of these technologies require an enormous investment to develop and acquire. Second, many new technologies are still to be perfected and are evolving rapidly, leading to appropriate caution on the part of physicians and the organizations that use them. A third barrier for certain types of technologies is reimbursement policies. For example, if insurers do not cover group sessions or interactions between physician and patient over the Internet, then these approaches will be less attractive to physicians and patients.

7. ***Expand programs and develop policies that:***

- Address geographic maldistribution of physicians,
- Improve access to care for underserved populations and communities,
- Promote appropriate specialty distribution and deployment,
- Promote workforce diversity, and
- Support analyses of data related to these issues.

The projected shortage of physicians is likely to have the greatest impact on underserved and poorer communities that have historically had the greatest difficulty recruiting and retaining physicians. To assure access for our most needy citizens, it will be important to maintain and expand programs that support access to physician services by underserved populations. In anticipation of future shortages, the number of scholarship and loan repayment awards under the NHSC should be increased.

As indicated in this report, shortages for non-generalists are likely. Although generalists play a central role in underserved communities, these communities also require access to non-generalists. Therefore, COGME recommends that the NHSC be expanded to include non-generalist specialties. These awards should be targeted to specialties with documented shortages in underserved communities. Giving underserved communities access to non-generalists should be accomplished while maintaining an emphasis on access to primary care services. By identifying specialties experiencing shortages for purposes of the NHSC program, the Federal Government would also send an important message to medical students about specialties in need.

Title VII of the Public Health Service Act includes programs specifically designed to encourage practice in rural and other underserved areas, to increase the diversity of the workforce, to promote more effective medical and interdisciplinary education, and to collect and analyze workforce data. These programs play a critical role in helping assure access to needed services and will be particularly important in a period of physician shortage. COGME recommends that these programs receive continued support.

In addition to physician workforce programs that directly address needs in health care delivery, policy exerts its influence through reimbursement and regulatory actions. For example, direct and indirect GME payments through Medicare, as well as differential payments for health care services, have an influence on training opportunities, medical specialty choices, and career location decisions. These influences should be evaluated, understood, and more closely aligned with health care policy goals.

RELATED ISSUES OF CONCERN

Distribution of Physicians: This analysis assesses the total number of physicians across the country and does not assess supply, demand, or need by State, region, or locality. It is possible for the Nation to have enough or even more than enough physicians in aggregate and still have significant shortages in specific communities. Although having an adequate supply nationally will make it easier to address distribution issues*, increasing the supply will not in and of itself address issues of maldistribution of physicians*. Although this issue is not the focus of this report, it is an issue of great importance to the Nation and to COGME. Given the shortages predicted in this report, it is likely that currently underserved areas will face greater shortages in coming years if steps are not taken to ameliorate the overall physician supply shortage. The Council intends to undertake a review of programs and strategies to address the distribution of physicians and to make recommendations in a future report for better assuring an adequate distribution of the physician workforce.

U.S. Medical School Graduates and International Medical School Graduates (IMGs): There are two major sources of new physicians in America: graduates of U.S. medical schools and graduates of non-U.S. medical schools. The Nation could address the predicted future shortage by increasing the number of physicians from one or both of these sources. This report neither recommends an increase in the number of IMGs entering residency training as a way to address future shortages, nor recommends a decrease in the number of IMGs entering the U.S. It is not the purpose of this report to assess the pros and cons of using IMGs to meet physician workforce needs in the U.S., but it is recognized that the issues of IMG policies, U.S. medical school capacity, and the total number of physicians produced in the U.S. are interrelated. Clearly, if a decision were made to reduce the reliance on IMGs, it would be necessary to increase U.S. medical school enrollment more than recommended above to achieve the goal of 27,000 new entrants in 2015. Conversely, an increase in the number of IMGs entering the U.S. would reduce the need for more U.S. medical graduates.

Impact of Reimbursement Policies on Demand for Physician Services: Undoubtedly, the demand for a specialty or group of specialties is affected by reimbursement policies. Low levels of reimbursement for services can depress demand below need. The models used in the current reassessment of supply, demand, and need rely heavily on historical patterns of use that have been influenced by reimbursement policies. Results of recent surveys of residents completing training in California and New York show that the incomes of non-generalists are significantly higher than the income of generalists and that the gap is growing (Nolan et al 2003a, 2003b, 2003c). Although the imbalance between the income of generalist and non-generalist physicians is not the focus of this report, it probably affects the measurement of demand and need. It may be appropriate to reassess the relative levels of reimbursement of generalists and non-generalists under current reimbursement systems, including Medicare.

Unnecessary Services: Some research findings suggest that some services provided by physicians may be of marginal benefit or even unnecessary (Weiner 1994, 1995, 2004; Fisher et al 2003a, 2003b). Drawing on recent research on staffing ratios in prepaid group practices and the relationship between health status and aggregate physician service utilization, the report presents what the impact would be on demand and need if some process were found to identify and eliminate unnecessary or ineffective services.

Some have suggested that the number of physicians educated and trained in the U.S. should take this into account (i.e., the Nation should produce fewer physicians because some services are unnecessary). However, in the absence of programs and policies that effectively identify and eliminate the unnecessary or inappropriate services, constraining supply is likely to lead to even greater shortages and delays in access to services for the public at large. Such shortages and delays might occur especially in underserved communities and among vulnerable populations.

Background

The Council on Graduate Medical Education (COGME) was authorized by Congress in 1986 to assess physician workforce trends, training issues, and financing policies, as well as to recommend appropriate Federal and private-sector efforts to address identified needs. One of the most important physician workforce issues for COGME and the Nation is the assessment of the number, specialty, and geographical distribution of physicians that would need to be educated and trained to assure access to quality care for Americans. For the last decade, a series of physician workforce policy goals held by COGME have centered around its "110/50-50" recommendations. These goals and recommendations should be revised.

First articulated in its *Third Report, Improving Access to Health Care Through Physician Workforce Reform: Directions for the 21st Century* (1992), the 110/50-50 recommendations called for reducing the number of physicians entering residency training from what was then 140 percent to 110 percent of the number of graduates from allopathic and osteopathic medical schools in the U.S. in 1993. Conceptually, the 110 percent would be sufficient to ensure that all U.S. medical school graduates would be able to enter graduate medical training, as well as IMGs equal in number to 10 percent of the U.S. graduates. The *Third Report* called for increasing the percentage of graduates who complete training and enter practice as generalists from the level then at 30 percent to at least 50 percent. COGME's *Eighth Report, Patient Care Physician Supply and Requirements: Testing COGME Recommendations* (1996), provided underlying physician supply and requirements projections that tended to support the reasonableness of the recommendations. COGME's *Fourteenth Report, COGME Physician Workforce Policies: Recent Developments and Remaining Challenges in Meeting National Goals* (1999), in calculating the progress made toward the COGME goals, found that as of 1997 and 1998, the Nation's first-year residents amounted to approximately 129 percent of the number of graduates from allopathic and osteopathic medical schools in the U.S. in 1993. This report also found that it would be necessary to reduce the number of first-year residents by about 3,400 to reach the 110 percent goal set by COGME in 1992.

The *Fourteenth Report* identified several recent developments that were likely to affect the supply or demand, or both, for physician services. These developments include: the evolving nature of managed care, the growing supply of non-physician clinicians, and the growing representation of women in medicine. In this 1999 report, the Council stated its intention of re-assessing the appropriateness of its 110/50-50 recommendations in light of recent developments.

Supply of Physicians, 2000-2020

OVERVIEW OF METHODOLOGY: BASELINE MODEL AND FACTORS AFFECTING FUTURE SUPPLY

The forecast of physician supply in the U.S. between 2000 and 2020 is based on the Physician Supply Model (PSM). This model, developed and maintained by the Bureau of Health Professions (BHPr), HRSA, DHHS, produces projections of the supply of physicians by type (Medical Doctor [MD] and Doctor of Osteopathy [DO]) and specialty for 1995 through 2040. For the purposes of this report, the years of interest are 2000 through 2020, and the specialty groups of interest are generalists and non-generalists. This section presents the total supply forecasts and factors affecting the overall supply of physicians in the U.S. Projections for generalists and non-generalists appear in Section V, "Physician Supply, Demand, and Need."

The unit of analysis for the assessment is a *full-time equivalent (FTE)* active physician. This unit includes all physicians active in medicine, regardless of whether they are providing patient care. It is estimated that about 6 percent of active physicians in 2000 were not providing patient care. Many of these physicians were involved in teaching, administration, and research (Pasko and Seidman 2002). Since one goal of the project is to assess the number of physicians that would need to be produced to meet future needs, it is necessary to include non-patient care physicians as well as active physicians in the projections. To take into account the fact that some physicians practice less than full-time, for this analysis, supply, demand, and need are calculated in terms of full-time equivalents; that is, two physicians working half-time are equal to one FTE.

The calculation of future physician supply begins with the number of physicians entering residency training. The methodology includes the following steps:

1. The PSM begins with the active base year physicians by type and post-medical school graduate year (PGY).

For each forecast year:

2. The base year physicians are aged, and age-specific death and retirement rates are applied.

3. The physicians are summed over all ages to calculate the base physicians by type and PGY.

4. Specialty distributions are applied by type and PGY.

5. Activity distributions are applied by type, specialty, and PGY.

6. New entrants by year (2001 through 2020) of each type of physician indicated below, using the data described, are tallied:

   - United States Medical School Graduates (USMGs): New graduates from U.S. medical schools and percentage of females by year;
   - Canadian Medical School Graduates (CMGs): New graduates from Canadian medical schools and percentage of females by year;
   - IMGs: International medical school graduates who are GME entrants and percentage of females by year; IMGs who are non-GME entrants and percentage of females by year;

7. New entrants are aged over the period 2000 through 2020 for each and the appropriate age and type-specific death and retirement rates are applied;

8. Specialty distributions are those applied by type and PGY to new entrants;

9. Activity distributions are those applied by type, specialty, and PGY to new entrants;

10. Forecasts of base year physicians and new entrant physicians by type, PGY, specialty, and activity are summed over PGY to produce final forecasts (Bannister et al 2001).

The forecast totals are then converted to FTEs. Table 1 presents the results of the baseline supply model.

The supply of physicians is projected to grow by some 190,000 FTEs (24 percent) between 2000 and 2020.[4] Over the same time period, the U.S. Census Bureau projects an 18 percent growth in the U.S. population, yielding a net 5 percent growth in the physician-to-population ratio. As indicated in Table 1, the supply expressed as FTEs per capita peaks around 2015, and then begins to fall, as the rate of population growth begins to outstrip the rate of growth in the supply of physician FTEs.

[4] It should be noted that data for the base year 2000 for the supply projections were unavailable before the current analysis. Thus, comparisons with other projections based on the PSM that used 1995 data as the base year are inappropriate. Projections using 1995 base year data yield supply projections lower than the actual supply between 1996 and 2000. Currently, the PSM is being updated to a more recent base year. These updates were unavailable to the authors during the period this report was developed.

The data used in the PSM for this project were derived from the following sources:

- *Current supply and characteristics*:
  - American Medical Association (AMA) Physician Masterfile
  - American Osteopathic Association (AOA) Masterfile
- *Distribution by age, gender, and IMG status*: AMA Physician Masterfile
- *New U.S. graduates 2000 by age and gender*: Association of American Medical Colleges (AAMC), AMA, and AOA Masterfile
- *New CMGs and IMGs*: AMA Graduate Medical Education data
- *Retirements, deaths, and departures*: Analysis of AMA Physician Masterfile patterns 1990 through 1995

Given this methodology, it is clear that the model takes a number of basic factors into account in making projections. These factors include:

1. The overall number of new entrants into the physician workforce and the source of the new entrants (i.e., U.S. medical schools or abroad);
2. The gender distribution of the current physician supply and of new entrants and its effect on the relative number of hours spent in professional activities (to calculate FTEs);
3. The age distribution of the current physician supply;
4. Retirement, death, and other separation rates of the current physician supply;
5. The specialty distribution of the current physician supply and the specialty choices of new entrants; and
6. The rates of different types of professional activities (e.g., patient care, teaching, and research) of the current physician supply.

These factors are included in the supply projection model through the use of historical rates and trends derived from both previous research and the data sources listed above. Below, these factors are discussed in more detail, and any assumptions made in the baseline model are revealed.

New Entrants

Number of U.S. medical school graduates: The baseline model assumes that the number of U.S. allopathic medical school graduates will remain essentially constant through 2020 at 16,000 per year. It also assumes that osteopathic graduates will continue to increase from about 2,300 in 2000 to 3,000 in 2009, and then stabilize at that level. It further assumes that the number of Canadian entrants into the U.S. health system will slowly rise from 191 in 2000 to 247 in 2020. Thus, for most of the period, it is assumed that there will be about 19,000 new USMG, CMG, and DO entrants each year. Table 2 presents the estimated entrants into the health care system between 2000 and 2020 as used in the model. Figure 1 shows the number of allopathic and osteopathic graduates over the past 20 years and the forecast for 2001 through 2020. Figure 2 depicts the extent to which the growth of the U.S. population has exceeded the growth in the number of students enrolled in U.S. medical schools.

The medical school community has discussed the possibility of new medical schools and increases in enrollment at existing medical schools (e.g., see Cooper 2003; Mullan 2003; Wood 2003; Hallock et al 2003; as well as Mullan 2000). Several new schools are in various stages of development or accreditation (e.g., in Florida, Arizona, and Texas).

TABLE 1
Supply of Physicians in the U.S., 2000-2020: Baseline Projections

Year	*FTE Physicians*	*U.S. Population (1,000s)*	*FTEs per 100k Pop.*
2000	781,227	276,241	283
2005	844,464	288,286	293
2010	899,540	300,431	299
2015	942,145	313,116	301
2020	971,817	325,942	298
% Change	*24%*	*18%*	*5%*

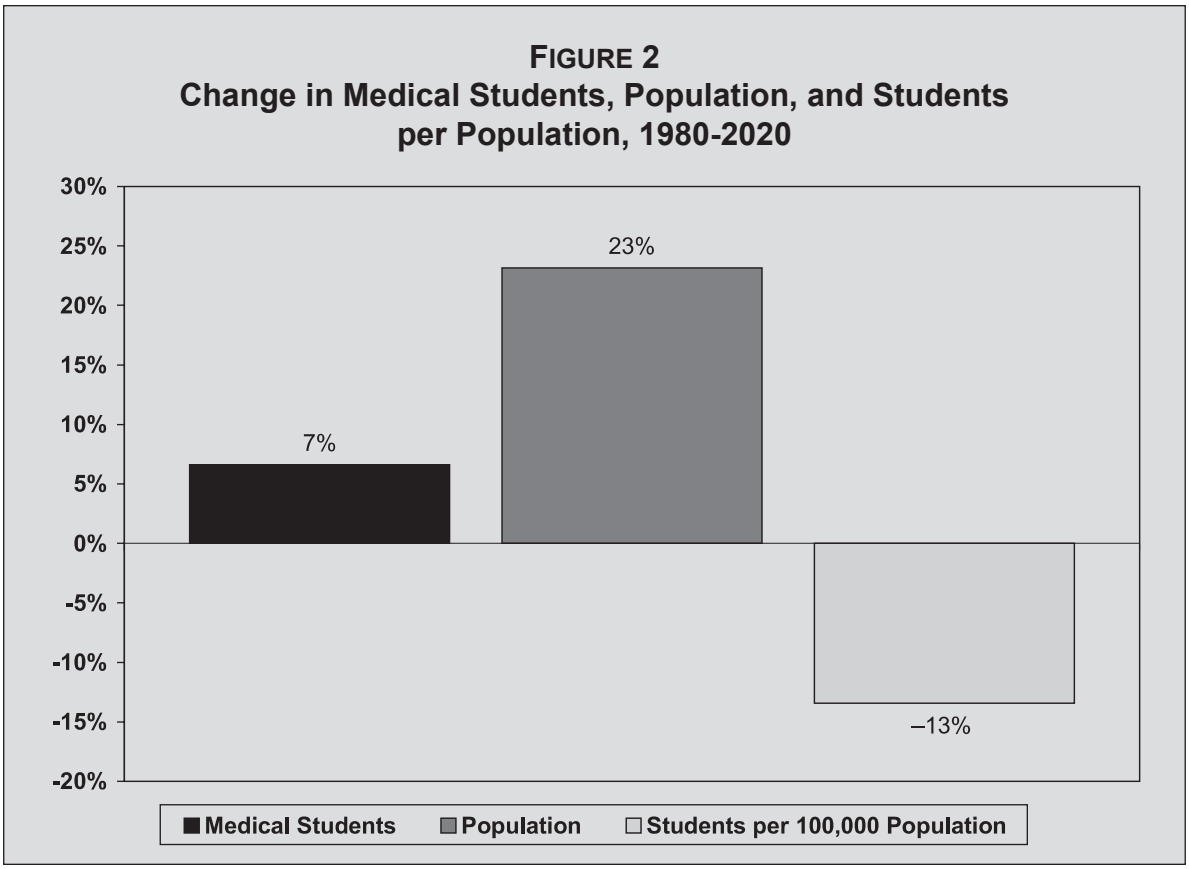
TABLE 2
Projected Number of New Entrants Into the Physician Supply, 2000-2020

Year	*USMG Entrants*	*CMG Entrants*	*DO Entrants*	*IMG Entrants*
2000	15,824	191	2,304	5,200
2005	16,000	219	2,650	5,200
2010	16,000	230	3,000	5,200
2015	16,000	245	3,000	5,200
2020	16,000	247	3,000	5,200
% Change	*1%*	*29%*	*30%*	*0%*

FIGURE 1
Total Number of Allopathic and Osteopathic Graduates, 1980-2020



Data for 1980-2000 are taken from: American Association of Colleges of Osteopathic Medicine, *2000 Annual Statistical Report*; Association of American Medical Colleges, *AAMC Data Book*. Data beyond 2000 are projections based on the projections used in the baseline supply model.



Source: American Association of Colleges of Osteopathic Medicine, *Annual Statistical Report 2000;* Association of American Medical Colleges, *AAMC Data Book;* U.S. Census Bureau.

Several additional new schools are being discussed in other locations, but this development is likely to add only a modest number of new physicians to the supply over the next several years. This is the case because of the time it takes before new medical schools produce practicing physicians, as well as the modest nature of current development efforts. This expansion is not factored into any models described in this analysis. Moreover, several other important issues related to the expansion of medical education in the U.S. would have to be addressed before any large-scale expansion could occur.

Number of international medical school graduates: The baseline model assumes 5,200 new IMG entrants per year based on historical trends. An analysis of AMA GME data and the AMA Physician Masterfile indicates that this is close to the experience throughout the 1990s. Given recent political developments (i.e., the tragic events of September 11, 2001; increased scrutiny of immigrants domestically; Operation Iraqi Freedom; as well as a host of others), it is possible that future immigration policies will limit the flow of IMGs into the U.S. in coming years.

It is certainly conceivable that the current inflow could decrease in the near future. Any decrease in the number of IMGs entering the physician supply without a simultaneous increase of USMG, CMG, and DO entrants would lead to fewer physicians than are currently projected. At the same time, it is also conceivable that the number of IMGs could increase because of the recent upswing in U.S. citizens attending medical schools abroad (Salsberg and Forte 2002). These potential changes are not factored into any models described in this analysis.

Women in Medicine

Women have made great strides in medicine over the past 20 years, nearly tripling their representation in the profession. Currently making up about 25 percent of the physician workforce, women will continue to become a larger part of the workforce because they currently make up nearly 50 percent of the students enrolled in U.S. medical schools (Salsberg and Forte 2002).

A number of studies have documented that women work fewer hours over the course of their professional work life than men (Kletke, Marder, and Silberger 1990; Bobula 1980; Martin et al 1988; Cooper 1994; Australian Medical Workforce Advisory Committee/Australian Institute of Health and Welfare [AMWAC/AHIW] 1996, 1998;

Sullivan and Buske 1998; Forte and Salsberg 1999). This phenomenon may reflect time taken for child rearing, for providing care for elderly parents or other relatives, and for taking care of other family concerns. The baseline model accounts for the gender difference as it is based on historical work patterns. As Table 3 shows, the FTE-to-physician ratio decreases over time. This decrease is indicative of the increasing representation of women in the physician workforce as well as the aging of the workforce.

TABLE 3
FTE-to-Physician Ratio, 2000-2020

Year	*Generalist*	*Non-Generalist*	*Overall*
2000	0.997	0.995	0.996
2005	0.994	0.992	0.993
2010	0.988	0.985	0.986
2015	0.981	0.979	0.980
2020	0.976	0.975	0.976
% Change	*–2%*	*–2%*	*–2%*

Aging of the Physician Workforce

Like the rest of the U.S. population, physicians, as a group, are growing older. In fact, between 1982 and 2001, the proportion of physicians aged 65 and older increased from 8 percent to 11 percent. In 2001, more than 84,000 practicing physicians were 65 years of age or older, another 118,000 between 55 and 64 will reach 65 by 2011, and another 203,000 between 45 and 54 will reach 65 by 2021 (Figure 3). The baseline model accounts for these changes by applying historical age-specific activity rates to the supply of physicians each year, as well as by adjusting for this in the FTE-to-physician ratios used to calculate FTEs. If these activity rates do change in the future, the projections of the baseline model will either under- or overestimate the actual supply of physicians depending on the direction of the change.

Separation From the Physician Workforce

In some ways, separation from the physician workforce is related to age. As a physician ages, he is more likely to leave practice for one reason or another, for example, retirement or death. The baseline model assumes that physicians in the future will separate from the workforce at the same age-specific rates as they have historically. In other words, physicians in the future will time their retirements as physicians have in the past. With the aging of the physician population, a larger and larger proportion of the physician workforce will be reaching the traditional age of retirement in the near future. This larger proportion is reflected in the baseline model by an increase in the net retirement rate from 1.2 percent in 2000 to 1.9 percent in 2019, a 58 percent increase.

There is no way to know with certainty the actual retirement patterns of physicians in future years. Earlier retirement of the baby-boom generation of physicians than of previous generations would significantly reduce the supply of physicians in 2020. On the other hand, if physicians are working fewer hours per week because of changing lifestyle choices, they may stay in practice for a longer period of time, not having as much chance to burn out or become dissatisfied for some other reason. This phenomenon might lead to an increase in the supply of physicians in 2020.

In addition, since there is no reason to expect the other sources of separation (e.g., death) to change, they are also held at their historical levels.

Specialty Distribution and Choices

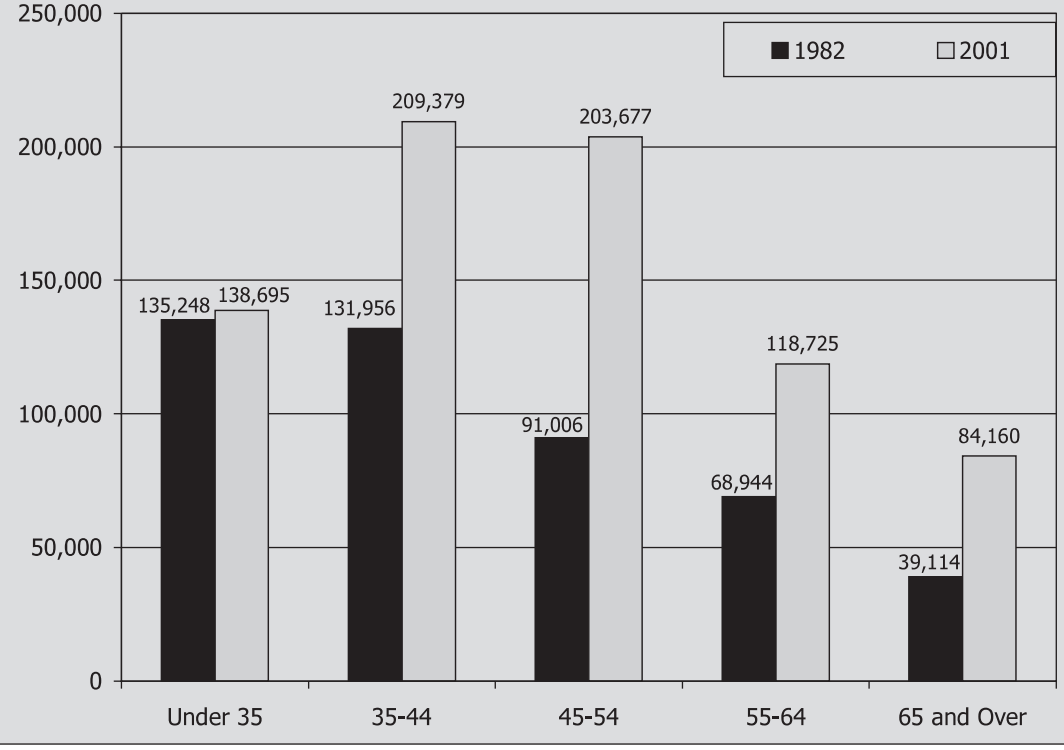
The issue of specialty distribution and choice has less to do with the overall supply of physicians than with the types of services provided by physicians. The specific specialty a physician practices has implications for the types of services provided. As mentioned previously, for the purposes of this re-assessment, discussion and consideration of specialty were limited to a generalist and non-generalist distinction. The baseline model assumes that physicians will choose specialties according to their historical patterns of specialty choice; that is, about 68 percent of physicians will eventually practice in non-generalist specialties. The model also assumes that physicians will have made their final specialty choices by the tenth year after the start of their graduate medical training.

There have been a number of attempts at understanding the reasons behind physicians' specialty choices (Hay 1991; Hurley 1991; Nicholson 2002; Puccio et al 2002; Newton and Grayson 2003; Dorsey et al 2003). The factors most often cited to explain variation in specialty choice include expected income, intellectual content of the specialty, research opportunities in the specialty, prestige of the specialty, gender and race/ethnicity of the physician, family considerations, and others. The dynamics of specialty choice are beyond the scope of this re-assessment. Thus, as noted above, unless otherwise stated, historical rates of specialty choice by age and location of education (USMG or IMG) are employed in the models presented in this paper.

Activity Rates

Being a physician involves a variety of activities, including patient care, medical teaching, medical research, and other medical activities. Physicians, however, are not limited to those types of activities. The rate at which the supply of physicians in the Nation participates in activities

FIGURE 3
Age Distribution of Active Allopathic Physicians in the U.S., 1982 and 2001



Sources: Eiler M. *Physician Characteristics and Distribution in the U.S. 1983 Edition.* American Medical Association; Pasko and Smart. *Physician Characteristics and Distribution in the U.S. 2003-2004 Edition.* American Medical Association.

within their field of expertise (i.e., medicine) and activities outside the realm of medicine directly affects the number of available physicians. The baseline model assumes that activity rates will remain at their historical levels. If activities outside the scope of what are currently considered the professional activities of a physician (e.g., physicians working as financial analysts) become more attractive to physicians, the effective supply of physicians in the U.S. would decrease.

Moreover, changes in the distribution of activities in which a physician participates could also have effects on the supply of physicians. For example, the average physician typically spends the most amount of her time in patient care. If more physicians devoted more time to research, the supply of physicians providing patient care services would decrease. Dynamics within the professional activities of physicians are beyond the scope of this re-assessment. In fact, since the models project active physicians, distinctions between types of professional activity are not taken into account. Again, such distinctions only become important if there is an increase in the rate of participation in an activity that is associated with significantly different practice patterns.

ALTERNATIVE SUPPLY SCENARIOS AND ASSUMPTIONS

The baseline models used in this report are based on historical data. A number of other scenarios were modeled and sensitivity analyses performed to assess the impact of potential changes in key factors influencing the supply of physicians. Each alternative scenario was built to represent the impact of changes to one key factor affecting the future supply of physicians in the U.S., or two factors in the case of hybrid models. The scenarios developed for this report are only a sampling of the myriad possibilities that could occur over the next two decades in the physician workforce. The following discussion presents the background and the results of the projections generated for each scenario.

Alternative Scenario One: Lifestyle Changes

A number of observers of the physician workforce have noted the desire of many, or even most, new physicians to balance professional and personal activities, i.e., to have a

more controllable lifestyle (Schwartz et al 1989; Schwartz et al 1990; Jarecky et al 1991; Bland and Isaacs, 2002; Gelfand et al 2002). These observers have also noted that the phenomena described above of women working fewer hours is part of a larger generational phenomenon, affecting not only physicians, but also other professionals as well (Bond et al 1998; Lang 2000; Gutner 2002). If the new generation of physicians prefers to work fewer professional hours, the FTE physician supply in the U.S. will be reduced.

By some indications, older physicians are reducing the hours they work (Cooper 2002b). For example, in New York, a recent survey finds that a significant proportion of physicians expect to reduce their hours worked in the year ahead (Salsberg et al forthcoming). If older physicians are also reducing their hours, it may lead to a decrease in total physician FTEs similar to that of the new generation of physicians.

To estimate how these lifestyle changes may affect the supply of physicians in the U.S. in the future, it was assumed that by 2020, physicians would work 10 percent fewer hours on average than presumed in the baseline model.[5] Table 4 presents the results of the scenario.

Under Alternative Scenario One, the supply of physicians is projected to grow by some 105,000 FTEs (13 percent) between 2000 and 2020 compared to the projected increase of 190,000 FTEs (24 percent) under the baseline projection. Thus, if lifestyle changes lead to a decrease in the hours worked by active physicians by 10 percent, the number of FTE physicians in 2020 would be 86,000 less than the baseline projections would suggest. The U.S. Census Bureau projects an 18 percent growth in the U.S. population, yielding a net 4 percent drop in the FTE physician-to-population ratio. It is important to note that according to this model, the FTE physician-to-population ratio peaks in 2005 compared to a peak in 2015 in the baseline model. Clearly, the lifestyle changes described above would limit the supply of physicians in the U.S.

Sensitivity Analysis: Alternative Scenario One

For a better understanding of the breadth of influence that lifestyle changes might have on the supply of physicians, a simple sensitivity analysis was performed by changing the assumption of how large the effect of lifestyle changes (i.e., the reduction in hours worked among physicians) would be by 2020. On the low-effect end, it was assumed that lifestyle changes would decrease hours worked by 5 percent by 2020; whereas on the high-effect end, it was assumed that lifestyle changes would decrease hours worked by 20 percent by 2020. Table 5 presents the results of this analysis.

A decrease of 5 percent in the number of hours worked by physicians by 2020 is projected to result in an increase of about 145,000 physician FTEs during the time period and, in every practical sense, a stable FTE physician-to-population ratio. On the other hand, a decrease of 20 percent in the number of hours worked by physicians by 2020 seriously depletes the physician supply in absolute as well as relative terms. This is the first projection in which the absolute number

TABLE 4
Supply of Physicians in the U.S., 2000-2020, Alternative Scenario One Projections: Physician Lifestyle Changes

Year	*Baseline FTE Physicians*	*Lifestyle Changes FTE Physicians*	*U.S. Population (1,000s)*	*FTEs per 100k Pop.*
2000	781,227	781,227	276,241	283
2005	844,464	824,004	288,286	286
2010	899,540	857,259	300,431	285
2015	942,145	877,625	313,116	280
2020	971,817	885,467	325,942	272
% Change	*24%*	*13%*	*18%*	*–4%*

[5] Technically, to create this scenario, the FTE-to-physician ratio was assumed to decrease a total of 10 percent between 2000 and 2020 above and beyond the decrease already factored into the baseline model (2 percent), moving from 0.996 to 0.889. The figure of 10 percent was chosen as a result of research around the differences among male and female physicians' work hours (Bobula 1980; Martin et al 1988; Schwartz et al 1988; Cooper 1994; AMWAC/AHIW 1996, 1998; Sullivan and Buske 1998; Forte and Salsberg 1999), where much of the discussion around lifestyle changes among physicians originated.

of FTEs peaks before 2020. Clearly, the assumption about future lifestyle changes could have important implications for the projected supply of physicians in the U.S. in 2020.

Alternative Scenario Two: Productivity Changes

Another important factor that can influence the available supply of physicians in the U.S. is physician productivity. Productivity, in this instance, is defined as output divided by time spent. Although the lifestyle changes above assumed a constant level of productivity and a decline in time spent practicing, here the focus is changes occurring in medical practice that allow physicians to practice more efficiently. New medical technologies, particularly in the area of information systems, could lead to an increase in physician productivity. For example, the electronic medical record could allow physicians to quickly, easily, and accurately access and assess all the necessary information on a patient's history instead of having to order the file be sent to him, and then shuffling through the paper file. Estimates of the potential productivity gains through the use of new technologies or implementation of already existing technologies are widely variable (Blumenthal 2002; Masys 2002; Goldsmith et al 2003). A recent study suggests a potential gain of 20 percent through the use of technology (Corrigan 2003). .

TABLE 5
Supply of Physicians in the U.S., 2000-2020, Alternative Scenario One Projections of Physician Lifestyle Changes: Sensitivity Analysis

Year	*Baseline FTE Physicians*	*5% Lifestyle Effect FTE Physicians*	*10% Lifestyle Effect FTE Physicians*	*20% Lifestyle Effect FTE Physicians*
2000	781,227	781,227	781,227	781,227
2005	844,464	834,109	824,004	804,512
2010	899,540	877,981	857,259	818,775
2015	942,145	908,741	877,625	821,376
2020	971,817	926,635	885,467	813,210
% Change	*24%*	*19%*	*13%*	*4%*

To determine the effect of increased productivity on the supply of physicians, it was assumed that the physician workforce would be 20 percent more productive by 2020.[6] Table 6 presents the results of the scenario.

Under Alternative Scenario Two, the supply of physicians is projected to grow by over 425,000 FTEs (55 percent) between 2000 and 2020 compared to 190,000 (24 percent) under the baseline projection. Thus, if physician productivity increases by 20 percent by 2020, the number of FTE physicians in 2020 would be 235,000 more than the baseline projections would suggest. The U.S. Census Bureau projects an 18 percent growth in the U.S. population between 2000 and 2020, yielding a net 31 percent increase in the FTE physician-to-population ratio. It is important to note that according to this model, the FTE physician-to-population ratio does not peak in the time period under investigation compared to a peak in 2015 in the baseline model. Clearly, productivity changes as described above could increase the supply of physicians in the U.S.

[6] To estimate how changes in the level of productivity may affect the supply of physicians in the U.S. in the future, a measure of productivity change had to be determined. Because FTEs are the units of supply under consideration, it was possible, once again, to adjust the FTE-to-physician ratio to represent a change in productivity: as productivity increases, the FTE-to-physician ratio increases. When the assumption of a total productivity gain over the 20-year period (2000 through 2020) of 20 percent (which works out to be just slightly above 0.9 percent annually[7]) beyond the decrease (due to working fewer hours) already factored into the baseline model (2 percent) was used, the FTE-to-physician ratio moved from 0.996 in 2000 to 1.212 in 2020. This annual increase in productivity is well within reason. Overall productivity in the U.S. economy grew between 1.0 percent and 4.8 percent annually between 1993 and 2002 (Bureau of Labor Statistics [BLS] 1993-2002). Quarterly increases since 2002 have generated larger annualized increases (BLS 2003).

Sensitivity Analysis: Alternative Scenario Two

On the low-effect end, it was assumed that physician productivity would increase by 10 percent; whereas on the high-effect end, it was assumed that physician productivity would increase by 30 percent. Table 7 presents the results of this analysis.

A physician productivity increase of 10 percent by 2020 results in an increase of over 105,000 physician FTEs beyond the baseline projections of physicians. On the other hand, an increase of 30 percent in physician productivity leads to a substantially higher projected physician supply. It is difficult to believe that gains of this magnitude could be realized, which suggests that further study of the impact of physician productivity enhancements is in order. Nonetheless, it is clear that the particular assumptions about potential productivity gains have important implications for the projected supply of physicians in the U.S. in 2020.

TABLE 6
Supply of Physicians in the U.S., 2000-2020, Alternative Scenario Two Projections: Physician Productivity Increases

Year	*Baseline FTE Physicians*	*Productivity Increases FTE Physicians*	*U.S. Population (1,000s)*	*Productivity Increases FTEs per 100k Pop.*
2000	781,227	781,227	276,241	283
2005	844,464	888,592	288,286	308
2010	899,540	997,981	300,431	332
2015	942,145	1,104,550	313,116	353
2020	971,817	1,207,285	325,942	370
% Change	*24%*	*55%*	*18%*	*31%*

TABLE 7
Supply of Physicians in the U.S., 2000-2020, Alternative Scenario Two Projections of Physician Productivity Increases: Sensitivity Analysis

Year	*Baseline FTE Physicians*	*10% Productivity Effect FTE Physicians*	*20% Productivity Effect FTE Physicians*	*30% Productivity Effect FTE Physicians*
2000	781,227	781,227	781,227	781,227
2005	844,464	865,967	888,592	912,432
2010	899,540	946,207	997,981	1,055,749
2015	942,145	1,016,904	1,104,550	1,208,729
2020	971,817	1,076,829	1,207,285	1,373,707
% Change	*24%*	*38%*	*55%*	*76%*

Alternative Scenario Three: Hybrid Lifestyle/Productivity Changes

Combining the previous two alternative scenarios reveals a more complete picture. This scenario portrays an environment in which physicians are working more productively, but also are working fewer hours, having more time to spend on other pursuits, such as their families. Working from the previous scenarios, the relevant assumptions here include a reduction of 10 percent in hours worked, coupled with an increase in productivity of 20 percent between 2000 and 2020.[7] Table 8 presents the projections derived from this scenario.

A consideration of the scenario with a similar change will project a growth in this scenario in which the supply of physicians will grow by almost 300,000 FTEs (38 percent) between 2000 and 2020 compared to 190,000 (24 percent) under the baseline projection. Thus, if both physician lifestyles change and productivity increases by 2020, the number of FTE physicians in 2020 would be 105,000 more than the baseline projections would suggest.

Sensitivity Analysis: Alternative Scenario Three

For a determination of the effects of a combination of alternative assumptions regarding lifestyle changes and productivity enhancements, a sensitivity analysis was developed. On the low-effect end, it was assumed lifestyle and productivity changes would be small: a 5 percent lifestyle effect (fewer hours worked) and a 10 percent productivity increase. On the high-effect end, it was assumed that lifestyle and productivity changes would be great: a 20 percent lifestyle effect (fewer hours worked) and a 35 percent productivity increase. Table 9 presents the results of this analysis.

A physician productivity increase of 10 percent, coupled with a 5 percent reduction in hours worked because of lifestyle changes by 2020, results in an increase of about 50,000 physician FTEs beyond the baseline projections of physicians. On the other hand, an increase of 35 percent in physician productivity, coupled with a 20 percent reduction in hours worked by 2020, leads to 166,000 more FTE physicians than those projected by the baseline model.

CONCLUSIONS: SUPPLY OF PHYSICIANS IN THE U.S., 2000-2020

Projections of the supply of physicians in the U.S. between 2000 and 2020 forecast that the supply of physicians will continue to grow in absolute terms throughout the period. Although the magnitude of the projected growth varies considerably, it is likely that the supply of physicians will grow between 100,000 and 300,000 FTE physicians during the time period, depending on the particular assumptions made about lifestyle changes and potential productivity gains in the future. The baseline physician supply projections suggest that by 2020 there will be 971,817 physicians practicing in the U.S. It is likely, however, that changes in physician lifestyle choices and in their level of productivity will have

TABLE 8
Supply of Physicians in the U.S., 2000-2020, Alternative Scenario Three Projections: Hybrid Lifestyle/Productivity Changes

Year	*Baseline FTE Physicians*	*Lifestyle/ Productivity Changes FTE Physicians*	*U.S. Population (1,000s)*	*Lifestyle/ Productivity Changes FTEs per 100k Pop.*
2000	781,227	781,227	276,241	283
2005	844,464	865,967	288,286	300
2010	899,540	946,207	300,431	315
2015	942,145	1,016,904	313,116	325
2020	971,817	1,076,829	325,942	330
% Change	*24%*	*38%*	*18%*	*17%*

[7] In fact, because both scenarios are built around changing the FTE-to-physician ratio, the net effect modeled is equivalent to a 10 percent increase in the ratio, which is exactly the same as the low end of the sensitivity analysis for Alternative Scenario Two.

an effect on that growth. It is conceivable that these changes will have an overall effect of increasing the physician supply beyond the baseline projection level. The magnitude of that effect is unclear at this time, but it will probably be modest. Thus, it is also likely that the supply of physicians will fall somewhere in the range of 972,000 and 1,077,000 physicians.

Further, analysis of the model results and factors affecting the future supply of physicians suggest a number of areas of targeted research, including: the effectiveness of current efforts to increase the medical education capacity in the U.S.; changes in the rate of retirement among physicians and their ramifications; generational lifestyle changes and their potential effects on the physician workforce; changes in activity rates among physicians in terms of professional activities within and outside of medicine; productivity enhancements among the physician workforce; and issues related to the selection of specialties by young physicians and changes in historical specialty-specific rates of selection.

TABLE 9
Supply of Physicians in the U.S., 2000-2020, Alternative Scenario Three Projections of Hybrid Lifestyle/Productivity Changes: Sensitivity Analysis

Year	*Baseline FTE Physicians*	*5% Lifestyle/ 10% Productivity Changes FTE Physicians*	*10% Lifestyle/ 20% Productivity Changes FTE Physicians*	*20% Lifestyle/ 35% Productivity Changes FTE Physicians*
2000	781,227	781,227	781,227	781,227
2005	844,464	855,080	865,967	877,134
2010	899,540	922,283	946,207	971,405
2015	942,145	978,098	1,016,904	1,058,917
2020	971,817	1,021,632	1,076,829	1,138,331
% Change	*24%*	*31%*	*38%*	*46%*

Future Demand for Physicians, 2000-2020

OVERVIEW OF METHODOLOGY: BASELINE MODEL AND FACTORS AFFECTING FUTURE DEMAND

The baseline forecast of demand for physicians in the U.S. between 2000 and 2020 is based on the Federal Physician Demand Model (PDM). This model, developed and maintained by BHPr, HRSA, DHHS, produces projections of full-time physician equivalent demand by specialty for 1995 through 2020. For the purposes of this report, the years of interest are 2000 through 2020, and the specialty groups of interest are generalists and non-generalists. This section presents forecasts of the total demand for physicians and factors affecting the overall demand for physicians in the U.S. Projections of demand for generalists and non-generalists appear in Section V.

The model's approach is to assign populations to specific delivery settings and then to choose a staffing configuration for each setting. First, the model defines populations according to gender, age (groups include: 0-4, 5-17, 18-44, 45-64, 65-74, 75-84, 85 and older), location (urban or rural), and insurance status. From these characteristics, a matrix of delivery settings is created. The model then distributes the U.S. population across these delivery settings. (Figure 4 shows a simplified matrix of these delivery settings.) Then, the model calculates the number of physicians necessary to meet the requirements of those populations based on how they are distributed across the delivery settings. These calculations are based on historical staffing patterns for the delivery settings. The data used to compile these historical trends are derived from the National Health Interview Survey (NHIS) and the National Ambulatory Medical Care Survey (NAMCS). The population projections used in the model are based on U.S. Census Bureau middle series estimates of population growth between 2000 and 2020 (Bannister et al 2001). The assumption most important to the accuracy of the model is that the utilization rates of the various populations included in the model and the staffing levels at the various delivery settings will remain at their historical levels (i.e., levels recorded during the early to mid-1990s) and constant over time through 2020.[8] A discussion of the effects of challenges to this assumption is included in the alternative scenarios section below.

FIGURE 4[9]
PDM Population/Delivery Setting Matrix (Simplified)

	Rural	*Urban*
Under 65	Staff HMO*	Staff HMO
	IPA† HMO*	IPA HMO
	FFS‡	FFS
	Medicaid Staff HMO	Medicaid Staff HMO
	Medicaid IPA HMO	Medicaid IPA HMO
	Medicaid FFS	Medicaid FFS
	No Insurance	No Insurance
65 and Above	Medicare Staff HMO	Medicare Staff HMO
	Medicare IPA HMO	Medicare IPA HMO
	Medicare FFS	Medicare FFS

*HMO = Health Maintenance Organization
†IPA = Individual Practice Association
‡FFS = Fee for Service

[8] It should be noted that demand estimates for 2000 through 2002 are not based on the PDM results. Instead, demand for physicians in these years is assumed to be equal to the actual supply of physicians. There are several reasons for this assumption. First, since the conceptualization of demand in this report is the actual utilization of physicians, the actual numbers of FTE physicians is a more accurate representation of demand than anything that the model might generate. Second, the assumption of balance at the outset is appropriate and avoids making a statement about the current relationship between supply and demand that could distract from the goals of the report (to re-assess the relationship between supply and demand and supply and need going forward). Finally, since one cannot make recommendations that can produce more or fewer physicians in the past, it is a moot point about whether there was a surplus or shortage of physicians in 2000, 2001, or 2002. The challenge is to estimate the levels of supply, demand, and need and the potential gaps between them in the future.

[9] Although Figure 4 does not include complete age and gender details, these population characteristics are accounted for in the model. The purpose of Figure 4 is to show the variety of delivery settings and insurance statuses covered in the model.

Conceptually, then, demand is being equated with use of physician services under a specific set of circumstances. Demand is not conceptualized in this model as what a population with certain characteristics might desire in terms of physicians, access to physicians, or physician services. In fact, in the absence of coercion, demand as defined in the model will consistently be lower than demand defined as population desire for services. This is an important conceptualization in terms of how to interpret the results of the forecasts presented below and in terms of how need is conceptualized in this report (for a discussion of need, see Section IV).

Table 10 presents the baseline model results.

The demand for physicians is projected to grow by almost 210,000 FTEs (26 percent) between 2000 and 2020. Over the same time period, the U.S. Census Bureau projects an 18 percent growth in the U.S. population, yielding a net 7 percent growth in the demand for physicians as expressed in an FTE physician-to-population ratio. Unlike the supply of physicians, the demand for physicians is not projected to peak during the time period under investigation. Relative to the baseline supply projections, demand is projected to grow more quickly; thus, a shortage is projected. However, this is only one projection. What happens if other factors that affect demand for physicians are taken into account?

ALTERNATIVE DEMAND SCENARIOS AND ASSUMPTIONS

The first alternative scenario entails an accounting of the effect that economic growth has on demand for physicians. The second alternative scenario modifies the assumptions that the age-specific utilization rates are constant, suggesting that these rates are changing for all age groups, but most important for populations over 45 years of age. The final alternative comes out of the work begun by John Wennberg and colleagues (Wennberg and Cooper 1999) and most recently exemplified in Fisher et al's (2003a, 2003b) just published multi-article research that suggests actual demand for services is much lower than current rates of utilization because of unnecessary service provision. The idea of unnecessary services is also related to work that suggests appropriate levels of demand for physician services are best exemplified in settings where earnest utilization review processes have been implemented. This line of reasoning is associated with Weiner's (1994, 1995) work in the mid-1990s examining HMO staffing levels and recent update examining large prepaid group practices (Weiner 2004).

TABLE 10
Demand for Physicians in the U.S., 2000-2020: Baseline Projections

Year	*FTE Physicians*	*U.S. Population (1,000s)*	*FTEs per 100k Pop.*
2000	781,227	276,241	283
2005	836,818	288,286	290
2010	883,245	300,431	294
2015	934,151	313,116	298
2020	987,937	325,942	303
% Change	*26%*	*18%*	*7%*

For a more comprehensive assortment of physician demand projections, several scenarios are presented based on each perspective listed above. Each alternative scenario was built to represent the manipulation of one major factor affecting the future demand of physicians in the U.S., or two factors in the case of hybrid models. Below, the reasoning behind, and the results of, the projections generated are presented. For a better understanding of the ramifications of the assumptions accompanying each alternative scenario, sensitivity analyses were also performed.

Alternative Scenario One: Economic Factor

The first alternative scenario works from the perspective currently championed by Cooper et al (2002, 2003) (past proponents include Schwartz and colleagues in the late 1980s and early 1990s, and Roehrig and Eisenstein in 1999). This perspective argues that four major factors drive demand for physician services: economic expansion, population growth, work effort of physicians, and services provided by other practitioners (i.e., non-physician clinicians). Cooper and colleagues suggest that the most important of the four factors affecting physician demand is economic expansion. They find a consistent correlation between the supply of physicians and economic growth. However, Cooper and colleagues suggest that the relationship is complex. Economic growth induces growth in demand for health services, causing a rise in health care spending. This growth in health care spending, in turn, leads to a growth in the health care workforce, of which physicians are an important part.

This perspective is certainly not without opponents (e.g., Grumbach 2002; Barer 2002; Weiner 2002). It is easy to believe that in an environment of increasing health care costs and declining budgets, resistance to this sort of perspective is going to arise. However, only one published research article has presented data that challenge Cooper and colleagues' findings (Anderson et al 2003). As with any perspective, though, proponents have never claimed that the theory holds under all conditions and assumptions.

Nonetheless, the jury may still be out on this perspective, but the evidence supporting it is compelling enough to generate a scenario based on some of its principles.

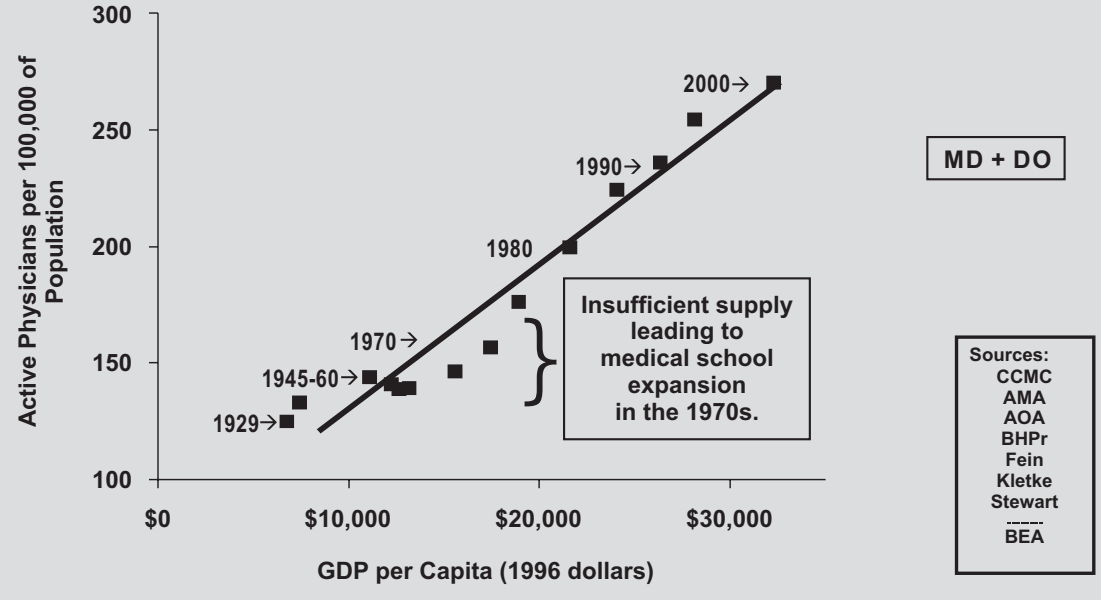
The baseline model used in this report to predict future demand for services takes each of the factors identified by Cooper and colleagues into account except for a consideration of economic expansion. All data necessary to incorporate the suggested causal pathway between economic expansion and demand for physician services were unavailable to construct an alternative scenario. Thus, the causal process was greatly simplified and the findings of Cooper et al (2002) that the use of physician services increases approximately 0.75 percent for every 1.00 percent increase in a Nation's gross domestic product (GDP) were employed. The scenario further assumed that GDP per capita will rise about 1.0 percent per year between 2000 and 2020 (Heffler et al 2003). Figure 5 shows the historical relationship between the growth of GDP and the supply of physicians in the U.S. Table 11 presents the projections of physician demand after incorporation of the economic factor.

Under Alternative Scenario One, the demand for physicians is projected to grow by over 340,000 FTEs (44 percent) between 2000 and 2020. This scenario compares to a growth of 206,000 FTEs (26 percent) under the baseline demand scenario. Over the same time period, the U.S. Census Bureau projects an 18 percent growth in the U.S. population, yielding a net 22 percent growth in the demand for physicians as expressed in an FTE physician-to-population ratio. The 22 percent increase in demand for physicians under this scenario far exceeds that (7 percent) predicted by the baseline model. It is interesting to note that the absolute growth in physician demand predicted under this scenario between 2000 and 2010 (19 percent) closely resembles that predicted by the BLS over the same time period (18 percent) and forecasts made by Cooper and colleagues (2002).

Sensitivity Analysis: Alternative Scenario One

Even though the predictions generated under the current alternative scenario are similar to other attempts to forecast physician demand in the future, it is important to understand how the results of the model might be different under an alternative set of assumptions about economic growth. Cooper et al (2002) point out that the assumption of the level of economic growth is a particularly important one for predictions incorporating this perspective. For a test of the effects of different assumptions about the rate of growth of the economy, a simple sensitivity analysis was performed. On the low-effect end, it was assumed that the U.S. economy would grow 0.5 percent annually between 2000 and 2020; whereas on the high-effect end, it was assumed that the U.S. economy would grow 2.0 percent annually. Table 12 presents the results of this analysis.

FIGURE 5
Relationship Between Active Physician Supply and GDP, 1929-2000



Source: Cooper 2002a.

Although the levels of economic growth experienced in the late 1990s in the U.S. are unlikely to occur for any sustained length of time, it is just as unlikely that the economy would decline for any extended period of time. The levels of economic growth considered in these analyses appear quite reasonable. On the conservative side (a sustained slow-growing economy: 0.5 percent annual GDP growth), demand for physicians will increase by 270,000 physicians between 2000 and 2020 (35 percent). On the other hand, a sustained 2 percent annual growth in the economy (a rate much closer to that in the early 1990s and to what has been projected over the next decade [Heffler et al 2003]) translates into a much more substantial growth of close to 400,000 FTE physicians between 2000 and 2020 (64 percent). The effect of economic growth is substantial, regardless of the level of economic growth assumed. Whether economic growth is the cause of physician demand growth is impossible to determine within the scope of this report. But even if they are only correlated, the end result will be the same: economic growth seems to coincide with growth in the demand for physicians.

Alternative Scenario Two: Changes in Age-Specific Utilization Rates

One assumption of the baseline model is that historical utilization rates will remain constant over time. With respect to age, independent investigation shows that utilization rates are changing. Most observers are familiar with findings suggesting that as the population grows older, overall utilization will increase because utilization rates increase

TABLE 11
Demand for Physicians in the U.S., 2000-2020, Alternative Scenario One Projections: Economic Factor

Year	*Baseline FTE Physicians*	*Economic Factor FTE Physicians*	*U.S. Population (1,000s)*	*Economic Factor FTEs per 100k Pop.*
2000	781,227	781,227	276,241	283
2005	836,818	849,494	288,286	295
2010	883,245	931,050	300,431	310
2015	934,151	1,022,643	313,116	327
2020	987,937	1,123,243	325,942	345
% Change	*26%*	*44%*	*18%*	*22%*

TABLE 12
Demand for Physicians in the U.S., 2000-2020, Alternative Scenario One Projections of Economic Factor: Sensitivity Analysis

Year	*Baseline FTE Physicians*	*0.5% Annual GDP Growth FTE Physicians*	*1.0% Annual GDP Growth FTE Physicians*	*2.0% Annual GDP Growth FTE Physicians*
2000	781,227	781,227	781,227	781,227
2005	836,818	843,130	849,494	862,380
2010	883,245	906,806	931,050	981,678
2015	934,151	977,310	1,022,643	1,120,300
2020	987,937	1,053,234	1,123,243	1,278,864
% Change	*26%*	*35%*	*44%*	*64%*

with age. As indicated in Figure 6, the number of Americans over 65 years of age is increasing and will increase significantly in the coming years. Figure 7 documents the increased use of inpatient services by age. Clearly, the aging of the population is leading to an increase in demand for services in America. However, if one examines utilization rates over time, especially physician office visits, it becomes evident that utilization rates by age group are changing.

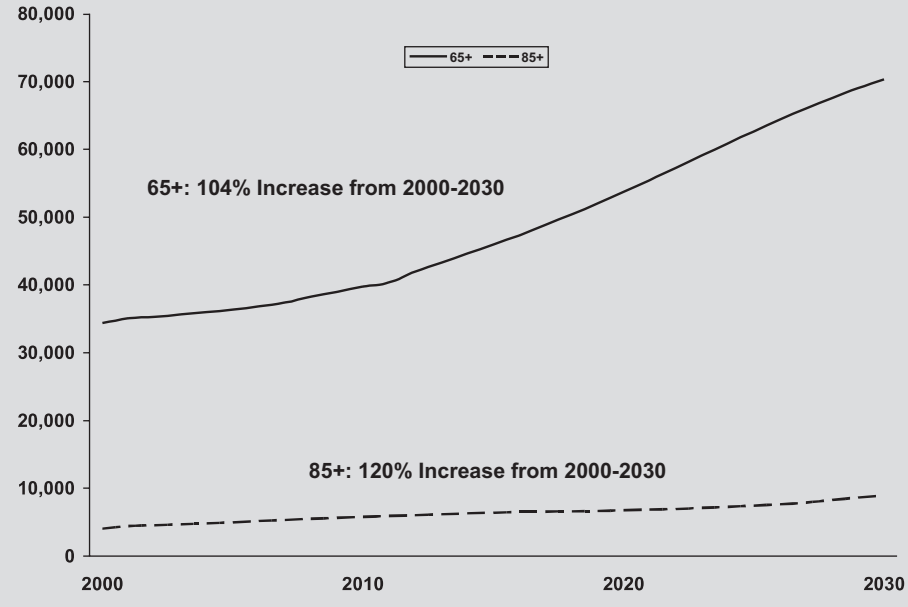
Analysis of the National Ambulatory Medical Care Survey (NAMCS) data from 1980, 1990, and 2000 on visits to physician offices by age group (Figure 8) indicates that the number of physician visits per capita for age groups over 45 years of age have been increasing over the past few decades. There is reason to believe that this trend will continue and may even accelerate as the baby-boom generation ages. The baby-boom generation has grown up with high expectations for health care and has experienced higher utilization rates than those of previous generations. In addition, as the baby-boomers age, many, but certainly not all, will have disposable income that they may choose to spend on health care (Knickman et al 2003).

Between 1980 and 2000, crude per capita visits to physician offices increased from 2.4 to 2.9. However, this increase was not evenly distributed across age groups. The largest gain was experienced among persons 75 to 84 years of age, increasing from 3.5 visits to 6.3 visits annually. All other groups above age 45 experienced gains as well, except the 85 years of age and above group. It turns out, however, that even though there was a global increase in utilization, for persons in the 15- to 24-year-old and the 25- to 34-year-old age groups, utilization rates declined between 1980 and 2000. Further, the more recent changes in utilization (i.e., 1990 compared to 2000) demonstrated a uniform set of increases and declines, with all groups below age 45 having experienced declines in annual per capita visits to physician offices and those age 45 and above having experienced increases in annual per capita physician office visit rates.

One explanation for the rise in use among those over 45 years of age is that it reflects the investment of many billions of dollars in medical research interventions. These interventions may well be leading to increased demand for medical services.

For the observed changes in age-specific utilization rates to be taken into account, a scenario was constructed that represented a continuation of the observed 1990 through 2000 trends between 2000 and 2010 and between 2010 and 2020.[10] Under this scenario, not only is the effect of the aging of the population considered, but also the trends in age-specific utilization rates (declining among

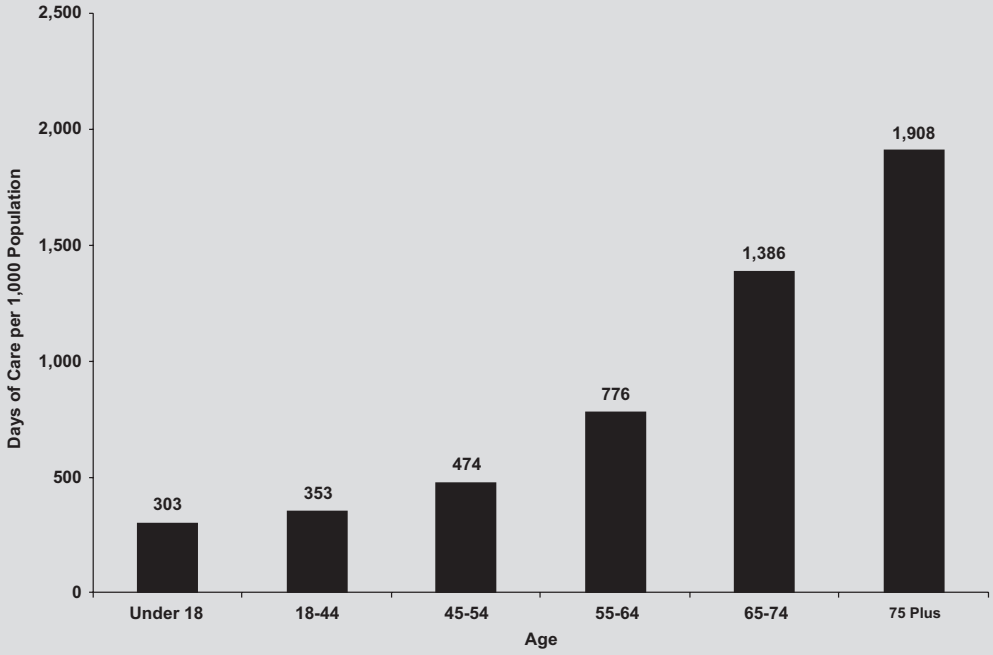
FIGURE 6
Number of Americans 65 and Over and 85 and Over, 2000-2030



Source: U.S. Census Bureau Population Projections.

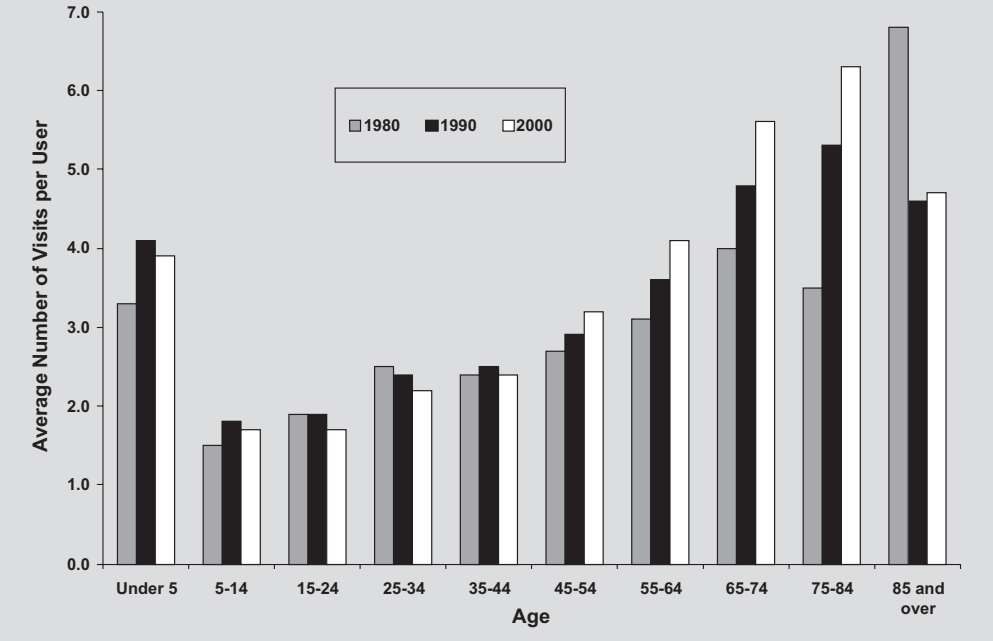
[10] For this scenario, the 10-year relative increases or declines in visits for each age group were calculated, using 2000 as the base year. These relative increases or declines were then applied to the baseline projections of FTE physician demand to generate the alternative FTE physician demand projections. The process was then repeated for 2020 using the 2010 projections as the base year. Projections for the intervening years of 2005 and 2015 were calculated by halving the adjustments made to the 2010 and 2020 baseline projects and by applying them to the 2005 and 2015 baseline projections, respectively.

FIGURE 7
Days of Care in Short-Stay Hospitals, 1999
Number of adult and pediatric days excluding care for newborns



Source: Centers for Disease Control and Prevention (CDC), *National Health Interview Survey,* as reported in National Center for Health Statistics. *Health, United States, 2001.*

FIGURE 8
Estimates of Ambulatory Care Visits to Physician Offices and Clinics, 1980, 1990, and 2000



Source: CDC National Center for Health Statistics. *National Ambulatory Medical Care Surveys 1980, 1990, 2000.* Web site: www.cdc.gov/nchs/

the younger population and increasing among the older population) are also taken into account. Table 13 presents the projections made based on this alternative scenario.

Under Alternative Scenario Two, the demand for physicians is projected to grow by close to 330,000 FTEs (42 percent) between 2000 and 2020 in comparison with the 206,000 FTE growth (26 percent) predicted by the baseline model. Over the same time period, the U.S. Census Bureau projects an 18 percent growth in the U.S. population, yielding a net 20 percent growth in the demand for physicians as expressed in an FTE physician-to-population ratio. It is important to observe the explosion of demand for physicians in the years after 2010, when the combined effect of an aging population and the increased utilization rates of the above age 45 group are evident. The 20 percent increase in demand for physicians under this scenario far exceeds that (7 percent) predicted by the baseline model. It is interesting to note that the absolute growth in physician demand predicted under this scenario between 2000 and 2010 (17 percent) closely resembles the results of the previous alternative scenario that represented an attempt to account for the effect of economic expansion on physician demand (19 percent). Further, as mentioned above, other predictions of physician demand unrelated to the current project are also consistent with the predictions of this alternative scenario.

Sensitivity Analysis: Alternative Scenario Two

The predictions generated under the current alternative scenario are similar to other attempts to forecast physician demand in the future. Despite this fact, it is important to understand how the results of the model might be different under an alternative set of assumptions about the change in age-specific utilization rates, especially in light of the explosive nature of the combined effects of an aging population and increased utilization among the older population. For a test of the effects of different magnitudes of change in age-specific physician utilization rates, a simple sensitivity analysis was performed. On the one hand, it was assumed that the age-specific utilization rates would change at half the rate they changed between 1990 and 2000. On the other hand, it was assumed that the age-specific utilization rates would change at one and a half times the rate they changed between 1990 and 2000.[11] Table 14 presents the results of this analysis.

The levels at which age-specific rates of utilization will grow in the future will have serious implications for the demand for physicians in the U.S. As is evident from the alternative projections of the high and low scenarios of utilization rate growth, the range of the effect is approximately 220,000 FTE physicians. In the low-growth scenario, demand for physicians grows to just over 1 million FTEs in 2020 (31 percent), a figure significantly lower than predicted in the initial projections taking into account age-specific utilization rate changes. Again, it is important to observe that almost 75 percent of the increase occurs between 2010 and 2020, testament to the combined effect mentioned above. On the other hand, if the changes in the utilization rates accelerate as is the case in the high-growth scenario, the demand for physicians may increase to almost 1.25 million FTE physicians, or 381 FTE physicians per 100,000 population. Since the aging of the U.S. population cannot

TABLE 13
Demand for Physicians in the U.S., 2000-2020, Alternative Scenario Two Projections: Changes in Utilization Rates

Year	*Baseline FTE Physicians*	*Changing Utilization Rates FTE Physicians*	*U.S. Population (1,000s)*	*Changing Utilization Rates FTEs per 100k Pop.*
2000	781,227	781,227	276,241	283
2005	836,818	841,384	288,286	292
2010	883,245	917,075	300,431	305
2015	934,151	1,008,022	313,116	322
2020	987,937	1,108,916	325,942	340
% Change	*26%*	*42%*	*18%*	*20%*

[11] To be more specific, on the low end, it was assumed that age-specific utilization rates would change between 2000 and 2010, and between 2010 and 2020, at half the magnitude observed between 1990 and 2000; whereas on the high end, it was assumed that age-specific utilization rates would change between 2000 and 2010, and between 2010 and 2020, at one-and-a-half times the magnitude observed between 1990 and 2000.

be reversed at this point, the effects of changes to the age-specific physician utilization rates are extremely important. Although this alternative scenario projects a wide range of potential effects associated with these changes, it is clear that closer examination and future research should be targeted at understanding the dynamics and trajectories of these rates.

Alternative Scenario Three: Elimination of Unnecessary Services/Increased Utilization Review

The first two alternative scenarios examined factors that were either inadequately taken into account or ignored completely in the baseline projections. However, the issue in the third alternative scenario deals with a different kind of problem in the baseline projections. This imperfection is that of the model, which too closely resembles reality, including not only the beneficial qualities of the current health care delivery system, but also its faults. In particular, unnecessary services, according to some, are common in the current health care delivery system.

There are a number of reasons to believe some current use is unnecessary or only marginally beneficial. Possible causes include: poor physician performance due to an oversupply of physicians in a geographical area; the complexities of current treatment modalities and the inability of individual physicians to sort through them competently enough to understand which test or treatment is appropriate; advertisements targeted toward the public that in turn induce patients to demand services from their physicians; the financial pressure on facilities; outright greed of a small minority in the medical profession; the ongoing medical liability crisis and the resultant practice of "defensive medicine"; a financing/reimbursement system that gives incentives to provide services without regard to outcomes. Regardless of the causes of the unnecessary provision, a long-standing, compelling argument exists that a substantial number of services provided by physicians and other practitioners in the health care delivery system are simply unnecessary or only marginally beneficial. Further, it is argued that it is these unnecessary services that are driving up health care costs and spending in the aggregate. And thus, proponents of this perspective argue that eliminating these unnecessary and marginal services provides two essential goods: efficiency and cost savings (Fisher et al 2003).

The work of Wennberg and colleagues showing the diminishing rates of benefit to the community of additional physicians can certainly be thought of as supporting this perspective. Recently, the work of Fisher et al (2003a, 2003b) showing the lack of relationship (and sometimes negative relationship) between the provision of services, level of spending on services, health care outcomes, and patient satisfaction provided another analysis supporting the perspective.

Coming from a slightly different perspective, Weiner (1994, 1995, 2004) and others (Hart et al 1997; Goodman et al 1996) have attempted to estimate demand for physician services in a way that bypasses these unnecessary services by examining closed, organized systems of health care delivery that employ more or less rigorous utilization review. In the early and mid-1990s, these examinations revolved around staff-model HMOs. This work has most recently evolved to examine large prepaid group practices having contracts with managed care plans (Weiner 2004). The earlier work found

TABLE 14
Demand for Physicians in the U.S., 2000-2020, Alternative Scenario Two Projections of Changes in Utilization Rates: Sensitivity Analysis

Year	*Baseline FTE Physicians*	*1/2 Historical Rate of Change FTE Physicians*	*Historical Rate of Change FTE Physicians*	*1-1/2 Historical Rate of Change FTE Physicians*
2000	781,227	781,227	781,227	781,227
2005	836,818	835,193	841,384	853,556
2010	883,245	847,615	917,075	938,297
2015	934,151	959,585	1,008,022	1,078,499
2020	987,937	1,026,854	1,108,916	1,240,453
% Change	*26%*	*31%*	*42%*	*59%*

that staff-model HMOs were able to provide equivalent quality of care with drastically smaller physician staffing levels. Those who looked more closely at these organizations found that patients were actually using many out-of-network services and challenged this early work (Hart et al 1997). This work continues, however, and the most recent updates show that although in the past these delivery systems may have required lower staffing levels, over time they have expanded. However, the expansion has not quite reached the levels observed outside of these delivery systems (Weiner 2004).

For this alternative scenario, the most important issue is estimating a level of unnecessary services (or thought of differently, a percentage of services that would not pass rigorous utilization review). The most recent work (Fisher et al 2003b; Weiner 2004), suggests that approximately 26.5 percent of the services are unnecessary or would not occur under a more rigorous system of utilization review. With that assumption made, Table 15 presents the resultant projections of physician demand through 2020.[12]

Under this alternative scenario, the growth in physician demand is approximately 150,000 FTE physicians (26 percent) between 2000 and 2020, in relative terms equivalent to the baseline model. The results are the same for demand expressed as a ratio of FTE physicians to 100,000 population. However, in absolute terms, the results of this scenario are remarkable. Whereas the baseline model predicts demand close to 1 million FTE physicians in 2020, this alternative forecasts less than a 750,000 FTE demand for physicians. This alternative scenario suggests that demand for physicians in 2020 will be smaller than the baseline model predicts for 2000.

Sensitivity Analysis: Alternative Scenario Three

One estimate of the effect of eliminating unnecessary services is presented above. Below, a range is constructed around this estimate, and its implications for physician demand are presented. In the low-effect scenario, only 20 percent could be identified and eliminated as unnecessary services; whereas in the high-effect scenario, a full third of services could be identified and eliminated as unnecessary. Table 16 presents the results. Clearly, the relative change in demand for physicians is unaffected by the assumption of the level of unnecessary services that could be identified and eliminated. Rather, the absolute level of demand is affected.

TABLE 15
Demand for Physicians in the U.S., 2000-2020, Alternative Scenario Three Projections: Reduction of Unnecessary Services

Year	*Baseline FTE Physicians*	*26.5% Reduction in Services FTE Physicians*	*U.S. Population (1,000s)*	*26.5% Reduction in Services FTEs per 100k Pop.*
2000	781,227	574,202	276,241	208
2005	836,818	615,061	288,286	213
2010	883,245	649,185	300,431	216
2015	934,151	686,601	313,116	219
2020	987,937	726,133	325,942	223
% Change	*26%*	*26%*	*18%*	*7%*

[12] Unlike all the other scenarios presented above, in this scenario and in all hybrid scenarios that include an assumption about unnecessary services, the effect is applied to the year 2000 demand estimates. This application is meant to represent the position that current levels of utilization suffer from the same problem of unnecessary services as future years will.

Alternative Scenarios Four and Five: Hybrid Models—Economic Expansion and Unnecessary Services/ Increased Utilization Review; Changes in Age-Specific Utilization Rates and Unnecessary Services/ Increased Utilization Review

The next two alternative scenarios involve an attempt to bring together the alternative demand scenarios presented previously. In both Alternative Scenarios Four and Five, the predicted expansion in demand due to either continued economic expansion or increasing rates of utilization by the portion of the population that is growing the fastest is coupled with efforts to identify and eliminate unnecessary service provision. Alternative Scenario Four couples economic expansion with utilization review, whereas Alternative Scenario Five couples increasing utilization predictions with utilization review. Tables 17 and 18, respectively, present the results.

Applying the assumptions of eliminating unnecessary services certainly appears to control the great increases in demand for physicians predicted by either economic

TABLE 16
Demand for Physicians in the U.S., 2000-2020, Alternative Scenario Three Projections of Reduction of Unnecessary Services: Sensitivity Analysis

Year	*Baseline FTE Physicians*	*20.0% Reduction in Services FTE Physicians*	*26.5% Reduction in Services FTE Physicians*	*33.3% Reduction in Services FTE Physicians*
2000	781,227	624,982	574,202	521,078
2005	836,818	669,454	615,061	558,158
2010	883,245	706,596	649,185	589,125
2015	934,151	747,321	686,601	623,079
2020	987,937	790,349	726,133	658,954
% Change	*26%*	*26%*	*26%*	*26%*

TABLE 17
Demand for Physicians in the U.S., 2000-2020, Alternative Scenario Four Projections: Economic Factor/Increased Utilization Review

Year	*Baseline FTE Physicians*	*Economic Factor/ Increased UR* FTE Physicians*	*U.S. Population (1,000s)*	*Economic Factor/ Increased UR* FTEs per 100k Pop.*
2000	781,227	574,202	276,241	208
2005	836,818	624,378	288,286	217
2010	883,245	684,322	300,431	228
2015	934,151	751,642	313,116	240
2020	987,937	825,583	325,942	253
% Change	*26%*	*44%*	*18%*	*22%*

*UR = Utilization Review

expansion or the increasing rates of utilization of services among specific groups within the population. The demand for close to 300,000 FTE physicians is eliminated under both of these alternative hybrid scenarios.[13]

CONCLUSIONS: DEMAND FOR PHYSICIANS IN THE U.S., 2000-2020

The baseline predictions of growth in the demand for physicians suggest that demand will increase by almost 210,000 FTE physicians by 2020, totaling over 987,000 physician FTEs. When other factors are taken into consideration, such as economic expansion and the observed increasing rates of utilization among those age 45 and above, growth in demand, in fact, may increase an additional 300,000 FTE physicians during that same time period. Yet, this growth is logical given the aging of the population; the Nation's investments in new and improved health and medical care services and procedures; and the Nation's continued increase in wealth. Given the findings presented above, it is likely that the Nation will demand between 1,025,000 and 1,240,000 physicians in 2020.

Further, although the Bureau of Labor Statistics (BLS) uses a different forecasting methodology, it is worth noting that the BLS forecast for physician job growth between 2000 and 2010 is 18 percent (Hecker 2001). In this report, the estimate of growth in demand for physicians between 2000 and 2010 is between 17 percent and 19 percent. The similarities in estimated demand provide some comfort with the current forecasts.

On the other hand, an important factor that is seldom taken into account in predictions of demand for physician services is the level of unnecessary services. Because demand is conceptualized as utilization of services (rather than the desire for services), consideration of unnecessary services is appropriate.[14] The alternative scenarios presented previously with regard to unnecessary services certainly imply that it is an important factor in physician workforce planning. However, the most difficult challenge to this perspective is developing solutions that can effectively identify and eliminate the unnecessary services. In the words of one major proponent of this perspective:

> *Previous research has shown that vulnerable populations may be harmed by reduced access to care or as a consequence of public hospital closures. It is not always clear, for example, whether services such as specialist consultations are wasteful or beneficial. The potential adverse impact of reductions in the use of beneficial services and disruptions in current practice patterns underscores the importance of further research on these issues and of the implementation and evaluation of demonstration projects intended to improve quality of care and promote conservative approaches to managing patients with chronic disease (Fisher et al 2003, p. 297).*

The implication of this position is to base policy decisions not on these initial exploratory analyses of utilization and outcomes, but rather on more targeted research results.

TABLE 18
Demand for Physicians in the U.S., 2000-2020, Alternative Scenario Five Projections: Changes in Utilization Rates/Increased Utilization Review

Year	Baseline FTE Physicians	Changing Utilization/ Increased UR FTE Physicians	U.S. Population (1,000s)	Changing Utilization/ Increased UR FTEs per 100k Pop.
2000	781,227	574,202	276,241	208
2005	836,818	618,417	288,286	215
2010	883,245	674,050	300,431	224
2015	934,151	740,896	313,116	237
2020	987,937	815,053	325,942	250
% Change	*26%*	*42%*	*18%*	*20%*

[13] Because the relative change in demand does not change at different levels of unnecessary services, sensitivity analyses are not presented here. However, such analyses are available upon request from the authors.

[14] That is, utilization of services is related to whether services are necessary, but the desire for services has nothing whatsoever to do with whether they are necessary.

Future Need for Physicians, 2000-2020

OVERVIEW OF METHODOLOGY: BASELINE MODEL AND FACTORS AFFECTING FUTURE NEED

The need for physicians, like demand, is defined with respect to current patterns of use of physician services. However, the calculation of need also includes the estimated levels of use of those who are currently uninsured if they were to be insured. Thus, the need for physicians is defined as the sum of current use plus anticipated use of the currently uninsured.

This conceptualization of need assumes that on average persons with ready access to health services will seek services commensurate with their need for those services. It also assumes that persons currently uninsured would use services at levels equal to those who are insured. In addition, based on previous research on the non-financial barriers to health care (e.g., racial disparities), it is assumed that the removal of such access barriers will also lead to a modest increase in use for all populations by 2.0 percent (Vector Research, Inc. 1995).

The baseline forecast of need for physicians in the U.S. between 2000 and 2020, again, is based on the Physician Demand Model (PDM). This model, developed and maintained by the BHPr, HRSA, DHHS, produces projections of full-time physician equivalents by specialty for 1995 through 2020. For the purposes of this report, the years of interest are 2000 through 2020, and the specialty groups of interest are generalists and non-generalists. Estimates of need are generated by relaxing the assumption of historical insurance rates and assuming that all uninsured in the Nation would have (or would be provided) insurance. These assumptions are the basis for the first baseline projections.[15] Table 19 presents baseline predictions of the need for physicians in the U.S. between 2000 and 2020.

TABLE 19
Need for Physicians in the U.S., 2000-2020: Baseline Projections

Year	*FTE Physicians*	*U.S. Population (1,000s)*	*FTEs per 100k Pop.*
2000	781,227	276,241	283
2005	907,758	288,286	315
2010	959,036	300,431	319
2015	1,014,992	313,116	324
2020	1,073,641	325,942	329
% Change	*37%*	*18%*	*16%*

It is important to note that this conceptualization of need is unconventional. Typically, need is defined according to either an ideal standard of health care or staffing found existing in a limited population, geographic area, or health care delivery system. In the final analysis, however, these types of conceptualizations are subjective and open to unknown (and sometimes unknowable) biases on any number of counts. The potential biases and their direction can begin to be listed by using an empirical conceptualization of need. First, the estimates of need based on this conceptualization, in most cases, will be higher than the estimates of demand (i.e., use). One possible scenario that would lead to higher demand than need would be one in which the uninsured population actually had higher rates of use as uninsured than they would with insurance. Second, the estimates of need are likely to underestimate the actual physician needs of the population. That is, there are other barriers to use beyond insurance and the non-financial barriers for which the baseline model cannot account. On the other hand, some would suggest that an estimate of physician need should exclude unnecessary services. Several alternative scenarios below present this perspective.

As described above, in the baseline projections, the approximately 41 million persons (Garrett, Nichols, and Greenman 2001) in the U.S. population who are currently uninsured are assumed to have insurance and to use services at the same rate as those who have historically had insurance. In the baseline model, the need for physicians is projected to grow by almost 300,000 FTEs (37 percent) between 2000 and 2020. Over the same time period, the U.S. Census Bureau projects an 18 percent growth in the U.S. population, yielding a net 16 percent growth in the per capita need for physicians as expressed in an FTE physician-to-population ratio. Unlike the supply of physicians, the need for physicians is not projected to peak during the time period under investigation. Moreover, relative to the baseline supply projections, the need for physicians is projected to grow more quickly; thus, a shortage of physicians is implied. The next section presents alternative forecasts of the need for physicians and factors affecting the overall need for physicians in the U.S.

[15] The organization used in the supply and demand sections of this report is not used in this section because the baseline PDM does not provide estimates of need for physicians as conceptualized here. In the previous sections, to differentiate baseline model projections clearly from the alternative scenarios, the baseline estimates were reported separately. In the case of need, by definition, the baseline PDM projections did not represent need as conceptualized in this report.

ALTERNATIVE NEED SCENARIOS AND ASSUMPTIONS

The first and second alternative scenarios presented below combine the baseline projections (full insurance assumptions) with scenarios identified in the demand section of this report (specifically, the effect of changing age-specific physician utilization rates and the effect of the identification and elimination of unnecessary services, respectively). A final scenario that combines the assumptions of a fully insured population, the changes in age-specific utilization rates, and the identification and elimination of unnecessary services is presented and discussed. For each alternative scenario, a sensitivity analysis is presented.

Alternative Scenario One: Changes in Age-Specific Utilization Rates

In the first alternative scenario predicting need for physicians in the U.S. between 2000 and 2020, the effects of continued changes in the age-specific physician utilization rates discussed in the previous section on demand are coupled with the effects of fully insuring the population of the U.S.[16] It is noteworthy that the assumptions with respect to the changes in utilization rates are the same as those assumptions for Alternative Scenario Two in the demand section (i.e., the changes in age-specific physician utilization rates observed between 1990 and 2000 would continue between 2000 and 2010 and between 2010 and 2020). Table 20 presents the ramifications of making these assumptions on the need for physicians between 2000 and 2020.

Under Alternative Scenario One, the need for physicians is projected to almost double to over 1,500,000 FTEs between 2000 and 2020. Over the same time period, the U.S. Census Bureau projects an 18 percent growth in the U.S. population, yielding a net 65 percent growth in the per capita need for physicians as expressed in an FTE physician-to-population ratio, moving from 283 physicians per 100,000 population to a staggering 468. The tremendous growth in the need for physicians in this scenario is testament to the gravity of changing rates of utilization.

Sensitivity Analysis: Alternative Scenario One

One major assumption of the need projections is that once insured, the historically uninsured will use physician services at the same rate as the historically insured. For each alternative scenario presented in the need section, the sensitivity analysis will relax that assumption by examining two levels of utilization of services by the uninsured. On the low-use end, it is assumed that once insured, the historically uninsured will use services at half the rate of the historically insured. On the high-use end, it is assumed that once insured, the historically uninsured will use services at twice the rate of the insured. Both assumptions are legitimate, because some have argued that the uninsured are likely to be younger and healthier than the insured (which includes the older population on Medicare). Thus, the uninsured are in less need of services than the historically insured. At the same time, others have argued that the uninsured are likely to be poor, un- or underemployed, and thus in need of greater services than the historically insured. Table 21 presents the results of this sensitivity analysis.

TABLE 20
Need for Physicians in the U.S., 2000-2020, Alternative Scenario One Projections: Changes in Utilization Rates

Year	*Baseline FTE Physicians*	*Changing Utilization Rates FTE Physicians*	*U.S. Population (1,000s)*	*Changing Utilization Rates FTEs per 100k Pop.*
2000	781,227	781,227	276,241	283
2005	907,758	977,658	288,286	339
2010	959,036	1,125,803	300,431	375
2015	1,014,992	1,309,650	313,116	418
2020	1,073,641	1,523,984	325,942	468
% Change	*37%*	*95%*	*18%*	*65%*

[16] This admixture of need and demand is made possible by having defined both in terms of utilization.

If the historically uninsured use physician services at half the rate of the historically insured population, between 2000 and 2020 there will be an increase of close to 700,000 (89 percent) physician FTEs. On the other hand, if the historically uninsured are on average more inclined to use physician services, the model projects an increase in need of over 800,000 (104 percent) FTE physicians by 2020. This analysis demonstrates that further research is needed to determine the exact effect of providing insurance to the historically uninsured population in the U.S. Whether the historical levels of utilization continue to hold in the future will have, as shown above, an effect on the number of physicians needed to adequately serve the population. Moreover, the analysis makes explicit the fact that assumptions about potential future changes in age-specific utilization rates have a much larger effect than assumptions about the physician utilization of the historically uninsured.

Alternative Scenario Two: Elimination of Unnecessary Services/Increased Utilization Review

As mentioned previously, in this second alternative scenario predicting need for physicians in the U.S. between 2000 and 2020, the effects of being able to ferret out unnecessary services through a rigorous utilization review process identified in the previous section on demand are coupled with the effects of fully insuring the population of the U.S. It is noteworthy that the assumptions with respect to unnecessary services are the same as those for Alternative Scenario Three in the demand section (i.e., approximately 26.5 percent of the services provided currently are unnecessary and these services could be identified and prevented). Table 22 presents the results associated with this scenario.

Under this alternative scenario, the percentage growth (37 percent) in need for physicians is exactly the same as the baseline need projections, as was the case in the hybrid alternative models in the demand section. Again, it is interesting to note that although the relative change in need for physicians is the same, the level of service use is significantly lower.

Sensitivity Analysis: Alternative Scenario Two

The sensitivity analysis presented below, in Table 23, shows the effect of altering the assumption of use among the historically uninsured once they become insured.

Alternative Scenario Three: Changes in Age-Specific Utilization Rates; Unnecessary Services/ Increased Utilization Review Hybrid

In the final scenario, assumptions are made beyond the baseline need model that incorporate both changes in age-specific utilization rates and the identification and elimination of unnecessary physician services through 2020. Combining all factors is an attempt to predict the future need for physicians in the U.S. the most accurately. The assumptions in this scenario are exactly the same as the main assumptions on physician need in Alternative Scenarios One and Two. Table 24 presents the results associated with this scenario.

TABLE 21
Need for Physicians in the U.S., 2000-2020, Alternative Scenario One Projections of Changes in Utilization Rates: Sensitivity Analysis

Year	*Baseline FTE Physicians*	*Low Utilization Rates FTE Physicians*	*Equivalent Utilization Rates FTE Physicians*	*High Utilization Rates FTE Physicians*
2000	781,227	781,227	781,227	781,227
2005	907,758	939,416	977,658	1,037,510
2010	959,036	1,084,913	1,125,803	1,189,614
2015	1,014,992	1,266,010	1,309,650	1,377,614
2020	1,073,641	1,477,711	1,523,984	1,596,006
% Change	*37%*	*89%*	*95%*	*104%*

Under the final alternative scenario, the need for physicians is projected to increase substantially to more than 1,120,000 FTEs (95 percent) between 2000 and 2020. This scenario is slightly less than 50,000 FTE physicians higher than the baseline need prediction. Over the same time period, the U.S. Census Bureau projects an 18 percent growth in the U.S. population, yielding a net 65 percent growth in the per capita need for physicians as expressed in an FTE physician-to-population ratio, moving from 208 physicians per 100,000 population to 344. Although the need for physicians does grow dramatically, efforts to identify and eliminate unnecessary services assert control over the growth, limiting the effects of changing patterns of physician utilization among a fully insured population.

Sensitivity Analysis: Alternative Scenario Three

Table 25 presents the results of lower and higher rates of utilization among the historically uninsured on the projections of the need for physicians between 2000 and 2020 for Alternative Scenario Three. As suspected, the increases in physician need predicted by the model are slightly lower when the utilization rates of the historically uninsured are assumed to be half of what has been found in the past. The increases in physician need are slightly higher when utilization rates of the historically uninsured are assumed to be double what has been found in the past.

TABLE 22
Need for Physicians in the U.S., 2000-2020, Alternative Scenario Two Projections: Reduction of Unnecessary Services

Year	*Baseline FTE Physicians*	*26.5% Reduction in Services FTE Physicians*	*U.S. Population (1,000s)*	*26.5% Reduction in Services FTEs per 100k Pop.*
2000	781,227	574,202	276,241	208
2005	907,758	667,202	288,286	231
2010	959,036	704,891	300,431	235
2015	1,014,992	746,019	313,116	238
2020	1,073,641	789,126	325,942	242
% Change	*37%*	*37%*	*18%*	*16%*

TABLE 23
Need for Physicians in the U.S., 2000-2020, Alternative Scenario Two Projections: Sensitivity Analysis

Year	*Baseline FTE Physicians*	*Low Utilization/ 26.5% Reduction in Services FTE Physicians*	*Equivalent Utilization/ 26.5% Reduction in Services FTE Physicians*	*High Utilization/ 26.5% Reduction in Services FTE Physicians*
2000	781,227	574,202	574,202	574,202
2005	907,758	639,094	667,202	711,194
2010	959,036	674,837	704,891	751,792
2015	1,014,992	713,944	746,019	795,973
2020	1,073,641	755,116	789,126	842,062
% Change	*37%*	*32%*	*37%*	*47%*

CONCLUSIONS: NEED FOR PHYSICIANS IN THE U.S., 2000-2020

There is no single, generally accepted standard for the number of physicians needed by a community or Nation. One can hold up the current use of physicians in communities with above-average health status indicators and set their rates of utilization as a benchmark (Goodman et al 1996). However, the differences between communities in terms of health delivery systems and population needs are so significant that they raise serious questions about the relevancy of using the workforce in one community for other communities. Moreover, as has been pointed out in a number of studies examining the correlation between community health status and the size of health workforce in a community, once a certain size of the health workforce is achieved, it is often difficult to measure the associated increase or decrease in health status. Thus, for many communities in the Nation, it might appear as though the size of the health workforce (in this case, the physician workforce) is not correlated with the health status of the community. The process of selecting the most appropriate communities to use as benchmarks

TABLE 24
Need for Physicians in the U.S., 2000-2020, Alternative Scenario Three Projections: Changes in Utilization Rates/Increased Utilization Review

Year	*Baseline FTE Physicians*	*Changing Utilization/ Increased UR FTE Physicians*	*U.S. Population (1,000s)*	*Changing Utilization/ Increased UR FTEs per 100k Pop.*
2000	781,227	574,202	276,241	208
2005	907,758	718,579	288,286	249
2010	959,036	827,465	300,431	275
2015	1,014,992	962,593	313,116	307
2020	1,073,641	1,120,128	325,942	344
% Change	*37%*	*95%*	*18%*	*65%*

TABLE 25
Need for Physicians in the U.S., 2000-2020, Alternative Scenario Three Projections: Sensitivity Analysis

Year	*Baseline FTE Physicians*	*Low Utilization/ Changing Utilization/ Increased UR FTE Physicians*	*Equivalent Utilization/ Changing Utilization/ Increased UR FTE Physicians*	*High Utilization/ Changing Utilization/ Increased UR FTE Physicians*
2000	781,227	574,202	574,202	574,202
2005	907,758	690,471	718,579	762,570
2010	959,036	797,411	827,465	874,367
2015	1,014,992	930,518	962,593	1,012,546
2020	1,073,641	1,086,118	1,120,128	1,173,064
% Change	*37%*	*89%*	*95%*	*104%*

would entail a great deal of additional analysis. Even then, this selection process would be open to criticism as biased and not reflecting the population of the Nation as a whole.

Therefore, for purposes of this analysis, the national experience has been used to compare the use of services by those with and those without heath insurance. The linchpin assumption made was that if those without health insurance were covered, they would use services at the same rate as those with health insurance. The sensitivity analyses relaxed the assumption, to some extent, which revealed the resultant effects on the prediction of future physician need.

The model and the alternative scenarios predicted a wide range of potential need for physicians in the U.S. in the future. The baseline model predicted an increase in need for physicians of 290,000 FTE physicians. The variation in the predictions associated with the alternative scenarios represented the results of assumptions having to do with other factors related to the need for physicians, that is, the changes in age-specific physician utilization rates and the identification and elimination of unnecessary services. It seems reasonable that the scenario that takes all factors into account (Alternative Scenario Three) is the most accurate way to predict future need for physicians. When all factors are taken together, then, the need for physicians is predicted to grow between 300,000 and 390,000 FTE physicians between 2000 and 2020.

In sum, it is predicted that there will be a need of between 1,086,000 and 1,173,000, resulting in a shortage of physicians in 2020 in the range of 65,000 and 150,000. It is noteworthy that without successful efforts to identify and eliminate unnecessary services, the physician supply-need gap could be much greater.

Physician Supply, Demand, and Need, 2000-2020: Specialty Mix Issues

One goal of the current re-assessment of physician supply, demand, and need over the coming decades is to determine the appropriate specialty mix. In COGME's *Third Report* (1992), a recommendation was made that one-half of all new practicing physicians be of the generalist variety (pediatrician, internist, family practitioner, and any combination). The recommendation had effects on the cohort of medical students and residents training in the 1990s thanks to a number of programs. The ranks of generalist physicians grew more rapidly than those of non-generalist physicians during the decade (Salsberg and Forte 2002). Toward the end of the 1990s, however, interest in generalist specialties began to wane, as the non-generalist specialties, once again, became more attractive to young physicians (Kimball 2000; AAMC 2002; Salsberg and Forte 2002).

In this section, the issue of specialty mix is addressed with regard to physician supply, demand, and need between 2000 and 2020. The strategy employed to address this issue is one that looks at a variety of specialty mix levels in an attempt to describe the physician supply, demand, and need if those mixes were to occur. For each main outcome variable (supply, demand, and need), the numbers of generalists and non-generalists projected under these assumptions are presented: 1) of a continuation of historical specialty mix patterns[17]; 2) of a move toward more non-generalist-based medicine resulting in a 30 percent generalist and 70 percent non-generalist physician supply; and 3) of a move toward more generalist-based medicine resulting in a 45 percent generalist and 55 percent non-generalist physician supply.[18,19] The baseline numbers of physicians are those projections identified in the previous sections as the most likely to occur.

SUPPLY OF GENERALIST AND NON-GENERALIST PHYSICIANS: BASELINE PROJECTIONS

In Section II, "Supply of Physicians," a combination of the baseline model and Alternative Scenario Three was identified as the most likely scenario for physician supply. In this scenario, both lifestyle changes among the physician workforce and productivity enhancements due to technological developments were considered. In terms of specialty mix, historical patterns suggest a slight move toward more generalist physicians (slightly less than 37 percent in 2000 to slightly more than 39 percent in 2020). Given these assumptions, Table 26 presents the supply of generalists and non-generalists in the U.S. from 2000 to 2020.

A small change in the specialty mix has a large impact on the relative growth rates of generalists and non-generalists between 2000 and 2020. If the historical patterns continue, generalists will grow by 116,000 FTE physicians (40 percent),

TABLE 26
Supply of Physicians in the U.S., 2000-2020, Baseline Specialty Projections

Year	*Generalist FTE Physicians*	*Non-Generalist FTE Physicians*	*Generalist FTEs per 100k Pop.*	*Non-Generalist FTEs per 100k Pop.*
2000	286,674	494,553	104	179
2005	317,203	538,013	110	187
2010	349,695	573,179	116	191
2015	378,651	600,874	121	192
2020	402,740	621,583	124	191
% Change	*40%*	*26%*	*19%*	*7%*

[17] Historical specialty mix patterns are derived from the PSM and PDM.

[18] It is important to note that these generalist and non-generalist mixes do not pertain to new entrants, but rather to the overall specialty mix in the physician supply. Given the length of a typical career in medicine, the entrant specialty mixes needed to achieve these overall mixes would have to exceed the 30 percent and 70 percent as well as 45 percent and 55 percent overall mixes. Currently, the new physician specialty mix approximates a 37 percent and 63 percent mix.

[19] It should also be noted that all specialty-specific differences (e.g., separation rates and activity rates) are not taken into account in any of these projections.

adding 20 FTE physicians per 100,000 population. Non-generalists will grow by some 127,000 FTEs (26 percent), adding about 12 FTE physicians per 100,000 population.

Supply Specialty Mix Alternative Scenario One: Non-Generalist Dominant Mix

As mentioned at the beginning of this section, generalist specialties have begun to lose favor among young physicians and those still in training, so it is unclear whether the patterns observed in the mid-1990s will continue in the future. The ramifications of a move toward a more non-generalist mix (in terms of the supply of physicians) are explored in this alternative scenario. In this scenario, instead of an increase in the generalist specialties, the mix is weighted toward a non-generalist mix. Specifically, it is assumed that by 2020, generalists will make up just 30 percent of the physician supply, whereas non-generalists will make up 70 percent. Table 27 presents the results of this change.

The move toward a specialty mix that is more non-generalist, dominated over the next two decades, seriously depletes the future generalist supply. Growing by less than 20,000 FTEs (7 percent) between 2000 and 2020, generalist physician growth does not keep up with population growth. On the other hand, the non-generalist supply grows by nearly 50 percent (223,000 FTE physicians), continuing to outpace population growth.

Supply Specialty Mix Alternative Scenario Two: Generalist-Weighted Mix

Certainly, some observers argue that the Nation would be better served having more generalist physicians. This scenario presents what the physician supply would look like if by 2020, the overall specialty mix of physicians approximated a 45 percent generalist and 55 percent non-generalist mix. Table 28 presents the results.

With a move toward a more generalist-weighted specialty mix over the time period of investigation, a very different physician supply results. Generalists grow by 174,000 FTE physicians (61 percent), adding about 37 FTEs per 100,000 population. The non-generalists grow by about 70,000 FTE physicians (14 percent), paralleling the growth of the population through 2010. Growth among the non-generalist physician supply begins to fall behind the overall population growth, however, after 2010.

DEMAND FOR GENERALIST AND NON-GENERALIST PHYSICIANS: BASELINE PROJECTIONS

In Section III, "Future Demand for Physicians," Alternative Scenario Two was identified as the most likely scenario for future demand for physicians in the U.S. In this scenario, the age-specific utilization rate changes observed between

TABLE 27
Supply of Physicians in the U.S., 2000-2020, Specialty Projections: 30% Generalist/70% Non-Generalist Scenario

Year	*Generalist FTE Physicians*	*Non-Generalist FTE Physicians*	*Generalist FTEs per 100k Pop.*	*Non-Generalist FTEs per 100k Pop.*
2000	286,674	494,553	104	179
2005	299,509	555,706	104	193
2010	307,757	615,117	102	205
2015	310,253	669,272	99	214
2020	307,297	717,026	94	220
% Change	*7%*	*45%*	*–9%*	*23%*

1990 and 2000 were projected to continue from 2000 to 2010 and from 2010 to 2020. In terms of specialty mix, historical demand patterns suggest a slight move toward more generalist physicians (slightly less than 37 percent in 2000 to slightly more than 37 percent in 2020). Starting from this baseline, and applying historical patterns of the demand for generalists and non-generalists, Table 29 presents the demand for generalists and non-generalists in the U.S. from 2000 to 2020.

Because of the slight change in the specialty demand mix, the demand for generalists and the demand for non-generalists grow at similar rates in this scenario (44 percent and 41 percent, respectively). In terms of relative demand for physicians, demand grows from 104 generalist FTEs per 100,000 population in 2000 to 126 in 2020. At the same time, demand for non-generalists grows from 179 non-generalist FTEs per 100,000 to 214. Compared to the baseline specialty projections of supply, the Nation will experience a shortage of generalists (9,000 FTEs), as well as non-generalists (75,000 FTEs). If the specialty mix in the supply is as projected in Alternative Scenario One above, the shortage of generalists will be exacerbated, whereas the shortage of non-generalists will be eliminated, with a small surplus (30,000 FTEs) throughout most of the period. In a more generalist-weighted supply scenario (Alternative Supply Specialty Mix Scenario Two above), there is a surplus of generalists (49,000 FTEs) and a shortage of non-generalists by 2010 that grows larger through 2020.

TABLE 28
Supply of Physicians in the U.S., 2000-2020, Specialty Projections: 45% Generalist/55% Non-Generalist Scenario

Year	*Generalist FTE Physicians*	*Non-Generalist FTE Physicians*	*Generalist FTEs per 100k Pop.*	*Non-Generalist FTEs per 100k Pop.*
2000	286,674	494,553	104	179
2005	331,580	523,636	115	182
2010	376,972	545,901	125	182
2015	420,449	559,075	134	179
2020	460,945	563,378	141	173
% Change	*61%*	*14%*	*36%*	*–3%*

TABLE 29
Demand for Physicians in the U.S., 2000-2020, Baseline Specialty Projections

Year	*Generalist FTE Physicians*	*Non-Generalist FTE Physicians*	*Generalist FTEs per 100k Pop.*	*Non-Generalist FTEs per 100k Pop.*
2000	286,674	494,553	104	179
2005	311,882	529,502	108	184
2010	339,856	577,220	113	192
2015	373,553	634,469	119	203
2020	411,935	696,981	126	214
% Change	*44%*	*41%*	*22%*	*19%*

Demand Specialty Mix Alternative Scenario One: Non-Generalist Dominant Demand Mix

In this scenario, the demand for physicians in 2020 is such that 30 percent of the physicians demanded are generalists and 70 percent are non-generalists. Generalists account for approximately 9 percent less of the total demand for physicians in this scenario compared to the baseline demand specialty mix. Non-generalists account for approximately 9 percent more of the total demand for physicians than in the baseline assumptions. Table 30 presents the demand for physicians under these assumptions.

In this scenario, demand for generalists and non-generalists grows in absolute terms through the period of interest. Demand for generalists grows at approximately the same rate as the population, remaining at 102 FTE physicians per 100,000 from 2005 on, while demand for non-generalists increases 57 percent in terms of FTEs and 33 percent in terms of FTEs per 100,000 population. Compared to the baseline specialty projections of supply, the Nation will experience a significant surplus of generalists (70,000 FTEs), as well as a large shortage of non-generalists (155,000 FTEs). If the specialty mix in the supply is as projected in Alternative Supply Specialty Mix Scenario One above, the surplus of generalists would be lessened to approximately 25,000 FTEs, and the shortage of non-generalists would be lessened substantially as well. In a more generalist-weighted supply scenario (Alternative Supply Specialty Mix Scenario Two above), there is a large surplus of generalists (128,000 FTEs). There is also a shortage of non-generalists by 2005 that grows larger through 2020.

Demand Specialty Mix Alternative Scenario Two: Generalist-Weighted Mix

In this scenario, the demand for physicians in 2020 is such that 45 percent of the physicians demanded are generalists and 55 percent are non-generalists. Compared to the baseline demand specialty mix, in this scenario generalists account for approximately 6 percent more of the total demand for physicians than in the baseline scenario. Non-generalists account for approximately 6 percent less of the total demand for physicians than in the baseline. Table 31 presents the demand for physicians under these assumptions.

In this scenario, demand for generalists and non-generalists grows in absolute terms through the period of interest. Demand for generalists grows at a substantial rate, moving from 104 FTE physicians per 100,000 in 2000 to 153 in 2020. Demand for non-generalists increases 23 percent in terms of FTEs and 5 percent in terms of FTEs per 100,000 population, a far slower pace than that of generalists. Compared to the baseline specialty projections of supply, the Nation will experience a significant shortage of generalists (97,000 FTEs), as well as a small surplus of non-generalists (12,000 FTEs). If the specialty mix in the supply is as projected in Alternative Supply Specialty Mix Scenario One above, the shortage of generalists will be exacerbated to approximately 192,000 FTEs and the surplus of non-generalists will be greatly increased as well. In a more generalist-weighted supply scenario (Alternative Supply Specialty Mix Scenario Two above), there would be a shortage of generalists (40,000 FTEs) and a shortage of non-generalists (46,000 FTEs) in 2020.

TABLE 30
Demand for Physicians in the U.S., 2000-2020, Specialty Projections: 30% Generalist/70% Non-Generalist Scenario

Year	*Generalist FTE Physicians*	*Non-Generalist FTE Physicians*	*Generalist FTEs per 100k Pop.*	*Non-Generalist FTEs per 100k Pop.*
2000	286,674	494,553	104	179
2005	294,665	546,719	102	190
2010	305,823	611,252	102	203
2015	319,279	688,743	102	220
2020	332,675	776,241	102	238
% Change	*16%*	*57%*	*–2%*	*33%*

NEED FOR GENERALIST AND NON-GENERALIST PHYSICIANS

In Section IV, "Future Need for Physicians," Alternative Scenario Three was identified as the most likely scenario for future need for physicians in the U.S. In this scenario, the age-specific utilization rate changes observed between 1990 and 2000 were projected to continue from 2000 to 2010 and from 2010 to 2020. Further, this scenario also accounted for unnecessary services that would be weeded out by a strong utilization review process. In terms of specialty mix, historical need patterns suggest a slight move toward more generalist physicians (slightly less than 37 percent in 2000 to slightly more than 37 percent in 2020). Starting from this baseline, and applying historical patterns of the need for generalists and non-generalists, Table 32 presents the projected need for generalists and non-generalists in the U.S. from 2000 to 2020.

Because of almost negligible changes in the specialty need mix, the demand for generalists and the demand for non-generalists grow at similar rates in this scenario (97 percent and 94 percent, respectively). In terms of relative need for generalist physicians, need grows from 76 generalist FTEs per 100,000 population in 2000 to 127 generalist FTEs in 2020. At the same time, need for non-generalists grows from 132 to 216 non-generalist FTEs per 100,000. Compared to the baseline specialty projections of supply, the expected physician workforce will experience a shortage of generalists (13,000 FTEs), as well as non-generalists (83,000 FTEs). If the specialty mix in the supply is as projected in Alternative Supply Specialty Mix Scenario One above, the shortage of generalists will be greatly increased, reaching over 100,000 FTEs by 2020. The shortage of non-generalists will be reversed, with a large initial surplus shrinking throughout the period. In a more generalist-weighted supply scenario (Alter-

TABLE 31
Demand for Physicians in the U.S., 2000-2020, Specialty Projections: 45% Generalist/55% Non-Generalist Scenario

Year	*Generalist FTE Physicians*	*Non-Generalist FTE Physicians*	*Generalist FTEs per 100k Pop.*	*Non-Generalist FTEs per 100k Pop.*
2000	286,674	494,553	104	179
2005	326,217	515,167	113	179
2010	374,604	542,472	125	181
2015	432,681	575,340	138	184
2020	499,012	609,904	153	187
% Change	*74%*	*23%*	*48%*	*5%*

TABLE 32
Need for Physicians in the U.S., 2000-2020, Baseline Specialty Projections

Year	*Generalist FTE Physicians*	*Non-Generalist FTE Physicians*	*Generalist FTEs per 100k Pop.*	*Non-Generalist FTEs per 100k Pop.*
2000	210,705	363,497	76	132
2005	266,312	452,266	92	157
2010	306,667	520,799	102	173
2015	356,746	605,847	114	193
2020	415,130	704,998	127	216
% Change	*97%*	*94%*	*67%*	*64%*

native Supply Specialty Mix Scenario Two above), there is a surplus of generalists (35,000 FTEs). There is also a shortage of non-generalists by 2010 that grows larger through 2020.

Need Specialty Mix Alternative Scenario One: Non-Generalist Dominant Need Mix

In this scenario, the need for physicians in 2020 is such that 30 percent of the physician need is associated with generalist services and 70 percent with non-generalist services. Compared to the baseline demand specialty mix, in this scenario generalists account for approximately 9 percent less of the total need for physicians than in the baseline scenario. Non-generalists account for approximately 9 percent more of the total need for physicians than in the baseline assumptions. Table 33 presents the need for physicians under these assumptions.

In this scenario, the need for generalists and non-generalists grows in absolute terms throughout the period of interest. The need for generalists grows at a higher rate than the population, increasing from 76 FTE physicians per 100,000 in 2000 to 103 FTE physicians per 100,000 in 2020. The need for non-generalists grows dramatically, increasing 116 percent in terms of FTEs and 83 percent in terms of FTEs per 100,000 population. Compared to the baseline specialty projections of supply, under this need scenario the expected physician workforce will experience a significant surplus of generalists (66,000 FTEs), as well as a large shortage of non-generalists (163,000 FTEs). If the specialty mix in the supply is as projected in Alternative Supply Specialty Mix Scenario One above, the surplus of generalists would be reversed and a shortage of 29,000 FTE generalists would result. The shortage of non-generalists would be lessened substantially to approximately 67,000 FTEs. In a more generalist-weighted supply scenario (Alternative Supply Specialty Mix Scenario Two above), there is a large surplus of generalists (124,000 FTEs). There is also a shortage of non-generalists by 2010 that grows significantly larger through 2020.

Need Specialty Mix Alternative Scenario Two: Generalist-Weighted Mix

In this scenario, the demand for physicians in 2020 is such that 45 percent of the physician need is associated with generalists and 55 percent with non-generalists. Compared to the baseline need specialty mix, in this scenario generalists account for approximately 6 percent more of the total need for physicians than in the baseline scenario. Non-generalists account for approximately 6 percent less of the total need for physicians than in the baseline. Table 34 presents the demand for physicians under these assumptions.

In this scenario, the need for generalists and non-generalists grows in absolute terms through the period of interest. The need for generalists grows at a substantial rate, moving from 76 FTE physicians per 100,000 in 2000 to 155 FTE physicians per 100,000 in 2020. The need for non-generalists increases 69 percent in terms of FTEs and 44 percent in terms of FTEs per 100,000 population, a far slower pace than that of generalists (103 percent). Compared to the baseline specialty projections of supply, the expected physician workforce will experience a significant shortage of generalists (102,000 FTEs), as well as a small surplus of non-generalists (5,000 FTEs). If the specialty mix in the supply were as projected in Alternative Supply Specialty Mix Scenario One above, the shortage of generalists would be exacerbated to approximately 197,000 FTEs and the surplus of non-generalists would also be greatly increased. In a more generalist-weighted supply scenario (Alternative Supply Specialty Mix Scenario Two above), there would be a shortage of generalists (44,000 FTEs) and a shortage of non-generalists (53,000 FTEs) in 2020.

TABLE 33
Need for Physicians in the U.S., 2000-2020,
Specialty Projections:
30% Generalist/70% Non-Generalist Scenario

Year	*Generalist FTE Physicians*	*Non-Generalist FTE Physicians*	*Generalist FTEs per 100k Pop.*	*Non-Generalist FTEs per 100k Pop.*
2000	210,705	363,497	76	132
2005	251,657	466,922	87	162
2010	275,940	551,525	92	184
2015	304,890	657,703	97	210
2020	336,039	784,090	103	241
% Change	*59%*	*116%*	*35%*	*83%*

TABLE 34
Need for Physicians in the U.S., 2000-2020,
Specialty Projections:
45% Generalist/55% Non-Generalist Scenario

Year	*Generalist FTE Physicians*	*Non-Generalist FTE Physicians*	*Generalist FTEs per 100k Pop.*	*Non-Generalist FTEs per 100k Pop.*
2000	210,705	363,497	76	132
2005	278,604	439,975	97	153
2010	338,000	489,465	113	163
2015	413,182	549,411	132	175
2020	504,058	616,071	155	189
% Change	*139%*	*69%*	*103%*	*44%*

Issues Beyond the Models

RESIDENT AND FELLOW WORK-HOUR RESTRICTIONS

All models presented above make no distinction between physicians in training (residents and fellows) and physicians who have completed their graduate medical training. As such, historical patterns of practice (e.g., work hours) are incorporated into the models and their projections. Thus, the recent implementation of regulations limiting resident and fellow work hours to 80 or fewer has not been taken into account. Although the general impact of these regulations is clear; that is, the total supply of physicians (FTEs) will decrease. It is unclear what the magnitude of the effect will be. It is also unclear how much of the reduced hours per week will be taken away from patient care versus educational activities. It is also possible that reduced work hours during training and increased flexibility in scheduling will contribute to such changes as increased job sharing and reduced patient care hours in physicians' practice patterns after training.

NON-PHYSICIAN CLINICIANS (NPCs)

Over the past 30 years, NPCs have become increasingly prominent in the health care field. This group, which includes nurse practitioners (NPs), advance practice nurses, physician assistants (PAs), chiropractors, acupuncturists, naturopaths, optometrists, podiatrists, and others, doubled in size between 1992 and 1997. The supply of NPs, PAs, and midwives tripled between 1990 and 2000 and is likely to nearly double between 2000 and 2020. In addition to their expanding number, the scope of practice and ability of NPCs to receive insurance reimbursement have been increasing slowly but steadily over the years (Wing et al 2003).

Although there has been some tension between physicians and NPCs, for the most part, these clinicians have been accepted by both the physician community and patients. It has also been suggested that as the number of NPCs grow, they will be more able to alter their practice environments (e.g., gain increased independence from physicians) and to compete with physicians (Cooper 1998). In the final analysis, the net effect of the presence of NPCs is the same: the supply of practitioners available to provide services to patients will be increased.

Given their growing numbers and their scope of practice, NPs and PAs are of particular importance in calculating the supply and demand for physicians. Since all PAs work under the supervision of physicians and almost all NPs work in collaboration with physicians, it is clear that the supply of physicians is increased by the growing number of NPs and PAs (e.g., the existing supply of physicians is able to serve additional patients because of the presence of NPs and PAs). However, data are not currently available on the magnitude of the enhancement of physician supply afforded by NPs and PAs, that is, how many additional patients a physician can see if an NP or PA is added to a practice. It is also likely that some additional visits to a practice with an NP or PA may reflect an enhancement of services as well as an increase in productivity.

In the models presented above, NPs and PAs and other NPCs are accounted for at historical levels of practice. Further, all models assume a fixed ratio of these practitioners-to-physician in the future. However, the supplies of NPs and PAs are growing more rapidly than the supply of physicians; thus, the ratio is actually increasing. As a result, it is likely, all else being equal, that the number of services provided in the future will be greater in the future because of the relative increase in NPs and PAs.

The number of practicing PAs, NPs, and Certified Nurse Midwives (CNMs) per 100 patient care physicians was approximately 16 in 2000, about 1 for every 6 physicians. If the number of NPs, PAs, and CNMs rises between 2000 and 2020 at the current rate of growth, then about 150,000 new PAs, NPs, and CNMs would be available to provide services to the Nation. This magnitude of increase on the supply of PAs, NPs, and CNMs would increase the ratio of these practitioners to physicians. The ramifications of an increase in this ratio for the supply of physicians in the U.S. and the provision of services are excellent topics for future research.

BOUTIQUE MEDICINE

A recent development has been the establishment of physician practices confined to a few hundred patients. To join a practice of this type, often referred to as "boutique medicine," patients usually have to pay a substantial annual fee. Reports on these practices indicate that physicians find them rewarding because they can focus on and provide individualized service to patients enrolled in their practice. The attraction to patients who enroll is that they receive individualized attention by a physician who knows them well and is very available. Given the cost to the patient, it is unlikely that this type of practice will become a very common model; however, there may be some interesting implications for the physician workforce.

Given the very limited number of patients per physician, a relatively small percent of the population could occupy a far greater share of the generalist physician workforce. It is also not clear what the impact would be on the use of such physicians in non-generalist specialties. Conceptually, the availability of a personal physician may lead to an increased role

for the physician and could reduce demand for specialists. In some ways, boutique medicine may be a new approach to personalized care provided by the general physician of the past.

Further research on boutique medicine, including research on patient and physician satisfaction and the use of services, appears warranted.

Conclusions: Physician Supply, Demand, and Need in the U.S., 2000-2020

Many of the models and scenarios developed for this report have been described previously. The goal of this section is to describe a predicted range for the levels of physician supply, demand, and need. (Figure 9 shows these levels.) Thus far, no one scenario has provided predictions that could be considered absolutely correct. However, the sensitivity analyses clarified the importance of the particular assumptions made in each scenario.

SUPPLY

The baseline supply model predicted that by 2020 about 972,000 FTE physicians would be in the physician supply. The alternative scenarios showed how this baseline prediction could be lowered or increased based on the lifestyle differences among newer physicians and likely developments to enhance the productivity level of physicians. Although lifestyle concerns will eventually affect all physicians, during the period of investigation (2000 to 2020) only a portion of the physician supply will be affected. On the other hand, it is unclear how or when the potential productivity enhancements will begin to affect the physician supply. It is certain that these enhancements will occur, through technology developments or through help from NPCs. Given that reasoning, it is predicted that in 2020 the supply of physicians will be in the range of 972,000 and 1,077,000 FTE physicians.

DEMAND

The baseline demand model predicted that by 2020 demand for physicians in the U.S. would be about 988,000 FTE physicians. The alternative scenarios showed this baseline prediction could be lowered or increased based on assumptions about the effects of economic expansion, the changes in age-specific physician utilization rates, and the elimination of unnecessary services through rigorous utilization review. As proponents of the perspective admit, no safe ways currently exist to identify and eliminate unnecessary services. As a result, it is unlikely that demand for physicians will experience declines of the magnitude predicted by the models assuming that unnecessary services are eliminated.

On the other hand, the U.S. economy is likely to continue to expand at a higher rate than has been assumed in most models presented in this report. However, it has not been decided whether there is, in fact, a causal relationship between economic growth and demand

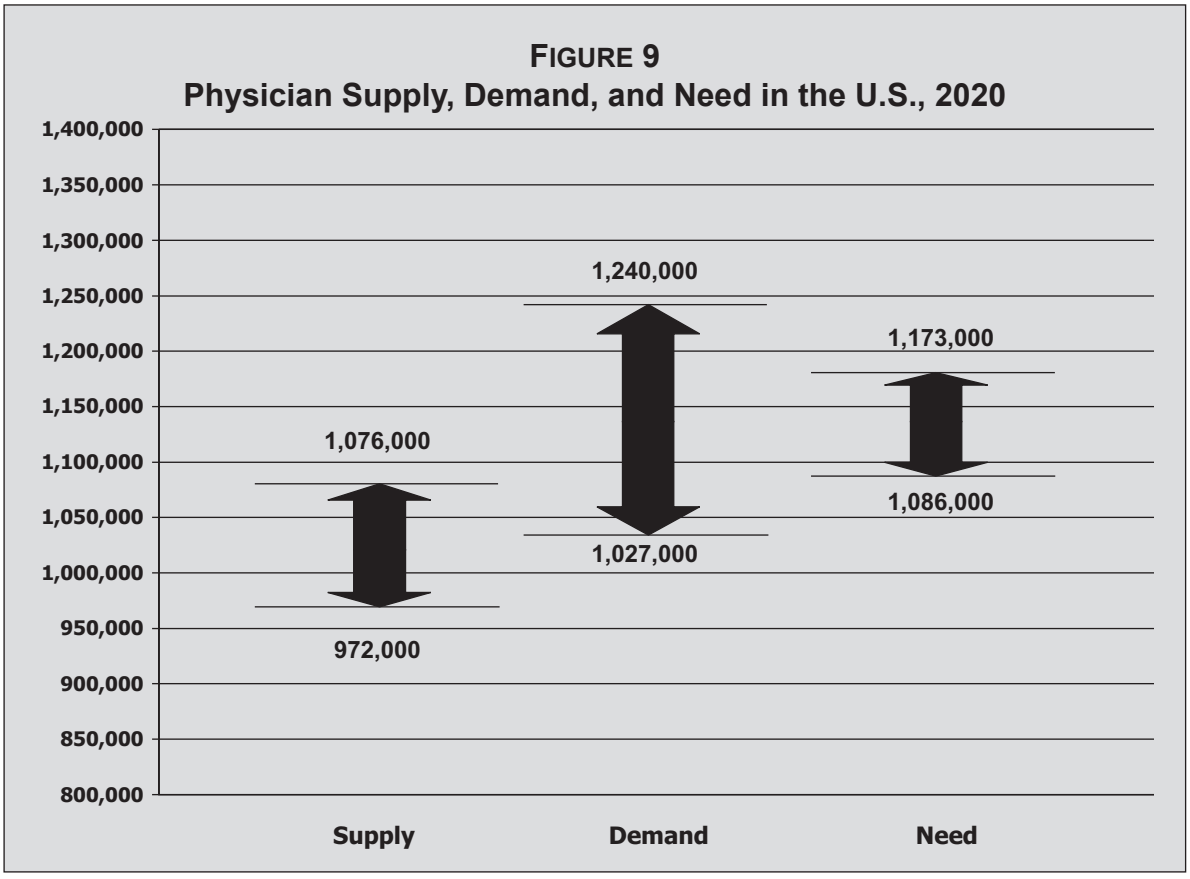


FIGURE 9
Physician Supply, Demand, and Need in the U.S., 2020

for physicians; the correlation between the two may be spurious. Certainly, more investigation is warranted.

Finally, age-specific physician utilization rates are increasing among the population above 45 years of age (and declining for those under age 45) at the same time that the population above age 45 is growing. Certain groups are growing at higher rates (e.g., the 65 years of age and older group). Although many have commented on the effect of the aging of the U.S. population, the changes in physician utilization rates have gone unnoticed. The added effects of these changing rates have been shown in several alternative scenarios in this report. Further changes in these rates should be monitored, but historical trends suggest that the changes modeled in the alternative scenarios presented in this report are reasonable. Thus, it is predicted that the demand for physicians in 2020 will require the equivalent of between 1,027,000 and 1,240,000 FTE physicians.

NEED

As difficult as need is to define, need has been conceptualized as equivalent to what physician utilization would be if the entire population of the U.S. were insured and utilized services in a manner similar to the historically insured population. Employing this conceptualization, the forecasting models predict that the need for physicians in the U.S. in 2020 will be about 1,075,000 FTE physicians. Under some alternative assumptions, the need for physicians was shown to be higher (if age-specific utilization rates are taken into account) or lower (if utilization review rigorously identified and eliminated unnecessary services). Even though a low probability of utilization review exists as it is currently performed to identify and eliminate unnecessary services completely, estimates of need should take into account that those services are, indeed, unneeded. Thus, it is predicted that physician need will be in the range of 1,086,000 and 1,173,000 FTE physicians.

SUMMARY

In sum, when the midpoint of the predicted range of supply and demand is used, the Nation is likely to face a shortage of about 85,000 FTE physicians in 2020. When the midpoint of the predicted range of supply and need is used, the Nation is also likely to face a shortage of about 96,000 physicians in 2020.

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