

Forecasting Allergy and Immunology Physician Supply and Demand through 2024

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Preface

The prevalence of asthma and allergy-related disorders in American continues to increase. Allergies affect as many as 40 to 50 million people in the United States, more than 20 percent of the nation's population (AAAAI, 1998; 2001). It has been estimated that absenteeism and reduced productivity due to allergies cost businesses in the United States more than \$250 million per year (Hewitt Associates, LLC, 1998).

Despite the breadth of asthma and allergy-related disorders, a relatively small population of physicians specializes in the medical discipline of Allergy and Immunology (A/I). In 1998, the American Academy of Allergy, Asthma and Immunology (AAAAI) commissioned an investigation of the workforce issues surrounding the specialty. The investigation was a response to several disturbing trends anecdotally noted by stakeholders in the A/I community. The most notable trend was that while the total number of physicians in the U.S. had increased steadily for more than 40 years, between 1990 and 1998, the number of physicians training in A/I fellowship programs had declined from 322 to 214, a decrease of 34 percent. This decline in production came at a time when asthma and allergy-related disorders were on the rise and public concern and initiatives to prevent and treat asthma and allergic conditions were growing.

Concerns about substitution by physicians in other specialties, such as Otolaryngology, Pulmonology, and Dermatology, as well as the primary care providers (Pediatricians, Family Practitioners, and Internists) due to increased managed care penetration throughout the country reinforced the need to examine the A/I physician workforce systematically and comprehensively, focusing on trends in fellowship training, A/I physician practice, and plans to leave practice.

The Center for Health Workforce Studies conducted the investigation of the production, supply, demand, and distribution of the A/I physician workforce. Through a series of reports, culminating in the summary report, *The Allergy and Immunology Physician Workforce 2000* (Forte et al., 2000), the Center described the current state of the specialty, made projections of the supply of A/I physicians and demand for A/I services in the future, and developed a number of recommendations to respond to the projected shortfall of A/I physicians in the future.

Having updated much of the data collected for the comprehensive assessment of the A/I physician workforce, the current report describes the findings from an update of the supply and demand forecasts made in the 2000 report. The comprehensive report in 2000 suggested that A/I was going to face the difficulties of dwindling supply and growing demand for A/I services.

This report was prepared by the Center for Health Workforce Studies at the University of Albany, State University of New York. The Center is dedicated to the collection, analysis, and distribution of health workforce data to assist health, professional, and educational organizations; policy makers; and the public understand issues related to the supply, demand, distribution, and use of health workers. This report was prepared by Gaetano J. Forte, Director of Information Management at the Center. The views expressed in this report are those of the Center for Health Workforce Studies and do not necessarily represent positions or policies of the University at Albany, State University of New York, or the American Academy of Asthma, Allergy and Immunology.

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Table of Contents

| | |
|--|----|
| Summary | 1 |
| Introduction: Physician Supply, Demand, and Workforce Policy since 1960 | 1 |
| <i>Physician Supply Growth: 1960 to 1980</i> | 1 |
| <i>Physician Workforce Policy: 1986 to the Present</i> | 2 |
| <i>Ramifications of the 1990s Physician Workforce Policies on Allergy and Immunology</i> | 4 |
| Forecasting A/I Physician Supply and Demand | 7 |
| Supply and Demand for A/I Physicians | 8 |
| <i>Supply Model Components</i> | 8 |
| <i>Demand Model Components</i> | 9 |
| <i>Forecast Assumptions</i> | 10 |
| <i>Supply and Demand Scenarios</i> | 12 |
| Assessing the Relationship between Supply and Demand | 14 |
| Forecasts | 15 |
| Conclusions | 21 |
| References | 22 |

Summary

Using data on the historical trends in the production of new A/I physicians, as well as data on separation rates derived from the *Survey of Physicians Providing Allergy and Immunology Services in the United States in 2004*, the Center has updated the age-cohort model it developed in 1999 to forecast the supply of A/I physicians through 2024. Making several assumptions about the incidence and prevalence of A/I-related conditions informed by extant population data and observations from the current supply of A/I physicians, the Center has also developed forecasts of demand for A/I physicians through 2024. This report briefly summarizes the results of these forecasting efforts, as well as a variety of the forecasting scenarios describing the potential relationship between A/I physician supply and demand over the next 20 years.

The Center's forecasting models show that the supply of A/I physicians is likely to fall below demand levels in the future. While the updated forecasts indicate a brighter future than the 1999 forecasts, in the sense that the updated predicted shortages are smaller, it is still the case that the A/I physician supply is predicted to fall short of the level of the demand in the future. The factors driving the change in the forecasts were: 1) an increase in the number of fellows in training; 2) a decline in the number of international medical graduates (IMGs) among A/I fellows, generally, and specifically, a decline in the number of temporary visa-holding IMGs in training; 3) an increase in the number of hours spent in patient care per week by current A/I physicians; and 4) a slight reduction in the rate of anticipated separation from the A/I workforce. These changes were detailed in *Physicians Providing Allergy and Immunology Services 2004* (Forte, 2005).

Introduction: Physician Supply, Demand, and Workforce Policy since 1960

Physician Supply Growth: 1960 to 1980

Between 1960 and 1980, the number of allopathic medical schools in the U.S. grew from 85 to 126, and the number of graduates more than doubled from 7,081 to 15,113 (AAMC, 2001). Moreover, the nation's physician supply grew rapidly, increasing from 235,303 active allopathic physicians in 1965 to 316,491 in 1975 (AMA, 1976). In 1976, in response to concerns about the rapidly growing supply of physicians, the Graduate Medical Education National Advisory Committee (GMENAC) was established to advise the nation on how many physicians were needed in the U.S., in total and by specialty (GMENAC, 1981). In 1980, GMENAC concluded that the nation faced a potentially serious surplus and recommended limiting the number of medical school positions and severely restricting the number of international medical school graduates (IMGs) entering the U.S. (GMENAC, 1981).

When GMENAC issued its report in 1980, there were 419,228 active physicians in the U.S. (Salsberg & Forte, 2002). The surplus GMENAC envisioned was based on an estimate that the number of physicians would grow to 535,750 by 1990 and 642,950 by 2000 unless steps were taken to reduce the growth in physicians (GMENAC, 1981).

Concerns about a potential surplus escalated with the publication of several papers in the early 1990s suggesting that the expansion of managed care and its emphasis on primary care would lead to an even greater surplus of physicians than predicted by GMENAC, especially medical and surgical specialists (Weiner, 1994, 1995; Gamliel et al., 1995; Wennberg, 1993). In fact,

Weiner estimated that under certain managed care expansion scenarios the U.S. required between 138 and 144 patient care physicians per 100,000 population, a level well below the 191 physicians per 100,000 population suggested by GMENAC (Salsberg & Forte, 2002). Since the nation already had 214 active physicians per 100,000 in 1990 and was experiencing a period of physician supply growth, the specter of a massive surplus of physicians by the turn of the century was raised. This concern was also echoed by the federal Council on Graduate Medical Education (COGME). In several reports between 1992 and 1998, the COGME reaffirmed its concern with a potential surplus of physicians (COGME, 1992; 1994; 1995a; 1995b; 1996; 1998).

In 2000, there were approximately 779,723 active physicians in the U.S., or 276 physicians per 100,000 population. However, if the GMENAC methodology for calculating physician supply is used, including a downward adjustment for physicians in training, the supply of physicians in 2000 would be 676,381, or 240 physicians per 100,000 population. Thus, as predicted by GMENAC, the physician supply in the U.S. grew very rapidly. Between 1980 and 2000, the physician supply in the U.S. increased by more than 320,000 physicians.

Physician Workforce Policy: 1986 to the Present

Although the federal government does not control the education, training, and supply of physicians in the U.S., a series of publicly supported reports and studies along with the work of the federal Council on Graduate Medical Education (COGME) have provided important guidance to the medical education and training community. COGME was authorized by Congress in 1986 to act as the federal physician workforce planning group (Grumbach, 2002a).

A central charge of COGME was to make policy recommendations with respect to the adequacy of the supply and distribution of physicians in the U.S. including current and future shortages or excesses of physicians in the medical and surgical specialties and subspecialties. After 1992, COGME held a set of physician workforce policy goals centered around its 110/50-50 recommendations, 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% to 110% of the number of graduates from allopathic and osteopathic medical schools in the U.S. in 1993 and increasing the percentage of those graduates who complete training and enter practice as generalists from the level then at 30% to at least 50%. Several years later, COGME's *Eighth Report: Patient Care Physician Supply and Requirements: Testing COGME Recommendations* (1996) provided projections of physician supply and requirements that supported the sagacity of the recommendations laid out in the *Third Report*.

In assessing the progress made towards the COGME 110/50-50 goals, COGME's *Fourteenth Report, COGME Physician Workforce Policies: Recent Developments and Remaining Challenges in Meeting National Goals* (1999), found that for 1997/98 academic year, the nation's first year residents numbered approximately 129% of the number of graduates of allopathic and osteopathic medical schools in the U.S., and that it would be necessary to reduce the number of first year residents by about 3,400 to reach the 110% goal. Moreover, the

Fourteenth Report found that while the number of generalists completing training each year had increased from earlier periods, the nation was still training too few generalists and too many specialists.

In contrast, several examinations of the balance of supply and demand for physicians suggested that the nation may be facing a shortage rather than a surplus of physicians in the coming years (Cooper, 2002; Cooper et al., 2002; Cooper et al., 2003; Bland and Isaacs, 2002; Forte et al., 2000). The work of Cooper, especially, started with the premise of a physician marketplace where consumers purchase services from physicians. The important drivers in such a system would be population growth and population wealth.

The arguments and justifications employed in the *Third Report*, however, were not based on market considerations. Instead, they were based on public health considerations including universal access to health care, cost efficiency, and the goals of cost-effective levels of physician supply and the appropriate mix of generalists to provide for the health needs of the U.S. The empirical evidence to support the recommended generalist/specialist mix (50-50) was drawn from international comparisons and from staffing patterns of closed managed care health care systems. As was revealed in the *Fourteenth Report* and other work, the models that informed the 110/50-50 recommendations were based on a health care delivery systems which had never been implemented as pervasively as predicted (Grumbach, 2002a), had changed sufficiently to render the recommendations obsolete, or had problems of their own (i.e., international supply/need imbalances).

Ultimately, in 2002 the COGME commissioned a report to take another look at physician workforce projections. In January 2005, the COGME released the findings of its re-examination of the previous physician workforce projections in its *Sixteenth Report: Physician Workforce Policy Guidelines for the United States, 2000 – 2020*. The report detailed forecasts of national physician supply and demand that indicated a substantial shortage of physicians by 2020. The magnitude of the shortage was estimated at 85,000 to 96,000 physicians, or between 7.5% and 8.5% of the likely number of physicians required to provide services for the nation's population in 2020.

The *Sixteenth Report* joined a growing number of voices that had arrived at the same troubling conclusion. In the late 1990s, prominent physician workforce researchers began to question the notion of a national physician surplus widely held earlier in the decade. With aging general and physician populations, a stagnant medical education and training effort, more than 4,000 designated primary care Health Professional Shortage Areas, a decline in the growth of managed care, a willingness of payers to continue supporting rising rates of physician utilization, and reports from a dozen medical specialties of current or impending physician shortages, it no longer made sense to think in terms of physician surpluses. The COGME's report attempted to bring all of these observations together.

While the recommendations by COGME in the early 1990s were codified in only one state,¹ they were part of efforts that were responsible for shifting the interest among medical students, especially those from U.S. medical schools (USMGs), away from specialty medicine toward primary care medicine (COGME, 1999; Oliver et al., 1997; Kimball, 1999). The increased funding of graduate medical education for primary care training was also a detriment to specialty training, especially after the Balanced Budget Act of 1997 that effectively capped federal funding for graduate medical training. Thus, for every new primary care training slot created, a specialty training slot had to be eliminated (COGME 1999). In particular, the production of new physicians in A/I, Anesthesiology, Critical Care Medicine, Endocrinology, Gastroenterology, and Rheumatology declined precipitously from the mid-1990s through the end of the century (Nolan et al., 2003). Moreover, it should come as no surprise that these specialties were also found to be in short supply several years later (Angus et al., 2000; Rizza et al., 2002; Sunshine, 2001; Sunshine et al., 2004; Forte et al., 2000; Schubert et al., 2001, 2003; Miller & Lanier, 2001; COGME, 2005).

Figure 1 – Physicians Completing Training in Selected Specialties, 1995-1999

| Specialty | 1995 | 1999 | % Change 1995-1999 |
|------------------------|-------|-------|--------------------|
| Allergy and Immunology | 145 | 84 | -42.1% |
| Anesthesiology | 1,761 | 891 | -49.4% |
| Critical Care Medicine | 104 | 67 | -35.6% |
| Endocrinology | 186 | 160 | -14.0% |
| Gastroenterology | 444 | 311 | -30.0% |
| Radiology | 1,664 | 1,426 | -14.3% |
| Rheumatology | 156 | 105 | -32.7% |

Source: Nolan et al., 2003.

The overall decline in A/I fellows in training was accompanied by a drop in the number of USMG fellows. The decline of USMGs training in the specialty had a number of important implications for the workforce. First, as the proportion of USMGs decreased, the proportion of international medical graduates (IMGs) increased. This was particularly problematic as it was found that as many as 25% of the IMG fellows had temporary visas, which when they expire require the physician to return to their native country for a specified period of time before being eligible to return, thus reducing the effective production of A/I physicians even more. It was estimated that the 84 fellows completing A/I training in 1999 translated into 54 new full-time equivalent (FTE) A/I physicians with much of the loss due to IMG graduates leaving the country.

For A/I, at least, the trend in production in the latter half of the 1990s quickly reversed course. Between 1999 and 2004, the number of fellows in training increased by 46 fellows (22%), from 209 in 1999 to 255. Further, the number of physicians completing training in A/I also increased by 44 fellows (52%), from 84 in 1999 to 128 in 2004.

¹ In the 1990s, California's state legislature entered into a temporary agreement with the University of California system to implement the COGMEs recommendations for graduate medical training sponsored by the university. The agreement expired in 2002 and was not renewed.

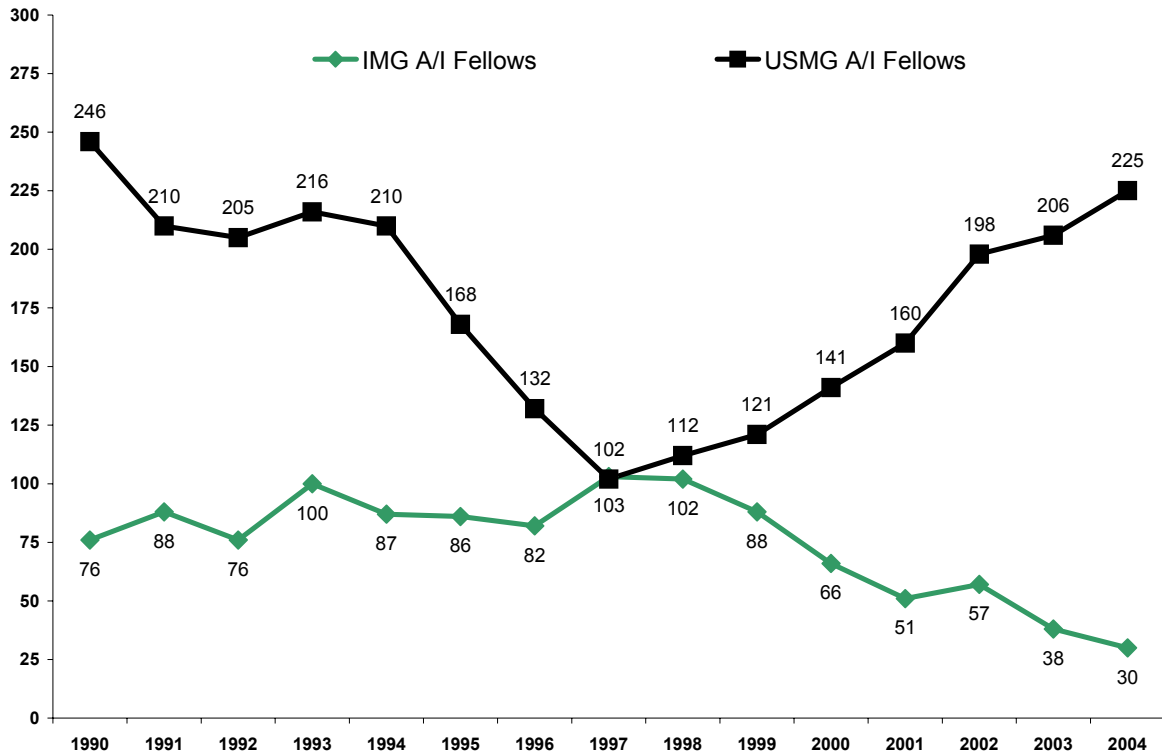
Figure 2 – Fellows Training in Allergy and Immunology, 1990-2004

| Year | Fellows in training | % Change from previous year |
|-------------------------|----------------------------|------------------------------------|
| 1990 | 322 | – |
| 1991 | 298 | -7.5% |
| 1992 | 281 | -5.7% |
| 1993 | 316 | 12.5% |
| 1994 | 297 | -6.0% |
| 1995 | 254 | -14.5% |
| 1996 | 214 | -15.7% |
| 1997 | 205 | -4.2% |
| 1998 | 214 | 4.4% |
| 1999 | 209 | -2.3% |
| 2000 | 207 | -1.0% |
| 2001 | 219 | 5.8% |
| 2002 | 255 | 16.4% |
| 2003 | 244 | -4.3% |
| 2004 | 255 | 4.5% |
| Change 1999-2004 | 46 | 22.0% |

Source: Journal of the American Medical Association Medical Education Theme Issues, 1991-2005.

At the same time, there were a number of indications that interest in A/I fellowship programs by USMGs was beginning to increase as well. Program directors continually reported that potential fellows (pediatric and internal medicine residents) held positive and improving views of A/I. Program directors also predicted that practice opportunities would be more numerous in the future. Few fellows completing training in A/I reported difficulties finding satisfactory practice positions (Forte & Salsberg, 2001; Forte et al., 2002; Beaulieu et al., 2003). Finally, the number of IMGs began to fall as a proportion of fellows in training.

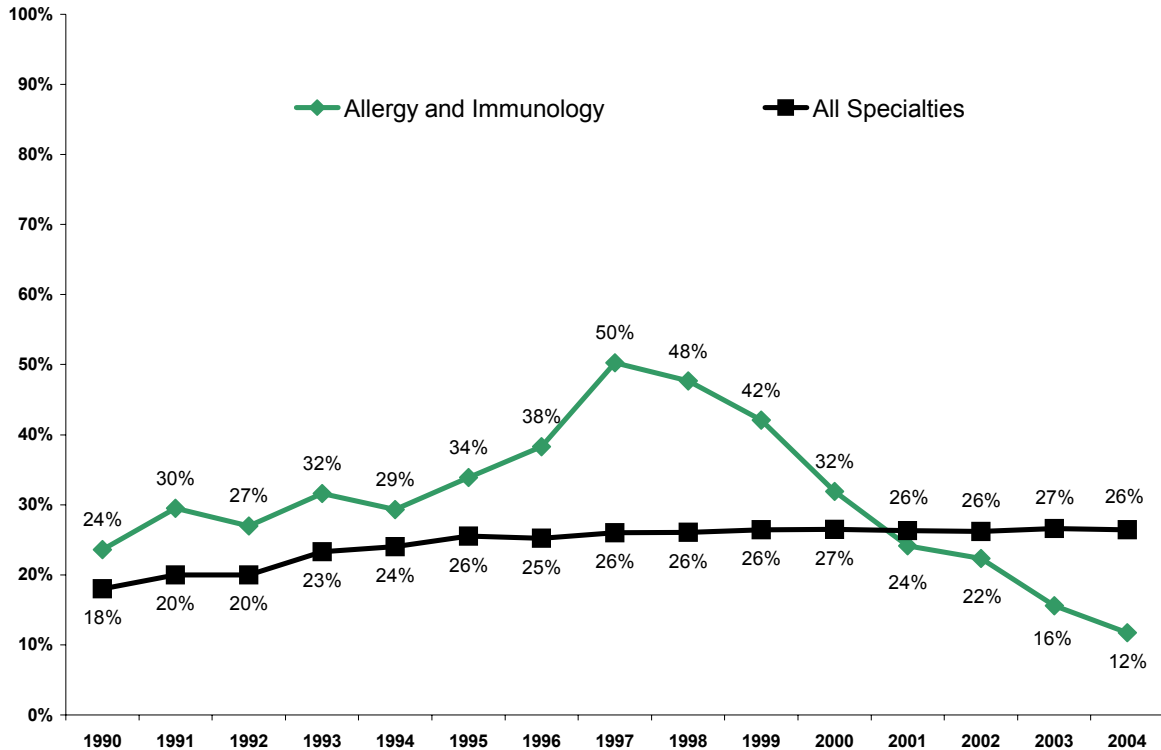
Figure 3 – Number of USMG and IMG Fellows Training in A/I, 1990-2004



Source: Graduate Medical Education Issues of JAMA, 1991-2005.

Two other trends are important to note while interpreting the decline of IMGs training in the specialty. First, considering all graduate medical education in the U.S., the percentage of all residents/fellows who are IMGs has remained at between 25% and 27% since 1995. Second, as mentioned above, the number of fellows in A/I training has increased substantially over the past several years. Thus, the observed decline in the percentage of fellows who are IMGs training in A/I is important as an indication of the renewed interest in the specialty by USMGs, as well as a boost to the effective production of A/I physicians who will practice in the U.S. Given the observations in 1999, the recent trends in A/I fellowship training seem to bode well for coping with the shortage of A/I physicians predicted previously (Forte et al., 2000).

Figure 4 – Percentage of Residents/Fellows who are IMGs in A/I and among All Specialties, 1990-2004



Source: Graduate Medical Education Issues of JAMA, 1991-2005.

Forecasting A/I Physician Supply and Demand

Understanding the current and future physician workforce from the perspectives of both supply and demand requires the analysis of a broad range of information. Many of the findings reported in *Physicians Providing Allergy and Immunology Services 2004* support the development of forecasts of the future supply and demand for A/I physicians in the future.

The main issues that must be addressed in any study of the current and future supply of A/I physicians are:

1. defining which physicians are considered A/I physicians;
2. defining and estimating a full-time-equivalent (FTE) A/I physician;
3. identifying and compiling the necessary data (i.e., age, separation rates, etc.) on A/I physicians; and
4. determining the number of A/I fellows in training that will go on to practice in the U.S.

In terms of demand, the key factors are:

1. demographic changes for both the age structure and the size of the population;
2. the use of nonphysician clinicians (e.g., nurse practitioners and physician assistants); and
3. technological/medical developments related to new treatments.

The issues around the A/I physician supply and demand were examined in *Physicians Providing Allergy and Immunology Services 2004*. The data and analyses in that report were used to update the supply and demand forecasting models developed in 1999 and reported on in *The Allergy and Immunology Physician Workforce 2000* (Forte et al., 2000). The updated model was then used to create several scenarios describing the relationship between the supply of A/I physicians and demand for their services in the future.

Supply and Demand for A/I Physicians

The components of the models developed to forecast the supply of A/I physicians and demand for their services are described below:

Supply Model Components

The supply model developed is of the age-cohort-flow model family. The model has the following basic structure:

$$Supply_t = Supply_{t-1} + New\ A/I\ Physicians\ Entering\ Practice_{t-1} - Separations\ from\ Practice_{t-1},$$

where t is the year for which the forecast is being made.

Supply: Supply is the number of physicians who are providing A/I patient care services in any particular year. Supply in the baseline year, 2004, was estimated based on the data collected in the *Survey of Physicians Providing Allergy and Immunology Services in the United States in 2004*. In the model, supply is further distinguished by two variables: 5-year age cohort and formally trained/non-formally trained classification.

New A/I Physicians: The number of new A/I physicians added to the supply for each year was estimated based on published data in the September 7, 2005 issue of the *Journal of the American Medical Association*.² These data were informed by the reported practice plans of physicians completing training in A/I derived from the *Fellows Completing Allergy and Immunology Training Programs Surveys* conducted between 1999 and 2003. The survey data provided estimates of the proportion of program completers who intended to enter patient care practice and the number of hours they intended to spend in patient care practice per week (allowing for the calculation of FTEs). An additional 25 FTE A/I physicians were added annually to represent physicians who provided A/I patient care services, but had not completed an A/I fellowship training program.³

It is important to note that since the 1999 forecasts, drastic changes have occurred in the production of formally-trained A/I physicians. First, the sheer magnitude of training has

² Specifically, data on the number of fellows who completed A/I training programs in 2004 were obtained from Appendix II, Table 9. *Resident Physicians Who Completed a Graduate Medical Education Program or Preliminary Year During 2003-2004*.

³ In the previous forecasts of A/I physician supply, this additional group of physicians was estimated to be 35 FTEs annually. The decrease to 25 in the current forecasts is intended to represent the observed, continuing trend of decreasing proportions of non-formally-trained physicians among the younger cohorts of A/I physicians.

increased dramatically from 84 A/I fellowship graduates in 1999 to 128 in 2005. Second, the composition of fellows-in-training has also changed. In 1999, 42% of the fellows-in-training were IMGs, while in 2004, only 12% were. The combination of these changes (magnitude and composition) had a direct effect on the A/I physician supply forecasts developed for this project. Instead of 52 FTE formally-trained A/I physicians being added to the existing supply each year, it is estimated that about 107 FTE formally-trained A/I physicians are now being added to the supply each year, an increase of more than 100%.

Separations: Separations from A/I patient care practice were made up of two components: cohort-specific 5-year mortality rates and cohort-specific A/I physician 5-year retirement rates. The mortality rates were based on National Vital Statistics System data (Hoyert et al., 2006). Cohort-specific A/I physician retirement rates were based upon the data collected in the 2004 survey. Separate rates of separation were developed for A/I fellowship-trained A/I physicians and those who had not completed A/I fellowship training.

The baseline year for the supply model was 2004, the most recent year for which reliable supply estimates were available. The supply model output was expressed in terms of patient care FTE A/I physicians per 100,000 population.⁴

Demand Model Components

The demand model employed had the following basic structure:

$$Demand_t = Demand_{t-1} +/- Adjustment\ to\ Demand_{t-1},$$

where t is the year for which the forecast is being made.

Demand: The level of demand for A/I physicians was based on the assumption that, in general, A/I physician supply and demand were roughly in balance in 2004. This assumption was based upon the findings from the *Survey of Physicians Providing Allergy and Immunology Services in the United States in 2004* as detailed in the report based upon it. Specifically, A/I physicians reported working longer hours in patient care and seeing more patients in 2004 than in 1999. Further, a greater percentage of A/I physicians reported increasing practice incomes in 2004 than in 1999. Moreover, A/I physicians reported greater increases in the numbers of cases of the following conditions over the two years prior to the survey in 2004 than in 1999: food allergies, adverse drug reactions, atopic dermatitis, and insect bite/sting reactions. Finally, no evidence was found that pointed to a decrease in the incidence or prevalence of the conditions most closely associated with the specialty (e.g., asthma, sinusitis, rhinitis, etc.) while the population continued to grow. These pieces of information point to a relationship between supply and demand that is more closely balanced than it had been in 1999, when there was a slight surplus of A/I physicians. Thus, the level of demand in 2004 was set equal to the A/I physician supply level.

⁴ Population estimates used in these forecasts were obtained from the United State Bureau of the Census: *File 1. Interim State Projections of Population by Sex: July 1, 2004 to 2030*. Retrieved on April 20, 2006, from <http://www.census.gov/population/projections/DownldFile1.xls>.

Adjustments to Demand: Both upward and downward adjustments were made to demand to form bands of estimated future demand. Ten-year demand adjustments of 5% and 10% were used to generate the demand bands.

The baseline year for the demand forecasts was 2004. The forecast demand was expressed in terms of patient care FTE A/I physicians per 100,000 population.

Forecast Assumptions

The forecasts of A/I physician supply and demand developed here are only valid under a specified set of assumptions. A discussion of the assumptions puts the forecasts in context of the larger policy discussion of physician supply and demand currently happening at the national level.

Young physicians: As documented in the report of the findings from the 2004 survey, younger A/I physicians were found to practice differently than their more mature counterparts. This group of A/I physicians reported seeing fewer patient per hour – i.e., reported being less productive. Further, previous data collected from fellows completing A/I training programs suggested that these new physicians were planning to work fewer hours per week than their older peers (Forte & Salsberg, 2001; Forte et al., 2002; Beaulieu et al., 2003). To a certain extent, the supply model did incorporate these observations in the calculation of FTE A/I physicians being added to the supply each year.

These observations are not limited to A/I physicians. A growing body of evidence suggests a more systematic bias toward fewer practice hours and a more balanced lifestyle among the younger cohort of physicians (Bland & Isaacs, 2002; Gelfand et al., 2002; Dorsey et al., 2003). In the past, this phenomenon was thought to be limited to female physicians, and thus there have been concerns raised about the growing number of women practicing medicine and the potential ramifications for the physician supply. However, given the observations among both young male and female physicians, the phenomenon has been re-classified as an emerging age cohort issue rather than a gender issue.

Productivity: Clearly, productivity has a major impact on the A/I physicians needed to adequately serve the nation's population. For example, a 10% increase in the productivity of existing A/I physicians would be the equivalent of a 10% increase in the number of A/I physicians practicing in the U.S. The difficulty for forecasting is that it is unclear what changes are likely to occur with regard to productivity. It is not even clear whether productivity will increase or decrease as there is evidence suggesting both (e.g., increasing case complexity might force productivity down, the increased use of non-physician clinicians [nurse practitioners and physician assistants] in group practice settings might drive productivity higher). Because of the uncertainty, the forecasts of A/I physician supply and demand did not directly incorporate changes in productivity.

Retirement/Separation patterns: The forecasts assumed that the retirement plans reported by A/I physicians in their responses to the 2004 survey reflected their most likely future retirement activities. A number of developments could hasten or delay their plans, especially beyond the short term. Without other sources of data, however, the alternatives were limited. The supply model also assumed that other separation rates (e.g., death) would remain constant over the time period of interest.

Non-formally trained A/I physicians: The baseline supply model assumed that 25 non-formally trained A/I physicians would be added to the supply of A/I physicians each year. This level was a reduction from the earlier forecasting work reflecting the continued increase in the proportion of formally-trained A/I physicians among the younger A/I physicians. While there was not enough information to make a definitive prediction about how this level might change in the future, some of the scenarios developed in the current forecasting effort explicitly incorporated an assumption about the eventual desistance of this source of new A/I physicians.

Economic outlook: While it is known that the demand for physician services is positively associated with the health of the economy (Cooper 2002, Cooper et al., 2002; Cooper et al., 2003), it was not possible to forecast with any certainty how the U.S. economy would behave over the next 20 years. Should the economy grow at a high rate, demand for physician services (including A/I physician services) is bound to rise rapidly, all else being equal; should the economy decline, growth in demand is likely to grow more moderately. However, these statements implicitly view the economy with a relatively short-term outlook; the long-term trend in the U.S. economy is moderate growth. The demand forecasts implicitly assumed this long-term trend would continue going forward.

Medical interventions and technologies: The development of new medical interventions and technologies has the potential to greatly affect demand for physician services. On the one hand, new interventions could reduce demand for A/I physician services through the expansion of over-the-counter alternatives to current prescription treatments or by making it somewhat easier for health care providers other than A/I physicians to successfully treat patients who currently rely on A/I physicians for their care. On the other hand, the expansion of treatment options could also complicate the selection of the appropriate alternative, and thus increase the demand for clinicians with the breadth and depth of knowledge to make the appropriate selection. Both 1999 and 2004 survey responses from A/I physicians provided evidence for the latter effect of new medical interventions and technologies on case complexity and future demand for services. However, the challenge these new developments pose for demand forecasting also encompasses the uncertainty and unevenness of the developments. It is not possible to predict when a new treatment drug intervention will be created or when clinical research will suggest a new mode of treating a particular A/I condition. As such, the demand forecasts did not incorporate adjustments for new medical interventions and technologies.

Geographic variation: The forecasts reported here targeted the A/I physician supply and demand at the national level. That is, they did not take into account geographic variation in supply or demand in different parts of the country nor attempt to forecast supply and demand at a sub-national level. Any assessment of supply and demand at the national level could (and assuredly does) mask significant variations across regions and individual communities. For example, it is entirely possible that the aggregate national supply of physicians be adequate to meet the aggregate demand for their services, even as specific regions and communities experience significant physician supply inadequacies. Sub-national forecasts were beyond the scope of the current forecasting effort, and thus geographic variation in supply and demand was not incorporated in the forecasts.

Government policy: While there is little national physician workforce policy, it does affect the supply of physicians, especially with regard to the production of new physicians. Following the tragic events of September 11, 2001, policy discussions around the issue of physicians trained in other countries coming to the U.S. for graduate medical training and practice became more serious and efforts to limit the number of these physicians gained momentum. A/I physician training exemplifies the outcome of this trend (and other trends not necessarily tied to government policy) with the rapid decline of international medical graduates among A/I fellows in training across the country in the past several years. In terms of the current forecasts, this decline resulted in an increased level of production of new A/I physicians as the number of formally-trained A/I physicians leaving the country directly after (or soon after) completion of training effectively dropped to nil.

Still, current national policy expresses a general concern with a surplus of physicians, even in light of a growing consensus that there is a shortage of physicians in particular specialties and the potential for an enormous physician shortage within the next 20 years (COGME, 2005). Calls for an increase in the number of undergraduate medical education opportunities as well as a lifting of the limits on graduate medical education funding have been made (COGME, 2005; AAMC, 2005). To the extent that these calls are acted upon in the future, the level of production of new A/I physicians could increase at rates higher than the current forecasts predict. This potential effect of government policy on the production of A/I physicians was not incorporated in the supply model as there was not enough information to predict the likelihood of its occurrence nor the magnitude of its effect.

Supply and Demand Scenarios

To reflect the potential variation in the A/I physician supply and demand, four supply scenarios and five demand scenarios have been developed. Each of the scenarios is described below.

Supply Scenarios: Four supply scenarios were developed to represent differing levels of production of new A/I physicians and the relative contribution of fellowship training programs compared to other sources of new A/I physicians. These two production factors (magnitude and source) were combined to generate four potential future supply forecasts.

Supply Scenario 1 – Baseline Production: This scenario represented an extrapolation of current production levels into the future: 1) the number of physicians who completed A/I training in the U.S. each year remained constant at 128 between 2004 and 2024; 2) those graduates represented a total of 107 full-time equivalent (FTE) A/I physicians added to the supply each year; 3) an additional 25 FTE A/I physicians who had not completed a formal A/I fellowship program were also added to the supply annually; and 4) the relative proportions of U.S. medical graduates (USMGs) and international medical graduates (IMGs) in A/I fellowship training programs remained constant at 12% between 2004 and 2024.

Supply Scenario 2 – Limited Entrance: This scenario had the following characteristics: 1) the number of physicians who completed A/I training in the U.S. each year remained constant at 128 between 2004 and 2024; 2) those graduates represented a total of 107 full-time equivalent (FTE) A/I physicians added to the supply each year; 3) no new physicians entered the A/I physicians supply who had not completed a formal A/I fellowship program after 2006; and 4) the relative proportions of U.S. medical graduates (USMGs) and international medical graduates (IMGs) in A/I fellowship training programs remained constant at 12% between 2004 and 2024.

Supply Scenario 3 – Increased Production: This scenario had the following characteristics: 1) the number of physicians who completed A/I training in the U.S. each year would increase by 10% starting in 2007; 2) there would be 141 new A/I physicians added to the supply each year, yielding 117.7 new A/I physician FTEs per year from 2007 through 2024; 3) an additional 25 FTE A/I physicians who had not completed a formal A/I fellowship program were also added to the supply annually; and 4) the relative proportions of U.S. medical graduates (USMGs) and international medical graduates (IMGs) in A/I fellowship training programs remained constant at 12% between 2004 and 2024.

Supply Scenario 4 – Limited Entrance and Increased Production: This scenario had the following characteristics: 1) the number of physicians who completed A/I training in the U.S. each year would increase by 10% starting in 2007; 2) there would be 141 new A/I physicians added to the supply each year, yielding 117.7 new A/I physician FTEs per year from 2007 through 2024; 3) no new physicians entered the A/I physicians supply who had not completed a formal A/I fellowship program after 2006; and 4) the relative proportions of U.S. medical graduates (USMGs) and international medical graduates (IMGs) in A/I fellowship training programs remained constant at 12% between 2004 and 2024.

Figure 5 – Supply Scenarios and Assumptions

| Model ID | Scenario Description | Assumptions |
|-----------------|--|--|
| S1 | Baseline Production | 1) 128 physicians completed A/I fellowship programs annually 2) those completers represented a total of 107 FTE patient care A/I physicians 3) Additional 25 FTE patient care A/I physicians added to the supply annually who were not formally trained in A/I 4) Percentage of USMGs and IMGs in A/I fellowship training: 88% USMG, 12% IMG |
| S2 | Limited Entrance | 1) 128 physicians completed A/I fellowship programs annually 2) those completers represented a total of 107 FTE patient care A/I physicians 3) No additional A/I physicians added to the supply annually who were not formally trained in A/I after 2006 4) Percentage of USMGs and IMGs in A/I fellowship training: 88% USMG, 12% IMG |
| S3 | Increased Production | 1) 141 physicians completed A/I fellowship programs annually after 2006 2) those completers represented a total of 117.7 FTE patient care A/I physicians 3) Additional 25 FTE patient care A/I physicians added to the supply annually who were not formally trained in A/I 4) Percentage of USMGs and IMGs in A/I fellowship training: 88% USMG, 12% IMG |
| S4 | Limited Entrance / Increased Production | 1) 141 physicians completed A/I fellowship programs annually after 2006 2) those completers represented a total of 117.7 FTE patient care A/I physicians 3) No additional A/I physicians added to the supply annually who were not formally trained in A/I after 2006 4) Percentage of USMGs and IMGs in A/I fellowship training: 88% USMG, 12% IMG |

Demand Scenarios: Five demand scenarios were developed by adjusting the rate of change in demand over time. The five scenarios represent potential changes in demand *every 10 years* between 2004 and 2024.

Figure 6 – Demand Scenarios and Assumptions

| Model ID | Scenario Description | Assumptions |
|-----------------|------------------------------|---|
| D1 | Large Demand Increase | 10% increase in demand for A/I physician services every 10 years |
| D2 | Small Demand Increase | 5% increase in demand for A/I physician services every 10 years |
| D3 | No Demand Change | No change in demand for A/I physician services during forecast period |
| D4 | Small Demand Decline | 5% decline in demand for A/I physician services every 10 years |
| D5 | Large Demand Decline | 10% decline in demand for A/I physician services every 10 years |

Assessing the Relationship between Supply and Demand

In order to assess the potential relationship between A/I physician supply and demand, the five demand scenarios were combined with the four supply scenarios and presented across four time points (2009, 2014, 2019, and 2024) to create a series of 20-cell matrices of unique supply-demand scenarios. At each time point, a simple calculation ($[\text{forecast supply} - \text{forecast demand}] / \text{forecast demand} * 100$) was made to describe the extent to which the forecast A/I physician supply was adequate to meet forecast demand. This calculation expressed the percentage of forecast demand that could be met by the forecast supply. Using this method, negative percentages indicated a forecast supply that could not meet the forecast demand for A/I

physicians; positive percentages indicated a forecast supply that could meet the forecast demand for A/I physicians with room to spare; and a zero percentage indicated a perfect balance of forecast supply and forecast demand for A/I physicians.

Forecasts

Figure 7 – A/I Physician Supply Forecasts, 2004-2024

| Scenario | 2004 | 2009 | 2014 | 2019 | 2024 | % Change 2004-2024 |
|----------|--------------|--------------|--------------|--------------|--------------|--------------------|
| S1 | 3,698 (1.26) | 3,844 (1.26) | 3,900 (1.22) | 3,896 (1.17) | 3,878 (1.12) | 4.9% (-11.4%) |
| S2 | 3,698 (1.26) | 3,770 (1.23) | 3,716 (1.16) | 3,629 (1.09) | 3,553 (1.02) | -3.9% (-18.9%) |
| S3 | 3,698 (1.26) | 3,877 (1.27) | 3,987 (1.25) | 4,034 (1.21) | 4,065 (1.17) | 9.9% (-7.1%) |
| S4 | 3,698 (1.26) | 3,803 (1.24) | 3,803 (1.19) | 3,767 (1.13) | 3,741 (1.08) | 1.2% (-14.6%) |

Note: Numbers in chart represent forecast FTE A/I physicians; numbers in parentheses represent forecast FTE A/I physician to 100,000 population ratios.

Figure 8 – A/I Physician Demand Forecasts, 2004-2024

| Scenario | 2004 | 2009 | 2014 | 2019 | 2024 | % Change 2004-2024 |
|----------|--------------|--------------|--------------|--------------|--------------|--------------------|
| D1 | 3,698 (1.26) | 4,047 (1.32) | 4,431 (1.39) | 4,842 (1.45) | 5,285 (1.52) | 42.9% (21.0%) |
| D2 | 3,698 (1.26) | 3,954 (1.29) | 4,229 (1.32) | 4,516 (1.36) | 4,816 (1.39) | 30.2% (10.2%) |
| D3 | 3,698 (1.26) | 3,859 (1.26) | 4,028 (1.26) | 4,197 (1.26) | 4,368 (1.26) | 18.1% (0.0%) |
| D4 | 3,698 (1.26) | 3,761 (1.23) | 3,826 (1.20) | 3,886 (1.17) | 3,942 (1.14) | 6.6% (-9.8%) |
| D5 | 3,698 (1.26) | 3,661 (1.20) | 3,625 (1.13) | 3,584 (1.08) | 3,538 (1.02) | -4.3% (-19.0%) |

Note: Numbers in chart represent forecast demand for A/I physicians in terms of FTE A/I physicians; numbers in parentheses represent forecast demand for A/I physicians in terms of FTE A/I physician to 100,000 population ratios.

Supply Scenario 1 – Baseline Production: This scenario represented an extrapolation of current production levels into the future: 1) the number of physicians who completed A/I training in the U.S. each year remained constant at 128 between 2004 and 2024; 2) those graduates represented a total of 107 full-time equivalent (FTE) A/I physicians added to the supply each year; 3) an additional 25 FTE A/I physicians who had not completed a formal A/I fellowship program were also added to the supply annually; and 4) the relative proportions of U.S. medical graduates (USMGs) and international medical graduates (IMGs) in A/I fellowship training programs remained constant at 12% between 2004 and 2024.

In this scenario, the supply of A/I physicians was forecast to increase from 3,698 FTE physicians in 2004 to 3,878 FTE physicians in 2024, a 4.9% increase. Taking into account the forecast population growth in the U.S., this increase became a decline, with the FTE A/I physician to 100,000 population ratio decreasing from 1.26 per 100,000 population in 2004 to 1.12 per 100,000 population in 2024, an 11.7% reduction.

The balance between A/I physician supply and demand was forecast to worsen between 2004 and 2024 under the baseline production scenario. Figure 9 presents the percentage shortage or surplus forecast under the five demand scenarios for the baseline production scenario. The current level of production provides enough new A/I physicians to keep up with population growth over the next 5 years (i.e., demand for A/I physicians remains at 2004 levels), but should

demand grow 5% every 10 years, by 2014, there would be close to an 8% shortage, and by 2024, a 20% shortage. The shortages would grow more quickly if demand were to grow by 10% every 10 years, with a 12% shortage in 2014 and a 27% shortage in 2024. Moreover, even if demand were to decline somewhat over the forecast period, shortages (albeit very small ones) could occur. Only in the event of relatively large declines in demand (10% every 10 years), does the current level of production result in a surplus of A/I physicians.

Figure 9 – A/I Physician Supply and Demand Forecasts: Baseline Production (S1)

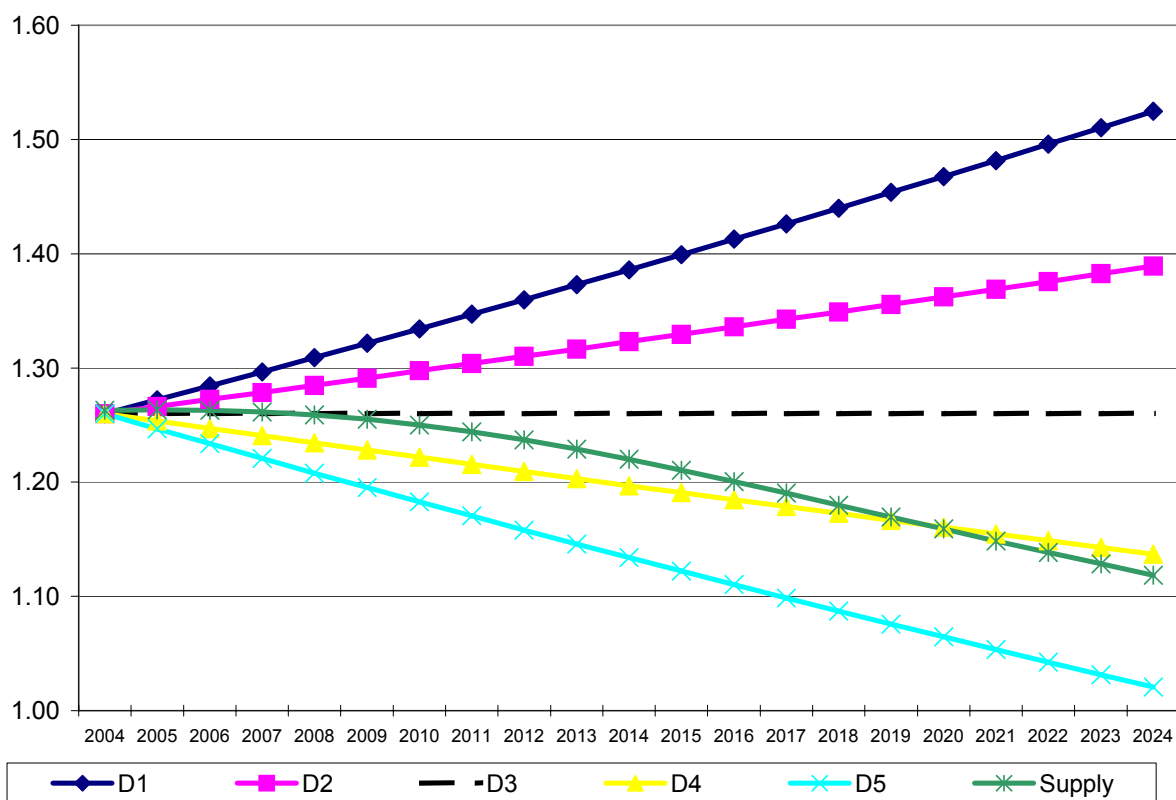


Figure 10 –Forecast Shortage/Surplus: Baseline Production (S1)

| Demand Scenario | 2009 | 2014 | 2019 | 2024 |
|-----------------|-------|--------|--------|--------|
| D1 | -5.0% | -12.0% | -19.6% | -26.6% |
| D2 | -2.8% | -7.8% | -13.7% | -19.5% |
| D3 | -0.4% | -3.2% | -7.2% | -11.2% |
| D4 | 2.2% | 1.9% | 0.2% | -1.6% |
| D5 | 5.0% | 7.6% | 8.7% | 9.6% |

Supply Scenario 2 – Limited Entrance: This scenario had the following characteristics: 1) the number of physicians who completed A/I training in the U.S. each year remained constant at 128 between 2004 and 2024; 2) those graduates represented a total of 107 full-time equivalent (FTE) A/I physicians added to the supply each year; 3) no new physicians entered the A/I physicians supply who had not completed a formal A/I fellowship program after 2006; and 4) the relative proportions of U.S. medical graduates (USMGs) and international medical graduates (IMGs) in A/I fellowship training programs remained constant at 12% between 2004 and 2024.

In this scenario, the supply of A/I physicians was forecast to decline from 3,698 FTE physicians in 2004 to 3,553 FTE physicians in 2024, a 3.9% increase. Taking into account the forecast population growth in the U.S., this decline widened, with the FTE A/I physician to 100,000 population ratio decreasing from 1.26 per 100,000 population in 2004 to 1.02 per 100,000 population in 2024, an 18.9% reduction.

The balance between A/I physician supply and demand was also forecast to worsen between 2004 and 2024 under the limited entrance scenario. Figure 11 presents the percentage shortage or surplus forecast under the five demand scenarios for the baseline production scenario. Were non-formally-trained A/I physicians no longer added to the supply of A/I physicians after 2007, the effects would be immediate: small shortages would begin to occur in 2008, and by 2014, if demand for A/I physicians were to remain at 2004 levels, there would be an 8% shortage, growing to 19% by 2024. If demand grew 5% every 10 years, by 2014, there would be close to a 12% shortage, and by 2024, a 26% shortage. The shortages would grow more quickly if demand were to grow by 10% every 10 years, with a 16% shortage in 2014 and a 33% shortage in 2024. Moreover, even if demand were to decline somewhat over the forecast period, shortages were forecast to occur by 2014, increasing to 10% by 2024. Only in the event of relatively large declines in demand (10% every 10 years) would the current level of production result in an adequate supply of A/I physicians in 2024.

Figure 11 – A/I Physician Supply and Demand Forecasts: Limited Entrance (S2)

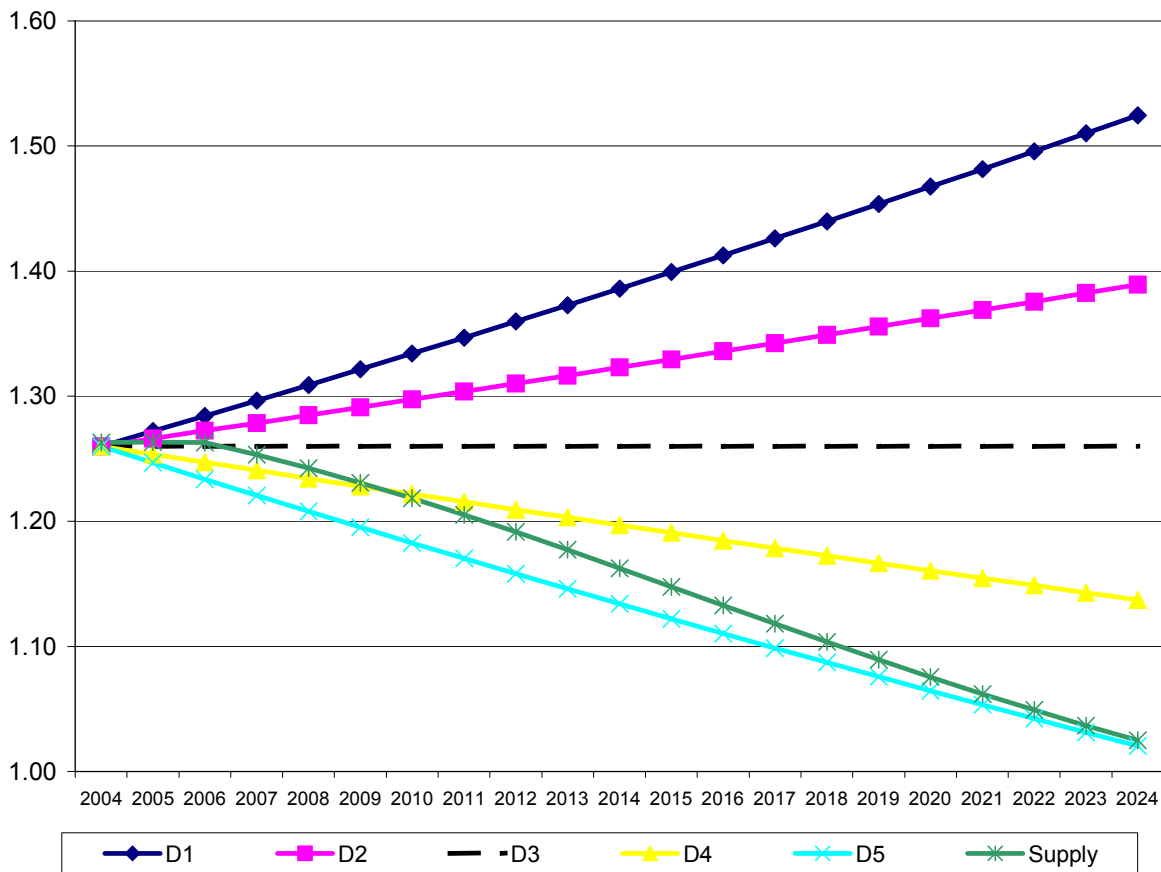


Figure 12 –Forecast Shortage/Surplus: Limited Entrance (S2)

| Demand Scenario | 2009 | 2014 | 2019 | 2024 |
|------------------------|-------------|-------------|-------------|-------------|
| D1 | -6.9% | -16.1% | -25.1% | -32.8% |
| D2 | -4.7% | -12.1% | -19.6% | -26.2% |
| D3 | -2.3% | -7.7% | -13.5% | -18.7% |
| D4 | 0.2% | -2.9% | -6.6% | -9.9% |
| D5 | 3.0% | 2.5% | 1.3% | 0.4% |

Supply Scenario 3 – Increased Production: This scenario had the following characteristics: 1) the number of physicians who completed A/I training in the U.S. each year would increase by 10% starting in 2007; 2) there would be 141 new A/I physicians added to the supply each year, yielding 117.7 new A/I physician FTEs per year from 2007 through 2024; 3) an additional 25 FTE A/I physicians who had not completed a formal A/I fellowship program were also added to the supply annually; and 4) the relative proportions of U.S. medical graduates (USMGs) and international medical graduates (IMGs) in A/I fellowship training programs remained constant at 12% between 2004 and 2024.

In this scenario, the supply of A/I physicians was forecast to grow from 3,698 FTE physicians in 2004 to 4,065 FTE physicians in 2024, a 9.9% increase. Taking into account the forecast population growth in the U.S., this increase becomes a decline, with the FTE A/I physician to 100,000 population ratio decreasing from 1.26 per 100,000 population in 2004 to 1.17 per 100,000 population in 2024, a 7.1% reduction.

While the balance between A/I physician supply and demand was also forecast to worsen between 2004 and 2024 under the increased production scenario, this supply scenario produced the most optimal forecasts in terms of the balance. Figure 13 presents the percentage shortage or surplus forecast under the five demand scenarios for the baseline production scenario. If the production of formally-trained A/I physicians were to increase by 10% beginning in 2007, small shortages would not begin to occur until 2012, and by 2014, if demand for A/I physicians were to remain at 2004 levels, there would only be a 1% shortage, growing to 7% by 2024. If demand grew 5% every 10 years, by 2014, there would be close to a 6% shortage, and by 2024, a 16% shortage. The shortages would grow more quickly if demand were to grow by 10% every 10 years, with a 10% shortage in 2014 and a 23% shortage in 2024. Moreover, if demand were to decline either by 5% or 10% every 10 years over the forecast period, this level of production would be adequate to meet demand for A/I physicians with a slight surplus.

Figure 13 – A/I Physician Supply and Demand Forecasts: Increased Production (S3)

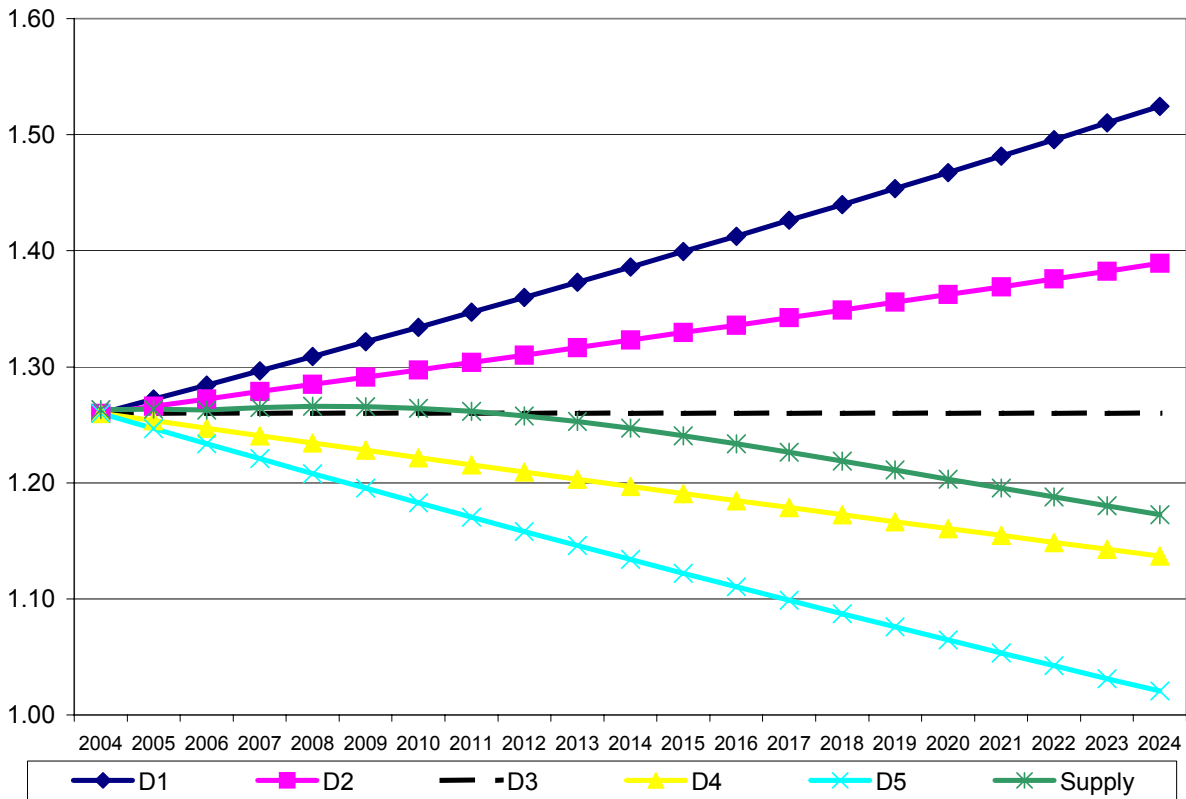


Figure 14 –Forecast Shortage/Surplus: Increased Production (S3)

| Demand Scenario | 2009 | 2014 | 2019 | 2024 |
|-----------------|-------|--------|--------|--------|
| D1 | -4.2% | -10.0% | -16.7% | -23.1% |
| D2 | -2.0% | -5.7% | -10.7% | -15.6% |
| D3 | 0.5% | -1.0% | -3.9% | -6.9% |
| D4 | 3.1% | 4.2% | 3.8% | 3.1% |
| D5 | 5.9% | 10.0% | 12.6% | 14.9% |

Supply Scenario 4 – Limited Entrance and Increased Production: This scenario had the following characteristics: 1) the number of physicians who completed A/I training in the U.S. each year would increase by 10% starting in 2007; 2) there would be 141 new A/I physicians added to the supply each year, yielding 117.7 new A/I physician FTEs per year from 2007 through 2024; 3) no new physicians entered the A/I physicians supply who had not completed a formal A/I fellowship program after 2006; and 4) the relative proportions of U.S. medical graduates (USMGs) and international medical graduates (IMGs) in A/I fellowship training programs remained constant at 12% between 2004 and 2024.

In this scenario, the supply of A/I physicians was forecast to grow from 3,698 FTE physicians in 2004 to 3,741 FTE physicians in 2024, a 1.2% increase. Taking into account the forecast population growth in the US, this increase became a decline, with the FTE A/I physician to 100,000 population ratio decreasing from 1.26 per 100,000 population in 2004 to 1.08 per 100,000 population in 2024, a 14.6% reduction.

Finally, the balance between A/I physician supply and demand was forecast to worsen under most demand scenarios between 2004 and 2024 under the combined increased production/limited entrance scenario. Figure 15 presents the percentage shortage or surplus forecast under the five demand scenarios for this supply scenario. Increasing the number of new formally-trained A/I physicians while simultaneously not adding any new non-formally-trained A/I physicians to the supply provided enough new A/I physicians to keep up with an unchanging demand for A/I physicians remains for the very short-term, but by 2014, a shortage of 6% was forecast. Should demand grow 5% every 10 years, by 2014, there would be a 10% shortage, and by 2024, a 22% shortage. The shortage would grow more quickly if demand were to grow by 10% every 10 years, with a 14% shortage in 2014 and a 29% shortage in 2024. Moreover, even if demand were to decline somewhat over the forecast period, a shortage was forecast by 2019. Only in the event of relatively large declines in demand (10% every 10 years), does the current level of production result in any type of surplus of A/I physicians.

Figure 15 – A/I Physician Supply and Demand Forecasts: Limited Entrance/Increased Production (S4)

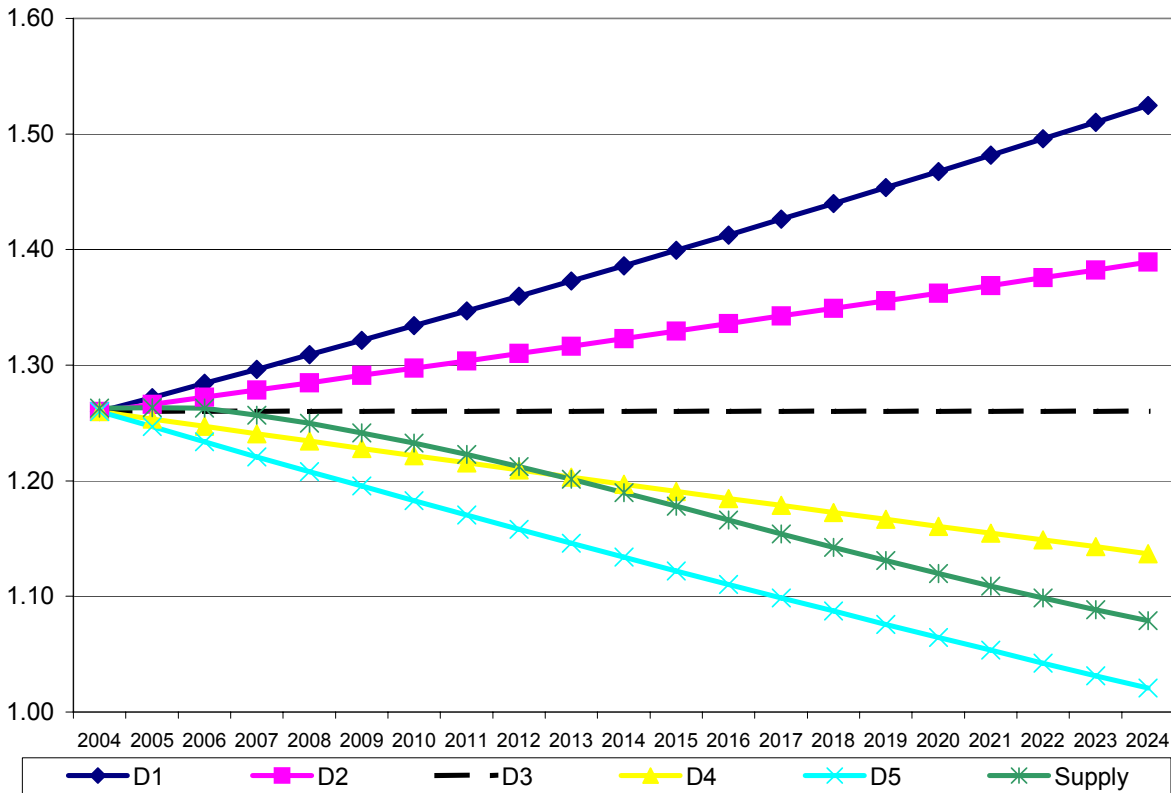


Figure 16 –Forecast Shortage/Surplus: Limited Entrance/Increased Production (S4)

| Demand Scenario | 2009 | 2014 | 2019 | 2024 |
|------------------------|-------------|-------------|-------------|-------------|
| D1 | -6.0% | -14.2% | -22.2% | -29.2% |
| D2 | -3.8% | -10.1% | -16.6% | -22.3% |
| D3 | -1.5% | -5.6% | -10.2% | -14.4% |
| D4 | 1.1% | -0.6% | -3.1% | -5.1% |
| D5 | 3.9% | 4.9% | 5.1% | 5.7% |

Conclusions

The most recent forecasts of A/I physician supply and demand presented in this report paint a more hopeful picture of the future than those generated in 2000. The shortages predicted here are less substantial than those predicted in the past. It is still the case, however, that unless demand for A/I physicians declines, it is likely that A/I physician shortages will begin to occur within the next decade. Demand is not likely to decline, though. Overall demand for physician services is forecast to increase over the next 20 years (COGME, 2005). Moreover, it is also expected by the A/I physician workforce that demand will continue to increase over time (Forte, 2005).

Because there is no mechanism to limit the A/I practice to physicians who are formally-trained in the specialty, in all likelihood, Supply Scenario 3 is the most likely production scenario presented. Given that, even if demand were to remain constant between 2004 and 2024, a small shortage would exist by 2014, growing to a moderate shortage in 2024. If physician demand continues to grow as predicted by A/I physicians and by physician workforce researchers generally, it is likely that the shortages will be more severe.

It should be noted that because there is a growing consensus at the national level of a general physician shortage in the future (COGME 2005), as well as recommendations for increased production of physicians on the order of 15% to 30% (COGME, 2005; AAMC, 2006), it is likely that the trend in increased production of new formally-trained A/I physicians will continue in the near future. If the efforts to increase the general physician workforce result in an increase in A/I physician production that surpasses the 10% increase built into the most likely supply scenario (Scenario 3), the predicted shortages may not be as great as forecast here.

Because no supply and demand forecasts are definite and the underlying assumptions informing them will undoubtedly change over time, it is recommended that these models be updated again in another five years to track how supply and demand are forecast to trend over the next 20 years. This is especially important currently because of the efforts at the national level to increase the physician supply in general. To the extent that these efforts are successful, it will become important to understand the effects on A/I physician production, supply, and the ability for the supply to adequately address demand for A/I services.

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