

TRENDS

Trends In The Physician Workforce, 1980–2000

A review of the evidence indicates that there is no physician surplus in the United States and that numbers of primary care physicians may have reached a plateau.

by **Edward S. Salsberg and Gaetano J. Forte**

ABSTRACT: Over the past twenty-five years the nation has struggled with a series of physician workforce issues: determining the appropriate number of physicians needed and the appropriate number to produce; the role of international medical school graduates; the mix of primary care and non-primary care physicians; efforts to increase the number of underrepresented minorities in medicine and the supply of physicians in rural areas; and the impact of the growing number of female physicians. This paper documents physician workforce trends over the past twenty years, especially as they relate to these issues.

BETWEEN 1960 AND 1980 the number of allopathic medical schools in the United States grew from 85 to 126, and the number of graduates more than doubled from 7,081 to 15,113.¹ The nation's physician supply grew rapidly, from 235,303 active allopathic physicians in 1965 to 316,491 in 1975.² 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 United States.³ In 1980 GMENAC concluded that the nation faced a potentially serious surplus and recommended that it limit the number of medical school positions and severely restrict the number of international medical school graduates (IMGs) entering the United States.⁴

When GMENAC issued its report in 1980, there were 459,555 active physicians in the United States.⁵ 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.⁶

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.⁷ In fact, Jonathan Weiner estimated that under certain managed care expansion scenarios, the nation required 138–144 patient care physicians per 100,000 population—well below the 191 physicians per 100,000 population suggested by GMENAC.⁸ Since the nation already had 238 active physicians per 100,000 in 1990 and was experiencing a period of growth in physician supply, the specter arose of a massive surplus of physicians by the turn of the century.⁹ This concern was echoed by the national Council on Graduate Medical Education (COGME). In several reports between 1992 and 1998, COGME reaffirmed its concern about a potential surplus of physicians.¹⁰

.....
Edward Salsberg is executive director of the Center for Health Workforce Studies, University at Albany, State University of New York. Gaetano Forte is a research associate there.

In 2000 there were approximately 780,000 active physicians in the United States, or 276 physicians per 100,000 population (Exhibit 1). U.S. physician supply grew by more than 320,000 physicians between 1980 and 2000. However, despite the sharp growth in supply, there is little indication of a U.S. surplus of physicians. Several recent examinations of the balance of supply of and demand for physicians suggest that the nation may be facing a shortage instead.¹¹

The Center for Health Workforce Studies at the University at Albany, State University of New York, surveys physicians completing training in New York annually to assess the relative demand, by specialty, for physicians entering practice. Initially, it was thought that there would be an indication of “saturation” in some specialties, since New York State has a very high physician-to-population ratio (estimated at 305 physicians per 100,000 population in 2000—well above the numbers recommended by GMENAC and COGME).¹² Yet despite this high ratio, based on the experience of residency program graduates in the job market, there has been no indication of a general surplus. For example, between 1998 and 2001 only 18 percent of 5,312 respondents had to change their practice plans because of limited

job opportunities.¹³ Despite the growing supply, this percentage has remained essentially unchanged each year. The most commonly reported reason for new physicians’ having difficulty finding a satisfactory practice opportunity was limited practice opportunities in desired locations rather than a general lack of practice positions. Similar findings have been reported in California in 2000 and 2001.¹⁴ Although an earlier report suggested that some new physicians were unemployed, the experience in New York and California over the past several years indicates that only a tiny percentage of physicians do not have confirmed practice plans shortly before graduation because of the lack of practice opportunities.¹⁵

In this paper we trace the path of U.S. physician supply analysis and recommendations, based on the published reports by government bodies and academic analysts during the past twenty years, as well as on our own work at the Center for Health Workforce Studies.

U.S. Medical School Graduations And IMGs Entering Medicine

The growth in physicians between 1980 and 2000 reflects a number of factors. As expected by GMENAC, the increased level of production of U.S. medical schools in the 1980s

EXHIBIT 1 Trends In U.S. Physician Supply And Projections, Selected Years 1980–2000

	1980	1985	1990	1995	2000
Active allopathic physicians	379,893	438,659	470,688	551,647	642,877
Active osteopathic physicians	17,620	24,014	30,924	35,720	41,121
Residents and fellows	62,042	75,411	92,080	96,352	95,725
Total active physicians	459,555	538,084	593,692	683,719	779,723
GMENAC supply projection	–	535,750	–	642,950	–
U.S. resident population (thousands)	227,016	237,729	249,231	262,571	282,124
Active physicians per 100,000 population	202	226	238	260	276

SOURCES: For allopathic physicians and residents, American Medical Association, *Physician Characteristics and Distribution in the U.S., 2002–2003 Edition*, Table 5.1. For osteopathic physicians, 1980–1995, *American Osteopathic Association Yearbook and Directory of Physicians, 1992*; and *American Association of Colleges of Osteopathic Medicine 1997 Annual Statistical Report*. For osteopathic physicians, 2000, Center for Health Workforce Studies, University at Albany estimate. For population, 1980–1995, U.S. Census Bureau, “Monthly Estimates of the United States Population: April 1, 1980 to July 1, 1999, with Short-Term Projections to November 1, 2000.” For population, 2000, U.S. Census Bureau, “Table ST-2001EST-01—Time Series of State Population Estimates: April 1, 2000 to July 1, 2001.”

NOTE: GMENAC is Graduate Medical Education National Advisory Committee.

and 1990s compared with earlier decades added greatly to the total supply, as did continued large numbers of IMGs entering at the graduate level. Also, the number of osteopathic graduates grew sharply.

U.S. allopathic medical schools responded to concerns over a potential surplus by stabilizing enrollment (Exhibit 2); in fact, the number of graduates in 2000 was only slightly higher than it was in 1980.¹⁶ During the same period the number of graduates of osteopathic medical schools more than doubled.¹⁷ Nevertheless, the combined growth in U.S. medical school graduates was only 12 percent between 1980 and 2000, while the U.S. population grew 24 percent.¹⁸

By the early 1990s it was clear that the supply of physicians in the United States was still growing rapidly, and a sizable number of IMGs were entering the medical education pipeline at the graduate level. These phenomena prompted a vigorous policy discussion and calls by COGME and others to limit the number of IMGs training in the United States.¹⁹

The rate at which IMGs entered practice in the United States dipped in the 1980s, only to increase sharply in the 1990s. Efforts to track IMGs entering the U.S. health care system have usually focused on the beginning of their pipeline in this country, such as the number of certificates issued by the Educational Commission for Foreign Medical Graduates (ECFMG), the number in the residency match program, or the number in residency training. However, these data have a number of serious

shortcomings.²⁰ An alternative approach is to track the number in practice. The number of active IMG physicians in the United States (excluding residents and fellows) increased by 44,823 between 1970 and 1980 (about 4,500 per annum for the decade), 27,046 between 1980 and 1990 (about 2,700 per annum for the decade), and 45,012 between 1990 and 2000 (about 4,500 per annum for the decade) (Exhibit 3).²¹ The growth of IMGs reflects both supply and demand factors, including IMGs' willingness to come to the United States to practice medicine and reimbursement benefits to teaching hospitals for training residents and fellows.

The introduction of new requirements in the late 1990s for IMGs seeking residency training in the United States, including a new clinical assessment examination, led to a surge in new applications for certification by the ECFMG before the new test went into effect and a subsequent drop in 1999 after the exam was in place.²²

Although the data are difficult to interpret, it appears that the number of non-U.S.-born IMGs entering residency training has moderated over the past few years. At the same time, the number of U.S.-born IMGs is growing. Although efforts in the mid-1980s to discourage U.S. citizens from attending foreign medical schools were effective, the number of U.S. IMGs in residency training in the United States has begun to increase in recent years.²³

Thus, while U.S. allopathic schools responded to public policy concerns about pro-

EXHIBIT 2 Trends In U.S. Medical School Graduations, Selected Years 1980–2000

	1980	1985	1990	1995	2000
Allopathic medical school graduates	15,113	16,318	15,398	15,888	15,674
Osteopathic medical school graduates	1,059	1,476	1,529	1,843	2,279
Total U.S. medical school graduates					
Number	16,172	17,794	16,927	17,731	17,953
Per 100,000 population	7.1	7.5	6.8	6.8	6.4

SOURCES: For allopathic medical school graduates, Association of American Medical Colleges, *AAMC Data Book: Statistical Information Related to Medical Schools and Teaching Hospitals, 2001*. For osteopathic graduates, *American Association of Colleges of Osteopathic Medicine 2001 Annual Statistical Report*. For population estimates, see Exhibit 1.

EXHIBIT 3**Trends In International Medical Graduates (IMGs), Selected Years 1980–2000**

	1980	1985	1990	1995	2000
Active allopathic IMGs	83,571	101,211	110,617	131,819	155,629
IMGs in allopathic residency/fellowship training	11,424	12,837	13,496	22,552	22,419
Total IMG physicians					
Number	94,995	114,048	124,113	154,371	178,048
Per 100,000 population	42	48	50	59	63

SOURCES: For allopathic physicians and residents, American Medical Association, *Physician Characteristics and Distribution in the U.S., 2002–2003 Edition*, Table 5.9. For population estimates, see Exhibit 1.

ducing too many physicians, the growth in osteopathic medical school graduates and IMGs worked to counter efforts aimed at limiting the number of physicians produced in this country.

Primary Care And Non-Primary Care Physicians

As noted above, the growth of managed care raised concerns that the nation needed more primary care physicians to meet the needs of the population. As a result, beginning in the 1980s there was a growing number of calls for additional primary care physicians, including some proposals that half of new graduates of residency training be in primary care specialties.²⁴ These reports and papers led to a series of federal and state policies and programs in the 1990s to encourage the production of more primary care physicians.²⁵ The net result was a sizable increase in the number of new physicians choosing primary care specialties, reflecting both an increase in family medicine residents and a decrease in internal medicine and pediatric residents choosing to subspecialize.²⁶

In the 1980s the number of active primary care physicians grew at a somewhat faster rate (31 percent) than the number of active non-primary care physicians (25 percent). As a result of the promotion of primary care, in the 1990s the rate of growth for primary care physicians (35 percent) continued to exceed the rate of growth for non-primary care physicians (29 percent). Training in family practice and pediatrics grew rapidly, leading to an in-

crease of 160 percent in the number of active family practitioners and 117 percent in the number of active pediatricians between 1980 and 2000. However, because the number of non-primary care physicians greatly exceeded the number of primary care physicians in 1980, the number of non-primary care physicians actually grew by 173,277 between 1980 and 2000, compared with 123,390 for primary care physicians (Exhibit 4).²⁷

Based on the results of resident exit surveys in New York and California, it would appear that the marketplace demand for non-primary care physicians exceeds the demand for primary care physicians. Thus, even in New York, where 68 percent of practicing physicians are non-primary care, and in California, with its high level of managed care penetration, the job market appears stronger for non-primary care physicians than for primary care physicians.²⁸ Accordingly, the number of medical school graduates selecting primary care specialties appears to have peaked, and an increasing number are once again choosing non-primary care specialties.²⁹ In the final analysis, then, there seems to be little support in the marketplace for the goal of half of new graduates being in primary care specialties.

Underrepresented Minority And Female Physicians

■ **Minorities.** On many fronts, the nation continues to promote diversity in the workforce. Among the physician workforce, the concern about a lack of diversity has been voiced by many.³⁰ Although efforts such as the

EXHIBIT 4
Trends In Active Allopathic Physician Supply, By Primary Care Specialty, Selected Years 1980–2000

Specialty	1980	1985	1990	1995	2000
Family practice	27,530	40,021	47,639	59,345	71,635
General practice	32,519	27,030	22,841	16,867	15,213
Internal medicine	71,531	88,862	98,349	115,168	134,539
Pediatrics	28,803	36,026	40,893	50,620	62,386
Active allopathic primary care physicians					
Number	160,383	191,939	209,722	242,000	283,773
Per 100,000 population	71	81	84	92	101
Active allopathic non–primary care physicians					
Number	281,552	322,131	353,046	405,999	454,829
Per 100,000 population	124	136	142	155	161

SOURCES: For physicians and residents, American Medical Association, *Physician Characteristics and Distribution in the U.S., 2002–2003 Edition*, Tables 5.1 and 5.2. For population estimates, see Exhibit 1.

NOTE: Figures in exhibit include residents and fellows.

American Association of Medical Colleges' (AAMC's) Project 3000 by 2000 have yet to reach their goals, the number of underrepresented minorities enrolled in U.S. allopathic medical schools has risen in the past twenty years.³¹ Between the 1979–80 and 1999–2000 academic years, the number grew from 5,086 (8 percent of all enrollees) to 7,853 (slightly less than 12 percent). However, this growth ended during the 1996–97 academic year. Since then the number of underrepresented minorities in U.S. medical schools has actually declined slightly. Thus, despite some initial progress, African Americans, Latinos/Hispanics, and Native Americans continue to be underrepresented in the U.S. physician workforce.

■ **Women.** The number of female physicians rose steadily, from 37,189 active allopathic physicians in 1980 to 148,768 in 2000, an increase of 300 percent (compared with an increase of 44 percent for men).³² Over this period the percentage of active allopathic physicians who were female increased from 10 percent to 23 percent. The number of female physicians will continue to grow, since women made up 45 percent of allopathic medical school students in the 2000–01 academic year and 38 percent of medical residents training in the United States in 2000.³³

Although the impact of having more women in medicine has not been determined completely, a number of studies and reports suggest that female physicians practice differently than their male counterparts do.³⁴

Geographic Distribution

One of the more entrenched physician workforce concerns in the United States has been the limited number of physicians in rural communities. In the 1980s and 1990s there was hope that as the number of physicians increased in this country, excess physicians would “trickle down” to rural areas. Data on changes in physician supply in rural areas are not readily available, but data are available for nonmetropolitan areas.³⁵ The data suggest that the number of active allopathic nonfederal physicians in nonmetropolitan areas increased by 61 percent between 1980 and 2000. This increase was undoubtedly helpful to those communities, but the increase was smaller than the 74 percent increase in metropolitan areas.³⁶ In absolute terms, the number of active allopathic physicians in metropolitan areas increased by more than 260,000 physicians, while nonmetropolitan areas experienced an increase of 30,000 physicians. Thus, “trickle down” may be the most appropriate term to describe the migration of new physicians into nonmetro-

politan areas.

In terms of per capita supply of physicians, metropolitan areas experienced slightly slower growth (37 percent, from 205 physicians per 100,000 population in 1980 to 280 in 2000) than nonmetropolitan areas did (43 percent, from 109 physicians per 100,000 population in 1980 to 156 in 2000).³⁷

In terms of specific geographic locations, physician supply grew somewhat unevenly between 1980 and 2000 (Exhibit 5). At first glance, it appears that the Northeast and North Central regions experienced the greatest physician supply growth. However, the number of physicians grew at the fastest rate in the South and West, in excess of 55 percent between 1980 and 2000. At the same time, the South and West experienced the fastest rate of population growth as well, with the population in the South growing 22 percent and in the West, 33 percent. Thus, the per capita physician supply in the South and West did not grow as quickly as it did in the Northeast and North Central regions.

Discussion

The nation's record of physician policy making and planning is mixed. While GMENAC correctly forecast the large increase in the number of active physicians in the country, its conclusion, as well as those of COGME and many analysts, that the growth would lead to a surplus appears to have been unfounded.

Although the nation's allopathic medical schools have heeded the policy calls to constrain their growth, the number of new osteopathic graduates has risen, and the number of IMGs entering the United States continues at high levels despite a dip in the 1980s. The wisdom of limiting U.S. medical school production while demand for residents and practicing physicians remains high and large numbers of IMGs continue to enter U.S. medicine is now being reevaluated.

During the 1990s the nation greatly increased the number and percentage of new primary care physicians being trained. Although the goal of having 50 percent of new graduates in primary care was not reached, it

EXHIBIT 5
Trends In The Geographic Distribution Of The Nonfederal Allopathic Physician Supply, Selected Years 1980-2000

Census region	Nonfederal allopathic physicians per 100,000 civilian population				
	1980	1985	1990	1995	2000
Northeast	242	280	303	349	370
Middle Atlantic	237	276	298	344	362
New England	254	293	320	364	391
North Central	169	192	207	237	255
East North Central	170	195	209	240	259
West North Central	166	186	203	231	246
South	170	194	212	237	252
East South Central	140	162	181	211	229
South Atlantic	194	222	240	265	279
West South Central	153	171	184	207	220
West	219	237	249	257	264
Mountain	179	193	208	224	229
Pacific	235	254	264	270	278

SOURCES: For allopathic physicians, American Medical Association, *Physician Characteristics and Distribution in the U.S., 2002-2003 Edition*, Table 5.18. For civilian population, 1980-1995, U.S. Census Bureau, "Current Population Reports," Series P-25, No. ST-99-2, 1044, 1045, 1106, and 1127. For civilian population, 2000, U.S. Census Bureau Report No. PHC-T-2.

NOTE: Physician supply figures include residents and fellows.

is now clear that this was an unrealistic goal and one not based on the U.S. marketplace. As noted above, there are growing concerns with potential shortages in a variety of non-primary care specialties. Nevertheless, in the long run, the increase in the number of primary care physicians during the past decade may have a beneficial impact on health care. The lesson for the medical education community and policy-makers may be the need to regularly reassess workforce needs by specialty and not to get locked into fixed ratios and fixed goals for the physician workforce. Better information on needs and moderate financial incentives may be sufficient to promote a physician workforce to meet the nation's future needs.

The number of underrepresented minority physicians in the United States has been increasing, but the increases have been modest, and African Americans, Latinos/Hispanics, and Native Americans remain severely underrepresented in medicine. The continued lack of diversity weakens the health care system. For this reason and in light of the most recent decrease in underrepresented minority enrollment in U.S. medical schools, the nation needs to redouble its efforts to address the lack of diversity in the physician workforce.

The number of women in medicine continues to rise steadily. Over the next thirty years half of all practicing physicians will be women. Research to date suggests that female physicians have different practice styles and patterns. Clearly, the changing demographics of medicine require additional research and attention if we are to be better prepared for the future.

.....
The authors gratefully acknowledge the data collection and manuscript preparation efforts of Mark S. Beaulieu and Karilyn C. Puccio of the Center for Health Workforce Studies, University at Albany, State University of New York.

NOTES

1. Association of American Medical Colleges, *AAMC Data Book: Statistical Information Related to Medical Schools and Teaching Hospitals, January 2001* (Washington: AAMC, 2001), Tables A1 and B1.
2. American Medical Association, *Physician Distribution and Medical Licensure in the U.S., 1975* (Chicago: AMA, 1976).
3. Graduate Medical Education National Advisory Committee, *Report of the Graduate Medical Education National Advisory Committee to the Secretary, Department of Health and Human Services*, vol. 1 (Washington: U.S. Department of Health and Human Services, 1981), 1.
4. *Ibid.*, 21–22.
5. AMA, *Physician Characteristics and Distribution in the U.S., 2002–2003 Edition* (Chicago: AMA, 2002), Table 5.1. To calculate this figure, we included all active allopathic and osteopathic physicians, as well as all residents and fellows in training.
6. GMENAC, *Report of the Graduate Medical Education National Advisory Committee*, vol. 2 (Washington: DHHS, 1981), 273, Table V.2.
7. J.P. Weiner, "Forecasting the Effects of Health Reform on U.S. Physician Workforce Requirement: Evidence from HMO Staffing Patterns," *Journal of the American Medical Association* 272, no. 3 (1994): 222–230; J.P. Weiner, *Assessing Current and Future U.S. Physician Requirements Based on HMO Staffing Rates: A Synthesis of New Sources of Data and Forecasts for the Years 2000 and 2020*, Pub. no. HRSA 94-526(P) (Washington: DHHS, Bureau of Health Professions, 1995); S. Gamliel et al., "Managed Care on the March: Will Physicians Meet the Challenge?" *Health Affairs* (Summer 1995): 131–142; and J.E. Wennberg et al., "Finding Equilibrium in U.S. Physician Supply," *Health Affairs* (Summer 1993): 89–103.
8. Calculated from GMENAC requirements of 466,000 physicians (GMENAC, *Report of the Graduate Medical Education National Advisory Committee*, vol. 2, 269, Table V.1) and a projected U.S. population of 243,513,000 (*Ibid.*, 274, Table V.3): $(466,000/243,513,000) \times 100,000 = 191$ physicians per 100,000 population; and Weiner, "Forecasting the Effects of Health Reform." The GMENAC requirements should be adjusted for non-patient care activities in order to make the comparison with Weiner. Using the rate of non-patient care physician activity among the supply of physicians in 1990, it was determined that approximately 13 percent of active (nonresident/fellow) physicians were engaged in non-patient care activities. Thus, the more appropriate comparison to Weiner's range is 166 patient care physicians per 100,000 population [$191 \times (1-0.13) = 166$].
9. There were 214 active physicians per 100,000 population in 1990: 501,612 active physicians, 92,080 physicians in residency/fellowship training, and 249,464,000 in the population.
10. Council on Graduate Medical Education, *Im-*

- proving Access to Health Care through Physician Workforce Reform: Directions for the Twenty-first Century, Third Report (Rockville, Md.: COGME/Health Resources and Services Administration, 1992); COGME, *Recommendations to Improve Access to Health Care through Physician Workforce Reform*, Fourth Report (1994); COGME, *Managed Health Care: Implications for the Physician Workforce and Medical Education*, Sixth Report (1995); COGME, *Physician Workforce Funding Recommendations for Department of Health and Human Services' Programs*, Seventh Report (1995); COGME, *Patient Care Physician Supply and Requirements: Testing COGME Recommendations*, Eighth Report (1996); and COGME, *International Medical Graduates, The Physician Workforce, and GME Payment Reform*, Eleventh Report (1998).
11. R.A. Cooper et al., "Economic and Demographic Trends Signal an Impending Physician Shortage," *Health Affairs* (Jan/Feb 2002): 140-154; K.I. Bland and G. Isaacs, "Contemporary Trends in Student Selection of Medical Specialties: The Potential Impact on General Surgery," *Archives of Surgery* (March 2002): 259-267; and G.J. Forte et al., *The Allergy and Immunology Physician Workforce 2000* (Rensselaer, N.Y.: Center for Health Workforce Studies, 2000).
 12. G.J. Forte et al., *Profile of New York State Physicians* (Rensselaer, N.Y.: Center for Health Workforce Studies, 2001).
 13. This figure includes U.S. medical school graduates and IMGs with permanent U.S. residence status. It does not include residents with temporary visas, since their visa status limits their U.S. practice options. J.A. Nolan et al., *Residency Training Outcomes by Specialty in 1998 for New York State and Selected Hospitals, A Summary of Responses to the 1998 Resident Exit Survey* (Rensselaer, N.Y.: Center for Health Workforce Studies, 1999); J.A. Nolan, *Residency Training Outcomes by Specialty in 1999 for New York State, A Summary of Responses to the 1999 Resident Exit Survey* (2000); J.A. Nolan et al., *Residency Training Outcomes by Specialty in 2000 for New York State, A Summary of Responses to the 2000 Resident Exit Survey* (2001); and J.A. Nolan et al., *Residency Training Outcomes by Specialty in 2001 for New York State, A Summary of Responses to the 2001 NYS Resident Exit Survey* (2002).
 14. J. Nolan et al., *Residency Training Outcomes by Specialty in California: A Summary of Responses to the 2000 and 2001 CA Resident Exit Surveys* (2002).
 15. R.S. Miller et al., "Employment-Seeking Experiences of Resident Physicians Completing Training during 1996," *Journal of the American Medical Association* 280, no. 9 (1998): 777-783.
 16. AAMC, *AAMC Data Book*, Table B1.
 17. American Association of Colleges of Osteopathic Medicine, *2001 Annual Report on Osteopathic Medical Education* (Chevy Chase, Md.: AACOM, 2002), Table 4.
 18. For estimates of the U.S. resident population from July 1980 to July 1995, see U.S. Census Bureau, "Monthly Estimates of the United States Population: April 1, 1980 to July 1, 1999, with Short-Term Projections to November 1, 2000," 2 January 2001, eire.census.gov/popest/archives/national/nation1/intfile1-1.txt (6 February 2002). For estimates of the U.S. resident population in July 2000, see U.S. Census Bureau, "Table US-2001EST-01—Time Series of National Population Estimates: April 1, 2000 to July 1, 2001," eire.census.gov/popest/data/national/popular_tables/table01.php (8 July 2002).
 19. See Note 10.
 20. For example, trends in ECFMG certificates issued do not equate to residency entrants and vary based on changes in the entrance requirements. The National Residency Match Program match data for IMGs miss a sizable number of IMGs who do not go through the match. Graduate medical education data from the AMA do not adequately account for new IMGs in training compared with repeaters, and selection of specialties and subspecialties can lead to longer training periods for IMGs compared with USMGs. In addition, some unknown percentage of J-1 visa holders return to their native countries after they complete training.
 21. These calculations exclude IMGs in residency or fellowship training. This methodology, which compares the number of IMGs at two points in time, does not take into account that some new IMGs replace others that leave practice; thus, it underestimates the actual number of new entrants. Replacement was probably higher in the 1990s than in the 1970s, as the base of IMGs in practice was much larger and some of the earlier cohorts were likely to be nearing retirement age.
 22. Educational Commission for Foreign Medical Graduates, *Educational Commission for Foreign Medical Graduates 2000 Annual Report* (Philadelphia: ECFMG, 2001).
 23. From 1986 to 1996 the number of U.S.-born IMGs in allopathic residency programs declined from 4,115 to 1,925. However, since 1996 their number has grown to 2,727; S.I. Etzel et al., "Graduate Medical Education in the United States," *Journal of the American Medical Association* 262, no. 8 (1989): 1029-1037; "Graduate Medical Education," *Journal of the American Medical Association* 278, no. 9 (1997): 775-784; and "Graduate Medical Education," *Journal of the American Medical Association* 286, no. 9 (2001): 1095-1107.
 24. In addition to the COGME reports, see, for example, Pew Health Professions Commission,

- Critical Challenges: Revitalizing the Health Professions for the Twenty-first Century* (San Francisco: University of California, San Francisco, Center for the Health Professions, 1995); R. Kronick et al., "The Marketplace in Health Care Reform: The Demographic Limitations of Managed Competition," *New England Journal of Medicine* 328, no. 2 (1993): 148-152; F. Mullan et al., "Doctors, Dollars, and Determination: Making Physician Workforce Policy," *Health Affairs* (Supplement 1993): 138-151; and E. Ginzberg, "Improving Health Care for the Poor: Lessons from the 1980s," *Journal of the American Medical Association* 271, no. 9 (1994): 464-467.
25. For example, federal Title VII funding; National Health Service Corps loan repayment opportunities; a Memorandum of Agreement in California requiring University of California medical education programs to produce a fifty-fifty mix of primary/nonprimary care physicians; and hospital reimbursement in New York State providing higher payments to teaching hospitals for training primary care physicians.
 26. Between 1992 and 1999 the number of graduates from family practice residency programs rose 52 percent, from 2,624 to 3,981. J.M. Colwill and J. Cultice, "Increasing Numbers of Family Practitioners—Implications for Rural America," in *Update on the Physician Workforce*, COGME Resource Paper Compendium (Rockville, Md.: COGME/HRSA, 2000), 29-39. Between 1990 and 1998 the number of residents training in pediatrics increased by 26 percent, from 6,115 to 7,728. B.D. Rowley, D.C. Baldwin, and M.B. McGuire, "Selected Characteristics of Graduate Medical Education in the United States," *Journal of the American Medical Association* 266, no. 7 (1991): 933-943, Table 1; "Graduate Medical Education," *Journal of the American Medical Association* 282, no. 9 (1999): 893-906, Table 1; H.R. Kimball, "Decline in Subspecialization Stabilizes," *American Board of Internal Medicine News Update* (Spring/Summer 2000): 1, 3; and American Academy of Pediatrics Committee on Pediatric Workforce, "Pediatric Workforce Statement (RE9750)" (Elk Grove Village, Ill.: AAP, 1998).
 27. The number of new family practitioners is partially offset by the decrease in general practitioners; however, the former receive formal postgraduate medical training, while the latter generally do not.
 28. See Note 13.
 29. AAMC, "U.S. Medical Seniors Enjoy Highest Match Rate Ever for First Year Residencies," Press Release, 21 March 2002, www.aamc.org/newsroom/pressrel/2002/020321.htm (22 March 2002).
 30. See, for example, R.G. Petersdorf, K.S. Turner, and H.W. Nickens, "Minorities in Medicine: Past, Present, and Future," *Academic Medicine* 65, no. 11 (1990): 663-670; COGME, *Improving Access to Health Care through Physician Workforce Reform*; Bureau of Health Professions, *Minority Physicians: A Profile* (Washington: U.S. Government Printing Office, 1993); and Institute of Medicine, *Balancing the Scales of Opportunity: Ensuring Racial and Ethnic Diversity in the Health Professions* (Washington: National Academy Press, 1994).
 31. H.W. Nickens, T.P. Ready, and R.G. Petersdorf, "Project 3000 by 2000: Racial and Ethnic Diversity in U.S. Medical Schools," *New England Journal of Medicine* 331, no. 7 (1994): 472-476.
 32. AMA, *Physician Characteristics and Distribution in the U.S.*, Tables 5.1 and 5.13.
 33. AAMC, *AAMC Data Book*, Table B8; and "Graduate Medical Education," *Journal of the American Medical Association* 286, no. 9 (2001): 1095-1107.
 34. See, for example, C.S. Weisman et al., "Male and Female Physician Career Patterns: Specialty Choices and Graduate Training," *Journal of Medical Education* 55, no. 10 (1980): 813-825; Australian Medical Workforce Advisory Committee/Australian Institute of Health and Welfare, *Influences on Female Participation in the Australian Medical Workforce* (Sydney: Australian Medical Workforce Advisory Committee, 1998); P.R. Kletke, W.D. Marder, and A.B. Silberger, "The Growing Proportion of Female Physicians: Implications for U.S. Physician Supply," *American Journal of Public Health* 80, no. 3 (1990): 300-304; S.A. Schroeder, "Managing the U.S. Health Care Workforce: Creating Policy amidst Uncertainty," *Inquiry* 28, no. 3 (1994): 266-275; and R.A. Cooper, "Seeking a Balanced Physician Workforce for the Twenty-first Century," *Journal of the American Medical Association* 272, no. 9 (1994): 680-687.
 35. Data on metropolitan and nonmetropolitan areas are provided in annual editions of the AMA's *Physician Characteristics and Distribution in the U.S.* In these documents nonmetropolitan areas are defined as counties of fewer than 50,000 residents.
 36. AMA, *Physician Characteristics and Distribution in the U.S., 2002/03 Edition*, Table 5.14; AMA, *Physician Characteristics and Distribution in the U.S., 1996/97 Edition*, Table A-14; and AMA, *Physician Characteristics and Distribution in the U.S., 1986 Edition*, Table A-6.
 37. Population data are derived from U.S. Bureau of the Census, *Statistical Abstract of the United States, 2001* (Washington: Bureau of the Census, 2001). While the per capita ratio is much lower in nonmetropolitan areas, there are many subspecialties that require large population bases to maintain reasonable volume of patients, and thus it should not be expected that the per capita supply of physicians in metropolitan and nonmetropolitan areas will ever be equal.