ORIGINAL ARTICLE

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Benchmarking the Future Generalist Workforce

CONTEXT. Previous workforce analyses by the Council on Graduate Medical Education (COGME) have concluded that the United States has too few, or just enough, generalists. However, recent trends suggest that more physicians are entering primary care, raising the possibility of a future surplus.

OBJECTIVE. To project the future supply of generalists relative to future requirements.

DESIGN. We developed a model that projects the supply of generalists into the future on the basis of the annual number of physicians entering and leaving the workforce. We calculated the number of clinically active generalists from the physician masterfiles of the American Medical Association and American Osteopathic Association. The number of graduating trainees entering the generalist workforce was calculated from the 1999 to 2000 AMA Annual Survey of GME. The number leaving was calculated by using age- and sex-specific rates or physician death and retirement provided by the Bureau of Health Professions.

MEASUREMENTS. Projected per capita number of clinically active generalists to the year 2025, relative to physician requirements suggested by COGME and several regional benchmarks of physician supply.

RESULTS. The supply of generalists is projected to grow from its current level of 69 per 100,000 to nearly 88 per 100,000 by the year 2025. Adjusting for the changing age–sex structure of the physician workforce decreases the "effective" supply to 85 generalists per 100,000. By the year 2025, the effective supply of generalists will exceed COGME's upper estimate of generalist requirements (80 per 100,000), resulting in an excess of about 18,000 full-time equivalent generalists. The future supply of generalists will also exceed most current regional benchmarks of generalist supply.

CONCLUSION. At current levels of training, the supply of generalists will grow substantially and soon exceed several benchmarks for generalist requirements.

Since the 1980 report by the Graduate Medical Education National Advisory Committee,[1] there has been increasing concern among policymakers about a physician surplus. In contrast to the prevailing concern about a surplus of specialists, most reform recommendations actually call for an increase in the number of generalists.[2–9] A recent report by the Council of Graduate Medical Education (COGME)[2] predicts a stable per capita generalist supply of about 66 generalists per 100,000 over the next 25 years, which is at the lower end of their estimated requirements of 60 to 80 generalists per 100,000.

Recent trends, however, suggest that more physicians are entering primary care fields.[10] Between 1994 and 2000, the total number of trainees in primary care specialties has increased by 10% (if only U.S. medical graduates are considered, the increase is about 24%).[11] As a result, the projection of a stable generalist workforce may be a substantial underestimate. COGME's most recent report[2] notes an increase in generalist trainees but estimates that the current number of trainees is still below their target level.

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See related editorial on pages 95–97.

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In this study, we developed an interactive workforce model to project the future supply of clinically active generalist physicians. We also sought to compare our estimates of the future generalist supply to the number "needed." Because there is no consensus on how best to estimate this number, we used four benchmarks: COGME's upper and lower estimates of desirable generalist supplies, and two regions that currently have a relatively low and high supply of generalists (Houston and Philadelphia, respectively). Regional benchmarking is a pragmatic approach to estimating a reasonably sized physician workforce.[12]

Methods

Physician Supply Model

We designed a workforce model using Stella software (High Performance Systems, Hanover, NH). The model projects the supply of generalist physicians into the future by using the basic structure shown in **Figure 1**. Generalist physicians were defined as active physicians in the self-designated primary specialties of general/family practice, internal medicine minus subspecialties, and pediatrics minus subspecialties.[13] We excluded physicians who reported that they worked most of the time in medical teaching, administration, or research; part-time physicians working fewer than 20 hours per week in clinical practice; residents; and fellows.

The future generalist physician supply represents a dynamic equilibrium between the current supply, the annual number of new generalist physicians entering the workforce, and the number of generalist physicians who leave the workforce through death, retirement, or the pursuit of such alternative activities as teaching, administration, or research. The key model variables, data sources, and key assumptions are summarized in **Table 1**.[14–16]

The number of graduating trainees entering the generalist physician workforce was calculated from the 1999 to 2000 American Medical Association Annual Survey of GME.[17] Generalist trainees were defined as physicians who completed a program in family practice, internal medicine, or pediatrics, minus the number of physicians in first-year program positions within the subspecialties of internal medicine and pediatrics. We based our calculations on first-year trainees because the number of combined program positions has increased recently; first-year positions better reflect the number of available training slots.

The number of international medical graduates (IMGs) among the generalist trainees was estimated from the proportion of all residents in each of the three primary specialties who were IMGs. Of these generalist IMGs, only those who were U.S. citizens or permanent residents of the United States were assumed to stay in the U.S. physician workforce; the proportion who were citizens or residents varied from 54% for internal medicine residents to 77% for family medicine residents.[17] The number of IMGs who will stay in the U.S. workforce is likely an underestimate since an estimated 1500 foreign physicians were granted J-1 visa waivers in 1995.[18]

We used retirement rates to represent the net attrition from the workforce to account for physicians who return to the workforce after taking time off to pursue other activities. Some strata—for example, female physicians in their 30s—have a negative retirement rate (i.e., increasing the workforce). In addition to the annual attrition, we set an arbitrary upper age limit of 75 for clinically active generalist physicians. This cut-off excluded about 2% of generalist physicians from the current workforce. Our base case did not take into account any further attrition for activities other than patient care (e.g., research, administration).

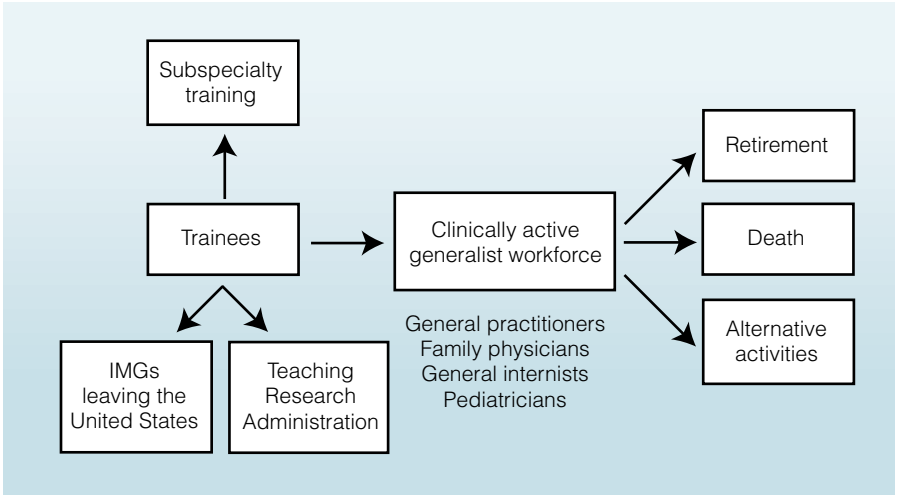

FIGURE 1. Schematic of the physician supply model. IMGs = international medical graduates.

TABLE 1
Key Supply Model Variables*

VARIABLE	DATA SOURCE	KEY ASSUMPTIONS
Current generalist supply	1999 physician master files of the American Medical Association (AMA) and American Osteopathic Association (AOA)	Excludes residents, fellows, and physicians working < 20 hours per week
New generalist physicians	1999–2000 AMA Annual Survey of GME[17]	Assumes that 5% family practice, 7% internal medicine, and 7% pediatric physicians will enter teaching, administration, and research[14]
International medical graduates	1999–2000 AMA Annual Survey of GME[17]	Assumes that only U.S. citizens and permanent residents remain in the U.S. workforce
Death and retirement	Bureau of Health Professions Separation Rates	Assumes an upper age limit of 75 for clinically active generalists
FTE adjustment	Bureau of Health Professions[15]	Average weekly work hours within age- and sex-specific strata
Population	U.S. Bureau of the Census[41]	Middle series projection

**FTE = full-time equivalent; GME = graduate medical education.*

The average age and proportion of women in the physician workforce are increasing. Some have argued that older physicians and female physicians work fewer hours, and as a result the effective supply of physicians in the future will be lower than that predicted by a simple "head count."[19, 20] We accounted for physician work hours to produce an FTE-adjusted supply.

The results of any workforce model are highly dependent on the underlying assumptions used, and differing assumptions represent the major differences between most workforce projections.[21] We designed our workforce model to allow easy access to all the major model parameters. Sensitivity analysis can be performed by using a button, slider, or dial to adjust input variables and thus model projections. For this study, we evaluated the effect of changes in the following: the rates of retirement and/or a mandatory retirement age for all generalist physicians; census projections; the number of IMGs entering the generalist workforce; and the number of GME graduates entering generalist careers.

Benchmarks

We compare our estimates of future generalist supply to four alternative benchmarks: COGME's lower estimate of generalist need (60 per 100,000), COGME's upper estimate of generalist need (80 per 100,000), a region with a relatively low generalist supply (Houston, 54 per 100,000), and a region with a relatively high generalist supply (Philadelphia, 98 per 100,000). The two regional benchmarks were selected to reflect the substantial regional variation in the current supply of generalists; estimates of the generalist supply for benchmark regions were derived from our work with the *Dartmouth Atlas of Health Care*.[22] To account for the disproportionate growth of the elderly population, which consumes greater amounts of health care resources, we adjusted the current regional rates for changes in the age and sex of the future population. Since the actual workforce input is not known by age and sex, we used a modification of the indirect adjustment method. We used the combined 1989 to 1992 National Ambulatory Medical Care Survey to calculate office visit rates to physicians associated with each age and sex stratum within the population.[23] Using projections for the year 2000 as the standard population, we calculated the expected number of physicians given the projected age and sex structure of the future population for each of the regional benchmark supply levels.

Results

In 1999, there were 190,235 clinically active generalist physicians in the United States, which equals 69 per 100,000 residents. Of these, 79,738 were in general or family practice, 72,040 were in general internal medicine, and 38,457 were in pediatrics. Based on the 1999 to 2000 AMA Survey of Graduate Medical Education,[17] we

estimate that 8437 new physicians entered the clinically active generalist workforce that year, assuming no significant physician unemployment. Of these, 3133 were in family medicine, 3066 were in general internal medicine, and 2238 were in pediatrics.

The generalist physician supply is predicted to grow from its current level of 69 physicians per 100,000 population to nearly 88 physicians per 100,000. Adjusting for physician work hours reduces this supply slightly from 88 physicians per 100,000 to 85 FTEs per 100,000.

The results of sensitivity analyses are shown in **Figure 2**. The projected generalist workforce is relatively insensitive to assumptions about retirement rates and changes in assumptions about the number of IMGs entering the generalist workforce. Changes in the population estimates or the number of GME positions have substantial effects on projections in the more distant future but much less effect in the short-term projections.

The relationship between the projected supply and the four benchmarks is shown in **Figure 3**. By the year 2025, our projections of the effective supply of generalists (85 per 100,000) will exceed COGME's upper estimate of generalist requirements (80 per 100,000), resulting in an excess of about 18,000 FTE generalists. Our estimates of the generalist supply by 2025 substantially exceed the Houston benchmark supply (58 per 100,000), which would result in an excess of 91,400 generalists if the Houston rate were applied nationally. Conversely, our estimates of future generalist supply are lower than the Philadelphia supply benchmark (98 per 100,000), which corresponds to a deficit of 76,500 generalists if

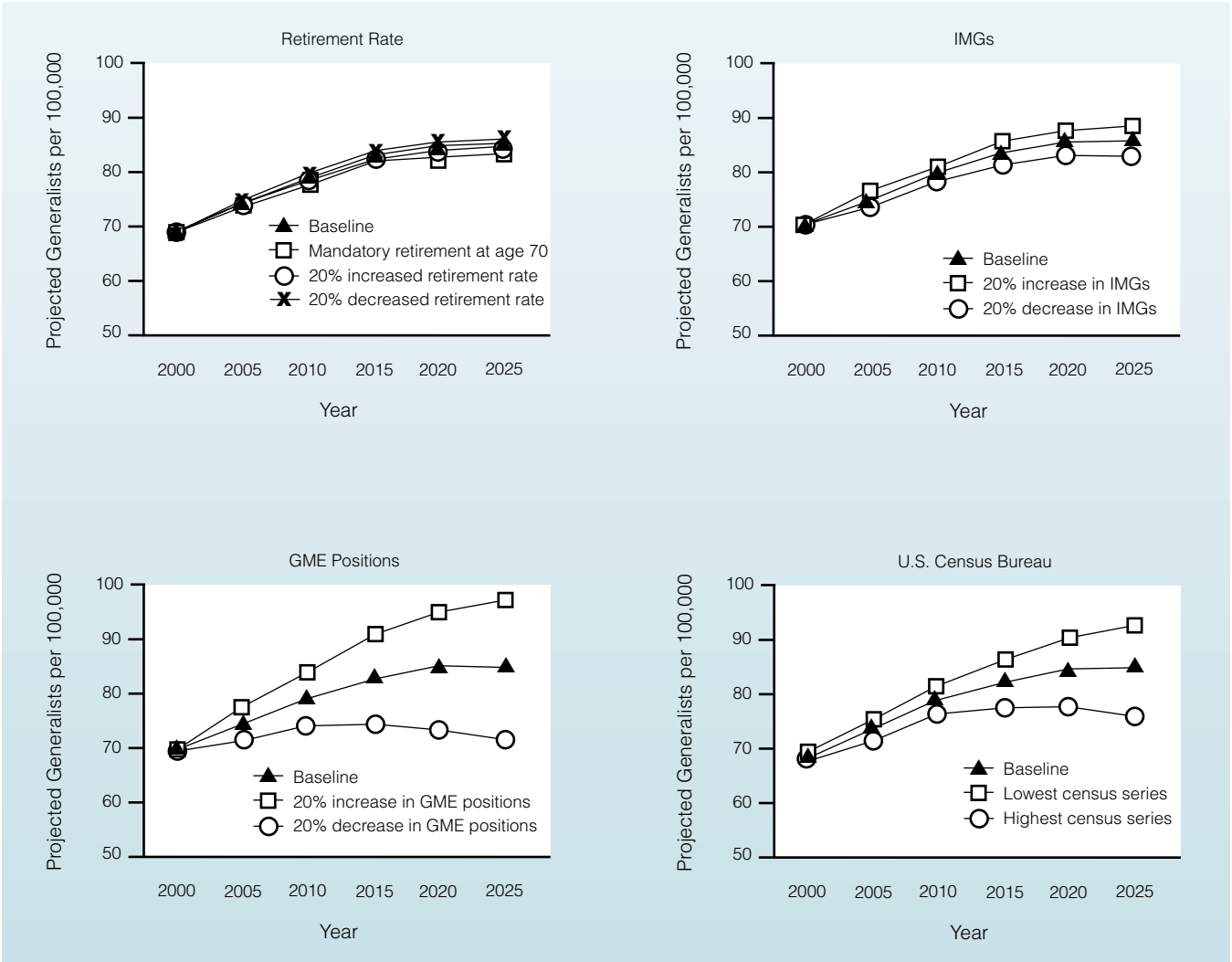

FIGURE 2. Projected supply of generalist physicians to the year 2025 under differing sets of assumptions. Baseline population projections are compared with the effect of a 20% increase or decrease in retirement rates, number of international medical graduates (IMGs) entering the generalist workforce, and number of residency graduates entering the generalist workforce. Baseline population projections using the U.S. Census Bureau's middle series projections are compared with the Bureau's highest and lowest projections. GME = graduate medical education.

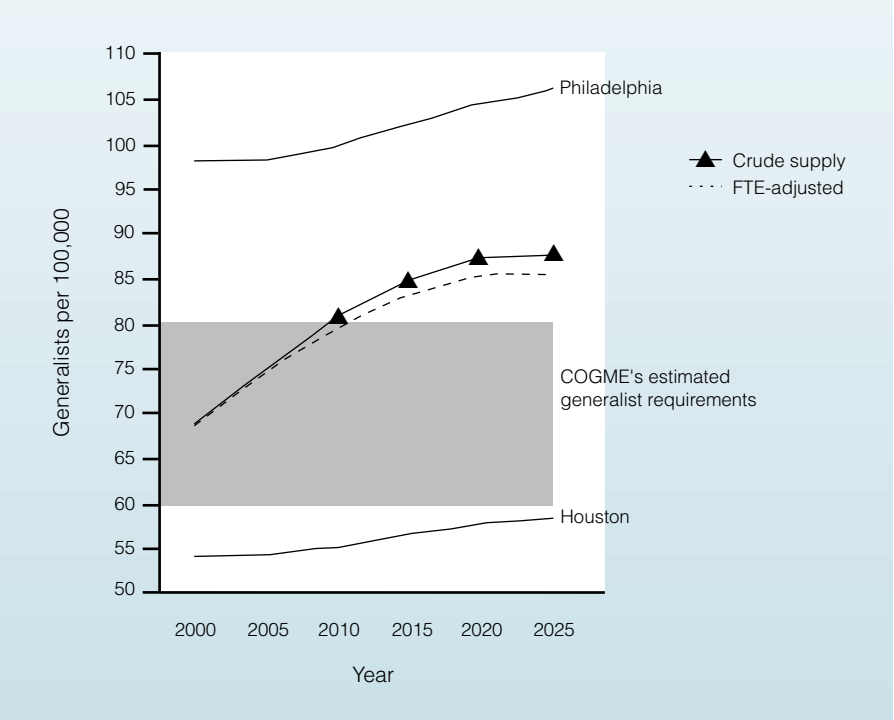

FIGURE 3. Projected supply of generalist physicians to the year 2025 compared with two regional benchmarks and the Council on Graduate Medical Education's range of estimated generalist requirements.

extrapolated nationally. The future supply of generalists compared with other potential regional benchmarks is listed in the **Appendix**.

Discussion

With current levels of GME training, we found that the per capita supply of generalist physicians will increase about 27% by the year 2025. The difference between these projections and the stable generalist supply predicted by COGME is due to a greater number of generalist trainees in the current analysis. COGME projected generalist physician supply in the year 2020 by using the increased GME graduates entering generalist careers and obtained results consistent with ours—262,313 generalist physicians in their model[2] and 286,246 generalist physicians in ours.

Our projections likely underestimate the future generalist workforce for several reasons. As discussed, our assumption that only IMGs who are U.S. citizens or permanent residents will stay in the United States probably causes an underestimate. We also assumed that all trainees who enter subspecialty training would go on to complete that training and would practice as subspecialists. However, the number of trainees who either do not complete their subspecialty training or complete it but practice as a generalist will determine whether the supply of generalists will increase even more than we project.

Compared with some regional benchmarks, our findings suggest that the United States already has an adequate number of generalist physicians and does not need more generalists as is commonly believed. Disagreements about the adequacy of the generalist physician supply are not particularly related to disagreements about projected supply, however, but to generalist requirements. The fundamental question is, "What is the marginal impact of increasing the generalist physician supply on the health and welfare of the population?"[12, 24] Unfortunately, the data are insufficient to answer this question directly, but some interesting comparisons are possible. The projected generalist supply in the year 2025 (85 per 100,000) approaches the current supply of generalists (adjusted for age and sex) in Miami, Florida (92 per 100,000). One can then ask the question, "Does the health of the population of Miami benefit from the increased generalist supply compared with an area of lower supply, like Minneapolis, Minnesota (74 per 100,000)?" In terms of crude outcome measures, such as mortality rate and patient satisfaction, the answer appears to be "no."[12] Furthermore, the greater amount of physician resources available in Miami does not appear to result in better performance on quality indicators related to process of care.[25] If indeed a larger physician workforce does not substantially improve the processes or outcomes of care, then the goal of increasing the generalist workforce is called into question.

If on the other hand, one is convinced that the supply of generalist in Philadelphia has important health benefits and should be our benchmark, then the work-

force implications are profound. In order to achieve a national generalist supply equal to the current supply in Philadelphia, we would need to increase the number of generalist trainees by 50% over the next 10 years to achieve this benchmark level by the year 2025.

Other studies that have used benchmarks to estimate a reasonably sized generalist workforce have concluded that the U.S. supply of generalists is already adequate. Whitcomb[26] used the per capita generalist supply in England, Germany, and Canada as benchmarks for the U.S. workforce and concluded that the United States had a sufficient supply of generalists. Similarly, Weiner[27] used the generalist supply in selected HMOs as a benchmark and found a small surplus. Some authors have questioned the use of international or HMO benchmarks because of the differences in practice patterns, demographics, and patient expectations between other countries and the United States and between HMO enrollees and the general population.[28] One of the advantages of the current analysis is that the use of regional benchmarks adjusted for age and sex of the population avoids some of these methodologic concerns.

One major factor not accounted for in our analysis is the role of nonphysician clinicians, such as nurse practitioners or physician assistants. The major effect of this omission is probably an underestimation of a potential future generalist surplus, since the supply of nurse practitioners and physician assistants is expected to more than double by the year 2015.[29] However, it is possible that a large supply of nonphysician clinicians in a benchmark region like Houston may have allowed those areas to manage with fewer generalist physicians.

Similarly, one might wonder whether the primary care effort of specialty physicians explains why some regions have fairly low supplies of generalists. If this were true, one would expect to see a substitution effect, in which the areas that have many specialists have few generalists and vice versa. However, the opposite is actually the case. There is a strong positive correlation between specialist supply and generalist supply in hospital referral regions, meaning that areas with more specialists also tend to have more generalists.[12]

The COGME and other groups have recommended that the number of physician training positions be substantially decreased and that a greater proportion of the remaining positions should be for generalists. The degree of surplus among specialists appears to be substantially greater than that among generalists,[2, 12, 27, 28] and there is broad consensus that the training of specialists should slow. The current analysis should alert policymakers against emphasizing generalist training while ignoring the difficult and more important task of decreasing the overall number of trainees.

The potential consequences of a growing supply of generalists on the profession and the health of the population are uncertain. Those who examined traditional economic indicators of workforce surplus, such as physician workload, income, and unemployment, have questioned warnings about physician oversupply.[30, 31] Yet, despite the characteristics of health care that make traditional supply-and-demand models inadequate,[32] recent data suggest that primary care physicians may well be facing some traditional economic consequences of oversupply. Both decreasing salaries[33, 34] and increasing difficulty in procuring employment[35, 36] may become increasingly important problems for generalist physicians as the workforce continues to grow.

More important, a growing oversupply of physicians, including generalist physicians, may have negative consequences for the health of the population.[24, 32, 37] We do not mean to imply that inadequate access to basic health care is not an important problem for many Americans. We suggest that barriers to access, rather than an overall inadequate physician supply, may be the dominant causes of underservice and that restructuring the provision of primary care rather than expanding the number of primary care physicians is likely to be the most successful approach to addressing the problem.[38, 39]

If the excess capacity of the physician workforce continues to grow, it may become both necessary and beneficial for physicians to seek opportunities for productive work in nontraditional activities. The complexities of the problems facing the health care system are such that the apparent surplus in physicians may be productively reallocated to important nonclinical care activities. There is an important need for physician contributions in clinical research,[40] particularly primary care research.[39] The rapidly changing knowledge base of medical science creates an important need for physicians to provide and receive life-long learning, to develop protocols for clinical care, and to help build the infrastructure for quality in the health care system.[41] Traditional fee-for-service reimbursement has made it exceedingly difficult to allocate professional time to these alternative, nonreimbursable activities. The growing oversupply of physicians increases the need to evaluate not only those health care reforms that will slow the growth of the physician workforce but also those that will allow for the rational allocation of physician resources in ways that maximize the benefits for the health of the population.

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Take-Home Points

- **Although previous analyses suggest that the United States has too few (or just enough) generalists, recent trends suggest that more physicians are entering primary care.**
- **We developed an interactive workforce model to estimate the future generalist supply relative to different estimates of future generalist requirements.**
- **The supply of generalist physicians will likely grow substantially to 85 generalists per 100,000 population by 2025.**
- **Future generalist supply will soon exceed the Council on Graduate Medical Education's upper estimate of generalist requirements, as well as most regional benchmarks.**
- **Workforce planners need to consider the size of the generalist workforce as well as the relative mix of generalists and specialists.**

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APPENDIX

Projected Generalist Workforce in the Year 2025 Compared with the Age- and Sex- Adjusted Supply of Generalists in the 25 Largest Hospital Referral Regions (HRRs) and the Largest HRR in Each State

STATE	HOSPITAL REFERRAL REGION	PROJECTED GENERALIST SUPPLY IN 2025 COMPARED WITH CURRENT HRR PER CAPITA SUPPLY		
		1999 GENERALIST PER 100,000	EXCESS	(DEFICIT)
CA	San Bernardino	47	116,919	
TX	Houston	54	91,400	
NV	Las Vegas	55	87,755	
UT	Salt Lake City	55	87,755	
MS	Jackson	58	76,818	
TX	Dallas	58	76,818	
CA	San Diego	61	65,882	
GA	Atlanta	61	65,882	
ID	Boise	61	65,882	
SC	Columbia	61	65,882	
TN	Nashville	61	65,882	
FL	Orlando	62	62,236	
NC	Charlotte	64	54,945	
OH	Columbus	64	54,945	
AL	Birmingham	65	51,300	
AR	Little Rock	65	51,300	
AZ	Phoenix	65	51,300	
IN	Indianapolis	65	51,300	
OK	Oklahoma City	65	51,300	
KY	Louisville	66	47,654	
LA	New Orleans	66	47,654	
NE	Omaha	66	47,654	
CA	Orange County	67	44,009	
CA	Los Angeles	68	40,363	
KS	Wichita	69	36,718	
MO	St. Louis	69	36,718	
MT	Billings	69	36,718	
IA	Des Moines	71	29,427	
ND	Fargo	71	29,427	
MN	Moorhead	71	29,427	
WI	Milwaukee	71	29,427	
MI	Detroit	72	25,781	
NH	Manchester	72	25,781	
PA	Pittsburgh	73	22,136	
SD	Sioux Falls	73	22,136	
VA	Arlington	73	22,136	
CO	Denver	74	18,490	
DE	Wilmington	74	18,490	
MN	Minneapolis	74	18,490	
WV	Charleston	74	18,490	
AK	Anchorage	75	14,845	
OR	Portland	75	14,845	
CT	Hartford	76	11,199	
NM	Albuquerque	78	3908	
HI	Honolulu	79	263	
NJ	Camden	79	263	
WY	Casper	80	—	–3383
RI	Providence	81	—	–7028
VT	Burlington	83	—	–14,319
MA	Boston	85	—	–21,610
WA	Seattle	86	—	–25,256
MD	Baltimore	87	—	–28,901
ME	Portland	87	—	–28,901
FL	Miami	92	—	–47,129
IL	Chicago	95	—	–58,065
NY	New York	96	—	–61,711
PA	Philadelphia	98	—	–69,002
DC	Washington	99	—	–72,647
NY	East Long Island	99	—	–72,647