The General Pediatrician: Projecting Future Workforce Supply and Requirements

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The General Pediatrician: Projecting Future Workforce Supply and Requirements

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ABSTRACT. *Objective.* **Trends affecting both the supply and requirements of child health physicians call into question earlier assessments about the adequacy of the general pediatric workforce. To understand the effects of these trends over time, we developed a model that projects the national supply of practicing general pediatricians over a 20-year period (2000–2020).**

Design. **The model incorporates current data on the practicing pediatrician workforce in the United States, pediatric residency graduates entering general pediatrics, and gender- and age-specific measures of productivity and of retirement or death. In addition, it accounts for projected changes in the size and ethnicity of the child population and the proportion of children currently receiving outpatient care from family practitioners.**

Main Outcome Measures. **Time trend of the supply of general pediatricians and the number of children in the population per practicing pediatrician.**

Results. **The baseline model projects that the number of general pediatricians will expand by nearly 25 000 by the year 2020, a 64% increase from the year 2000, whereas the child population is projected to expand by only 9%. The increase was robust to sensitivity analyses measuring the impact of each of the model's variables on the future supply of pediatricians. In all probable scenarios, the general pediatrician workforce will expand significantly more rapidly than the child population. In addition, the trend in pediatrics is in marked contrast to the other primary care specialties.**

Conclusions. **Despite a number of factors that might attenuate the growth of the general pediatrician workforce, none seems sufficient to slow its expansion in relation to the pediatric population. To maintain practice volumes comparable to today, pediatricians of the future may need to provide expanded services to the children currently under their care, expand their patient population to include young adults, and/or compete for a greater share of children currently cared for by nonpediatricians.** *Pediatrics* **2004;113:435–442;** ***workforce, child/children, primary care, access, graduate medical education.***

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ABBREVIATIONS. AAP, American Academy of Pediatrics; GME, graduate medical education; AMA, American Medical Association; AOA, American Osteopathic Association; IMG, international medical graduate; FTE, full-time equivalent; NAMCS, National Ambulatory Medical Care Survey.

In 1980, the Graduate Medical Education National Advisory Committee predicted a surplus of general pediatricians by the year 2000, sparking an ongoing debate about the nation's requirements for pediatricians. In the past 2 decades, a number of trends affecting workforce supply and the child population have altered the debate but have also left it unresolved.

Varied opinions about the adequacy of the workforce arise from equally varied assumptions about the factors impacting the workforce. For instance, market forces in the early 1990s were perceived to favor primary care, leading many experts to conclude that primary care physicians, including general pediatricians, were in undersupply. In turn, the number of residents in general pediatrics increased by >10% in the past decade.[1,2] Not surprisingly, this has resulted in an expanding supply of pediatricians, leading the American Academy of Pediatrics (AAP) to conclude in 1998 that the aggregate workforce was adequate.[3] However, others point out that the growth in supply may have been attenuated by a decline in physician productivity, with longer patient visits[4] and more pediatricians working part time to care for their own families.[5]

In some settings, general pediatricians face competition from family practitioners[6] and midlevel providers[7–9] at the same time that more of the care for

newborns and inpatients has been delegated to neonatologists[10] and hospitalists, respectively. On the other hand, general pediatricians today care for chronically ill children with increasingly complex and time-consuming needs for medical care and coordination of care. Greater racial and ethnic diversity, particularly in the context of unmet social needs, may lead to greater requirements for pediatric health care.

Public policy and perceived job opportunities also influence the workforce. The primary care specialties of pediatrics, general internal medicine, and family medicine often are grouped together in such considerations. For example, proposals to decrease graduate medical education (GME) positions to more closely match the output of US medical schools were advanced in the early 1990s in conjunction with efforts to increase interest in primary care among US medical graduates.[11] The current practice environment once again may be turning physicians away from practices in primary care.[12] Despite convention, it is unclear whether it is appropriate to presume that each of the primary care fields will be impacted equally. The impact on the general pediatrician workforce of fewer pediatric residency positions, or fewer pediatric residents choosing practices in primary care, has not been systematically assessed or compared with other primary care specialties. Whether these potential shifts will take place is, once again, a matter of opinion.

With the countervailing impacts of these multiple variables and uncertainty about their future trends, it is not surprising that there is disagreement about the future supply and requirements for general pediatricians. Despite the many and varied opinions, little child health workforce research exists in the literature. In particular, there have been no recent models forecasting the general pediatrician workforce. Furthermore, the assumptions used in previous models[3,13,14] have not been accessible to pediatricians or policy analysts and have not been consistently accompanied by sensitivity analysis. Sensitivity analyses examine the impact of each assumption to clarify its effect on the projected workforce.

This article presents a workforce model based on current data to project physician supply and its relative adequacy by using input variables that are easily modified for sensitivity analysis. The model helps to answer fundamental questions facing all specialties, applied in this analysis to general pediatrics: Is the future supply likely to be balanced with the requirements of the population? How might changes in physician and population characteristics, and in market forces, alter the balance of supply and requirements? Are all primary care specialties facing similar fates?

METHODS

Physician-Supply Model

Broadly speaking, the future general pediatrician supply represents a dynamic equilibrium among the current supply, the annual number of new residency graduates entering the workforce, and the number of general pediatricians who leave the workforce through death, retirement, or the pursuit of alternative activities such as teaching, administration, or research. Using the schematic depicted in Fig 1, we designed a workforce model using Stella software (High Performance Systems Inc, Lebanon, NH). The key model variables, data sources, and key assumptions are summarized in Table 1. General pediatricians were defined through the American Medical Association/American Osteopathic Association (AOA) Master Files as clinically active physicians with a primary self-designation in general pediatrics, excluding residents and fellows. We excluded physicians who reported that they worked the majority of the time in medical teaching, administration, or research. We also excluded part-time physicians working <20 hours per week in clinical practice.

The number of graduating trainees entering the general pediatric workforce was calculated from the 1999–2000 AMA Annual Survey of Graduate Medical Education (see appendix II in ref 2). Generalist trainees were defined as those physicians completing residency in pediatrics, minus the number in program year 1

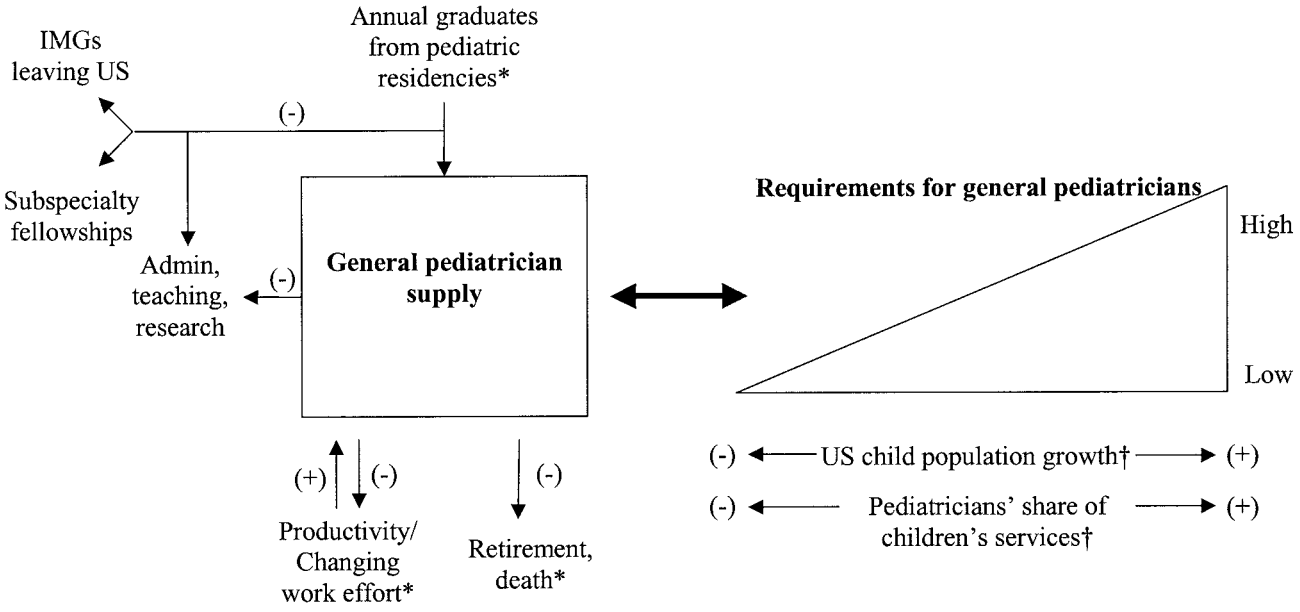


Fig 1. Overview of the general pediatrician workforce model. * Adjusted for physician age & gender; † Utilization of physician services was adjusted for projected age, gender, and ethnicity of child population.

TABLE 1. Key Supply Model Variables

Variable	Data Source	Key Assumptions in Baseline Model
Current general pediatrician supply	1999 AMA (January 1, 1999) and AOA (June 1, 1999) Physician Master Files	Excludes residents, fellows, and <20 hours per week clinical practice
New general pediatricians	1999–2000 AMA Annual Survey of Graduate Medical Education[2]	Assumes 6% of general pediatrics enter teaching, administration, and research[35]
IMGs	1999–2000 AMA Annual Survey of Graduate Medical Education[2]	Assumes US citizens and permanent residents remain in US workforce and 75% of foreign IMGs remain[16]
Death and retirement	Bureau of Health Professions Separation Rates (1995)	Assumes upper age limit of 75 years for clinically active generalists
FTE adjustment	AAP (2000)	Average weekly work hours within age- and gender-specific strata
Population	US Bureau of Census (2000)	Middle series projection
Market share	NAMCS (1999)	% visits to pediatricians by patient age: 83% 0–4 years, 72% 5–9 years, 57% 10–14 yrs, and 39% ≥15 yrs

positions in pediatric subspecialties. Because of the recent growth in internal medicine/pediatrics residencies, we included graduates of these programs, discounting the estimated number entering nongeneralist positions[15] and then dividing the remaining number by 2 to reflect the estimated clinical time these dually trained physicians devote to pediatric care.

The number of international medical graduates (IMGs) among graduating pediatric residents was estimated from data specifying first-year pediatric residents who were IMGs.[2] Of these IMGs completing pediatric training, all of those who were US citizens or permanent residents (53% of IMGs total) were assumed to stay in the US physician workforce, whereas 25% of noncitizen IMGs (47% of IMGs total) were excluded from the US workforce, an estimate giving consideration to those who will return to their home countries after completing graduate medical training.[16]

We used retirement rates compiled by the Bureau of Health Professions (Bureau of Health Professions, unpublished data, 1995). These rates represent the annual net attrition from the physician workforce by gender and decade of life for contiguous years from 1990 to 1995. These rates can actually be negative within some strata, accounting for those who return to the workforce after time off pursuing other activities, eg, child rearing. In addition to the annual attrition, we set an arbitrary upper age limit of 75 years for clinically active general pediatricians. This cutoff excludes ~2% of generalist physicians from the current workforce.

The demographics of the pediatric workforce are changing. Similar to all other physician groups, the average age of pediatricians is increasing. Women make up ~65% of pediatric residents and are more likely than their male counterparts to enter the general pediatrics workforce. Older physicians and female physicians work fewer hours, and as a result, the effective supply of physicians will be lower than predicted by a simple "head count." We accounted for these concerns by using gender- and age-specific work hours for pediatricians[17] to produce a full-time equivalent (FTE)-adjusted supply.

We calculated the current proportions of outpatient office visits by children to pediatricians in 4 age strata (0–4, 5–9, 10–14, and 15–19 years) using data from the 1999 National Ambulatory Medical Care Survey (NAMCS).[18] Our denominator was all office visits by children to family practitioners and pediatricians, the 2 primary care groups with the greatest overlapping interests in the care of children. Because NAMCS is ostensibly a sample of physician visits, visits to nonphysician providers such as physician assistants and nurse practitioners may not be reliable and thus were not considered.

Benchmarks

The baseline value for the number of children per pediatrician was calculated by using the current active workforce and the US child population in the year 2000. We refer to this baseline value as the benchmark. This allows us to compare changes over time to a recent, factual supply of pediatricians and children. Also, this benchmark conforms to the AAP workforce statement in 1998, which suggested that the present aggregate number of general pediatricians in relation to the child population was adequate.

The results of any workforce-projection model depend on its underlying assumptions. We designed our workforce model such that all major model parameters are transparent and modifiable, allowing us to perform and report sensitivity analyses on each variable in the model. Thus, our projections incorporate sensitivity analyses of each of the individual variables in the model. Each sensitivity analysis modifies 1 variable in the model while holding all other variables constant to ascertain the impact of that variable on the projected workforce. Others can test our model by using their own assumptions and predictions of trends by going to www.dartmouthatlas.org/workforce_model.php.

RESULTS

Unadjusted Model

In 2000, there were 38 457 general pediatricians in practice in the United States. Each year, an additional 1911 residency graduates enter practice in general pediatrics. After accounting for attrition of practicing pediatricians through retirement and death, the overall number of general pediatricians will increase by one third over the next 10 years to 51 612. By the year 2020, we estimate that there will >61 800 general pediatricians in practice in the United States, representing 64% more than today (see Table 2). These calculations use current estimates of retirement rates for pediatricians and do not account for gender- or age-related differences in productivity.

Over the same period, the US Census Bureau estimates that the child population will grow only 9.3%. From today's benchmark of 1 general pediatrician for every 2040 children (or 49 pediatricians per 100 000 children), in 2010 there will be 1 pediatrician for every 1572 children (64 per 100 000), and in 2020, 1 pediatrician per 1386 children (72 per 100 000). These unadjusted ratios were calculated by using the US Census Bureau's middle series estimates and include the entire projected child population. Any barriers to access to medical care would result in fewer children per pediatrician at each projected time point.

Pediatrician Age- and Gender-Adjusted Model

The numbers of general pediatricians were adjusted for differences in age- and gender-related productivity (Table 2). This caused an effective decrease in the number of FTE general pediatricians by ~1110 general pediatricians in 10 years and 2230 in 20 years. Despite these adjustments, the workforce of general pediatricians is still projected to grow 33% by 2010 and 58% by 2020. This is equivalent to 1 FTE pedia-

TABLE 2. Unadjusted and FTE-Adjusted Models of General Pediatrician Supply 2000–2020

	Year	No. of Pediatricians	Change From 2000	Children per Pediatrician	Pediatricians per 100 000 Children
Unadjusted	2000	38 457	0	2040	49
	2005	45 250	6793	1767	57
	2010	51 612	13 155	1572	64
	2015	57 215	18 758	1444	69
	2020	61 846	23 389	1386	72
FTE adjusted*	2000	38 457	0	2040	49
	2005	44 748	6291	1787	56
	2010	50 498	12 041	1606	62
	2015	55 511	17 054	1488	67
	2020	59 619	21 162	1438	70

* Adjusted for age- and gender-specific variation in physician productivity to create an FTE measure.

trician for every 1606 children by 2010 and for every 1438 children by 2020.

Modeling Changes in GME

From 1997 through 2003, the number of positions offered in categorical pediatric residencies expanded consistently, averaging slightly <1% per year. Future residency growth at this rate will expand the workforce by an additional 983 FTE general pediatricians above the baseline by 2010 and an additional 3806 by 2020 (see Fig 2 and Table 3). Comparing this model to the baseline adjusted model, there would be 30 fewer children per pediatrician in 10 years (1576 children per pediatrician) and 86 fewer children per pediatrician in 20 years (1352).

We also modeled the impact over time of proposals to restrict expansion of residency positions by limiting the number of GME positions to 110% of US medical graduates. Within 10 years, this would decrease the number of general pediatricians by 3107, as compared with the baseline adjusted model, and by 5989 at 20 years. This scenario results in 1 pediatrician per 1711 and 1598 children in 10 and 20 years, respectively. Despite significant reductions in GME positions, these ratios still reflect a workforce that is expanding faster than the child population.

Even if 50% fewer residents entered pediatrics training annually or there occurred an equivalent decrease among pediatric residents selecting careers in general pediatrics, the workforce would be sufficient to maintain the benchmark per capita supply of pediatricians over the next 20 years. This scenario projects 2096 children per pediatrician in 2020, which is nearly identical to the ratio in the year 2000, which was deemed to be adequate by the AAP (Table 3).

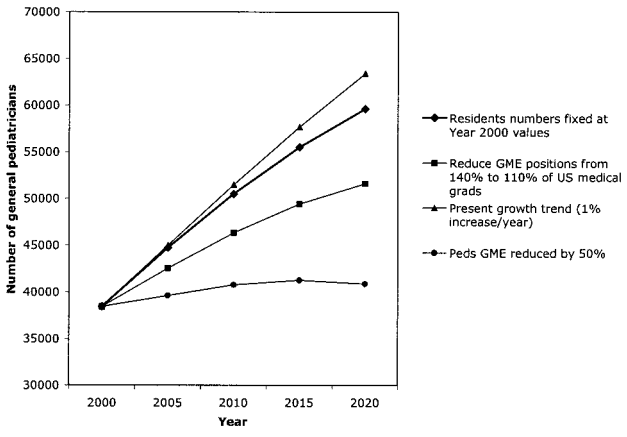


Fig 2. Effect of GME variation on the general pediatrician workforce.

Changes in Pediatricians' Retirement Rates and Productivity

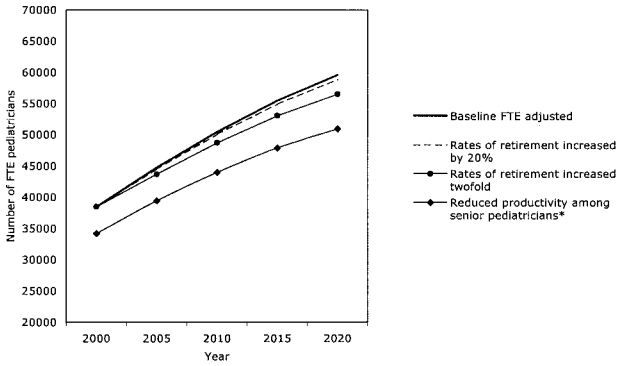
Factors such as decreased career satisfaction[19] or changing lifestyle priorities could lead general pediatricians to exit the workforce more readily. Pediatricians may choose to retire earlier or may scale back their practices, thereby decreasing their clinical productivity. Conversely, factors such as a slumping economy may force delayed retirement. For our sensitivity analyses on effects of retirement, we created 2 models with elevated rates of retirement and one in which these rates decrease. First, practicing pediatricians were modeled to retire at a 20% higher rate than baseline age- and gender-specific rates. This has a modest effect, with ~400 fewer general pediatricians by 2010 and slightly ~700 fewer pediatricians by 2020 (as shown in Fig 3). Second, with a doubling of retirement rates, ~1750 fewer general pediatricians will be in practice by 2010 and 3070 fewer by 2020. However, it should be noted that, even in the more extreme second scenario, growth in the general pediatrician workforce still significantly outpaces child population growth (Table 3). The workforce expands beyond benchmark ratios, with 1 pediatrician per 1645 children in 2010 and 1 per 1487 in 2020. If pediatricians were to retire at a 20% lower rate across age and gender strata, the per capita workforce is projected to be nearly 30% greater in number than the benchmark in 2010 and 50% in 2020, leaving 1593 and 1420 children per pediatrician in 2010 and 2020, respectively.

The same factors that could lead to early retirement might instead lead to a reduction in productivity through decreased patient care hours. Our analysis of the impact of reduced patient care hours on the effective workforce incorporated a progressively diminished work effort among mid- and late-career pediatricians (Fig 3 and Table 3). In this sensitivity analysis, general pediatricians from 50 to 59, 60 to 69, and 70 to 75 years were assumed to decrease their productivity by 30%, 40%, and 50% from baseline, respectively. The subsequent reduction in the FTE-adjusted workforce would be insufficient to reverse current trends. In this scenario, there would be 4330

TABLE 3. Sensitivity Analyses of Determinants of Workforce Supply

Supply Analyses (All FTE Adjusted)	No. of Pediatricians			No. of Children per Pediatrician (Middle Series Population Estimate)		
	2000	2010	2020	2000	2010	2020
Baseline trends	38 457	50 498	59 619	2040	1606	1438
GME-related						
Current trend (annual growth at 1%)	38 457	51 481	63 425	2040	1576	1352
Limits on IMGs*	38 457	47 391	53 630	2040	1711	1598
Entry into pediatric residencies reduced by 50%	38 457	40 790	40 902	2040	1988	2096
Work effort						
20% decreased retirement rates†	38 457	50 914	60 382	2040	1593	1420
20% increased retirement rates†	38 457	50 106	58 913	2040	1619	1455
Doubling of retirement rates†	38 457	48 742	56 546	2040	1664	1516
Productivity reduced in mid to late career‡	38 457	44 008	50 979	2040	1843	1682

* Represents a reduction in the overall number of GME positions to 110% of the number of US medical graduates entering pediatrics in 2000.
† Retirement rates modified within all age- and gender-specific strata.
‡ Productivity reduced from baseline levels by 30%, 40%, and 50% for pediatricians aged 50–59, 60–69, and 70–75 years, respectively.



*Pediatricians in their 50's, 60's and 70's were modeled with a decreased productivity of 30, 40, and 50% respectively, to simulate scaling back clinical practice among mid-career and senior pediatricians.

Fig 3. Impact of retirement and productivity on growth of the general pediatrician workforce.

more FTE general pediatricians in 2010 than needed to maintain the per capita benchmark of year 2000, with an excess of >9000 FTE pediatricians by 2020. This translates to 1 FTE pediatrician per 1843 children in 2010 and 1 per 1682 in 2020.

Range of Child Population Estimates

We conducted sensitivity analyses for the full range of child population estimates provided by the US Census Bureau. The baseline model used the middle population estimate; the number of children per pediatrician would be 1606 in 10 years and 1438 in 20 years. The low population estimate projects the lower bounds of population growth, resulting in a greater disparity between the child population and the pediatrician workforce. Using this estimate, there will be 1536 children per pediatrician in 10 years and 1270 in 20 years. With the high population estimate, the general pediatrician workforce would still increase 25% faster than the child population by 2020, resulting in 1694 children per pediatrician in 2010 and 1659 in 2020 (Table 4).

We also adjusted for projected shifts in age, gender, and race/ethnic make-up of the child population over time, which can alter the relative requirement for health care services due to varied utilization. Using NAMCS data on office-based utilization rates by age, gender, and race/ethnicity,[18] demographic shifts across these parameters from 2000 to 2020 may require an additional 525 FTE general pediatricians above the baseline model by 2010. By 2020, an additional 1770 FTE general pediatricians may be needed. Still, in 2010 the number of FTE pediatricians is projected to expand by 10 295 beyond those needed to maintain the benchmark per capita ratio and by 15 917 in 2020. Sensitivity analyses corresponding to the various population projections are shown in Table 4.

Market Share Analyses

Presently, pediatricians see 83% of all primary care outpatient office visits by children 0 to 4 years old, 72% of visits by children 5 to 9 years old, 57% of visits by children 10 to 14 years old, and 39% of visits by children 15 to 19 years old (unpublished data using the 1999 NAMCS). If this baseline market share were to shift, the relative requirements for pediatrician services would change, impacting the number of general pediatricians needed. We performed a range of analyses on market share, ranging from a loss of 10% to 50% of the present share of patients in each age category to a growth of 10% to 50% of the untapped market of physician visits, holding other variables constant. We also considered the effect of pediatricians capturing 100% of children's visits. Results of a subset of these analyses are shown in Table 4. Even with 100% of the market across all age groups, there will still be more general pediatricians in practice than are necessary to maintain pediatrician-to-child ratios at current levels.

Comparative Analyses: Other Primary Care Specialties

Finally, we projected growth of the general pediatrician workforce alongside that of general internists and family practitioners, adjusting for shifts in demographics brought about by the aging of the population. As depicted in Fig 4, the general pediatrician workforce will expand at a substantially higher rate relative to its target population than the other primary care disciplines, estimated at 44% over the next 20 years as compared with 7% within family

TABLE 4. Sensitivity Analyses of Variables Impacting Requirements for Health Care Services

Scenarios of Altered Requirements		Additional Pediatricians Needed*		Excess No. of Pediatricians† Beyond Needs*	
		2000 (Base Year)	2010	2020	2000 (Base Year)	2010	2020
Baseline Projected Growth of Child Population		Referent			10 820	17 686
Alternate child population projections	Low estimate		(−1725)	(−4908)		12 545	22 594
	High estimate		2169	6456		8 651	11 230
	Adjusted for demographic shift		525	1769		10 295	15 917
Market share: proportion of children's outpatient visits that are with general pediatricians	Decreased by 50% among older children (ages >10 y)		(−2798)	(−2957)		13 618	20 643
	Decreased by 20% below current share (ages 0–19 y)		(−5717)	(−6042)		16 537	23 728
	Increased by 50% above current share (ages 0–19 y)		5791	6121		5029	11 565
	100% of visits occur with pediatricians (ages 0–19 y)		11 274	11 915		(−454)	5 771

* "Need" implies the number required to maintain stable (year 2000) child-to-pediatrician ratios when accounting for change in demand.
† Supply was determined by using a baseline model of FTE-adjusted pediatrician workforce growth over time.

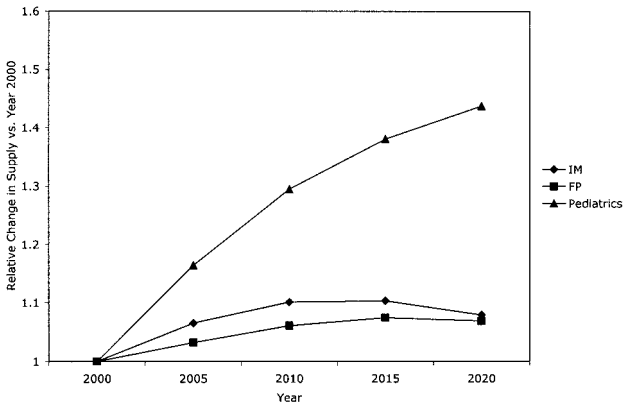


Fig 4. Projected per capita supply for primary care physicians, adjusted for changing population demographics.

medicine and 8% in internal medicine. A shift in population demographics, with an expanding elderly population, is the primary driver of the disparity between pediatrics and the other primary care specialties.

DISCUSSION

Despite a number of factors that might attenuate the growth of the general pediatrician workforce, none appears sufficient to slow its expansion in relation to the pediatric population. Within the primary care disciplines, the rate of expansion of the general pediatrician workforce is uniquely high. Concerns about a shortage of general pediatricians seem unfounded. Instead, there may be substantial pressure to change professional activities to accommodate the growth of the supply of general pediatricians.

Recent reports from residency graduates entering practices in general pediatrics suggest that the employment opportunities for general pediatricians may be tightening.[20] Thus, recent declines in US medical graduates' interest in entering pediatric residencies[21] and primary care interest among pediatric residents[20] may be a reflection of a shrinking market more than a cause for concern about future shortages. Indeed, we predict that declining primary care interest among trainees, declining physician productivity, or increased utilization of services are unlikely to lead to an aggregate shortage of general pediatricians.

On the contrary, certain practice trends in pediatrics may exacerbate the effects of a growing supply of general pediatricians. Without question, extraordinary gains in public health have been afforded by vaccinations. Because less physician time is required to provide vaccinations than to manage the acute and chronic morbidities of the associated conditions, these gains may have the added effect of diminishing the need for pediatric services. In addition, the expansion of the supply of neonatologists and hospitalists will lead to fewer hospitalized patients and newborns for general pediatricians to care for. Although this change largely shifts work from 1 pediatric specialty to another, the narrowing scope of general pediatric practice is driven by a desire to improve practice efficiency. Similarly, the growing role of pediatric nurse practitioners may further attenuate the need for pediatricians.

Previous projections of the pediatric workforce have been complex and often vague in describing the methodology used to forecast the supply and relative requirements for general pediatricians.[3,13,14,22] Despite >20 years of discussion about the supply of pediatricians as part of the larger workforce debate, no testable and modifiable model has been published specific to the pediatric workforce. The model used in this study represents a straightforward, systematic approach to projecting the future general pediatrician supply, taking into account a variety of factors that influence supply, and considering a subset of determinants of relative requirements for pediatricians as well. Regardless of methodology, there is general agreement that the presence of <1500 children in the population for every full-time practicing general pediatrician represents an ample pediatrician supply. Because some children lack access to medical care and others receive their care from practitioners not included in our analyses, there are effectively fewer children seeking care from pediatricians than our model implies.

Despite its strengths, the model has certain limita-

tions. First, as a national supply model, it does not take into account the significant regional variation in general pediatrician supply across the United States.[23,24] It is intriguing that there is currently more than a threefold variation in per capita pediatrician supply across communities, a far greater difference than any anticipated changes in the aggregate supply of pediatricians. Furthermore, previous experience has shown that growing the supply in aggregate does not reduce disparities in regional supply.[25]

Our model (and all previous models) fails to incorporate racial and ethnic variations in the general pediatrician workforce, although earlier studies suggest that insufficient underrepresented minorities are entering pediatrics.[26] Diversity in the workforce is most likely to be an important factor in determining access for certain populations, rather than a significant source of variation in the aggregate supply of physicians.

Data sources used in workforce projections must be scrutinized. Physician specialty and the baseline active workforce were identified via the AMA/AOA Physician Master Files. Inaccuracies in this source should not bias our model, because our analyses focused on the relative growth of the workforce over time. The variables determining these trends were not linked to any master-file variables. Age- and gender-specific productivity of physicians was determined from national surveys of AAP members, which may not be generalizable to nonmembers. The data used for retirement rates are somewhat dated (1990–1995), but, to the best of our knowledge, this information represents the best data source available on retirement rates of physicians. Additionally, the rates were subjected to sensitivity analyses with little impact on our conclusions. Because no model can accurately predict all variables related to workforce growth, the accuracy of any projection model becomes increasingly suspect as it makes predictions at more distant time points. For this reason, we limited the forecast to 20 years. Our sensitivity analyses confirm that our predictions were robust within the time frame reported.

If policy makers were to successfully enact a system of universal access to medical care for children including adequate reimbursement for services rendered, new measures of utilization and productivity should be incorporated into the model. Similarly, if the millions of nonurgent acute care visits by children to emergency departments[27] were shifted to the primary care office setting, new analyses should be conducted. However, recent trends in emergency department use suggest that an increasing proportion of care is being sought there rather than less.[28]

Should universal coverage for children be achieved, the impact on requirements for pediatricians is unlikely to be marked. Using the most-current data, ~15% of children <18 years are uninsured.[29] Previous research has shown that primary care utilization among previously uninsured populations increases between 25% and 30%.[30,31] Thus, overall requirements for primary care services could be expected to increase by ~5%, with this increased utilization predominantly divided between general pediatricians and family practitioners. Recent studies on utilization from the State Children's Health Insurance Program do not suggest an excessive pent-up demand among the uninsured.[32,33]

Historically, the field of pediatrics has redefined itself as the pattern of childhood disease has shifted. For instance, at its inception, the field of pediatrics was comprised of physicians with a special interest in the unique nutritional needs of infants. With the advent of pasteurization as well as mass-produced infant formula, pediatricians shifted their focus, placing a higher premium on prevention and well-child care, a move motivated in part by declining morbidity and mortality among children noted as early as the mid-1930s.[34] An increasing prevalence of behavioral diagnoses in children of all ages and complex chronic illness among children surviving formerly fatal conditions represent 2 recent examples of the changing nature of pediatric practice. Without question, the epidemiology of childhood diseases remains a primary driver of the evolution of the practice of general pediatrics.

However, the influence of shifts in childhood illness may become secondary in the future. Instead, a workforce expansion that, in all likely scenarios, dramatically exceeds that of the child population may transform the professional lives of pediatricians. Those wishing to remain fully employed by today's standards will have limited options: they will need to provide significantly more medical services to the fewer children under their care, expand their patient population to include more young adults, or attract a significantly greater proportion of children's visits currently going to nonpediatricians, including greater penetration of traditionally underserved markets. Alternatively, general pediatricians may be faced with less work and less income and may need to find alternative outlets for their professional attention and skills. Some have proposed a role for pediatricians as providers for the expanding population of geriatric patients.[34] A less revolutionary shift might include an expanded role as political, social, educational, and/or public health advocates of children. The changes imposed by ongoing expansion of the workforce could increasingly challenge the viability of the traditional role of the general pediatrician but may also provide new opportunities for the profession to serve the diverse needs of children.

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