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Final Report of the FOPE II Pediatric Workforce Workgroup

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ABSTRACT. From the inception of the Future of Pediatric Education II (FOPE II) Project, it was acknowledged that any discussion of pediatric education would need to encompass a review of the pediatric workforce. This report looks at the current trends in pediatric workforce and draws some conclusions regarding future growth and composition. In addition to looking at demographic trends, ranging from geography to gender, the report explores influences including managed care, telemedicine, and others. Models for determining workforce needs are described and scenarios and projections are discussed. *Pediatrics* 2000;106(suppl):1245-1255; *pediatric workforce*.

ABBREVIATIONS. FOPE, Future of Pediatric Education; IMG, international medical graduate; AMA, American Medical Association; HMO, health maintenance organization; PNP, pediatric nurse practitioner; NAPNAP, National Association of Pediatric Nurse Associates and Practitioners; PA, physician assistant; AAPA, American Academy of Physician Assistants; COGME, Council on Graduate Medical Education; PCPR, pediatrician-to-child population ratio; GMENAC, Graduate Medical Education National Advisory Committee; ABP, American Board of Pediatrics; Med/Peds, internal medicine and pediatrics; URM, underrepresented minorities; PGY, postgraduate year; AMG, American medical schools graduate; NIH, National Institutes of Health.

The 1978 Future of Pediatric Education (FOPE) I Report, written approximately 22 years ago, addressed many issues that remain cogent. However, several issues vital to the 21st century of pediatrics were not considered. One major difference, which reflects the substantial influx of women pediatricians, is that the title of this FOPE II Report has been changed from manpower to workforce.

The first 4 areas of the following, included in the 1978 FOPE I Report on Manpower, remain important and have been updated. The remainder were not addressed but are included in this report.

1. Pediatricians, increasingly practicing in groups, must be prepared to work as part of a health team. In the future, solo practice probably will be rare.

2. It is vital that pediatricians collaborate with family practitioners and nonphysician health care providers in training health professionals who will care for children and in the direct provision of care of children. These providers are and will be major components of the child and adolescent care team.
3. Although mention was made of the potential influence of women and foreign (international) medical graduates (IMGs) on the workforce, discussion of these issues has been expanded because of the substantially greater numbers of IMGs currently practicing or in training.
4. The FOPE I Report recommended that at least the numbers of graduates from pediatric residencies at that time should be maintained. A number of changes over the past 2 decades have been considered and included in our recommendations. The FOPE I Report did not differentiate between the number of general versus subspecialty pediatricians needed and did not mention the impact of adult subspecialists on workforce needs.
5. The geographic distribution of children and of health professionals has been addressed in this report. This affects the numbers and types of training needed. For example, because pediatricians in rural areas generally do not have the subspecialty referral base enjoyed by suburban and urban pediatricians, the pediatrician-to-population ratio might be higher and the training more extensive in subspecialty care.
6. Managed care was virtually unknown when the 1978 report was written. Market-demand greatly influences workforce needs and has been considered in this report.
7. Telemedicine was generally not available and, therefore, not mentioned in the FOPE I Report. The influence of access to and volume of consultants and reviews via telemedicine has been addressed in this report.

CURRENT WORKFORCE

Physicians

Between 1978 and 1997 the number of accredited medical schools increased from 116 to 125, and the number of graduates per year rose from 13 500 to over 15 000. During this same period, the total number of physicians doubled from 310 000 to 620 000.

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Between 1978 and 1995 the number of pediatricians increased from 29 462 to 50 620, internists from 71 531 to 91 427, and family practitioners from 27 530 to 54 709.¹ In 1994, 21% of all primary care physicians were pediatricians, 36% family practitioners, and 43% internists. Fifty-four percent of pediatricians are under 45 years of age and, thus, retirement might not be a significant factor until 2015 to 2020.²

According to American Medical Association (AMA) data, in 1996, 94% of pediatricians were involved predominantly in patient care with 64% working in an office-based setting; 30% in a hospital-based setting; and the remaining 6% were primarily involved with administration, research, and teaching.³ The net annual pretax salary for a practicing pediatrician is \$140 500. Fifty-three percent of pediatricians are self-employed and 46% are employed by an organization. Seventy-seven percent of practicing pediatricians, of whom 33% are in solo practice and 67% in group practices with the median number of members being 4, contract with health maintenance organizations (HMOs).⁴

The average number of office visits per week is 97.4 or ~20 per day expanding to 121 patient visits per week if hospitalized patients visits are also included.⁴ Work effort varies with age, gender, and whether self-employed or salaried in a managed care or fee-for-service practice or small or large group practice. On average, women and younger physicians work fewer hours, whereas rural physicians and solo, self-employed physicians work longer hours per week.

Pediatric Nurse Practitioners (PNPs) and Physician Assistants (PAs)

Currently, 5850 PNPs have become certified by the National Certification Board of Pediatric Nurse Practitioners and Nurses. This Board appropriately is composed primarily of nurses, but pediatricians also serve. The educational preparation of PNP has evolved over >30 years with the trend moving away from certificate programs toward master's and post-master's preparation. As of 1997, there were at least 67 PNP programs in the United States (National Association of Pediatric Nurse Associates and Practitioners [NAPNAP], personal communication, 1997).

According to a 1992 NAPNAP survey, 85% of their members had baccalaureate degrees or higher. Women have consistently comprised 98% to 99% of NAPNAP members, and 79% are under 50 years of age. Their salaries range between \$30 000 and \$60 000.⁵

In 1992, ~12% of PNPs practiced in towns or rural areas with populations below 15 000. Approximately 60% had prescription privileges, and 23% had hospital privileges. Only 8% were able to bill for services using their own names, and an additional 45% were able to bill through the physicians or agencies with whom they worked.⁶

The American Academy of Physician Assistants (AAPA) estimates that 28 800 (83%) of the ~34 700 PA program graduates were in practice in early 1997. In 1996 there were 71 accredited PA programs, and

an additional 14 programs had provisional accreditation. Approximately 4% of AAPA members work in pediatrics, and 40% work in family practice and are likely to see children in their practices (AAPA, personal communication, 1997).

Approximately 62% of PAs responding to an AAPA survey had a baccalaureate or higher degree and had been in practice an average of 9 years. Approximately 28% of PAs work in areas with fewer than 50 000 people. PAs work an average of 43.5 hours per week, and ~33% take call. Their average salary is \$61 500.⁷

It is clear that nonphysician providers, especially PNPs, provide a great deal of care to children.

GEOGRAPHY

Currently 51 000 000 Americans (20% of the US population) live in rural areas, but <11% of US physicians live in rural areas. Fifty-four percent of the physicians in rural areas are in primary care versus 38% in metropolitan areas. The Council on Graduate Medical Education (COGME) Analysis in 1994 suggested that family practitioners are 5 times more likely than general internists or general pediatricians to practice in rural areas (and settle there with the same rate as the general population). During the past 20 years there has been a 31% growth in physicians practicing in rural areas, compared with 59% in metropolitan areas, although this growth has not been true for small counties of <2500 people that have experienced a drop in their physician-to-population ratio. Physicians in rural areas spend 16% more time in patient care and have 38% more patient visits per week than do those in metropolitan areas. Because an adequately served area is defined as 1 physician per 2000 patients and a shortage is anything greater than 1 physician per 3500, 67% of the shortage areas are in rural settings. The south has the greatest need for primary care physicians with at least 1096 and probably 2732 additional physicians needed to adequately serve the area.⁸

The area with the highest pediatrician-to-child population is the District of Columbia with ~200 pediatricians per 100 000 children under 17 years of age; New England and other Middle Atlantic States also have high ratios. States with lower pediatrician-to-child populations include the mountain, west north central, and west south central regions.² Access remains an issue to patients living in the inner-city and remote rural areas.

Factors that influence the geography of where practitioners tend to settle include location of their residencies (considering that states with the lowest ratios of physician-to-child population have no residency programs), locations of family and friends, personal lifestyle preferences, medical needs of the community, availability of practice opportunities, income, and, to some degree, the availability of telemedicine.

The Pediatric Workforce Workgroup examined the relationships of pediatric services to the geographic distribution of pediatric populations (0–21 years of age) in 10 cities including Atlanta, Boston, Chicago, Detroit, District of Columbia, Houston, Minneapolis,

New York, Philadelphia, and Seattle. The conclusions were as follows:

The distributions of pediatricians among counties of 10 major US metropolitan areas do not parallel the distributions of the child populations. The variance of the pediatrician-to-child population ratio (PCPR) was high with the larger ratios being associated with larger cities or the primary medical centers within a metropolitan area.

In 1980, the Graduate Medical Education National Advisory Committee (GMENAC) report indicated that an ideal child health physician per child population ratio is 4.9 per 10 000, or approximately 1 child health physician per 2.033 children.⁹ The median PCPR among the 77 counties included in these analyses was 3.8 per 10 000 (1 physician per 2632 children). The 25th and 75th percentiles for the PCPR were 1.6 and 7.2, respectively.

The conclusion of uneven distribution of pediatricians with respect to the child population is supported by the results of the Lorenz curves. These curves are a distance away from the line of unity. On average, 50% of the cumulative number of pediatricians equated with 70% of the cumulative number of children in the population.

When data for an entire state (Texas) were used, the conclusion, negating the uneven distribution of physicians to the child population, was supported. Accounting for the distribution of family physicians, general practitioners, and internal medicine physicians also did not alter the conclusions as reflected by the Lorenz curves.

Regression analyses for both the metropolitan area model and the state (Texas) model indicated the potential impact of median household income to be an independent predictor of the PCPR. The PCPR was higher in counties with higher income levels.

This study has several limitations. It is an ecologic study; thus the data were aggregate at the county level. Therefore, the results are not necessarily applicable to smaller geographic units. The population data were obtained from the 1990 US Census, while the physician data were obtained for 1997. Population shifts could have affected the results. The study sample is based on 10 major US metropolitan areas that were not randomly selected. Generalizations to all major US metropolitan areas may not be accurate. In developing the regression model, only factors available on US census data ROMS were available for inclusion. There might be other significant factors that were not accounted for in this analysis. However, we believe that the conclusions from these data provide valuable insights.

The distribution of pediatricians in the United States should be monitored closely with the increased use of managed care. Further detailed analyses of smaller city areas, rural and urban areas, and other predictive factors would provide other valuable information regarding physician distribution.

A great deal of the legislative energy directed toward increasing the number of primary care physicians relates to the pressing need to increase access for care in rural towns and in many inner-cities. Although growth in the total number of physicians

in the past 20 years has resulted in a better geographic distribution, the health profession shortage in selected geographic areas has persisted. Currently there are 2000 health professional shortage areas involving 35 million people, of whom ~12 to 14 million are children. An additional 6000 to 7000 pediatricians might be required to care for these children.¹⁰

PIPELINE

Current trends, pressures, and movements in health care are affecting all aspects of the pediatric health care workforce including the production of generalist and subspecialty trained pediatricians for practice and academic settings. American Board of Pediatrics (ABP) data reveal that beginning in the 1960s, there has been an impressive increase in the number of American trained and internationally trained examinees.

On average, 722 physicians were certified per year in general pediatrics between 1966 and 1970. Over the next 2 decades the annual number of newly certified pediatricians increased nearly threefold, and an even more impressive increase has occurred over the last decade. The numbers of physicians certified in general pediatrics increased from 2121 in 1988 to 2754 in 1997, representing an increase of 30% over 8 years. The 1997 data represent a 2.5-fold increase in the annual production rate of certified pediatricians since 1970, when the number was 788. During this same time span the population of the United States increased by 28%.

In 1995, the total number of trainees in general pediatrics, including both categorical pediatrics programs and combined internal medicine and pediatrics programs, surpassed 9000 for the time. The fastest growing segment has been the combined internal medicine and pediatrics (Med/Peds) trainees with the total number of residents more than doubling from 1991 to 1997 (724 vs 1514).¹¹ Currently, >400 Med/Ped positions are offered through the NRMP in >90 programs.¹² This represents a steady, impressive growth since the early 1980s when there were fewer than 10 programs offering fewer than 50 positions.

Pediatric cardiology was the first pediatric subspecialty to successfully petition for the establishment of subspecialty certification and formal training programs. The first cardiology examination was given in 1961. Thirteen years later, the first examinations in hematology/oncology and nephrology were given, and over the last 20 years, 9 additional subspecialty examinations have been established. In 1999, sub-board certification in neurodevelopmental disabilities and developmental/behavioral pediatrics was established. In addition to the subspecialties listed, pediatricians may also receive a certificate of added qualifications in medical toxicology and sport medicine. However, the numbers choosing to do the latter have been very small. Finally, for many years the ABP and the American Board of Internal Medicine have jointly sponsored a separate, independent board in allergy/immunology, which also certifies in clinical and laboratory immunology.

By the end of 1997, 11 198 subspecialists had been

certified, compared with 63 494 generalists. This represents an overall pediatrician rate of subspecialization of 18%, which is much less than the corresponding percentage of subspecialty trained internists. Interest in subspecialty training has been declining recently, while the interest in generalism has grown among medical students. During the last 10 years, the interest in careers in general pediatrics has increased from 60% to 72%, while the combined interest in obtaining additional training in a formal pediatric subspecialty or another specialty, such as anesthesiology or radiology, has decreased from 40% to 26%.¹¹

The majority of pediatric subspecialists practice their subspecialty full-time in an academic setting; nearly 75% practice at least part-time in an academic setting and 68% practice full-time in an academic setting. These figures exclude data from neonatologists because of the different nature and clinical demands of their practice. Of the neonatologists surveyed, 39% practice full-time in an academic setting and an additional 14% practice at least part-time in an academic setting. In 1995 the ABP initiated the Pediatric Subspecialty Fellow Tracking Program to maintain accurate workforce information. The results from the first survey included responses from over 95% of the approved subspecialty training programs. Comparison of the 816 first-year fellows with the number of first-year trainees in general pediatrics roughly yields a 1:3 ratio—which is much greater than the overall ratio of certified subspecialists to general pediatricians. This ratio reflects an attrition rate during training and/or other factors because the number of examinees for the subspecialty boards has not been increasing. The reasons for this attrition includes Canadian trainees, the return home of IMGs, and individuals who do not complete the 3 years of training.

ETHNIC ORIGINS, RACE, AND GENDER

The issues of race, ethnic origins, and gender are relatively distinct with regard to their potential impact on future trends in pediatric workforce needs. The predominant issues of race and ethnic origins deal with representativeness of the workforce and the need to provide services to underrepresented minorities (URM) who in many situations also are the principle component of underserved populations. A secondary issue, related to this later aspect, is significant shifts in the composition of the pediatric population over the next few decades. The issues involved with gender reside more in calculations of full-time availability of individual practitioners when assessing physician to patient ratios and trends away from pediatric subspecialty training. One dimension that is not addressed from a quantitative perspective in this report is the impact that race, ethnic origin, and gender will have on nonphysician and nonpediatrician health care providers. Of note, the data reported often come from a single source or study and do not have extensive corroborating data.

Currently 67% of children under age 18 years are white, non-Hispanic and this will decrease to 54% by 2020.¹³ In contrast, a recent American Academy of

Pediatrics survey indicated that young pediatricians who graduated from medical school from 1983 to 1989 represented 5% black, .1% Native American, and 80.6% white, with 12% of all surveyed being Hispanic.¹⁴ There also has been a slow increase in black pediatric trainees from 1978 to 1995 (274–388) and only 872 Hispanic residents in 1995.¹⁵ This low percentage reflects a general trend in medical education that has seen a gradual increase in the absolute numbers of URM students but no significant percentage increase when the overall number of students is taken into consideration.^{16,17} The entering medical student class of 1995 had 12.4% URM students, compared with 9.1% in 1975.

Because communities with a high proportion of black and Hispanic residents are 4 times as likely as other communities to have physician shortages, the desirability of placing physicians into these communities is an important workforce issue.¹⁸ Historically, black physicians are 5 times as likely, and Hispanic physicians twice as likely, to practice in communities with a high proportion of corresponding minority residents as nonminority physicians.¹⁹ There is no recent evidence that this trend is changing. Pediatric specific data about career choice are not available, but 60% of all URM medical school graduates indicate a plan to go into a generalist field.²⁰ Data on the number of URMs in Med/Peds residencies who go on to subspecialty training are not available.

A higher percentage of URM pediatricians increases the probability of placing physicians in underserved areas that traditionally have a disproportionate number of URM residents. Given an inherent value in the pediatric workforce having a more representative cultural and ethnic diversity relative to the population served, the current discrepancy is projected to worsen. The URM pediatric population is rapidly increasing; the URM pediatrician workforce is not.

Gender considerations of workforce needs are most influenced by the trend in pediatrics toward a predominance of female practitioners. Forty-five percent of current practicing pediatricians are women, as are over 60% of current trainees.^{15,21} A recent study indicated that there are no gender differences with regard to productivity per unit time, but an AAP survey indicated that female pediatricians work 82.8% as many hours as male pediatricians.^{14,18}

There is also a tendency for female pediatricians to pursue primary care rather than subspecialty careers. Recent ABP data for career plans for first-time examination candidates indicated that 61% of women planned general pediatrics careers versus 39% of males.¹⁵ Twenty-two percent of all pediatricians in 1991 were women. However, 67% of postgraduate year (PGY)-1 positions in pediatrics in 1991 were filled by American medical graduates, and that number increased to 70.4% in 1996. Seventy percent of these women indicated that they were interested in generalist careers. A disproportionate percent of women who opt for general pediatric practice also gravitate toward employment in HMOs, work fewer hours, and see fewer patients.

The pediatrician workforce of the future will be

predominantly female with a tendency toward primary care practice and somewhat reduced overall productivity per individual primarily because of decreased hours worked. There may be an impact on numbers of pediatric subspecialists if current trends continue with the majority of subspecialty trainees being male and a diminishing number of males going into pediatrics.

IMGS

Through most of the 1950s, the number of internationally trained pediatricians was negligible. Their numbers began to increase during the late 1950s and reached 19.5% of all examinees in 1960. Over the past decade, and until 1999, there had been an enormous number of IMGs who have entered American training programs and have stayed on to practice in the United States. Over this period (1988–1998), the number of American medical schools graduates (AMGs) has remained relatively constant, while the number of PGY-1 positions had increased substantially. Currently the number of PGY-1 positions available is ~130% of the total number of graduates of American medical schools. In 1990 there were 5708 pediatric residents in categorical programs, compared with 7831 in 1997, and this rise is very substantially accounted for by IMGs. However, the 3-step examination for IMGs has reduced the number of IMG trainees entering the match in 1999 and 2000. The number of IMGs who submitted complete match applications fell by 1690 positions in all disciplines between 1999 and 2000.

There are 208 Accreditation Council on Graduate Medical Education-approved pediatric residency training programs in the United States. In 1996, 10% of these had only IMGs, and 35% had >50% IMGs.

Although a number of IMGs perform well, until recently they have not competed favorably with AMGs in the pediatric certifying examinations. For example, in 1996, 38% of the candidates were repeaters, and 61% of these were IMGs.

A number of organizations, including the Association of American Medical Colleges, COGME, and the Institute of Medicine, have recommended that the number of IMGs in training programs be reduced. Most suggest that this be accomplished by reducing the number of PGY-I positions to 110% of the total AMGs. The effect of such a reduction might eventually greatly affect the pediatric workforce. According to ABP data, currently 27% of pediatricians in the United States are non-Canadian IMGs.

MANAGED CARE

The managed care sector has created a large demand for primary care physicians as these organizations recruit to build primary care service programs. The vigor of this recruitment does not translate directly into a need for more physicians because much of the demand is to enable these organizations to enroll greater numbers of patients, many of whom already are receiving primary care services from the very physicians being sought or from other physicians. The needed increment in primary care physicians cannot be extrapolated from the current de-

mands of managed care organizations to recruit primary care physicians.

Weiner²² looked at managed care standards to compare HMO staffing ratios with the US physician workforce in general. They assumed universal insurance coverage and growth in the managed care sector staffing ratios that are more heavily tilted toward generalists. HMOs generally operate with ~60% generalist physicians and 40% specialty physicians. Review of data from the ABP show that for the past 6 years only 23% to 30% of graduates of US residency programs are entering specialties, suggesting that the mix of pediatricians who are entering the workforce currently is in line with managed care practice standards and does not suggest a need to alter the current mix of generalist and specialty physician graduates in pediatrics.

The pediatrician-to-population ratio estimates of managed care organizations do not differ from those of others. This will be discussed later in this report under the section, "Models for Determining Workforce Needs."

HOSPITALISTS

There recently has been a major movement in pediatrics toward the use of hospitalists, reducing the need for inpatient care skills in primary care providers for children. The net impact of this trend on workforce issues is unclear at this time. It may allow for increased productivity by the outpatient care provider, because of a reduction in time required for inpatient care. This could occur without an increase, or perhaps even a decrease, in all providers assuming an appropriate level of efficiency of the hospitalists. It may also facilitate the use of more nonpediatricians to provide care, as the need for inpatient skills is minimized and as the perceived benefit of using broadly trained pediatric generalists for primary care is diminished. It is important to note, however, that outpatient pediatric care is also becoming more complex and skills previously seen as inpatient are being utilized in outpatient settings.

THE EFFECT OF TELEMEDICINE ON THE PEDIATRIC WORKFORCE NEEDS OF THE FUTURE

The recent revolution in telemedicine, ie, telecommunication, multimedia, and information technology, to provide and support health care when distance separates participants, offers an opportunity to address the problem of the unequal geographic distribution of physicians and the lack of health care services in rural and urban America.

Many predict that telemedicine will have a significant impact on the delivery of care in the future; some predict that telemedicine will revolutionize how care is delivered.^{23–26} As these technologies become more developed and widely disseminated, physicians will likely be able to manage larger numbers of patients. Patient management will be facilitated by new information support systems designed for use by both physicians and patients. For these reasons it has been predicted that this increase in productivity will result in the need for fewer physicians, both generalists and subspecialists, to meet

health care demands (J. H. Sanders, personal communication, 1998).

Competition in the health care industry has encouraged the dissemination of telemedicine. Integrated delivery systems are aggressively seeking competitive advantage and are willing to explore the use of new technologies to support this goal.²⁷⁻²⁹ Telemedicine is proving attractive in that the technology offers the potential to leverage a managed care organization's investment in providers and to use them in a more cost-effective way.²⁸ Evidence of clinical efficacy and cost-effectiveness is under study at a variety of sites. Monitoring publication of these studies will provide early indication of factors that will influence the adoption of telemedicine.

Although it is too early to suggest that data from the implementation of telemedicine systems can be or should be used to predict how such technologies will alter physician workforce projections, it is not too early to recognize that technologies of this sort will modify how health care is delivered. These technologies will also play a role in reshaping the relationships among physicians, their patients, and other members of the multidisciplinary care team. It is recommended that the American Academy of Pediatrics monitor developments in telemedicine reimbursement, financing, regulation, and competition as presages to wide-spread dissemination of these technologies. In doing so, the American Academy of Pediatrics can encourage the pediatric societies to participate in setting clinical and technological standards for care delivered via telemedicine and can position itself in a timely manner to address changing workforce needs that may result.

POSITIONS AVAILABLE

Another way to determine the need for pediatricians is to review the degree of difficulty experienced by graduates in finding a position. Miller and associates³⁰ found that 3.9% of pediatric graduates experienced a problem in finding a position in 1996. These problems were experienced at a point in time where there were 50 620 pediatricians, of whom ~36 000 were employed in general pediatric practice. The same authors reported that 86.7% of the pediatric graduates in 1996 sought a position in a clinical primary care-based practice. Four and one half percent reported that they accepted a position in a small town to secure a position, although they might have preferred to work in a larger city. In addition, 5.6%, who preferred to remain in their state, were required to move out of state to find a position. Furthermore, 17.6% of program directors said they predicted that more serious problems in finding positions were expected in the future, and, therefore, 6.1% had decreased the number of residency slots that their programs were offering between 1994 and 1995; 20.6% indicated that they were contemplating a reduction in the number of their positions in the future.³⁰

Seifer and associates³¹ reported that the demand for pediatricians was flat and declining. This statement was predicated on a retrospective review of advertisements for positions for pediatricians in 7

medical journals during the period 1984, 1987, 1990, 1993, and 1995.

QUALITY OF CARE

There is a small but growing body of data that show that pediatricians provide superior care to children, compared with nonpediatric providers. For example, a recent study showed that pediatricians are more likely to provide immunization during non-health maintenance visits and are more likely to use systems to track undervaccinated children.³²

One might assume that superior health care for children might mean that treatment should be given to children only when there is good evidence that those who receive treatment do better than those who do not. Pianosi and associates³³ documented that family physicians are more likely to prescribe antibiotics for the treatment of viral tracheitis in children than are pediatricians. Kirshner et al³⁴ showed that family practitioners were more likely to prescribe antibiotics and cough suppressants for asthma than were pediatricians. Thus, pediatricians in these 2 studies were much more likely to provide treatment only when required and, thus, to provide superior and lower cost care than were family practitioners.

Providing best health care also might mean that children should be admitted to a hospital only if absolutely necessary, because hospital admissions are costly economically and upsetting to children as well as disruptive to their families. Children with chronic asthma who are cared for by pediatricians are much less likely to be admitted to hospitals than are those cared for by family physicians.³⁵ There also is evidence to show that children with asthma are much less likely to be readmitted to the hospital if they are followed by a pediatrician than by a family physician. In New Mexico, the introduction of community-based pediatric care led immediately to a reduction in all pediatric admissions to a local hospital.³⁶

Providing the best health care also might imply that laboratory studies should be ordered only if they are useful in making a diagnosis or if they might affect treatment. In a study of growing pains, family physicians were much more likely than either pediatricians or orthopedic surgeons to order unnecessary investigations.³⁷ There also is good evidence that family physicians are significantly more likely than pediatricians to order unnecessary blood tests for acute illnesses (L. Lakdawalla, unpublished data).

Providing the best health care also requires sound fundamental knowledge of childhood disease. The better understanding a physician has of childhood illnesses, the more confident and less fearful the physician might be and, therefore, might better be able to make decisions based on sound judgment. Family practitioners are much more concerned than pediatricians about the presumed dangers of fever and are much more inclined to awaken a child to give medication for fever. Family physicians are also significantly but unnecessarily more concerned about brain damage as a consequence of febrile seizures than are pediatricians.³⁸

Providing the best health care requires that a physician be available to care for children 24 hours a day. A recent study that compared the availability of pediatricians and family practitioners in Montreal, Toronto, Ottawa, and Winnipeg, by calling a matched group of each, found that pediatricians were more available after hours by telephone or in person than were family practitioners.³⁹

Providing the best health care also requires appropriate follow-up and referral to subspecialists. Selected conditions such as serous otitis media require appropriate and timely follow-up and further treatment or referral to a otorhinolaryngologist only if required. Family physicians have been shown to prescribe high-cost antibiotics to treat persistent middle-ear effusions twice as often as pediatricians. At 9-week follow-up visits, family physicians were 3 times more likely than pediatricians to refer patients for myringotomy, tubes, and surgery unnecessarily. This surgery, which is the most common surgical procedure performed on children, adds enormous costs to the health care system.⁴⁰

Providing the best health care also implies that it is the most cost-effective. In this era of fiscal restraint, it is imperative that physicians order only appropriate investigations, prescribe appropriate medication, and admit children to hospital only if ambulatory care would be unsafe. A considerable body of evidence shows that pediatricians accomplish all of these objectives.⁴¹

Although carefully performed matched control studies are relatively limited, data currently available suggest that community pediatricians provide superior care for children, compared with other practitioners. We believe that pediatricians should provide first contact, continuous, comprehensive, and coordinated care for neonates from birth through the end of adolescence. The service role of pediatricians should emphasize additional unmet needs of patients currently, including adolescent mental health problems, learning disorders, and the care of children with complex problems. Given the explosion of new medical information, we believe that only physicians with at least 3 years of specialty training in pediatrics can be expected to provide excellent care for children. Although family physicians provide care for many healthy children adequately, our goal should be to provide the best possible health care for all children; parents in the United States should have the right to choose a pediatrician. The most compelling argument for government to support, encourage, and train pediatricians is that they are extremely cost-effective.

ENSURING QUALITY THROUGH RESEARCH

One essential mechanism to ensure high quality of care is the promulgation of new knowledge, ie, research. Part of the pediatric workforce must be dedicated to research, and it must be supported.

In his 1998 presidential address to the American Pediatric Society, Dr Ralph Feigin reported on a survey he conducted of US and Canadian medical schools.⁴² Some of his major findings are: 1) an average of 56.9% of total departmental support was

derived from clinical income; 2) the average for support from federal research grants was 10.7% with an additional 11.0% coming from nonfederal funds; and 3) National Institutes of Health (NIH) support for pediatric research is clustered in a small number of departments. Further, as the margin between clinical revenue and expense is decreased, the capacity of clinical departments to subsidize research programs has been compromised significantly.

Moy et al⁴³ reported an inverse relationship between growth in NIH awards in the past decade and managed care penetration among medical schools located in various regions.

Clearly if high quality of care for children is important, support for these researchers who deal with infants, children, adolescents, and young adults must be ensured.

MODELS FOR DETERMINING WORKFORCE NEEDS

The determination of workforce needs must be based on data, but the data can be different depending on the type of model used.

A needs-based model projects workforce requirements based on existing estimates of morbidity and use of necessary health maintenance and prevention services.⁴⁴ The GMENAC model started with data on the prevalence of disease, the estimated percentages of persons with specific diagnoses who would require care for those conditions, and the number of visits estimated to be required per episode of illness per year.⁴⁵ It summed all of the morbidities for the entire US population, estimated the percentage requiring treatment from each specialty, and estimated the percentage of each specialty's visits that should, according to GMENAC, be delegated to nonphysician providers. The total national requirement for physicians was determined by dividing the visits needed by the number of visits estimated to be provided by physicians in each specialty. These estimates assumed no barriers to access and are estimates for an efficient health care system; they predated the growth of managed care.

Demand-based models forecast future requirements assuming the continuation of existing patterns of care delivery and staffing.⁴⁴ Using demand-based models derived from HMO data from 7 Kaiser-Permanente plans, a number of demand-based estimates can be made.⁴⁶ The number of general pediatricians in 1993 was 13.1 per 100 000 population. Using a GMENAC needs-based model, the estimate derived indicated that there should be 12.1 pediatricians per 100 000 population for the future. By comparison, a demand-based model plan extrapolating data from the HMO population from the 7 Kaiser-Permanente plans indicated that the need was 16 per 100 000.

A similar needs-based plans using Kaiser Permanente Portland HMO estimates placed the pediatrician need at 11.9 per 100 000 population. Data derived from 2 other mature HMOs indicated a need for 16.6 pediatricians per 100 000 population. Using the best data available as derived from the current literature concerning needs-based models for pediatric requirements, the need for pediatricians would average 14.2 per 100 000 population, with a potential

upper limit of 15.3 per 100 000 population. If these were, in fact, the needs for generalist pediatricians, no downsizing in the current supply of pediatricians would be required and no substantive growth would be dictated.

Goodman and associates⁴⁷ have suggested the use of benchmarking as an alternative to needs-based or demand-based planning. The optimal number of physicians for a given population is unknown, according to Goodman et al, and cannot be estimated from needs-based or demand-based models. Needs-based planning requires detailed knowledge of the efficiency and efficacy of individual medical services for specific conditions. Yet, the efficacy of most medical services and the productivity of physicians in delivering those services are uncertain. Moreover, patient-level outcomes research will not resolve questions in medical care efficacy for future resource planning given the many different physician specialties, the increasing number of new disease entities, the rapid change in health care technologies, and the organization of health care services.

Demand-based planning, which assumes that current utilization is an indicator of the patients' needs or desires for a service, perpetuates current patterns of care without regard to patient or population outcomes or evidence that the supply of medical resources can reduce or induce patient demand. In contrast, benchmarking states that one can examine healthy plans and communities, measure workforce deployment, and select those benchmarks that achieve the lowest level of deployment without a measured loss of either patient care access or quality attributable to a shortage of physicians. Those estimates can then be used for future planning.

Recognizing the differences in the definition of these various models and the approaches that they have taken to determine manpower needs, one can readily understand the discrepancies noted in the literature that may provide the basis for any recommendations that this Task Force may make.

PROJECTED WORKFORCE NEEDS

Recent analyses of the physician workforce have yielded widely disparate estimates about how well physician supply will match the demand for physician services at the turn of the century. Weiner,²² assuming extensive growth in managed care, estimated a 40% physician surplus in the year 2000. In contrast, Cooper,⁴⁸ who also assumed a substantial growth in managed care, estimated a surplus of only 5% in the year 2000, 18% in 2010, and <2% in the year 2020. The discrepancy between these forecasts relates to the uncertainty about future: 1) demand for physician services under managed care, 2) physician output in a reorganized health care delivery system, and 3) physician productivity with alterations in gender and geographic location.

In recent years there have been sharp declines in the proportion of physicians in solo practices and in the proportion of physicians who have an ownership interest in their practices. The proportion of physicians in group practices and the average size of group practices are rising. Previous studies also have

shown that employee physicians work fewer hours per week and see fewer patients per week than do physicians who are self-employed.^{49–51} Because the proportion of employee physicians is increasing rapidly, projections of the total physician supply are likely to overestimate future growth in the amount of services that physicians may actually provide.

Past research also has shown that the work efforts of physicians is associated closely with their demographic characteristics. Female physicians, on average, work fewer hours a week than do male physicians, and older physicians are likely to work fewer hours than are younger physicians. In addition, physician work effort varies by specialty, and it is higher in rural than in urban areas. Additional analyses have found that employee physicians working in salaried positions and physicians in large group practices have lower work effort and fewer patient visits than their counterparts in solo or small group fee-for-service practices. The number of hours physicians worked per week decreased by ~3% during the 1970s, but in recent years has remained fairly stable.⁵⁰ In contrast, the number of patient visits per physician per week has fallen significantly.⁵¹ This decline in patient visits per physician has been pervasive, cutting across all components of the physician population.

Workforce studies examining the balance between the future supply of and demand for physician services make a number of explicit and implicit assumptions about physician output and work effort. Cooper⁴⁸ assumed a general decline in physician work effort because of the aging of the physician population, continued increases in the proportion of female physicians, and general changes in the lifestyle and expectations of physicians. Weiner²² incorporated assumptions about physician output when developing staffing requirements for different sectors of the health care delivery system. The analyses reported above did not take into account any differences in output that may result from changes in practice organization, for example, the growing number of employed physicians. Consequently, they are not likely to assess accurately the labor supply responses to the growth of managed care and restructuring of the health care system.

Kletke and associates⁴⁹ examined data from 2 different databases maintained by the AMA: the AMA Physician Masterfile, which provides data on the size and composition of the entire US physician population; and the AMA Socioeconomic Monitoring System, which provides socioeconomic data on physicians' practices.

The objective of their analysis was to project the aggregate time worked by patient care physicians, measured in terms of full-time equivalent physicians, according to several different scenarios that might be developed with regard to future changes in physician practice organizations. Their analysis was limited to the population of nonfederal, postresidency, patient care physicians. They measured full-time equivalent physicians based on the hours that physicians worked per week and defined one full-time equivalent to equal a work week of 57.9 hours per

week (the average amount of time worked by physicians in 1994 according to the SMS survey data). The full-time equivalent measure weights each physician with an estimate of the time spent in professional activities, thereby taking into account the lower work effort of employee physicians. The analysis consists of 4 steps: 1) projecting the size and composition of the population of nonfederal, post-resident patient care physicians; 2) developing regression estimates of hours worked by physicians with respect to type of practice and other demographic characteristics; 3) establishing a lower-bound, middle-range, and upper-bound scenario for the growth of employee physicians; and 4) estimating the growth of full-time equivalent physicians for each of the 3 scenarios by applying estimates of hours worked to the projected composition of the physician population.

Transition probabilities for mortality, retirement, and accession (ie, resumption of professional activity) were derived from logistic regression analyses of Masterfile data based on a physician's age, sex, and place of graduation. Data on the number of entrants to the physician population were obtained from the Division of Graduate Medical Education of the AMA. They assumed that the flow of new entrants into the physician population would generally remain the same as in 1996. It was thereby assumed that the number of entrants to the physician population would remain constant and that the characteristics of the new physicians (ie, specialty choice, country of graduation, and age, etc) remained constant.

According to the projection assumptions (that is, that the number of entering physicians remains at the current level), the size of the physician population will increase by 27.7% between 1994 and 2010. Because of the changing demographic composition of the population, there is a disproportionate growth (32.2%) for the nonfederal postgraduate medical education patient care physicians. The proportion of active physicians who are in this body of the population increases from 75.7% in 1994 to 78.4% in 2010. The data also showed large projected increases in the number of female physicians, which is particularly true for the subspecialty of pediatrics and in the number of physicians over 45 years of age.

The average number of hours worked per physician by employee physicians, self-employed solo physicians, and self-employed physicians for the years 1990–1995 has remained fairly stable over that period. On average, employee physicians work ~5.5 hours less per week than did self-employed solo and group physicians. The data also document that the average number of hours worked per week is higher for male physicians than for female physicians and is higher for younger physicians than for older physicians. The differential in the work effort between employed physicians and self-employed physicians was statistically significant when they controlled for age, sex, specialty, and country of graduation. In addition, their data showed that female physicians, young physicians, and primary care physicians are disproportionately employed physicians. To incorporate current patterns of practice organization into

their projections for full-time equivalent physicians, their analyses used the results of a multinomial regression to distribution the projected physician population for the future and their data projected a lower-bound scenario in which the future number of employed physicians would be 43%, a middle-range scenario with an increase to 60% in the year 2010, and an upper-bound scenario where their numbers increased to 80% in the year 2010.

For scenario A in which the proportion of employed physicians remains constant, they found that there would be 618 477 full-time equivalent physicians in 2010 or 2.3% less than the projected supply. A decrease in average work effort is noted because of the projected changes in physician characteristics other than their practice organization (eg, the growing number of older physicians and female physicians who have a lower work effort than the physician population as a whole). The number of full-time equivalent physicians in 2010 would be 3.7% less than the baseline projected supply according to scenario B where the proportion of employed physicians increased to 60%, and it would be 5.4% less than the actual supply according to scenario C, where the number of employed physicians increased to 80%.

Because of the reduction in average work effort, the supply of physician services is actually growing at a slower rate than the number of physicians.

The studies of Kletke and associates⁴⁹ document that the proportion of employed physicians is likely to increase in future years because of a wide variety of factors, including the physicians in the expansion of managed care. Nevertheless, when all factors are taken into account, Kletke et al⁵² estimate a supply of 41 600 pediatricians in general pediatric practice in the year 2000; 46 700 in 2005; and 51 500 in the year 2010. In addition, they project 6200 pediatricians in subspecialty practice in the year 2000; 7300 in the year 2005; and 8400 in the year 2010.

It is of interest to review additional data with regard to previous and current forecasts for the needs for future pediatricians. In 1995, there were 33 000 pediatricians in office-based practices. Using a needs-based approach, and in particular the GMENAC needs-based model developed 16 years ago but updated and based on a projected increase the population of children, one might predict a need for 34 000 pediatricians. These data are based on a GMENAC assumption that 1 pediatrician may care for 2033 children.

In 1991, the US Bureau of Health Professions contracted with the consulting firm of Abt Associates⁵³ to update the needs-based requirement model of GMENAC for 7 physician specialties, including pediatrics.⁵³ Abt estimated requirements based on ideal levels and types of medical care (preventative and curative) without regard to barriers opposed by ability to pay, access, availability, or lack of knowledge. Abt Associates recommended a ratio of child population to general pediatricians of 2430/1, suggesting that the need for general pediatricians could be dropped to 28 400.

Other available staffing ratio information comes

from HMOs or from practices serving privately insured patients and is, therefore, based on children currently under the care of physicians. Staffing ratios of children to full-time equivalent pediatricians from a variety of different HMOs are shown below.

In contrast to these HMO ratios, a ratio of 1400:1 was found in the private practices of 91 practices that belong to the American Academy of Pediatrics Pediatric Research in Office Settings Network, a network of 700 clinicians engaged in office-based research.

Children enrolled in prepaid group practices have been found to use preventive health care services at a higher rate than children in fee-for-service practices. In general, children enrolled in prepaid group practices make 4 to 5 visits per year, compared with 3 visits per year made by children in fee-for-service practices.

It is important to recognize that using any models designed to assess the appropriate ratio of children per pediatrician, a large number of factors must be considered. These include differences in physicians productivity that may vary according to gender, personal characteristics, lifestyles, or geographic location. In addition, local differences in demand for pediatric services will vary according to child health status and use of services. There currently is a lack of information examining ratios, quality of care, and health outcomes. Studies that link these 3 issues are needed as are additional studies that focus on the appropriate number of children per pediatric subspecialist.

Using extrapolation methods that look at current staffing patterns in HMOs and private practices such as those described above, then determining how many children a single pediatrician full-time equivalent can care for, and then extrapolating that number to the total requirements for pediatricians nationally, one might suggest that if there were 1 pediatrician per 1200 to 1400 children, this would be ideal. One can then use the projections of the US Census Bureau of children under 17 years of age to extrapolate the number of pediatricians needed. For the year 2010, the low projections are 65 million and the mid (probable) projections are 72.5 million children.⁵⁴ The various possibilities are as follows:

Pediatricians/ Children	Number of Children 2010	Number of Pediatricians
1:1200	65.0 M	54 200
1:1200	72.5 M	60 400
1:1300	65.0 M	50 000
1:1300	72.5 M	55 800
1:1400	65.0 M	46 400
1:1400	72.5 M	51 800

None of these figures are markedly discrepant from the prediction of 51 500 general pediatricians available using the detailed model and full-time equivalent analysis devised by Kletke et al.⁵²

According to recent data collected by the American Medical Association in 1995, there were 50 620 self-designated active pediatricians (both certified and noncertified) in the United States. The main professional activity of ~93% of these pediatricians

was the provision of patient care in office-based and hospital-based settings. These data suggest that we should seek to stabilize the total number of pediatricians at current levels or that their number should increase slightly during the next decade. In 1995, 25% of all pediatricians were younger than 35 years of age, and another 34% were between 35 and 44 years of age. The implication of this age structure on the current pediatric workforce is that retirement would not be expected to be a significant factor affecting the workforce until 2015–2025 when large numbers of pediatricians reach 65 years of age.

In devising appropriate estimates for pediatrician needs for the future, one should place greater reliance on models that have utilized recent changes in the demographics of the pediatrician supply rather than on those that have not. In particular, the increased number of women and international graduates in pediatrics is a most important consideration.

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THE FOPE II WORKFORCE WORKGROUP

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Final Report of the FOPE II Pediatric Workforce Workgroup

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