▲ Growth and Change in the Physician Assistant Workforce in the United States, 1967–2000

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The physician assistant (PA) profession grew rapidly in the 1970s and 1990s. As acceptance of PAs in the health care system increased, roles for PAs in specialty care took shape and the scope of PA practice became more clearly defined. This report describes key elements of change in the demography and distribution of the PA population between 1967 and 2000, as well as the spread of PA training programs. Individual-level data from the American Academy of Physician Assistants, supplemented with county-level aggregate data from the Area Resource File, were used to describe the emergence of the PA profession between 1967 and 2000. Data on 49,641 PAs who had completed training by 2000 were analyzed. More than half (52.4%) of PAs active in 2000 were women. PA participation in the rural workforce remains high, with more than 18% of PAs practicing in rural settings, compared with about 20% in 1980. Primary care participation appears to have stabilized at about 47% among active PAs for whom specialty is known. By 2000, 51.5% of practicing PAs had been trained in the states where they worked. The profession has grown rapidly; 56% of all PAs were trained between 1991 and 2000. In 2000, more than 42% of accredited PA programs offered a master's degree, compared to master's degree programs in 1986. Although many critical issues of scope of practice and patient and physician acceptance of PAs have been resolved, the PA profession remains young and continues to evolve. Whether the historical contribution of PAs to primary care for rural and underserved populations can be sustained in the face of increasing specialization and higher-level academic credentialing is not clear. J Allied Health 2007; 36:121–130.

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IN THE EARLY 1960s, the idea of a new type of medical health care provider began to take shape in the United States, promoted initially by physicians at Duke University. Alternatively referred to as "externes," "physician assistants (PAs)," and "medexes"[1] in the early literature, the basic idea was to create a new type of care provider who would take on many of the routine and less complex aspects of health care. As conceived by early proponents of the concept, PAs would work under the direct supervision of physicians, and the scope of PA practice would be determined by the physician supervisor.[1–3] Conflict arose early between the medical proponents of PAs and skeptics in both the medical and nursing communities. Some nursing associations in particular saw the PA idea as a sexist response by a predominantly male medical community to the growing independence of nurses.[1] Many in medicine, including the American Medical Association, were also concerned about the proper scope of practice for PAs, prescriptive authority, and the amount of independence that PAs might have from physicians.[2,4]

Despite the doubts, concerns, and occasional outright hostility to the PA idea, the first PA training programs opened in the late 1960s and early 1970s[3,4] and aimed to train nonphysician health care providers who would help fill expected gaps in the generalist physician workforce, especially in rural areas and in underserved urban areas. Most of the early concerns and doubts about the PA idea were quelled as PAs began to earn the confidence of patients, other health care providers, regulators, and insurers. Early health services research on PAs generally found that PAs were cost-effective and safe providers of health care.[4] Through the 1980s and 1990s, the scope of PA practice expanded, educational and board certification requirements were increasingly standardized, and the regulatory environment evolved in ways that supported the expansion of the profession,[4–9] including full prescriptive authority in most states.[7,9] Specialty roles for PAs also emerged during the 1980s and 1990s, and by 2000 many PAs were working in surgical and medical subspecialty practices, far from the primary care specialties that provided almost all the jobs for PAs in the first years of the profession.

Since those early days, managed care, increased specialization, and social change have taken the PA profession in directions that were quite unexpected in the early 1970s. In 1975, fewer than 3,700 PAs had completed training. By 2000, more than 40,000 PAs practiced in all 50 states and the District of Columbia and PA training was taking place in 116

programs. This report provides a numerical and geographic portrait of that expansion in terms of the growth and distribution of both the PA population and PA training programs. Changes in PA demography, medical specialization, geographic distribution, and training prerequisites are reviewed, and the implications of those changes for the health care workforce and the future of the PA profession are considered.

Methods

Data Sources

This study used data from the American Academy of Physician Assistants (AAPA) supplemented with data from the Area Resource File (ARF).[10] The 2001 AAPA data contain information on 53,638 active and inactive PAs and include information on members and nonmembers of the AAPA. The AAPA data are based on periodic surveys of PAs and data from PA training programs. Data elements include gender, ZIP code–level practice location data for 1995–2001, state-level location data for 1991–1994, active/inactive status for 1991–2001, clinical specialty for 1991–2001, and the program the PA graduated from and the date of starting practice. Clinical specialty data were missing at a high rate (39% in 2000). When AAPA census data from 1991 to 2000 were missing for some years because of nonresponse to the survey or to a particular question, the AAPA imputed location, practice status, and specialty based on data collected previously or subsequently according to a conservative imputation protocol.[11] The version of AAPA data used in this study did not include information on PA age, race/ethnicity, or detailed location information before 1995. The Area Resource File provided population data from 1980, 1991, and 2000 for calculation of provider/population ratios, PA counts at the county level for 1980 and 1991, and physician counts at the county level for various years.

Change in the geographic distribution of PAs is described at the regional level using the nine U.S. Census Bureau divisions. The rural/urban geography of PA location is described using the 1993 version of the county-level Urban Influence Codes developed by the Economic Research Service of the U.S. Department of Agriculture.[12,13] Under the Urban Influence Codes taxonomy, counties are classified into one of nine categories: two types of metropolitan counties (called "urban" in this report) and seven types of nonmetropolitan counties (collectively called "rural" in this report). The nonmetropolitan counties can be grouped into useful categories that capture the size of the largest community in the county and whether or not the county is geographically adjacent to a metropolitan county (with a minimum commuting criterion). In the analysis presented below, Urban Influence Codes are used to identify five types of counties. They are grouped and named as follows: codes 1 and 2 are "urban," codes 3 and 4 are "large adjacent" (adjacent to a large metro area), codes 5 and 6 are "adjacent small" (adjacent to small metro areas), code 7 is "large nonadjacent" (not adjacent to a metro area with a town of more than 10,000) and codes 8 and 9 are "nonadjacent small" (not adjacent to metro counties with no city of 10,000 or more). County-level Area Resource File data on the geographic distribution of PAs in 1980 and 1991 were used to compare with AAPA data from 2000.

Study Population

Of the 53,638 PAs in the AAPA data set, 3,997 were still in training or had not commenced practice in 2000 and so were excluded from the analysis. Of the remaining 49,641 PAs, 9,605 were not in practice in 2000 and were excluded from the cross-sectional analyses of the population of PAs in 2000 (they were included in the historical analyses as appropriate). There were no location data available for 581 of the PAs active in 2000, so those PAs were excluded from regional and rural/urban analyses. Because this study analyzed virtually the entire population of PAs and because of the large numbers, statistical confidence intervals and statistics are not presented. For example, the 95% confidence interval of a rural estimate of 50% would be very narrow (48.8%–51.2%).

Results

The PA Population in 2000: Demography and Distribution

Selected aspects of demography and distribution of PAs in 2000 are presented in Table 1. By 2000, the majority of PAs (52.4%) were women, a remarkable transformation for what began as an almost exclusively male profession. PAs were widely distributed across the nine census divisions. The fact that 56.2% of the PAs active in 2000 were trained between 1991 and 2000 reminds us that PAs are still relatively new to the American workforce. About 18.1% of PAs were practicing in nonmetropolitan counties and, not surprisingly, rural PAs were much more likely than their urban counterparts to be practicing in primary care specialties.

In Figure 1, the distribution of PAs in 2000 across urban and rural settings is compared with the distribution of primary care physicians (family physicians, general internists, and general pediatricians) and the distribution of the population. Primary care physicians are considerably more concentrated in metropolitan areas than PAs, with 88.6% of primary care physicians located in metropolitan areas compared with 80% of the population. The distribution of PAs across nonmetropolitan and metropolitan areas is much closer to the distribution of the U.S. population.

Demography, Location, Specialty, and Attrition: 1967–2000

Demography

Between 1967 and 2000, 49,641 persons graduated from PA training programs. As Figure 2 shows, there were two periods of fairly explosive growth in the number of graduates

TABLE 1. Clinically Active Physician Assistants in the United States, by Rural-Urban Location, 2000

	Rural Subcategories				Overall		
	Large Adjacent	Large Nonadjacent	Adjacent Small	Nonadjacent Small	Overall Rural	Urban	Total
Gender (%)							
Male	50.7	54.5	54.4	52.6	53.6	46.3	47.6
Female	49.3	45.5	45.6	47.4	46.4	53.7	52.4
In primary care (%)*	66.3	62.6	67.8	78.3	69.4	42.5	47.8
Graduation era (%)							
1967–1980	23.9	20.5	22.4	22.1	22.0	17.7	18.5
1981–1990	24.7	23.8	23.9	20.9	23.1	25.8	25.3
1991–2000	51.4	55.7	53.7	57.0	54.8	56.5	56.2
Census division (%)†							
New England	1.3	4.3	7.8	4.6	5.6	6.5	6.3
Mid-Atlantic	8.5	6.5	17.1	3.1	10.2	21.3	19.3
East North Central	18.9	11.0	13.8	10.3	12.6	12.1	12.2
West North Central	5.5	20.3	11.4	24.0	16.3	4.9	6.9
South Atlantic	26.1	17.6	21.9	17.0	20.0	21.3	21.1
East South Central	0.8	3.6	4.9	5.8	4.5	3.1	3.3
West South Central	15.4	8.1	10.1	7.2	9.3	8.5	8.6
Mountain	8.6	16.3	5.5	18.9	11.9	6.7	7.7
Pacific	14.9	12.4	7.5	9.0	9.7	15.7	14.6
Total no. of physician assistants	636	1,598	2,956	1,940	7,130	32,325	39,455‡

*Primary care includes family practice, general internal medicine, and general pediatrics. Practice specialty was not known for 39.1% of all cases.
†States in each census division areas follows: New England: CT, ME, MA, NH, RI, VT; Mid-Atlantic: NJ, NY, PA; East-North Central: IL, IN, MI, OH, WI; West North Central: IA, KS, MO, MN, NE, ND, SD; South Atlantic: DE, DC, FL, GA, MD, NC, SC, VA, WV; East South Central: AL, KY, MS, TN; West South Central: AR, LA, OK, TX; Mountain: AZ, CO, ID, MT, NV, NM, UT, WY; Pacific: AK, CA, HI, OR, WA.
‡There were 40,036 active physician assistants in the United States in 2000. Practice location was not known for 581 of them.

per year. The first period of rapid increase came in the mid-1970s. The number of graduates increased from 282 in 1972 to 1,610 in 1976. This was followed by some decrease in the number of yearly graduates, with an average of 1,200 per year between 1980 and 1990. Beginning in the early 1990s, the number of PA graduates increased substantially each year until 2000, when more than 4,000 students graduated from training. In that year, the number of PAs graduating and entering practice made up 10% of the total active PA workforce in the United States.

Figure 2 also shows the transformation in the gender profile of PA classes over the study period. During the late 1960s and early 1970s, PA graduates were almost entirely male, because most programs were aimed at retraining military corpsmen for roles in the civilian health care workforce. By the end of the 1970s, women were entering training in increasing numbers, making up half of the yearly population of new graduates. Sixty-two percent of the PAs who graduated in 2000 were women.

Location

A goal of most of the early PA training programs was to train PAs for careers in rural settings.[2,4] Analysis of the location of PA practices across time shows that between 1980 and 2000, PAs were fairly evenly distributed across rural and urban settings in terms of PA/population ratios (Figure 3), with urban ratios being slightly higher. Graduates from the 1970s practiced in rural settings at a slightly higher rate than those from later cohorts (22% compared with 18%; not shown in table). At the census division level, the regional distribution of PAs was close to that of the distribution of the U.S. population in 1980 and 2000 (not shown in table).

Specialty

Another emphasis of early PA programs was the training of PAs for careers in primary care. The emergence of roles for PAs in subspecialty practice and surgical assisting, especially during the 1980s, created substantial employment opportunities for PAs.[14] It also led to a decline in the proportion of PAs practicing in primary care (although the number of primary care PAs increased because of the explosive growth of the profession). Hooker and Cawley estimate that in 1974, 68.8% of all PAs were practicing in the primary care specialties of family medicine, general internal medicine, and general pediatrics. As shown in Table 1, this had declined to 47.8% by 2000. (Hooker and Cawley[4] estimate that it had reached 43% in 2002.) PAs from early

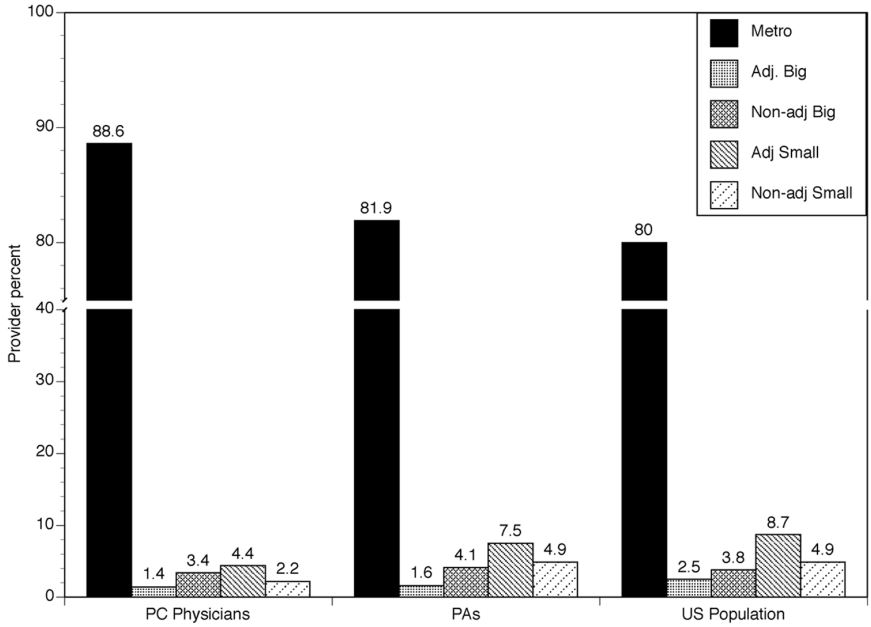

FIGURE 1. Proportional distribution of primary care physicians compared with physician assistants and U.S. population by location type (Urban Influence Codes group), 2000. Data from AAPA, 2001, and ARF, 2002.

graduate cohorts appeared to be only slightly more likely to be working in primary care in 2000 than later graduates, as shown in Figure 4.

Attrition

Currently, many PAs train for roles in specialty care while others leave primary care for specialist positions. This can be seen clearly in Table 2, which compares the specialty of PAs known to be in primary care in 1991 with their specialties in 2000. Seventy-five percent of the PAs who were in primary care in 1991 were practicing in primary care specialties in 2000. Twenty-five percent had changed to other specialties (PAs who had left practice or whose specialties in 2000 were unknown were excluded from this analysis). The most common specialties that primary care PAs changed to were

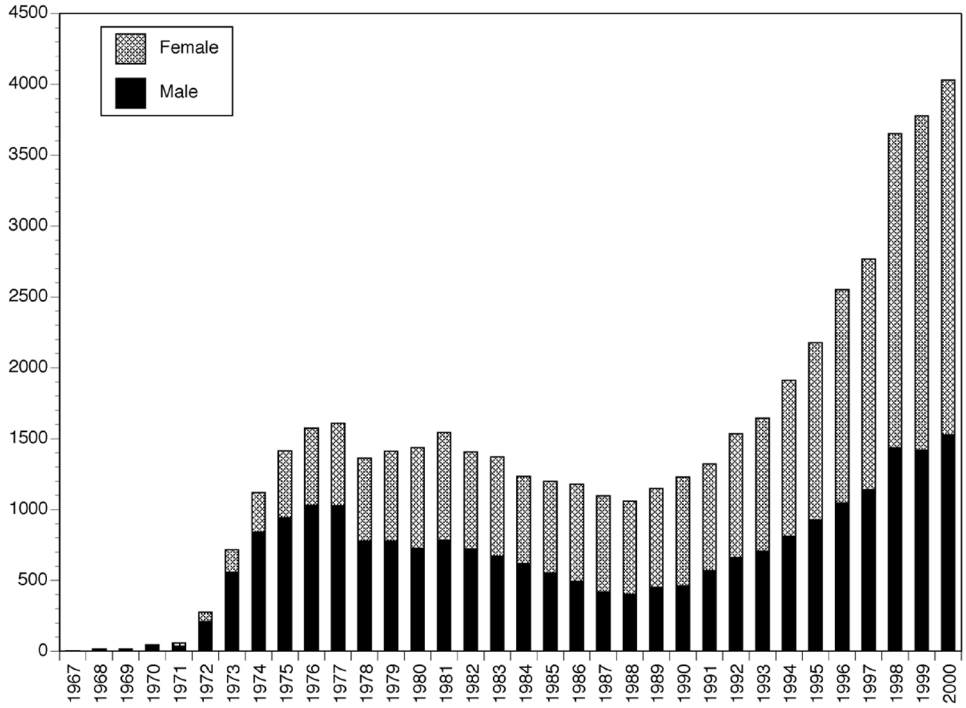

FIGURE 2. Physician assistant graduates per year, male and female, 1967–2000 (49,641 total graduates). Data from AAPA, 2001.

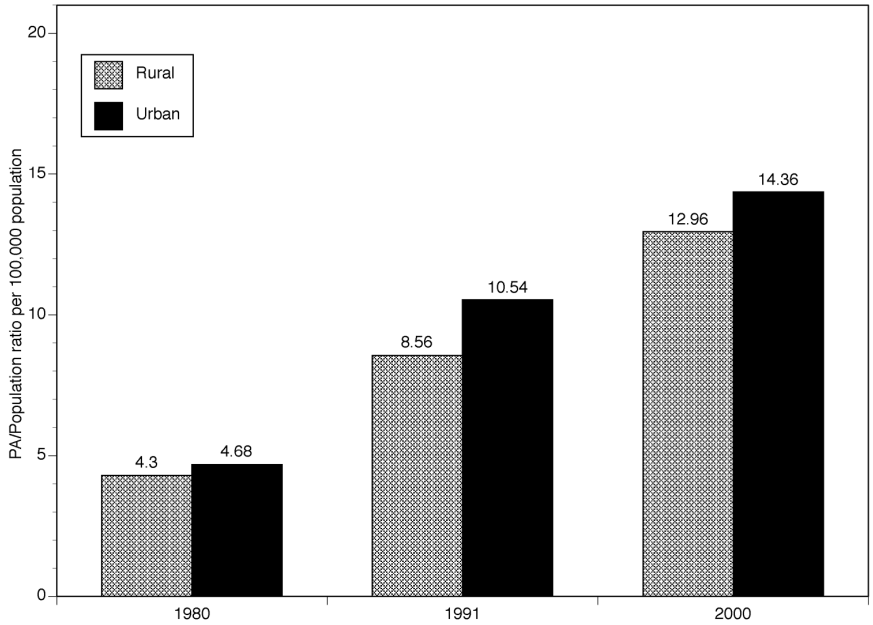

FIGURE 3. Physician assistant/population ratios per 100,000 population by rural and urban, 1980–2000. Data from AAPA, 2001, and ARF, 2002.

the internal medicine subspecialties (5.7%), emergency medicine (5.1%), and the surgical subspecialties (3.7%).

THE GROWTH OF PA TRAINING PROGRAMS: 1967–2000

Number of Programs

The two periods of rapid increase in the number of PA graduates were mirrored by two periods of rapid increase in the number of active PA training programs in the United States. As shown in Figure 5, there were just six active PA training programs in the United States that had graduated PAs by 1969. A sharp increase between 1970 and 1974 (due in part to increased federal support of PA programs[2]) provided the training slots necessary for the rapid mid-1970s growth in the number of graduates shown in Figure 2.

After the first period of expansion, the number of active training programs remained fairly steady from 1975 to 1994. Between 1994 and 2000, the number of active programs

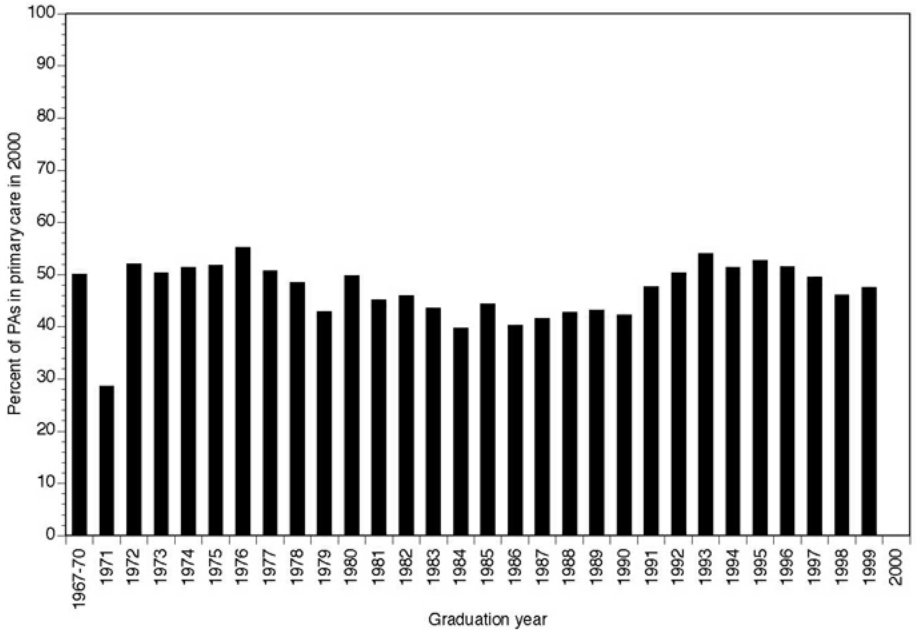

FIGURE 4. Percentage of physician assistants practicing in primary care in 2000, by graduation year of physician assistants for whom specialty is known. Data are missing for 39.3% of the population. Data from AAPA, 2001.

TABLE 2. Specialty of Physician Assistants in 2000 of Those Known to Be in Primary Care Specialties in 1991*

	1991	2000
% Family/general medicine	72.8	56.3
% General internal medicine	21.1	14.2
% Internal medicine subspecialty	—	5.7
% Emergency medicine	—	5.1
% General pediatrics	6.1	4.8
% General surgery	—	0.4
% Pediatric subspecialty	—	1.3
% Surgical subspecialty	—	3.7
% Obstetrics/gynecology	—	1.0
% Occupational medicine	—	3.2
% Other	—	4.3
% Total	100.0	100.0
No. of physician assistants	3,971	3,971

*Only physician assistants active in both 1991 and 2000 for whom specialty is known.

almost doubled, to 116 open programs by 2000. Although the net number of programs remained steady throughout the late 1970s and 1980s, many programs closed during this period and were replaced by new programs. In some years, program closures exceeded the number of new programs opening, as seen in Figure 6.

By 2000, PAs were being trained in programs spread across 41 states and the District of Columbia. About 51.5% of PAs practicing in 2000 were practicing in the states in which they were trained. In 1991, only 46.2% of the PAs had been trained in the state where they were practicing (data not shown). While more than 70% of the PAs practicing in some large states like Texas, California, and New York were trained in those states, Figure 7 shows that the majority of PAs practicing in 31 out of 50 states did not receive their training locally.

Trends in PA Credentialing

A typical PA training program takes 26 months to complete. To practice as a PA, a graduate of an accredited PA training program must pass a certification examination (to stay certified, the PA must complete continuing medical education training and take a recertification examination every 6 yrs). Prerequisites and degree requirements to enter a PA program, however, vary widely. Consequently, the degree or certificate that a graduate receives from their program also varies widely. However, a trend toward PA programs offering higher degrees has emerged over the past 20 yrs. Table 3 shows that in 1986, none of the 49 accredited active PA training programs in the country offered a master's degree.[15–19] Most offered baccalaureate degrees, and 28% offered either an associate's degree or certificate only. By 2000, 42.9% of programs offered master's degrees and only 14.3% offered associate's or certificate-level degrees as their highest degree.

Discussion

The demography, practice characteristics, and geographic distribution of the PA population changed rapidly over its first 33 yrs. One of the early changes that occurred in the

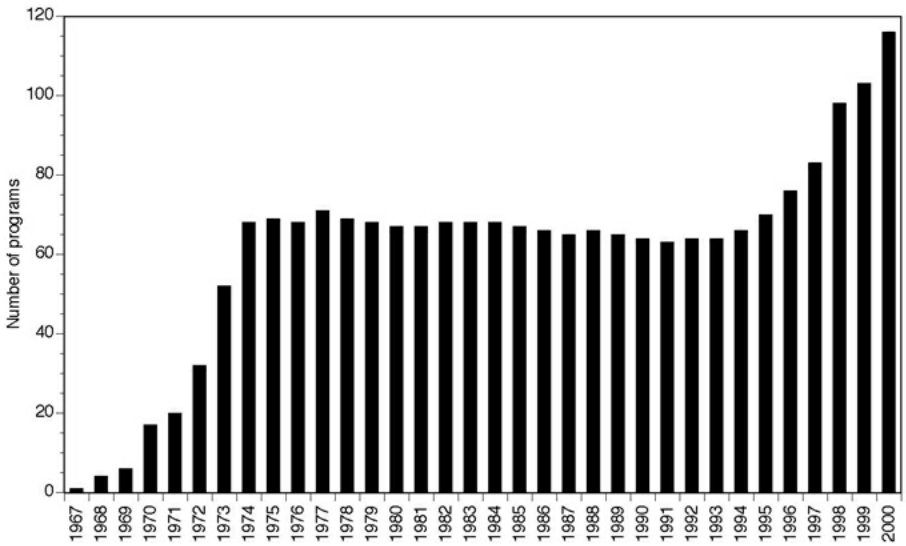

FIGURE 5. Number of open physician assistant training programs by year, 1967–2000. In the data presented, a program was considered open if it graduated PAs in that year (according to the AAPA data). This method identifies a somewhat larger number of open programs in the 1970s and 1980s than the number of accredited programs identified as open in those years by the Accreditation Review Commission on Education for Physician Assistants. This probably reflects a number of phenomena, including lag time in accrediting programs once accreditation began in 1972, programs operating under provisional accreditation status, and programs operating without accreditation. By 2000, the AAPA data and the Accreditation Review Commission on Education for Physician Assistants data agree about the number of programs training PAs (116 in that year). Data from AAPA, 2001.

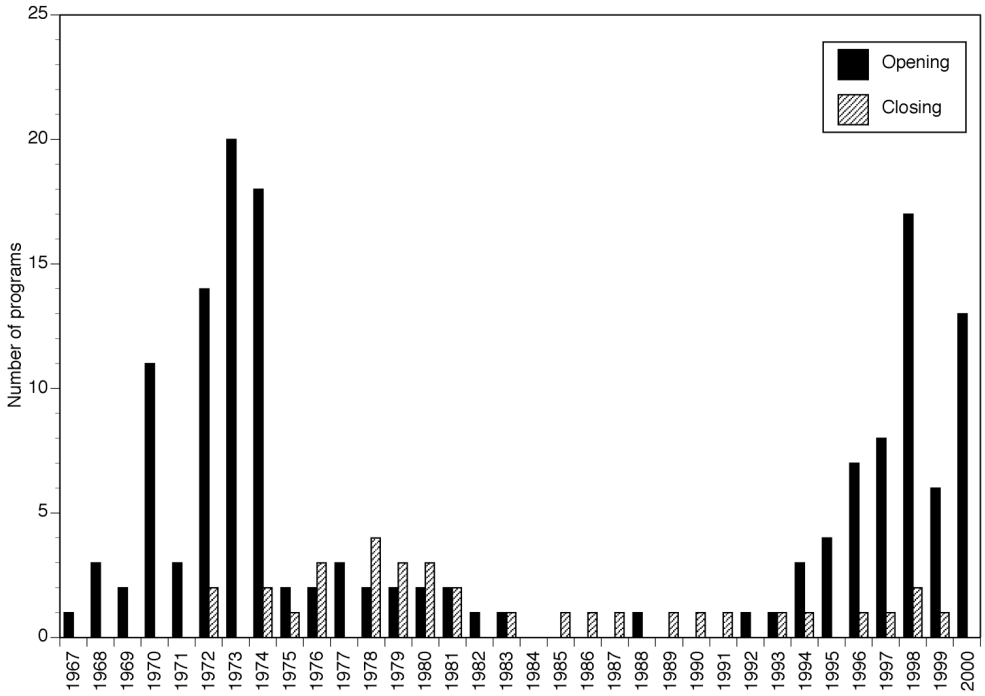

FIGURE 6. Physician assistant training programs opening/closing by year, 1967–2000. Data from AAPA, 2001.

profession was a transformation from an almost exclusively male profession to one that is now well more than 50% female (62% of the PAs who graduated in 2000 were women). This change began very early in the history of the profession; by 1983, women made up more than 50% of PA students. Another major transformation occurred in the specialty profile of the PA population. While primary care specialties (taken together) have remained the largest single specialty of PAs, more than half of PAs worked in subspecialties of internal medicine and surgery by 2000. Specialty roles appear to be attractive to PAs with experience in primary care as well as to newer graduates whose training may be more oriented toward the wide variety of specialist roles that have emerged as the profession has evolved. In terms of geographic distribution, PAs now practice in all 50 states and the District of Columbia, with their distribution roughly mirroring that of the population, both at the regional level and across the rural/urban spectrum (Figure 1). The rural/urban distribution is much closer to the distribution of the U.S. population than for primary care physicians, who remain much more concentrated in metropolitan counties.

By 2000, PA training took place in more than 116 programs in 41 states that produced more than 4,000 graduates per year. (In 2005, there were 134 programs training PAs.) There were two periods of rapid growth in the number of PA programs. The first came in the late 1970s and the second in the late 1990s (see Figure 6). In between, numerous programs closed as the market for PAs temporarily stagnated during the 1980s. One of the most dramatic changes in PA training that has occurred is the increase in the number and percentage of PA programs offering a master's degree as a terminal degree. In 1986, none of the PA training programs in the country offered a master's degree. In 2000, 42% of the programs offered a master's degree. This is a profound change in a profession that was founded with the intention of transforming and enhancing the skills of military medics and, later, other health providers such as paramedics, technicians, and nurses so that they could function at a higher level within the health care system. It is a change that, in the long run, may make PA training a less attractive and less viable option for those from other allied health professions whose training regimens do not include baccalaureate-level training.

LIMITATIONS

Although the data presented in this report are helpful in forming a picture of the transformation of the demography of the PA population and historical trends in PA training, the data are subject to a number of limitations that dictate caution in interpretation of the results. Perhaps the most important limitation is that the AAPA data used in this study did not contain information on work setting; this prevents us from knowing much about how clinical practice for PAs actually has changed over the years, particularly as specialty care roles for PAs developed. We do know from other data that in 1994, most PAs practiced in either solo/group practice settings (29.5%) or hospitals (25.7%).[4,20]

The lack of age, race/ethnicity, and temporal data frustrate efforts to understand how those demographic dimensions may influence practice specialty, location, and

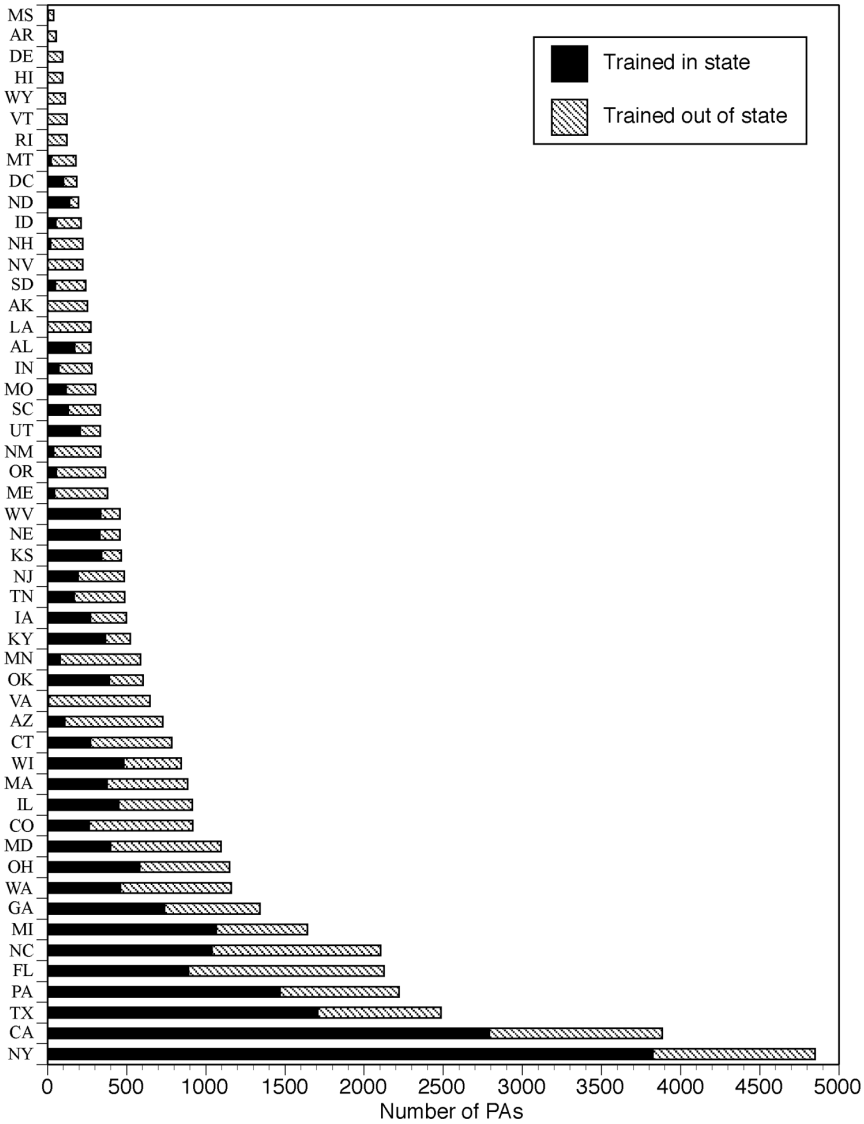

FIGURE 7. Number of physician assistants trained in state working in 2000, by state. Data from AAPA, 2001.

chances of being in practice. To some extent, graduation year serves as a proxy for age, but because a PA career is frequently a second career, it is a very rough proxy that cannot be relied on strongly for purposes of predicting retirement or observing location or specialty trends. Finally, practice status, location, and specialty data were only available at the individual level for 1991–2000 and were in some cases imputed from data collected in other years. Some comparisons with earlier periods, such as the PA/population ratios for 1980, are based on aggregate county data from the Area Resource File (data that originated from the AAPA) and should be treated with appropriate caution.

Conclusions

The information presented in this report augments a fairly rich literature on the PA profession by providing a numeric and geographic portrait of the early growth and maturation of a new health profession. Hooker and Cawley[4] have suggested that the PA profession entered a period of consolidation in the 1990s in which barriers to PA practice continue to fall and acceptance of PAs widens, but where there is less expansion of the clinical scope of PA practice than occurred in earlier years. In many important respects, this appears to be the case. While some substantial interstate regulatory differences remain,[9] many key issues of scope of PA practice, prescriptive authority, integration into the health care system, and patient acceptance appear to have been largely settled in most states.[4,8] In addition, the effectiveness and productivity of PAs have been well documented.[5,20–23] The results of this study, however, suggest that other important questions and issues remain to be resolved. These issues include the number of PAs and PA programs that can be sustained in the workforce, specialty roles for PAs, long-term effects of the "feminization" of the profession, and the effects of changing academic requirements for PA students.

The number of PAs that can be supported in the workforce is not known, and the continuing evolution of specialty roles for PAs makes this question particularly diffi-

TABLE 3. Highest Degrees Granted by Physician Assistant Programs, 1986–2000

	1986–1987	1989–1990	1994	1997–1998	2000–2001
Highest degree (%)					
Master's	—	5.9	18.6	25.8	42.9
Bachelor's	71.4	64.7	61.0	52.8	42.9
Associate	10.2	11.8	5.1	6.7	4.0
Certificate	18.4	17.6	13.6	14.6	10.3
No. of programs	49	51	59	89	126

cult. Postgraduate specialty training for PAs has been relatively rare. In 1996, only about 5% of active PAs had participated in such programs, which were mostly oriented toward surgical practice.[24] Because the distribution of PAs across specialties increasingly mirrors the distribution of physicians across specialties, the possibility of postgraduate training for PAs interested in specialty practice is an emerging theme in PA education. At the same time, there is no evidence that primary care has approached a saturation level for PAs. In addition, resolution of issues surrounding the substitutability of different provider types (including primary care physicians, nurse practitioners, and other health care providers) will come to bear strongly on the evolution of the PA profession in coming years.[25] The continued growth of the use of PAs in specialty practices, hospitals,[26] and primary care settings[21,23] suggests that the number of training programs and the number of graduates will continue to grow.

The "feminization" of the PA workforce appears to be part of a larger trend seen in other traditionally male-dominated professions such as medicine and law.[27] The current population of active physicians is approximately 30% female,[28] and the present population of medical students is about 50% female.[29] Among PAs, however, the trend is more strongly developed. The PA workforce was 52.4% female in 2000 and more than 70% of PA students were women. Ballweg[2] noted that the trend toward the master's degree appears to be associated with the increasing number of women in PA programs. The gender transformation of the PA workforce may figure prominently in the overall future of PA roles in specialty care. In a recent report discussing the feminization of the PA profession, Lindsay[30] noted that female PAs, like their physician counterparts, have tended to concentrate in primary care practice more than men but that recent evidence suggests that women are moving into specialty practices at an increasing rate. The long-term effect of this trend might be to lower the proportion of PAs in primary care even more.

Finally, the decline of the associate's degree credential and the increase in master's-level training may, by altering the PA student applicant pool, have long-term effects on the profession, possibly inhibiting the ability of rural communities and rural states to "home grow" PAs who will work in rural and underserved settings. A recent study by Evans et al.[31] found that PA students with no previous academic degree before PA training were more likely to show a commitment to primary care, rural care, and care for the underserved than students entering training with a degree. The higher costs of training associated with higher-level credentialing may also affect graduate career choices.

The information presented here reminds us that the PA profession is still young, despite much change and the resolution of critical issues over the past 30 yrs. The PA profession was, in the beginning, a primary care–oriented profession whose early advocates and practitioners aimed to serve rural and underserved populations. PAs continue to make a large and effective contribution to primary care, including a substantial contribution in rural and underserved settings.[20,22] Whether the PA profession can, or will, continue to contribute at a high level to primary care, especially for rural and underserved populations, is not certain. The ultimate distributions of PAs across the rural/urban and primary care/specialty care dimensions are still evolving.

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