

Working Paper #105

**Geographic and Demographic
Dimensions of the Adoption of a Health
Workforce Innovation: Physician
Assistants in the United States, 1967-2000**

December 2005

by

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This study was conducted by the WWAMI Center for Health Workforce Studies, funded by the National Center for Health Workforce Analysis of the Bureau of Health Professions, Health Resources and Services Administration (Contract #6-U79-HP-00003-04). The authors thank and acknowledge the American Academy of Physician Assistants, which provided data used in this study. Results and opinions expressed in this paper are the sole responsibility of the authors.



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Geographic and Demographic Dimensions of the Adoption of a Health Workforce Innovation: Physician Assistants in the United States, 1967-2000

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ABSTRACT

BACKGROUND

The physician assistant (PA) profession experienced rapid growth 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 paper describes changes in the demography and distribution of the PA population between 1967 and 2000, as well as the spread of PA training programs.

METHODS

Individual level data from the American Academy of Physician Assistants (AAPA), supplemented with county level aggregate data from the Area Resource File (ARF) was used to describe the emergence of the PA profession between 1967 and 2000. Data on 49,641 PAs who had completed training by 2000 was analyzed.

RESULTS

Over half (52.4%) of PAs active in 2000 were women. PA participation in the rural workforce remained high, with over 18 percent of PAs practicing in rural settings, compared to about 20 percent in 1980. Primary care participation declined over the study period but appears to have stabilized at about 47 percent among active PAs for whom specialty is known. By 2000, 51.5 percent of practicing PAs had been trained in the states where they worked. In 2000 over 42 percent of accredited PA programs offered a Master's degree; in 1986, no programs offered Master's degrees.

DISCUSSION

The PA profession remains young and continues to evolve. Whether or not 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.

INTRODUCTION

The first physician assistant (PA) training programs opened in the late 1960s and early 1970s (Hooker & Cawley, 2003; Smith, 1970) 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. Since that time, managed care, increased specialization and social change have taken the PA profession in directions that were quite unexpected in the early 1970s. The number of training programs grew rapidly and the prerequisites for entering those programs changed substantially. A predominantly male profession transformed into a majority female profession. Full prescriptive authority was authorized for PAs in most states (Hooker & Copher, 2005; Sekscenski et al., 1994; Wing et al., 2004). Scope of practice and insurance regulations also underwent change as the PA profession gradually gained acceptance from patients, physicians, insurers, and regulators (Cawley, 1996; Druss et al., 2003; Hooker & Cawley, 2003; Hooker et al., 2005; NCHWA, 2004; Sekscenski et al., 1994; Wing et al., 2004).

After initially being accepted in only a handful of states, over 40,000 PAs practiced in all 50 states and the District of Columbia by 2001 (Mississippi was the last state to legalize PA practice in 2000), and the number is expected to reach 58,000 in 2006. Hooker and Cawley (2003) have described the evolution of the profession as falling into five phases: (1) a period of ideology in which a new type of generalist practitioner was envisioned by early leaders such as D. Robert Howard, Eugene Stead, and Richard Smith (1961-1965) (see also Ballweg, 2003; Smith, 1970), (2) a period of implementation in which federal support for PA training was first garnered, American Medical Association endorsement was received, and the first states adopted legislation legalizing PA practice (1966-1972), (3) a period of evaluation in which health

services research evaluated the efficiency, efficacy, and safety of the PAs and in which patient acceptance of PAs spread (1973-1980), (4) a period of incorporation characterized by a significant increase in specialty practice for PAs, the updating of many state medical practice acts to include and expand the roles of PAs (1981-1990), and finally (5) a period of maturation and consolidation in which barriers to PA practice continue to decrease, acceptance of PAs continues to widen, but there is less expansion of the clinical scope of PA practice than occurred earlier (1991-present) (see also Wing et al., 2004).

The evolution of this key health profession is a case study of how a new profession emerged and was transformed as it developed internally, while at the same time was shaped by sometimes unanticipated social, economic and political forces (Ballweg, 2003; Cawley, 1996; Pedersen, 2003). Hooker and Cawley's framework provides a useful backdrop for this study, which describes the evolution of the PA profession during the past three decades with an emphasis on the demography of the PA population, the evolution of specialty roles, the number and location of PA training programs, and the geographic location of PAs within the United States.

METHODS

DATA SOURCES

This study uses data from American Academy of Physician Assistants (AAPA) supplemented with data from the Area Resource File (ARF) (BHP, 2002). The 2001 AAPA data contains information on 53,638 active and inactive PAs and includes 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 the years 1995 to 2001, state level location data for the years 1991 to 1994, active/inactive status for years 1991 to 2001, clinical specialty 1991 to 2001, the program the PA graduated from and the date of starting practice. Clinical specialty data were missing at a high rate (39 percent 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 conservative imputation protocols (AAPA, 2002). The AAPA data set did not contain information on PA age, race/ethnicity or detailed location information prior to 1995. The ARF 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 1993 version of the county level Urban Influence Codes developed by the Economic Research Service of the U.S. Department of Agriculture (Ghelfi & Parker, 1997; Hart et al., 2005; Larson et al., 2003a). Under the UIC taxonomy, counties are classified into one of nine categories, two types of metropolitan counties (called "urban" in this paper) and seven types of nonmetropolitan counties (collectively called "rural" in this paper). 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, the UIC codes are grouped to identify five types of counties: codes 1 and 2 are grouped to "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 ARF data on the geographic distribution of PAs in 1980 and 1991 was used to compare to AAPA data from 2000.

As noted above, the AAPA data did not include ZIP code data from years earlier than 1995 so it was not possible to use the ZIP-code based Rural Urban Commuting Area (RUCA) (Morrill et al., 1999) codes to analyze long-term change in the geographic distribution of PAs. However, RUCA based description of the distribution of PAs at Census Division and state levels in 2000 are presented in Appendix 1 and Appendix 2.

STUDY POPULATION

Of the 53,638 PAs in the AAPA data set, 3,997 were still in training or had not commenced practice in the year 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 analyzes virtually the entire population of PAs and because of the large numbers, statistical confidence intervals and statistics are not presented. For example, the 95 percent confidence interval of a rural estimate of 50 percent would be 48.8 through 51.2 percent.

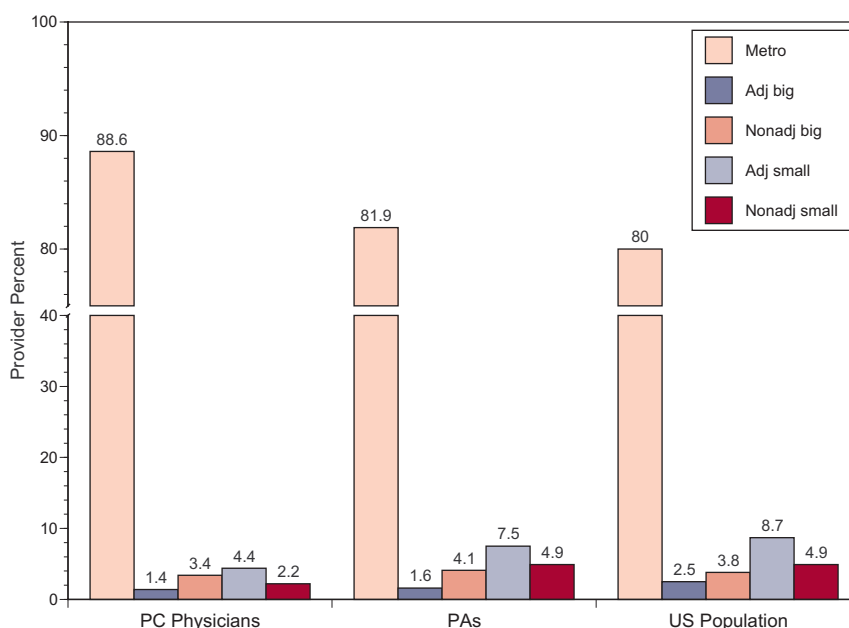
RESULTS

THE PA POPULATION IN 2000

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 percent, 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 percent 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 percent 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.

Figure 1: Proportional Distribution of Primary Care (PC) Physicians Compared to PAs and U.S. Population, by Location Type (UIC group), 2000



Source: ARF, 2002 (physicians, US population); AAPA data 2001 (PAs).

In Figure 1, the distribution of PAs in 2000 across urban and rural settings is compared to the distribution

of primary care physicians (family physicians, general internists and general pediatricians) and the

Table 1: Clinically Active PAs in the United States, by Rural-Urban Location, 2000

	Rural Subcategories				Overall		
	Large Adjacent	Large Nonadjacent	Adjacent Small	Nonadjacent Small	Overall Rural	Urban	Grand 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 number of PAs	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 percent of all cases.

† States in each Census Division as 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 PAs in the U.S. in 2000. Practice location was not known for 581 of them.

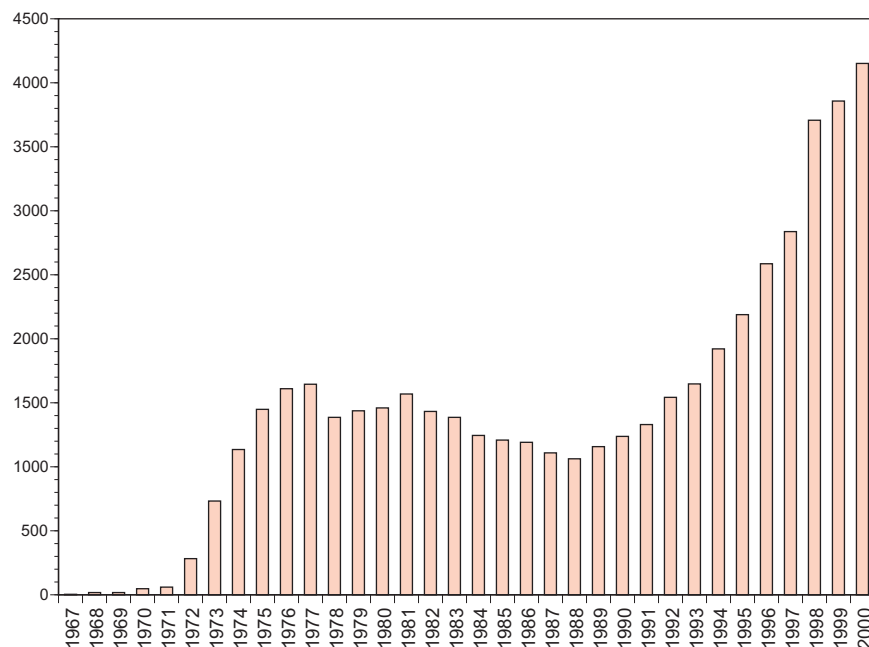
distribution of the population. Primary care physicians are considerably more concentrated in metropolitan areas than PAs, with 88.6 percent of primary care physicians located in metropolitan areas compared to 80 percent of the population. The distribution of PAs across nonmetropolitan and metropolitan areas is much closer to the distribution of the U.S. population.

DEMOGRAPHY, LOCATION, SPECIALTY, ATTRITION, 1967-2000

Demography of PAs, 1967-

2000. 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 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

Figure 2: PA Graduates per Year, 1967-2000 (49,641 total graduates)



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 over 4,000 students graduated from training. In that year, the number of PAs graduating and entering practice made up 10 percent of the total active PA workforce in the United States.

There has been a transformation in the gender profile of PA classes. During the late 1960s and early 1970s PA graduates were almost entirely male, as 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. Figure 3 shows

Figure 3: PA Graduates per Year, Male and Female, 1967-2000 (49,641 total graduates)

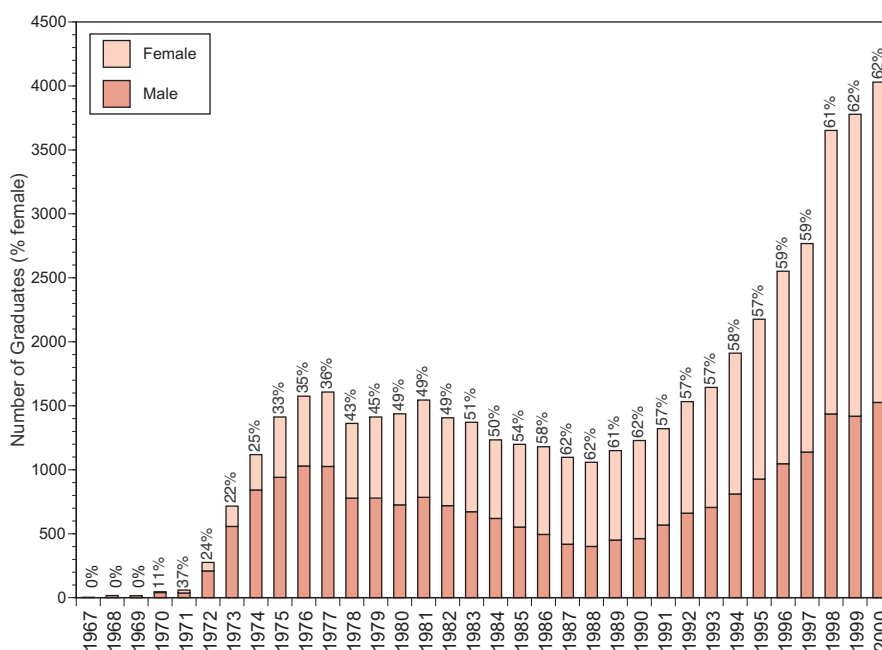
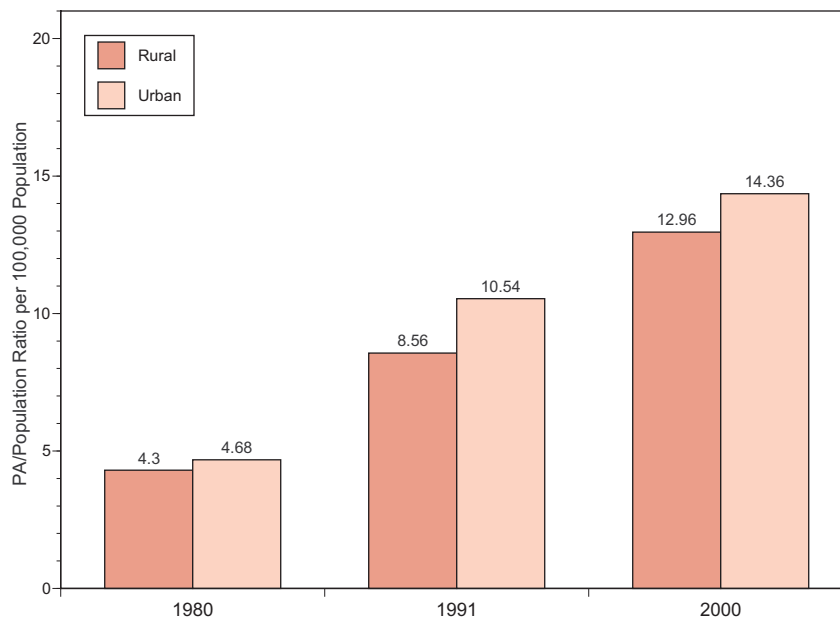


Figure 4: PA/Population Ratios per 100,000 Population by Rural and Urban, 1980-2000



Source: ARF, 2002; AAPA data.

the distribution of the U.S. population. As shown in Table 2, the distribution of PAs by Census Division remained roughly similar between 1980 and 2000. For example, in 1980, 20.6 percent of all active PAs practiced in the South Atlantic Region where 16.3 percent of the population resided. In 2000, 18.4 percent of the population of the United States lived in that region and 21.1 percent of all PAs practiced there.

PAs in Primary Care.

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 (Hammond, 2003). It also

that by 2000, women represented 62 percent of the new graduates. By 2000, women also made up 52 percent of the total practicing PAs in the United States.

led to a decline in the proportion of PAs practicing in primary care (though the number of primary care PAs increased because of the explosive growth of the

PA Location. A goal of most of the early PA training programs was to train PAs for careers in rural settings (Ballweg, 2003; Hooker & Cawley, 2003). 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 4), with urban ratios being slightly higher. In 2000, graduates from early graduation cohorts were somewhat more likely to be found practicing in rural settings than their counterparts who graduated in the 1990s (Figure 5).

In 1980, the regional distribution of PAs was not substantially different from

Figure 5: Percent of PAs in Rural Practice in 2000, by Graduation Year (39,455 active PAs)

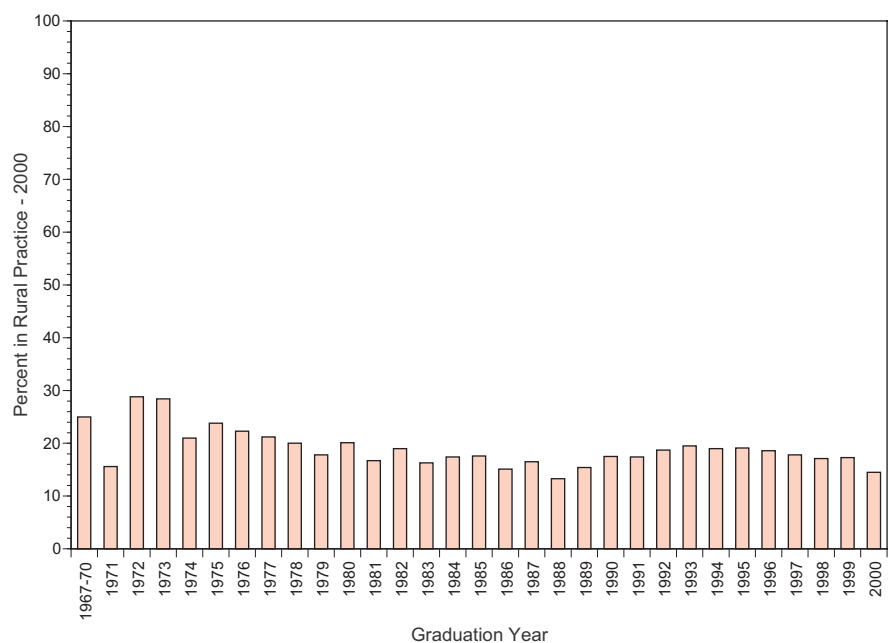


Table 2: Regional Distribution of PAs Compared to Distribution of U.S. Population, 1980 and 2000, by Census Division*

	1980		2000	
	% PAs	% U.S. Population	% PAs	% U.S. Population
New England	6.1	5.5	6.3	5.0
Mid-Atlantic	17.5	16.2	19.3	14.1
East North Central	11.9	18.4	12.2	16.0
West North Central	7.1	7.6	6.9	6.8
South Atlantic	20.6	16.3	21.1	18.4
East South Central	3.7	6.5	3.3	6.0
West South Central	8.3	10.5	8.6	11.2
Mountain	7.2	5.0	7.7	6.5
Pacific	17.6	14.0	14.6	16.0
Total	100.0	100.0	100.0	100.0

* For states in each census division, see note at bottom of Table 1.

profession). Hooker estimates that in 1974, 68.8 percent of all PAs were practicing in the primary care specialties of family medicine, general internal medicine and general pediatrics. As shown in Table 1 above, this had declined to 47.8 percent by 2000 and was estimated to be 43 percent in 2002 by Hooker and Cawley (2003). PAs from early graduate cohorts appeared to be only slightly more likely to be working

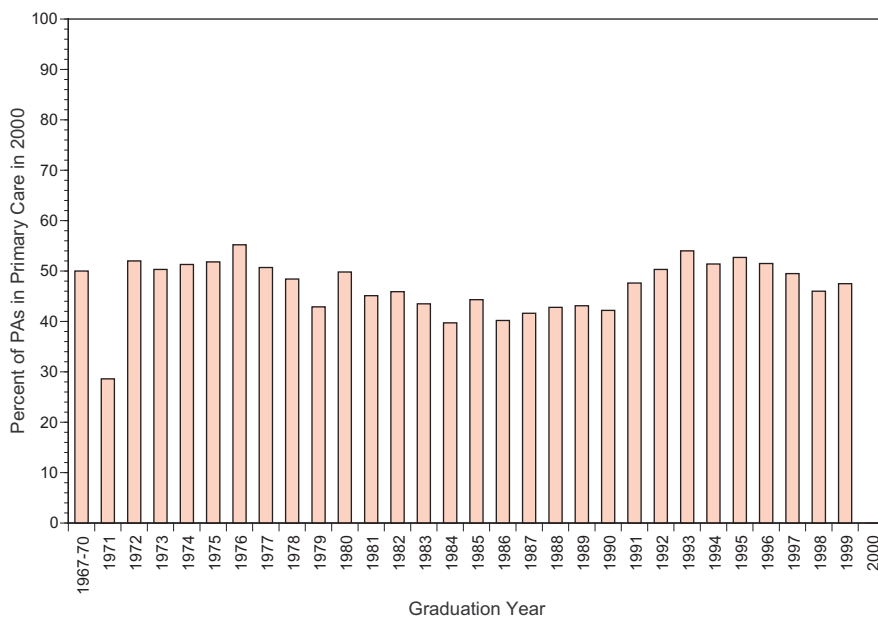
in primary care in 2000 than later graduates, as shown in Figure 6.

Currently, many PAs train for roles in specialty care while others leave primary care for specialist positions. This can be seen clearly in Table 3, 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 the internal medicine subspecialties (5.7%), emergency medicine (5.1%) and the surgical subspecialties (3.7%).

Attrition. Since the PA profession is a young one, a large fraction of those trained are still practicing. About 80 percent of all the PAs trained in the United States since 1967 were still in practice. The proportion of PAs not practicing by graduation year is shown in Figure 7. Not surprisingly, graduates of the earliest classes are the least likely to still be in

practice, but even among early graduates, more than 60 percent are still actively practicing. The large percentages of 1999 and 2000 graduates who are not practicing probably represent data collection lags or recent graduates who had not yet entered the workforce after their graduation.

Figure 6: Percent of PAs Practicing in Primary Care in 2000, by Graduation Year*



* Of PAs for whom specialty is known. Data are missing for 39.3 percent of population.

THE GROWTH OF PA TRAINING PROGRAMS, 1967-2000

Number of Programs. The two periods of rapid increase in the number of PA graduates resulted from two periods of rapid increase in the number of active PA training programs in the United States. As shown in Figure 8 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 [Ballweg, 2003]) 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 until 1994. Between 1994 and 2000, the number of active programs almost doubled, to 116 programs open by 2000. Though 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 9.

By 2000, PAs were being trained in programs spread across 41 states and the District of Columbia. About 51.5 percent of PAs practicing in 2000 were practicing in the states in which they were trained. In 1991 only 46.2 percent of the PAs had been trained in the state where they were practicing (data not shown). While over 70 percent of the PAs practicing in some large states like Texas, California and New York were trained in those states, Figure 10 shows that the majority of PAs practicing in 31 out of 50 states did not receive their training locally.

Trends in PA

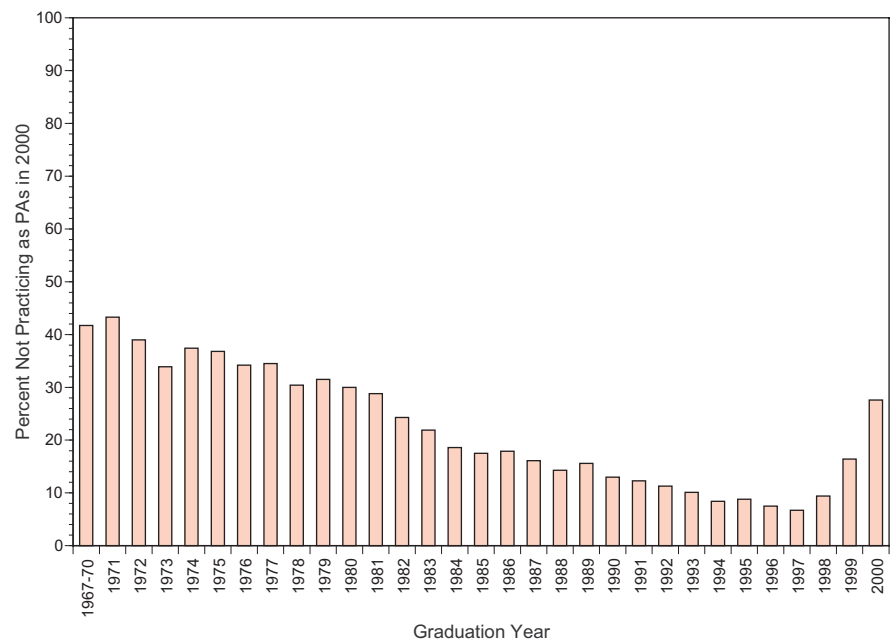
Credentialing. A typical PA training program takes 26 months to complete. To practice as a PA, a graduate of an accredited PA training program must pass a certification examination (to stay certified, the PA must earn CME credit and take a recertification exam every six years). Prerequisites and degree 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 towards more PA programs offering higher degrees has emerged over the past 20 years. Table 4 shows that in 1986, none of the 49 accredited active PA training programs in the country were offering Master's level degrees from their programs. Most were offering baccalaureate

Table 3: Specialty of PAs 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
Number of PAs	3,971	3,971

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

Figure 7: Percent of PAs Not in Practice in 2000, by Graduation Year (49,641 graduates)



degrees and 28 percent were offering either an associate degree or certificate only. By 2000, 42.9 percent of programs were offering Master's degrees and only 14.3 percent were offering associate or certificate level degrees as their highest degree (Association of Physician Assistant Programs, 1987, 1990, 1994, 1998, 2001).

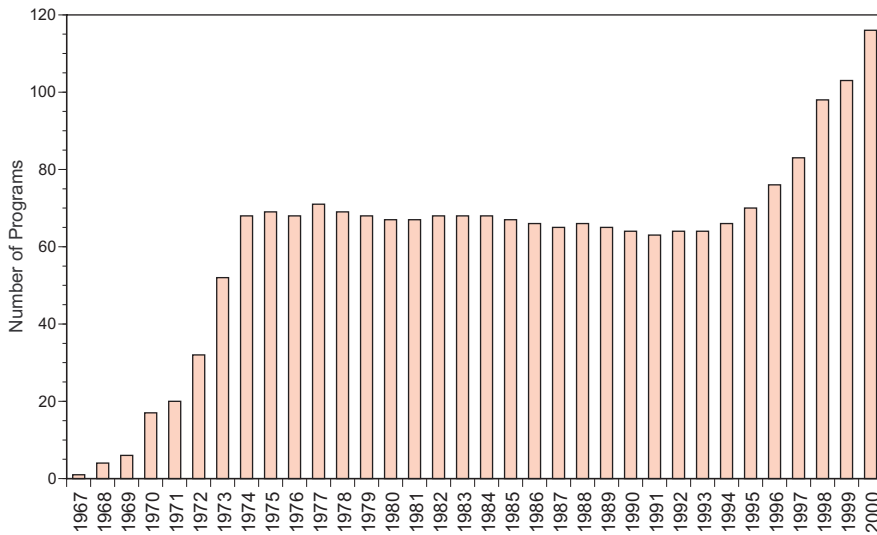
DISCUSSION

The PA profession evolved rapidly over its first 33 years. While primary care specialties (taken together) have remained the largest single specialty of PAs, emerging roles for PAs in subspecialties of internal medicine and surgery have transformed the profession in ways that were probably unanticipated by its founders. As the data in Table 3 demonstrates, 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 become available as the profession has evolved. The data presented also shows clearly that one of the early changes that occurred was the transformation from an almost exclusively male profession to one that is now well over fifty percent women (62% of the PAs who graduated in 2000 were women).

In terms of geographic distribution, PAs practiced in all 50 states and the District of Columbia in 2001, 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.

In 2001, PA training took place in 116 programs in 41 states and the District of Columbia that graduated

Figure 8: Number of Open PA 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 (ARC-PA). 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 ARC-PA data agree about the number of programs training PAs (116 in that year).

Figure 9: PA Training Programs Opening/Closing by Year, 1967-2000

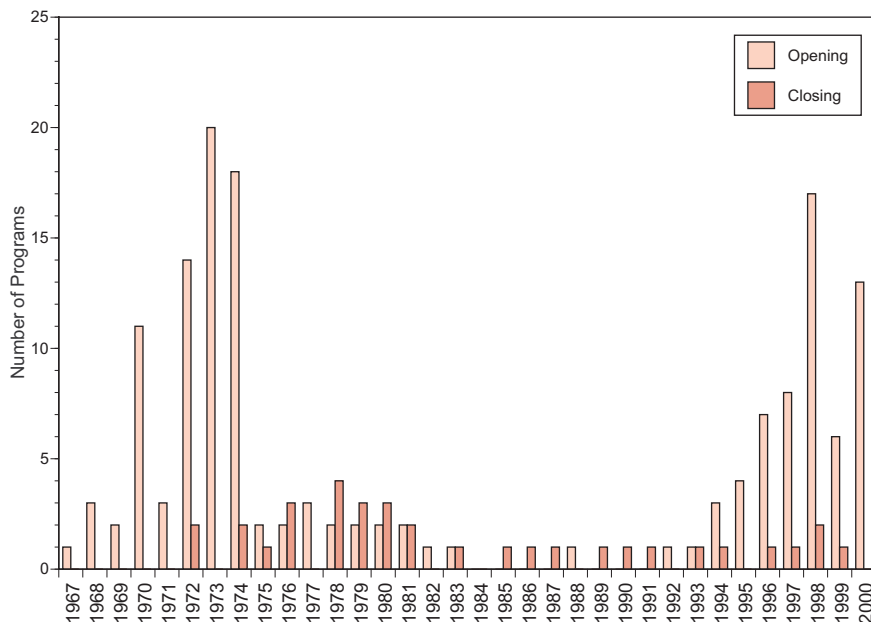
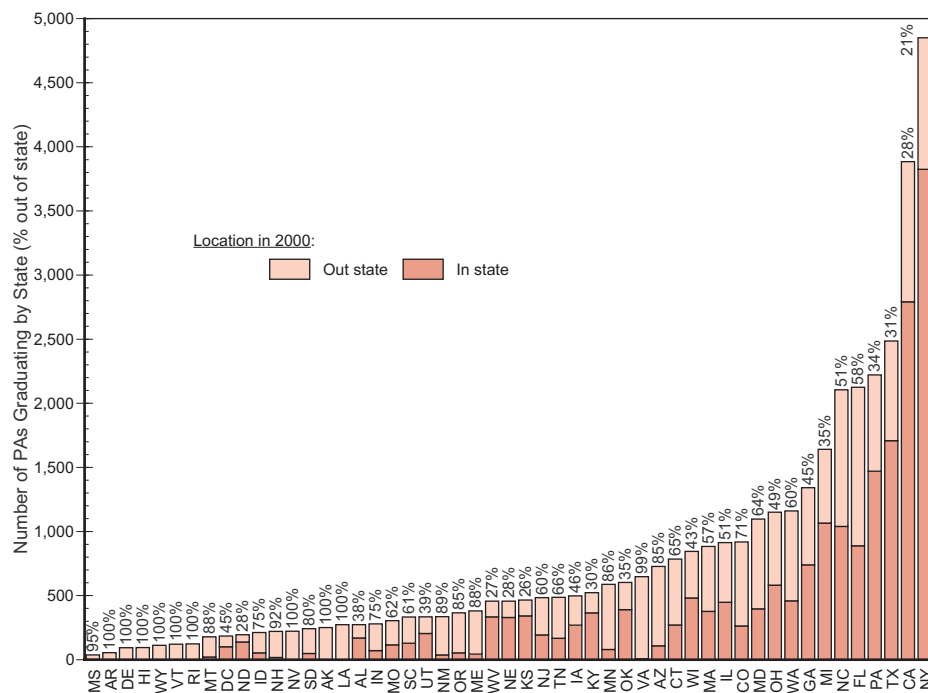


Figure 10: Number of PAs Trained Within a State Working In and Out of State in 2000, by State



enhancing the skills of military medics, and health providers like paramedics and technicians, 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 regimes do not include baccalaureate level training.

LIMITATIONS

While the data presented above are helpful in forming a picture of the transformation of the demography of the PA population and historical trends in PA

over 4,000 graduates per year. In 1980, 13 years after the Duke program graduated the nation's first class, there were only about 1,500 graduates. There were two periods of rapid growth in the number of PA programs and graduates. The first came in the late 1970s and the second in the late 1990s (see Figure 8). 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 Master's degrees as their terminal degree. In 1986, none of the PA training programs in the country offered a Master's degree. In 2000, 42 percent 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

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 does 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%) (Hooker & Cawley, 2003; Larson et al., 2001).

The lack of age, race/ethnicity and temporal data frustrate efforts to understand how those demographic dimensions may influence practice specialty, location, and chances of being in practice. To some extent, graduation year serves as a proxy for age, but since 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 locational or specialty trends. Finally, practice status, location and specialty data were only available at the individual level for the years 1991 through 2000 and were, in some cases imputed from data collected in other years. Some comparisons to earlier periods, such as the PA/population ratios for 1980, are based on aggregate county

Table 4: Highest Degrees Granted by PA Programs, 1986-2000

	1986-87	1989-90	1994	1997-98	2000-01
Highest degree					
% Masters	—	5.9	18.6	25.8	42.9
% BA/BS	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
Number of programs	49	51	59	89	126

data from the ARF (data that originated from the AAPA) and should be treated with appropriate caution.

CONCLUSIONS

The data presented in this paper augment a fairly rich literature that describes the history of the PA profession by providing a numeric and geographic portrait of the early growth and maturation of a new health profession. While some substantial inter-state regulatory differences remain (Wing et al., 2004), many key issues of scope of PA practice, prescriptive authority and patient acceptance appear to have been largely settled in most states (Hooker & Cawley, 2003; NCHWA, 2004). Other important questions and issues, however, remain to be resolved.

The data presented here indicate that the profession continues to grow in terms of number of PAs, number of training programs, and specialty roles for PAs. The number of PAs that can be supported in the workforce is not known; specialty roles are still evolving and there is no evidence that primary care has approached a saturation level for PAs. PAs appear to be highly productive (Larson et al., 2001) and make a large contribution to total care. Evidence from Washington State, for example, shows that PAs are providing over 14 percent of the primary care outpatient visits in rural areas (9 percent in urban areas), and over 18 percent of the rural outpatient visits provided by female providers (Larson et al., 2003b). Whether or not this level of contribution to care can be sustained or increased is unclear. The decline of the Associate degree credential and the increase in Master's level training may have long-term effects on the profession, possibly inhibiting the ability of rural communities and rural states to "grow their own" PAs who will work in rural and underserved settings. The higher costs of training associated with higher level credentialing may also affect graduate career choices. In addition, resolution of issues surrounding the substitutability and complementarity 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.

The PA profession was, in the beginning, a primary care oriented profession whose early advocates and practitioners aimed to serve rural and underserved populations. Whether the PA profession can or will continue to contribute at a high level to primary care and care for rural and underserved populations is not certain. The data presented here shows that the PA profession is still a young one, despite much change and the resolution of critical issues over the past 30 years. The ultimate distributions of PAs across the rural/urban and primary care/specialty care dimensions are still evolving.

REFERENCES

- AAPA (2002). Technical notes on AAPA census surveys and member opinion surveys.
- Association of Physician Assistant Programs (1987). *Third annual report on physician assistant education programs in the U.S., 1986-87*. Alexandria, VA: Author.
- Association of Physician Assistant Programs (1990). *Sixth annual report on physician assistant education programs in the U.S., 1989-90*. Alexandria, VA: Author.
- Association of Physician Assistant Programs (1994). *Tenth annual report on physician assistant education programs in the U.S., 1993-94*. Alexandria, VA: Author.
- Association of Physician Assistant Programs (1998). *Fourteenth annual report on physician assistant education programs in the U.S., 1997-98*. Alexandria, VA: Author.
- Association of Physician Assistant Programs (2001). *Seventeenth annual report on physician assistant education programs in the U.S., 2000-01*. Alexandria, VA: Author.
- Ballweg, R. (2003). History of the profession. In R. Ballweg, S. Stolberg, E. M. Sullivan (Eds.), *Physician Assistant: A Guide to Clinical Practice* (pp. 1-22). Philadelphia: Saunders.
- BHPr (2002). *Area Resource File*. Washington, DC: Bureau of Health Professions, Health Resources and Services Administration, DHHS.
- Cawley, J. F. (1996). The evolution of new health professionals: a history of physician assistants. In M. Osterweis, C. J. McLaughlin, H. R. Mannasse, C. L. Hopper (Eds.), *The U.S. Health Workforce: Power, Politics, and Policy* (pp. 189-207). Washington, DC: Association of Academic Health Centers.
- Druss, B. G., Marcus, S. C., Olfson, M., Tanielian, T., Pincus, H. A. (2003). Trends in care by nonphysician clinicians in the United States. *New England Journal of Medicine*, 348(2), 130-137.
- Ghelfi, L. M., Parker, T. S. (1997). A county-level measure of urban influence. *Rural Development Perspectives*, 12(2), 32-41.
- Hammond, J. (2003). Education. In R. Ballweg, S. Stolberg, E. M. Sullivan (Eds.), *Physician Assistant: A Guide to Clinical Practice* (pp. 23-37). Philadelphia: Saunders.

- Hart, L. G., Larson, E. H., Lishner, D. M. (2005). Rural definitions for health policy and research. *American Journal of Public Health*, 95(7), 1149-1155.
- Hooker, R. S., Cawley, J. F. (2003). *Physician Assistants in American Medicine*. New York: Churchill Livingstone.
- Hooker, R. S., CIPHER, D. J. (2005). Physician assistant and nurse practitioner prescribing: 1997-2002. *Journal of Rural Health*, 21(4), 355-360.
- Hooker, R. S., CIPHER, D. J., Sekscenski, E. (2005). Patient satisfaction with physician assistant, nurse practitioner and physician care: a national survey of Medicare beneficiaries. *Journal of Clinical Outcomes Management*, 12(2), 88-92.
- Larson, E. H., Hart, L. G., Ballweg, R. (2001). National estimates of physician assistant productivity. *Journal of Allied Health*, 30(3), 146-152.
- Larson, E. H., Johnson, K. E., Norris, T. E., Lishner, D. M., Rosenblatt, R. A., Hart, L. G. (2003a). *State of the Health Workforce in Rural America: Profiles and Comparisons*. Seattle: WWAMI Rural Health Research Center.
- Larson, E. H., Palazzo, L., Berkowitz, B., Pirani, M. J., Hart, L. G. (2003b). The contribution of nurse practitioners and physician assistants to generalist care in Washington State. *Health Services Research*, 38(4), 1033-1050.
- Morrill, R., Cromartie, J., Hart, L. G. (1999). Metropolitan, urban, and rural commuting areas: toward a better depiction of the U.S. settlement system. *Urban Geography*, 20(8), 727-748.
- NCHWA (2004). *A Comparison of Changes in the Professional Practice of Nurse Practitioners, Physician Assistants, and Certified Nurse Midwives: 1992 and 2000*. Washington, DC: National Center for Health Workforce Analysis, Bureau of Health Professions, Health Resources Services Administration.
- Pedersen, D. M. (2003). Credentialing: accreditation, certification and licensing. In R. Ballweg, S. Stolberg, E. M. Sullivan (Eds.), *Physician Assistant: A Guide to Clinical Practice* (pp. 38-49). Philadelphia: Saunders.
- Sekscenski, E. S., Sansom, S., Bazell, C., Salmon, M. E., Mullan, F. (1994). State practice environments and the supply of physician assistants, nurse practitioners, and certified nurse midwives. *New England Journal of Medicine*, 331(19), 1266-1271.
- Smith, R. A. (1970). MEDEX. *Journal of the American Medical Association*, 211(11), 1843-1845.
- Wing, P., Langeller, M. H., Salsberg, E. S., Hooker, R. S. (2004). The changing professional practice of physician assistants: 1992-2000. *Journal of the American Academy of Physician Assistants*, 17, 37-59.

Appendix 1: Geographic Distribution of PAs Using RUCA-Based Categories, by Census Division, 2000

Census Bureau Divisions*	Total Number of PAs	Geographic Distribution Within Census Division, by RUCA† Category (%)			
		% Urban	% Large Rural	% Small Rural	% Isolated Small Rural
New England	2,496	82.3	5.6	6.9	5.2
Mid-Atlantic	7,612	86.1	5.0	5.3	3.5
East North Central	4,807	79.8	9.2	6.3	4.8
West North Central	2,737	56.0	15.0	13.1	15.9
South Atlantic	8,303	81.4	8.6	5.6	4.4
East South Central	1,307	70.0	13.7	10.8	5.5
West South Central	3,400	77.7	10.8	7.9	3.7
Mountain	3,026	72.5	11.6	9.5	6.4
Pacific	5,759	86.2	6.9	4.1	2.7
Total	39,447	79.7	8.6	6.7	5.0

* States in each Census Division are as 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.

† Based on aggregation of Rural-Urban Commuting Areas: Version 1.1 (based on 1998 ZIP codes and 1998 population data). The RUCA codes are aggregated as follows: Urban: 1.0, 1.1, 2.0, 2.1, 2.2, 3.0, 4.1, 5.1, 7.1, 8.1, 10.1; Large Rural 4.0, 5.0, 6.0; Small Rural 7.0, 7.2, 7.3, 7.4, 8.0, 8.2, 8.3, 8.4, 9.0, 9.1, 9.2; Isolated Small Rural 10.0, 10.2, 10.3, 10.4, 10.5.

Appendix 2: Geographic Distribution of PAs Using RUCA-Based* Categories, by State, 2000

	Total Number of PAs	Geographic Distribution Within State, by RUCA Category (%)			
		% Urban	% Large Rural	% Small Rural	% Isolated Small Rural
Alabama	269	85.9	6.7	4.5	3.0
Alaska	253	44.3	21.3	20.2	14.2
Arizona	726	76.2	12.5	8.1	3.2
Arkansas	56	64.3	16.1	14.3	5.4
California	3,895	92.6	3.8	2.6	1.0
Colorado	913	86.4	1.9	7.1	4.6
Connecticut	779	97.6	1.2	0.6	0.6
Delaware	94	93.6	—	6.4	—
D.C.	185	100.0	—	—	—
Florida	2,111	92.3	2.2	4.0	1.5
Georgia	1,313	77.6	13.7	5.6	3.0
Hawaii	93	69.9	20.4	5.4	4.3
Idaho	212	53.8	23.1	13.7	9.4
Illinois	909	75.8	12.0	8.6	3.6
Indiana	277	82.3	6.1	9.0	2.5
Iowa	499	50.1	12.8	21.0	16.0
Kansas	465	50.1	26.0	11.4	12.5
Kentucky	519	60.9	17.7	15.2	6.2
Louisiana	272	81.6	11.8	4.4	2.2
Maine	380	47.9	12.6	21.8	17.6
Maryland	1,080	95.3	3.2	0.9	0.6
Massachusetts	869	92.9	2.0	4.1	1.0
Michigan	1,635	79.3	9.8	4.6	6.2
Minnesota	586	68.5	9.2	9.2	12.6
Mississippi	36	83.3	11.1	5.6	—
Missouri	299	75.3	8.7	10.0	6.0
Montana	179	40.2	15.6	19.6	24.6
Nebraska	456	55.9	14.7	15.1	14.3
Nevada	221	83.3	7.2	5.9	3.6
New Hampshire	220	60.5	25.5	6.4	7.7
New Jersey	484	97.9	2.1	—	—
New Mexico	332	55.7	28.6	10.5	5.1
New York	4,917	88.7	4.4	3.8	3.1
North Carolina	2,094	73.1	12.1	7.8	7.0
North Dakota	194	42.8	9.3	11.9	36.1
Ohio	1,143	89.9	7.3	2.0	0.8
Oklahoma	597	64.0	16.4	13.9	5.7
Oregon	362	69.3	21.3	3.6	5.8
Pennsylvania	2,211	77.6	7.1	9.9	5.4
Rhode Island	126	99.2	—	—	0.8
South Carolina	328	82.6	6.7	7.6	3.0
South Dakota	238	34.9	25.2	10.5	29.4
Tennessee	483	70.0	13.5	9.9	6.6
Texas	2,475	80.9	9.2	6.6	3.3
Utah	332	77.7	9.9	6.0	6.3
Vermont	122	38.5	9.0	27.0	25.4
Virginia	641	85.0	7.6	3.7	3.6
Washington	1,156	80.4	8.9	5.7	4.9
West Virginia	457	30.4	28.7	16.6	24.3
Wisconsin	843	70.5	8.3	11.9	9.4
Wyoming	111	34.2	20.7	28.8	16.2
Total	39,477	79.7	8.6	6.7	5.0

* Based on aggregation of Rural-Urban Commuting Areas: Version 1.1 (based on 1998 ZIP codes and 1998 population data). The RUCA codes are aggregated as follows: Urban: 1.0, 1.1, 2.0, 2.1, 2.2, 3.0, 4.1, 5.1, 7.1, 8.1, 10.1; Large Rural 4.0, 5.0, 6.0; Small Rural 7.0, 7.2, 7.3, 7.4, 8.0, 8.2, 8.3, 8.4, 9.0, 9.1, 9.2; Isolated Small Rural 10.0, 10.2, 10.3, 10.4.

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Grumbach, K., Hart, L. G., Mertz, E., Coffman, J., Palazzo, L. (2003). Who is caring for the underserved? A comparison of primary care physicians and nonphysician clinicians. *Annals of Family Medicine*, 1(2), 97-104.

Hummel, J., Cortte, R., Ballweg, R., Larson, E. (1994). Physician assistant training for Native Alaskan community health aides: the MEDEX Northwest experience. *Alaska Medicine*, 36(4), 183-188.

Larson, E. H., Hart, L. G., Ballweg, R. (2001). National estimates of physician assistant productivity. *Journal of Allied Health*, 30(3), 146-152.

Larson, E. H., Hart, L. G., Goodwin, M. K., Geller, J., Andrilla, C. (1999). Dimensions of retention: a national study of the locational histories of physician assistants. *Journal of Rural Health*, 15(4), 391-402.

Larson, E. H., Hart, L. G., Hummel, J. (1994). Rural physician assistants: a survey of graduates of MEDEX Northwest. *Public Health Reports*, 109(2), 266-274.

Larson, E. H., Palazzo, L., Berkowitz, B., Pirani, M. J., Hart, L. G. (2003). The contribution of nurse practitioners and physician assistants to generalist care in Washington State. *Health Services Research*, 38(4), 1033-1050.

Muus, K. J., Geller, J. M., Ludtke, R. L., Pan, S., Kassab, C., Luloff, A. E., Hart, L. G. (1996). Comparing urban and rural primary care PAs: implications for recruitment. *Journal of the American Academy of Physician Assistants*, 9(8), 49-60.

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Larson, E. H., Hart, L. G., Muus, K., Geller, J. (1999). *Content of physician assistant practice: results from a national survey*. Working Paper #55. Seattle, WA: WWAMI Rural Health Research Center, University of Washington.

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