Will the NP Workforce Grow in the Future?

New Forecasts and Implications for Healthcare Delivery

David I. Auerbach, MS, PhD

Background: The nurse practitioner (NP) workforce has been a focus of considerable policy interest recently, particularly as the Patient Protection and Affordable Care Act may place additional demands on the healthcare professional workforce. The NP workforce has been growing rapidly in recent years, but fluctuation in enrollments in the past decades has resulted in a wide range of forecasts.

Objectives: To forecast the future NP workforce using a novel method that has been applied to the registered nurse and physician workforces and is robust to fluctuating enrollment trends.

Research Design: An age-cohort regression-based model was applied to the current and historical workforce, which was then forecasted to future years assuming stable age effects and a continuation of recent cohort trends.

Subjects: A total of 6798 NPs who were identified as having completed NP training in the National Sample Survey of Registered Nurses between 1992 and 2008.

Results: The future workforce is projected to grow to 244,000 in 2025, an increase of 94% from 128,000 in 2008. If NPs are defined more restrictively as those who self-identify their position title as "NP," supply is projected to grow from 86,000 to 198,000 (130%) over this period.

Conclusions: The large projected increase in NP supply is higher and more grounded than other forecasts and has several implications: NPs will likely fulfill a substantial amount of future demand for care. Furthermore, as the ratio of NPs to Nurse Practitioners to physicians will surely grow, there could be implications for quality of care and for the configuration of future care delivery systems.

Key Words: health workforce, health care organization and delivery

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As the full implementation of the Patient Protection and Affordable Care Act (PPACA) grows nearer and US healthcare costs continue to rise, the issue of whether the United States is producing an adequate number of healthcare providers has become a central issue in recent research and policy activity. Even before the passage of the PPACA, the Health Resources and Services Agency forecasted that demand for patient-care physicians would grow by 22% from 2005 to 2020, whereas supply would grow by 13%, leaving a shortfall of more than 50,000 FTE.[1]

Projections such as these have led both to attempts to boost physician numbers with various provisions contained within the PPACA[2,3] and to increased attention to the nurse practitioner (NP) workforce as critical providers of care.[4] The degree to which NPs substitute for, or complement, care that would be otherwise provided by physicians varies depending on the scope of practice laws and the training and role of the NP among other factors. Nevertheless, primary-care NPs have been estimated to be able to handle on the order of 50%–90% of care provided by primary-care physicians with comparable or better quality of care.[5,6] Moreover, because NP training has fewer institutional barriers and shorter training time compared with physician education, it has the potential to increase supply very rapidly in a short period of time. In fact, the number of NPs more than doubled between 1996 and 2008.

A key question for policymakers is whether past growth in the NP workforce will continue. All existing models of NP supply in the United States have made use of the common input-output model.[7] Those models tend to use recent trends to forecast new graduates from educational programs (the input) and retirements (the output) and overlay them onto assumptions about how many hours providers work, by age, once in the workforce. Then, they typically use the most recent year of workforce data available and "march forward" (ie, the number of 42-y-old professionals in 2011, not yet observed, will be similar to the number of 41-y-olds observed in 2010, after adjustments for expected hours worked).

Because of complex internal dynamics of the workforce, however, such models can result in inaccurate forecasts, especially several years beyond the observed data.[8] For example, with regard to the general nursing workforce, in the 1990s, very large numbers of baby boomer RNs were temporarily out of the workforce or working part time. Forecasts at the time, which did not account for this, projected a total workforce size that would peak in the mid 2000s and decline thereafter.[7] As it turned out, the nursing workforce continued to grow steadily throughout the 2000s as those boomer RNs increased their workforce participation and work effort as they entered their peak working years of their 40s and 50s. In that case, the dynamics within the workforce itself dominated trends in the new entry of RNs, which did slow down in the early 2000s.

From the RAND Health, Boston, MA.
The author declares no conflict of interest.
Reprints: David I. Auerbach, MS, PhD, RAND, 20 Park Plaza, Ste 920, Boston, MA 02116. E-mail: auerbach@rand.org.
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Prior forecasts of the NP workforce also have used the input-output methodology and obtained forecasts that were highly dependent on recent enrollment trends. In the mid 1990s, an era of rapidly increasing enrollment in NP programs[9] predicted strong workforce growth through 2015, whereas a more recent forecast in an era of stagnant enrollments in NP programs actually projected a declining workforce after 2003.[10] Although the former forecast turned out to be fairly accurate, the latter was entirely off the mark—despite stagnating enrollment and graduation, the over all workforce continued to grow through the 2000s at the same rate as in the 1990s.

In this paper, I analyze the NP workforce from 1992 to 2008 and use an age–cohort-based forecast model to project the total supply and age structure of the NP workforce to 2025.

METHODS

Data

The main data source used in the analysis was the National Sample Survey of Registered Nurses conducted by the US Health Resources Services Agency in the Department of Health and Human Services. The survey is a representative sample of roughly 30,000–35,000 licensed RNs (between 1% and 2% of all licensed RNs) conducted every 4 years since 1977. However, 1992 is the first year in which NPs were separately identified under definitions consistent through the current survey. For the purpose of the main results presented in this study, NPs were defined as RNs who had completed a formal NP education program and were employed in nursing. FTEs were measured by counting an NP working <30 (but more than 0) hours per week as ½FTE. Under these definitions, the survey yielded 6798 sampled NPs for the 5 survey years from 1992 to 2008, with 1735 NPs identified in 2008. When weighted using sampling weights provided by the National Sample Survey of Registered Nurses (NSSRN), those NPs represented 128,000 FTE NPs in 2008.

For the purpose of a sensitivity analysis, an alternative definition of NP supply was used—professionals both educated as an NP and who consider their position title to be an NP. Only about two thirds of NPs employed in nursing consider their position title to be NP with a majority of the remainder considering themselves as a "staff nurse" or in "instruction" or "administration/management."

Data on the number and age distribution of NPs in 2002, 2005, and 2008 were also obtained from the American Academy of Nurse Practitioners. The American Academy of Nurse Practitioners (AANP) obtains counts of licensed NPs from state boards of nursing and then cleans and removes duplicates from the data (eg, NPs licensed in multiple states) to obtain a final database. They also periodically conduct surveys from that database to obtain additional details (age, earnings, practice sites, work specialty) on NPs. To help establish the validity of the data from the NSSRN, the age distribution of NPs in 2008 was compared with data on the more than 70,000 licensed NPs recorded in the database of the American Academy of Nurse Practitioners. Despite minor differences in who is sampled in each data source, the age distributions are quite similar, with no 5-year age group differing by >1.5% points between samples and a χ^2 failing to reject identical distributions (full distributions are available in supplementary materials, Supplemental Digital Content 1, http://links.lww.com/MLR/A270). The average age of an NP (48 y) was identical in each sample.

Data on enrollments and on graduates from NP programs were obtained from the American Academy of Colleges of Nursing. Population forecasts by age and sex used in projections were obtained from the US Census Bureau.

Forecast Model

Details of our forecasting model have been described elsewhere.[8] Briefly, the model used a regression analysis where the dependent variable was the logarithm of the number of FTEs produced by NPs for each single-year age group between the ages of 25 and 64 years for the 5 survey years 1992, 1996, 2000, 2004, and 2008 divided by the female US population for that given age and year. For example, one of the 200 observations (5 survey years times 40 y of age) was the number of FTE NPs observed at age 36 in the year 2000 divided by the number of 36-year-old female US residents in that year. The explanatory variables were dummy variables for 5-year age groupings and cohort groupings (eg, age 30–34, or born between 1970 and 1974). The coefficients on the age variables describe the relative likelihood of people to be working as FTE NPs at different ages, combining life-cycle effects such as childbearing or retirement with ages at which people first become NPs. The coefficients on the cohort variables describe the propensity of people born in a certain range of years to eventually work as NPs. Cohort effects were identified for cohorts born between 1930 and 1980. The model (regression output available in the supplemental materials Supplemental Digital Content 2, http://links.lww.com/MLR/A271) obtained a final adjusted R^2 of 0.73, and all coefficients were significant at the $P<0.001$ level, except for the 1930 cohort ($P=0.03$).

After using the observed data to generate coefficient estimates, the model is used for forecasting by making assumptions about future population sizes, age, and cohort effects. Population forecasts were obtained from the US Census Bureau. Future cohorts were assumed to become NPs according to the same age patterns as those observed from 1992 to 2008. Two alternative assumptions were used with respect to the behavior of future cohorts of NPs not yet observed to enter the profession. The default assumption used was that future cohorts would have the same propensity to become RNs as the most recently observed cohorts (those born between 1975 and 1979). Two alternatives were used—that future cohorts would become NPs at a rate either 25% greater or 25% lower than those born between 1975 and 1979. The former alternative is consistent with a continuation of recent trends (but more moderately so) in which enrollments in NP programs increased by 70% between 2004 and 2009 and graduations increased by 48% over the same period.

RESULTS

Figure 1 shows the overall trend in the number of NPs since 1992. The full-time equivalent supply of NPs has grown steadily since 1992, adding roughly 6000 NPs per

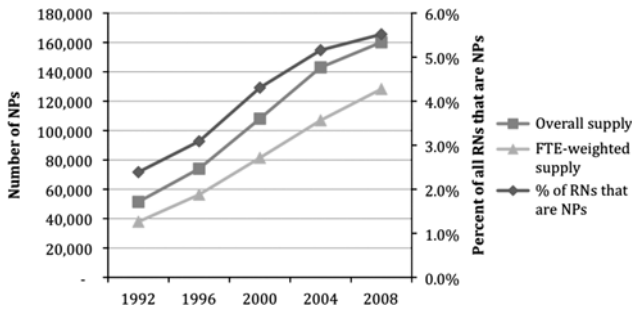

FIGURE 1. Number of nurse practitioners in the United States, and as a percentage of all registered nurses. Source: data from the National Sample Survey of Registered Nurses, 1992–2008.

year. The overall supply has grown in tandem, although less slowly from 2004 to 2008 than FTE supply, reflecting greater work intensity per NP in 2008 (perhaps a stemming from the recession). In 2008, the ratio of full-time to part-time NPs was 4:1, whereas it had been 3:1 in previous years. The percentage of all RNs who are NPs has grown more slowly in recent years, reflecting strong growth in the RN workforce.

To better understand the underlying trends in workforce growth, Figure 2 shows the distribution of the workforce over the same years as in Figure 1, by age group. Similar to the RN workforce, the NP workforce has been aging, mainly as a result of the large baby boomer cohorts that entered nursing in the 1970s and 1980s. The average age of the NP workforce grew from 43.6 to 48.3 and the percentage of FTE NPs over the age of 50 grew from 24% to 46% from 1992 to 2008.

Descriptive statistics such as the average age of the workforce, however, mask a deeper workforce complexity. The interplay of entry, retirement, and inner workforce dynamics lies at the core of the age-cohort workforce model that has been used extensively to forecast the RN workforce in previous publications.[8,11] The model uses multiple years of data to separately identify both trends in (1) whether people born in certain years are more or less likely to eventually become NPs and (2) the workforce patterns as NPs age (which incorporates information on the ages at which they are becoming NPs). That identification allows one to forecast the workforce and the age distribution of the workforce many years ahead using the assumptions that (1) the age patterns observed will continue and (2) that future cohorts will enter the workforce at a predictable rate.

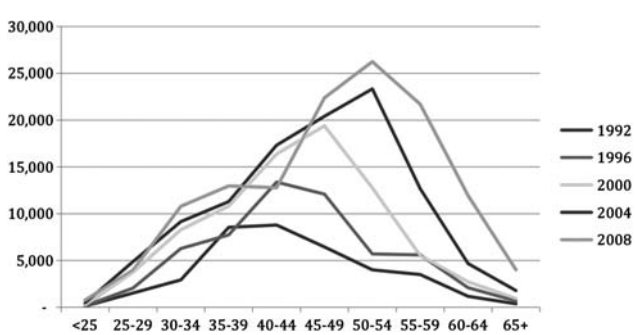

FIGURE 2. Number of full time equivalent nurse practitioners, by age group, from 1992 to 2008. Source: data from the National Sample Survey of Registered Nurses, 1992–2008.

The former assumption has been discussed in prior work on the nursing workforce. Essentially, it assumes that, even though there may be more NPs entering the workforce now than in prior years, the age pattern of when they enter and how much they work will remain similar. Figure 3 illustrates the NP workforce from a cohort-age perspective.

For example, there were roughly 15,000 FTE NPs born between 1950 and 1952 who were observed working at ages 40–42 [Note: As in the note to Figure 3, this figure denotes only NPs born in 1950 at age 42, born in 1951 at age 41, and born in 1952 at age 40 (ie, all observed in 1992), because of the quadrennial nature of the National Sample Survey of Registered Nurses]. Four years later (at ages 44–46), there were 25,000 FTE NPs born in those same years. The addition of 10,000 represents the combination of additional new entrants and changes in workforce participation (such as hours worked, or shifting jobs in or out of nursing). The 1954–1956 cohort, in contrast, produced roughly 10,000 more FTE NPs at the same age than the 1950–1952 cohort, and generally, at comparable ages, each successive cohort has produced more NPs than the previous. For example, so far, the cohorts born in the 1970s appear to be on a trajectory to far surpass the production of the baby boomer cohorts of the 1950s. Further, the curves are roughly parallel, providing confidence in the assumption that the age effects can be predicted to remain steady in the future.

Further confidence in the stability of age effects is evident upon analysis of newly minted NPs in the NSSRN between 2000 and 2008. For example, NPs working in 2000 who had become NPs between 1995 and 2000 were 39 years old on average, 53% were over 40, and they had taken an average of 13.9 years between the completion of their initial RN education and their NP education. By 2008, new NPs were slightly (insignificantly) younger (38.2, $P = 0.2$) and had completed their NP programs slightly sooner after becoming an RN (12.1 y, $P < 0.01$). Because those changes

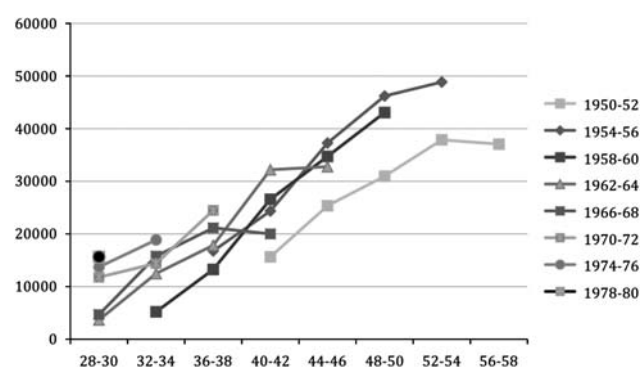

FIGURE 3. Full-time equivalent nurse practitioners (NPs) by age group and 3-year birth cohort. Source: data from the National Sample Survey of Registered Nurses, 1992–2008. Note: The data shown represent only NPs born in 1950 at age 42, born in 1951 at age 41, and born in 1952 at age 40 (ie, all observed in 1992), because of the quadrennial nature of the National Sample Survey of Registered Nurses.

are small or insignificant, no adjustments are made to the model.

The model's forecast of the future supply of NPs is shown in Figure 4, both for the default assumption and for the 2 alternatives. The workforce is predicted to continue to grow rather steadily, adding roughly 6 to 7000 NPs per year, increasing 94% overall in size from 2008 to 2025 (244,000 FTE NPs compared with 128,000 in 2008). That workforce growth represents a slower rate of growth than in the past—the workforce previously doubled in size in just 11 years from 1997 to 2008. Under the alternative "low" and "high" scenarios in which new cohorts become NPs at a rate either 25% less or greater than the most recent cohorts, the workforce is projected to grow to between 227,000 FTEs and 268,000 FTEs, respectively—81% to 113%.

When we redefine NPs as those working in nursing and who consider their position title to be "NP," the workforce grows (under the same assumptions as the default forecast above) from 86,000 FTEs in 2008 to 198,000 FTEs in 2025, representing a higher rate of growth (130%) than that above. This faster growth likely stems from the fact that a steadily growing proportion of those educated as NPs have considered their position title to be NP—from 47% in 1992 to 63% in 2000 to 67% in 2008.

These forecasts of steady growth mask underlying structural changes within the workforce as the baby boomers retire. Figure 5 illustrates 1 aspect of those changes—the age structure—by plotting the forecast percentage of the NP workforce over the age of 50. The model fits the data fairly well, almost matching the marked doubling of the percentage of the NP workforce over the age of 50 between 2000 and 2008 (22%–44%). That percentage is forecasted to plateau over the next several years and then to decline until 2020, as the baby boomers retire in large numbers, before rising again as today's entrants age into their 50s.

DISCUSSION

The NP workforce is projected to continue growing in size at a steady rate into the foreseeable future, reaching 170,000 FTEs by 2015 (from 128,000 today), 200,000 by 2020, and 236,000 by 2025. Although large numbers of NPs will retire in the coming decade, new cohorts of NPs are entering the workforce in ever larger numbers and appear poised to more than offset the retirements, despite the stagnation in enrollments in the late 1990s and early 2000s.

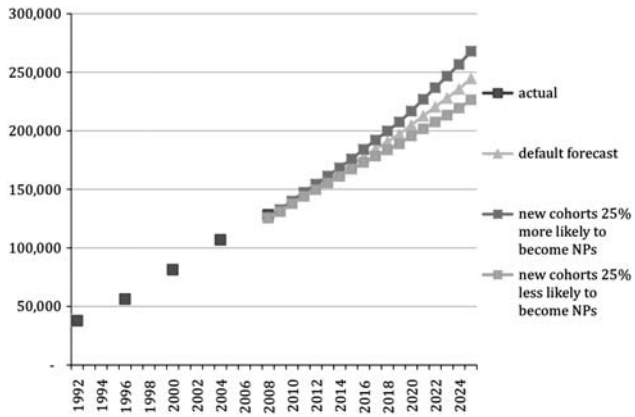

FIGURE 4. Forecast of total nurse practitioner supply to 2025 under 3 scenarios. Source: data and forecasts based on data from the National Sample Survey of Registered Nurses, 1992–2008.

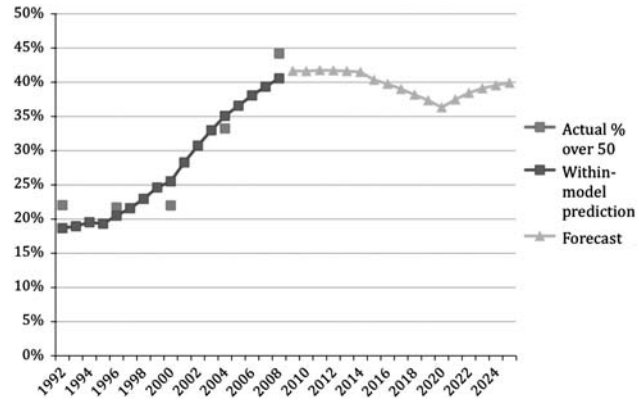

FIGURE 5. Forecast of percentage of nurse practitioners over the age of 50. Source: data and forecasts based on data from the National Sample Survey of Registered Nurses, 1992–2008.

Although those forecasts are not very sensitive to modest fluctuations in enrollment patterns, there are a number of uncertainties in the coming years that could cause reality to deviate from these forecasts. A factor that could decrease new enrollment is the adoption of the doctoral requirement for new NPs, which has been recommended by the American Academy of Colleges of Nursing (but is currently in place in only a limited number of schools) starting in 2015. Transitions to a doctorate were adopted among pharmacists and physical therapists in the past decade, and at least among pharmacists the change was noted as a factor decreasing supply (at least in the short run) as schools made the transition.[14] In contrast, particularly with large increases in the insured beginning in 2014, the demands for additional healthcare providers combined with institutional and other constraints in the medical education pipeline could greatly boost the society's demand for NPs, increasing earnings, and training slots akin to what has been observed in the past decade for RNs.[15]

In addition to uncertainty about future trends in workforce entry of NPs, a limitation of the forecasts is their reliance on relatively small numbers of observations of NPs in the NSSRN sampling frame. To address this limitation, as noted above, the age distribution of NPs in the NSSRN was compared with, and found to be very similar to, that of the much larger sample of NPs from the AANP. As a second validation exercise, the same forecast model was applied to RNs with a Master's degree identified in the Current Population Survey between 1992 and 2008 (NPs are not identified, per se, in the survey). The workforce size was projected to increase by 67% from 2008 to 2025, lower than in the forecasts above. However, this set of providers as identified in the Current Population Survey also includes other advanced-practice RNs such as nurse midwives and clinical nurse specialists, who have been increasing their numbers more slowly in recent years, and excludes the significant population of NPs without Master's degrees.

There are 3 main implications of these forecasts. The first concerns the ability of a growing NP workforce to provide needed care where the physician workforce may fall short. As noted, forecasts of the physician workforce suggest much slower growth, partly because of the larger institutional constraints on growth, such as access to residency slots. Recent updates to those forecasts suggest shortages as large as 90,000 physicians in the coming decade.[2,3] Combined with these projections, those trends suggest a ratio of physicians to NPs shrinking from 5:1 to 3:1 and of primary-care physicians to primary-care NPs (assuming, conservatively, as in Ku et al[16] that half of the NPs work in primary care now and in 2025) from 4.1:1 to 2.3:1 by 2025.

The second implication is related to the nature of care that patients in the coming decades will receive, in addition to the quantity. If the mix of primary-care providers tilts toward higher ratios of NPs to physicians, there may well be transitional difficulties as practices work to clarify roles and optimize relationships among provider teams. It is also likely that NPs will find continued employment filling roles in other settings such as nurse-managed health centers and retail clinics. Data from the AANP suggest that the number of NPs practicing in NP-only practices increased from roughly 3500 in 2004 to 6200 in 2009/2010 [Note: This calculation is based on data from 2 surveys of the AANP. The 2004 survey[12] reported 3.66% of NPs (after adjusting reported setting percentages so they add to 100%) among the 97,000 total number working in NP only clinics compared with 4.56% of the 135,000 (similarly reweighting) in 2009/2010.[13]]. The growing presence of NPs may also add pressure on insurers and state governments to loosen the scope of practice restrictions, which could impact NP roles in healthcare delivery.

The third implication is for the quality of care delivered. Considerable literature (eg, as recently reviewed in Newhouse et al[5]) has consistently documented similar or better quality of care where NPs are used in place of MDs. Yet, that literature was concerned with existing and prior models of care. In the long run, as models of care provision among providers of mixed backgrounds and training mature, there may be further improved outcomes as suggested by some literature, as a result of the different but complementary foci of NP and physician training and approaches to patient care. A recent paper as part of the Institute of Medicine future of nursing report provided considerable evidence of successful care models that incorporate RNs, NPs, and physicians working together in complementary roles.[17] The changing ratio of providers projected in these and physician forecasts add even more urgency to the successful diffusion and implementation of such models.

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