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Implications Of The Rapid Growth Of The Nurse Practitioner Workforce In The US

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ABSTRACT Concerns about physician shortages have led policy makers in the US public and private sectors to advocate for the greater use of nurse practitioners (NPs). We examined recent changes in demographic, employment, and earnings characteristics of NPs and the implications of those changes. In the period 2010–17 the number of NPs in the US more than doubled from approximately 91,000 to 190,000. This growth occurred in every US region and was driven by the rapid expansion of education programs that attracted nurses in the Millennial generation. Employment was concentrated in hospitals, physician offices, and outpatient care centers, and inflation-adjusted earnings grew by 5.5 percent over this period. The pronounced growth in the number of NPs has reduced the size of the registered nurse (RN) workforce by up to 80,000 nationwide. In the future, hospitals must innovate and test creative ideas to replace RNs who have left their positions to become NPs, and educators must be alert for signs of falling earnings that may signal the excess production of NPs.

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The US nurse workforce is changing in several profound ways. The more than one million baby-boom registered nurses (RNs) are well on their way to retirement, which creates difficulties in maintaining adequate staffing and quality of care in some hospitals and other organizations that rely on RNs.¹ While unexpectedly large numbers of people in the Millennial generation are continuing to become RNs, reducing the chance that large-scale national shortages will develop, the nurse workforce is nevertheless facing an experience gap as baby-boom RNs pass the baton to their Millennial replacements.² Still another recent development in nursing and in how health care is provided in the US concerns the dramatic increase in the number of advanced practice RNs, particularly those who are prepared in the role of nurse practitioner (NP).

The magnitude of this development became

apparent when we recently forecast the numbers of physicians, NPs, and physician assistants (PAs) through 2030 and noted how health care delivery is likely to be affected by the rising numbers of NPs and PAs.³ That forecast indicated that in each year between 2016 and 2030, the number of NPs practicing in the US is expected to grow 6.8 percent—much faster than the projected increase in the number of physicians (1.1 percent) and PAs (4.3 percent). The growth in the number of NPs is driven by a remarkable expansion in the number of NP educational programs (from 356 in 2010 to 467 in 2017), which collectively now graduate nearly as many new NPs as medical schools do physicians each year.^{4–6} Recent growth may also be fueled by a reduction in the length of time between RN and NP education, which averaged 8.2 years in 2008.⁷

The sharp increase in NP supply has implications for health care delivery, both in the mix of physicians, NPs, and PAs who provide primary

and specialty care and for the RN workforce—as most NPs practice as RNs before completing their education to become an NP. Our previous analysis of the NP workforce was limited to assessing its size and future growth relative to the physician and PA workforces. In contrast, this article characterizes in detail the recent growth of the NP workforce. Specifically, we examined national and regional dimensions of the increasing supply of NPs, focusing on the types of settings that employ them. We also describe recent trends in NPs' earnings, age, and distribution across the geographic regions of the country, as well as how the rapid growth of NPs has likely affected some employers of RNs.

Study Data And Methods

DATA Our data were obtained from the Census Bureau's American Community Survey (ACS) via single-year files obtained through the Integrated Public Use Microdata Series. The survey first identified NPs, nurse anesthetists, and nurse-midwives in 2010, but it ultimately grouped nurse-midwives with NPs in its public release files because of the small numbers of nurse-midwives. As there are roughly twenty times more NPs than nurse-midwives in the US, for this analysis we considered all people in the combined category to be NPs.^{8,9} The survey identified 1,017 NPs in 2010, 2,001 in 2017, and 10,905 in the period 2010–17.

Importantly, occupational data from the ACS categorize respondents' profession by self-characterization of their work. Consequently, the survey data will not match supply figures based on licensure data. For example, the American Association of Nurse Practitioners identified 240,000 licensed NPs in 2017, a number that exceeded our estimate based on ACS data—likely because a substantial portion of NPs either are not working or are working in a position that they would not characterize as “nurse practitioner,” as other survey data have found.¹⁰ We also examined the supply of physicians ($N = 80,649$ in 2010–17) and nurses who were not advanced practice RNs in the ACS data ($N = 239,272$ in 2010–17).

METHODS We defined full-time-equivalent (FTE) NPs and RNs by dividing each respondent's usual weekly hours worked by forty hours. We used sampling weights provided by the Census Bureau to estimate total workforce counts. Both NPs and RNs were grouped regionally based on their reported state of residence. The geographic distribution of NPs according to the ACS was further validated by comparing counts of NPs from 2017 published in the Occupational Employment Statistics (OES) of the Bureau of

Labor Statistics. Earnings were estimated among respondents who indicated that they worked at least thirty hours per week.

LIMITATIONS Our study had a number of limitations. One was the small number of nurse-midwives classified as NPs noted above, and another was the possible misclassification of other people as NPs because of incorrect self-reports. However, the main limitation was the relatively small sample size. Standard errors for overall supply and earnings were estimated to be 2–3 percent as high as the estimate itself and on the order of 10 percent as high as the estimates of supply by region. Although the ability to make precise inferences was limited in some cases, we found that the ACS data matched information from other sources with great precision. For example, the geographic distribution of NPs in 2017 across nine US regions very closely matched that found in the OES ($r = 0.97$). Despite some differences in the measures (for example, the OES data exclude self-employed NPs and do not account for part-time workers), the percentage of NPs by region differed by no more than 2 percentage points for any given region between the two data sets.

Study Results

The number of FTE NPs in the US more than doubled (an increase of 109 percent) in the period 2010–17, from approximately 91,000 to 190,000 (exhibit 1). Over this same period, the number of RNs who were not advanced practice RNs grew 22 percent (from roughly 2.5 million to 3.0 million), and the total number of physicians grew 9 percent (from roughly 870,000 to 950,000) (see the online appendix).¹¹ Real (that is, inflation-adjusted) earnings for NPs also grew 5.5 percent over this period (exhibit 1), which suggests that demand continues to increase overall. In all years, fewer than 1 percent of NPs were unemployed (data not shown).

The dramatic growth in the NP workforce from 2010 to 2017 reflects extremely rapid growth in entry into NP programs (NP graduates more than tripled from 2006–07 to 2016–17), particularly among younger RNs. In 2010 baby boomers ages 50–54 made up the largest group of NPs. But years of rapid entry into the NP workforce among Millennial RNs meant that in 2017 the largest group of NPs were ages 30–34 (exhibit 2).

Growth in the numbers of NPs occurred relatively evenly across employment settings (exhibit 3). The number of NPs employed in hospitals, physician offices, and outpatient care clinics (which collectively employed 83 percent of NPs in 2017) grew 116–142 percent.

On average, NPs in all settings enjoyed infla-

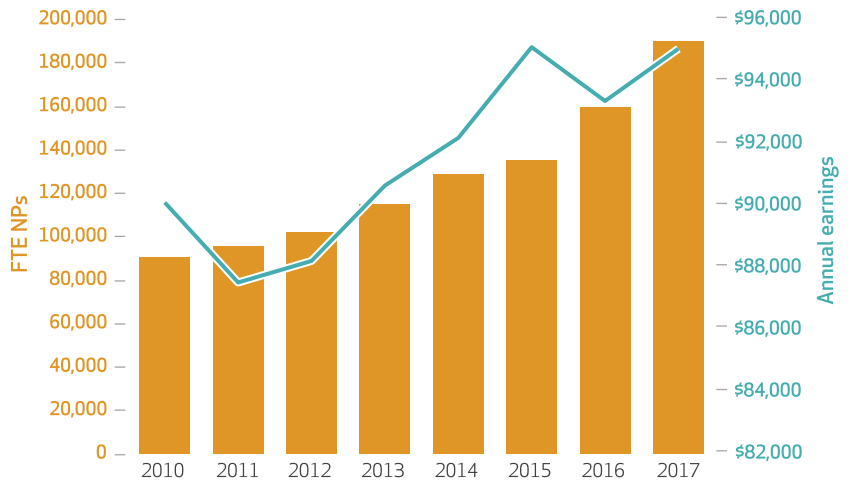
tion-adjusted earnings growth, though growth in earnings was highest in outpatient care clinics, where employment also grew the fastest. This suggests growing demand for NPs in these care delivery settings.

There were also different regional patterns in growth in the number of NPs (exhibit 4). Across all nine US regions the increase in the number of NPs per capita in 2010–17 varied from 49 percent in the South Atlantic region to more than 150 percent in the East South Central and West South Central regions (the states in each region are listed in the notes to exhibit 4). In 2017 the East South Central region led the nation in the number of NPs per capita, followed by New England—which had had the most NPs in 2010. Consistent with other literature, we also found that NP supply growth from 2010 to 2017 was notably slower in states with restrictive scope-of-practice regulations (100 percent) than in states with full practice authority for NPs (133 percent) (data not shown).^{12,13}

The percentage of the RN workforce represented by NPs grew in all regions from 2010 to 2017, reflecting faster growth in the NP supply than in the RN supply (exhibit 5). Yet there were substantial differences across regions. In 2010 the percentages of all RNs who were NPs varied from just 2.6 percent in the West South Central region to 5.1 percent in New England. In 2017 the

EXHIBIT 1

Number and average annual earnings of full-time-equivalent (FTE) nurse practitioners (NPs) in the US, 2010–17

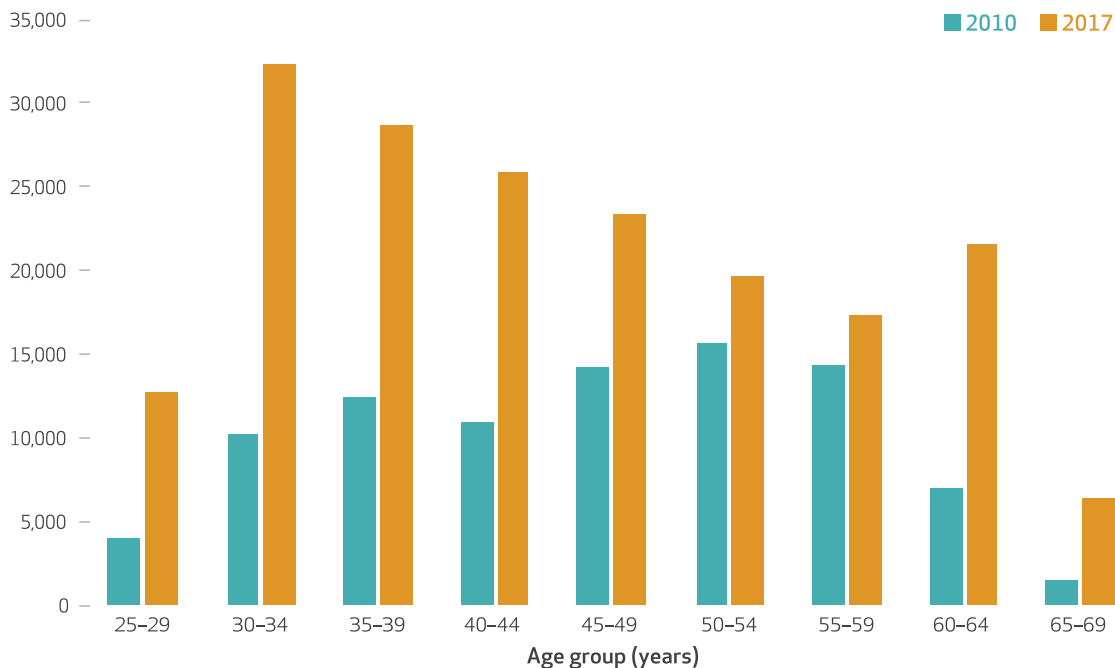


SOURCE Authors' calculations based on data from the American Community Survey. **NOTES** The earnings data are for survey respondents who worked at least thirty hours per week. The amounts were adjusted for inflation using the Consumer Price Index for All Urban Consumers and are reported in 2017 dollars.

region with the smallest share was the South Atlantic region (5.1 percent) and that with the largest share was the East South Central region (8.6 percent). In the latter region nearly one in

EXHIBIT 2

Number of full-time-equivalent nurse practitioners, by age group, 2010 and 2017



SOURCE Authors' calculations based on data from the American Community Survey.

EXHIBIT 3

Number and average earnings of full-time-equivalent nurse practitioners (NPs), by employment setting, 2010 and 2017

Employment setting	Number			Average earnings (\$)		
	2010	2017	Growth (%)	2010	2017	Growth (%)
Hospitals	34,616	74,642	116	98,269	101,243	3
Physician offices	21,844	48,942	124	87,443	90,475	3
Outpatient care centers	13,612	32,967	142	86,565	94,560	9
Other	19,244	32,122	67	80,935	88,176	9

SOURCE Authors' calculations based on data from the American Community Survey. **NOTES** Earnings data are for survey respondents who worked at least thirty hours per week. Amounts were adjusted for inflation using the Consumer Price Index for All Urban Consumers and are reported in 2017 dollars. Hospitals, physician offices, and outpatient care centers are the most common employment settings for NPs. The next two most common settings were colleges and universities and nursing facilities, where the number of NPs grew 183 percent and 127 percent, respectively.

10 RNs were NPs. In fact, growth in the number of NPs in the East South Central region (from 6,844 to 17,801) was large enough to approach the amount of absolute growth in RN supply in the region (from 171,231 to 188,819) (data not shown).

Discussion

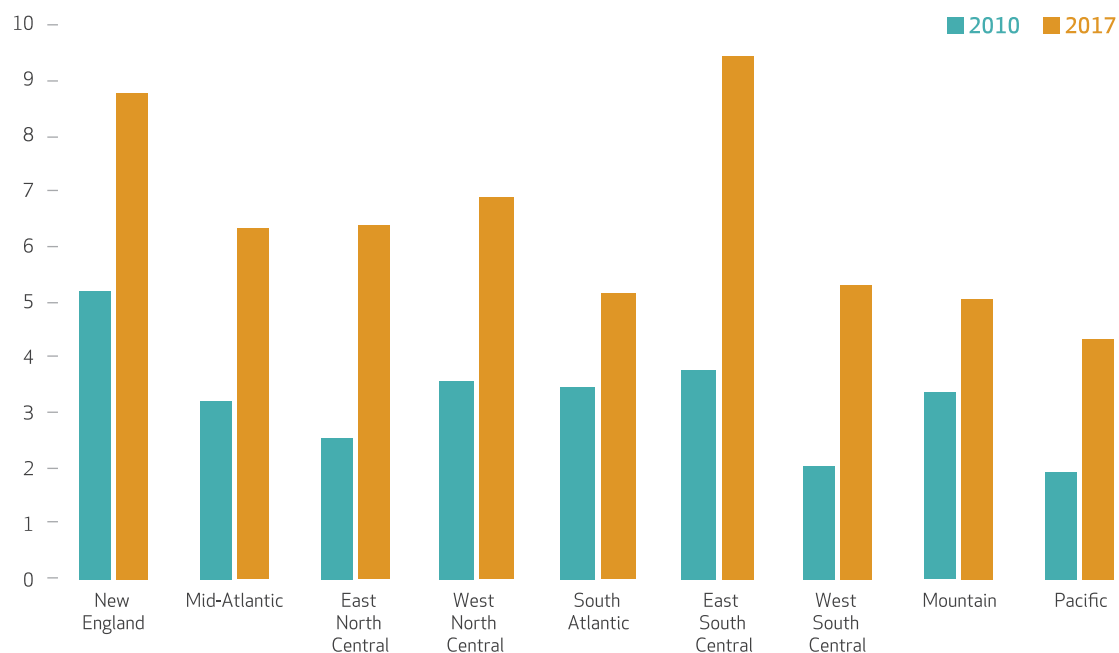
Fueled by a rapid increase in the number of graduates, the size of the NP workforce more than doubled in just seven years—an unprecedented

rate of growth for a major profession.¹⁴ The growth has been broad based across care settings and accompanied by modest 5.5 percent aggregate real earnings growth from 2010 to 2017. Strikingly, more NPs than physicians were added to the health care workforce over this period, although physicians outnumbered NPs ten to one in 2010.

Overall growth in the numbers of NPs has been particularly rapid in outpatient clinics, a growing locus of health care delivery, and in the East South Central region, which surpassed New Eng-

EXHIBIT 4

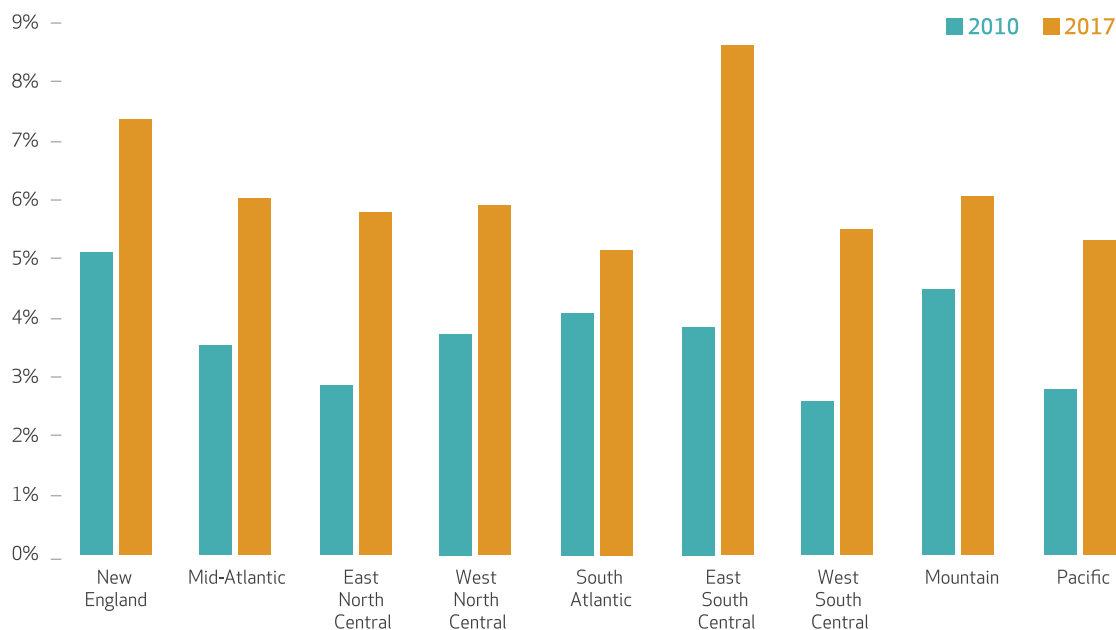
Number of full-time-equivalent nurse practitioners per 10,000 residents, by US region, 2010 and 2017



SOURCE Authors' calculations based on data from the American Community Survey. **NOTES** New England includes CT, MA, ME, NH, RI, and VT. The Mid-Atlantic region includes NJ, NY, and PA. The East North Central region includes IL, IN, MI, OH, and WI. The West North Central region includes IA, KS, MN, MO, NE, ND, and SD. The South Atlantic region includes DE, DC, FL, GA, MD, NC, SC, VA, and WV. The East South Central region includes AL, KY, MS, and TN. The West South Central region includes AR, LA, OK, and TX. The Mountain region includes AZ, CO, ID, MT, NV, NM, UT, and WY. The Pacific region includes AK, CA, HI, OR, and WA.

EXHIBIT 5

Percent of all full-time-equivalent registered nurses who were nurse practitioners, by US region, 2010 and 2017



SOURCE Authors' calculations based on data from the American Community Survey. **NOTE** The states in each region are listed in the notes to exhibit 4.

land to have the highest density of NPs per capita in the US in 2017. It is unclear whether the rapid growth in some regions was driven by differences in demand for NPs, the supply of new graduates, scope-of-practice laws, or other factors.

When RNs become advanced practice RNs and practice in the role of NP, their contribution to the health care delivery system typically changes. Most RNs work in inpatient hospital settings, whereas the majority of NPs practice in primary care—typically in ambulatory care practices, where they collaborate with physicians, PAs, and other professionals.¹⁰ Thus, when RNs become NPs, this can lead to a net shift of labor out of the acute hospital setting. As noted above, in the East South Central region, for example, the number of RNs grew 10 percent, while the number of NPs grew 160 percent. Had the number of NPs also grown by 10 percent, there would have been roughly 10,000 (6 percent) more RNs practicing in the region than was the case (although this may overstate the true reduction in the RN workforce because some nursing students never intend to work for long as an RN but rather seek an educational path directly toward becoming an NP). Across all nine US regions, the reduction in the supply of RNs resulting from the relatively faster growth of the NP workforce suggests that there were up to 80,000 fewer RNs than would have otherwise have been the case—a consequence described in more detail below.

Implications

This acceleration in the number of NPs has numerous implications for the provision of health care in the US, some of which have been explored elsewhere.¹ Most obvious and direct is that more care will be provided by NPs: There are projected to be two NPs for every five physicians in 2030, compared to less than one NP per five physicians in 2016. The Medicare Payment Advisory Commission has reported that the share of all Medicare evaluation and management office visits that were billed by NPs and PAs grew from 4.6 percent in 2010 to 12.3 percent in 2017, while the share of beneficiaries who received at least one service billed by an NP grew from 16 percent to 34 percent—with most of this growth driven by increased visits billed by NPs.¹⁵ Though some of the increase in patients' use of NPs occurs under physician supervision, differences in training, philosophy, efficacy, and approach toward patient care across different types of providers will be reflected throughout the health care system as the number of NPs continues to increase.

Beyond this change, one implication that has been relatively unexplored in the literature, but that is a frequent topic among hospital chief nursing executives, has to do with the fact that new RN graduates seem to be increasingly leaving hospital positions after only one or two years (during which time they acquire clinical experience) to begin a master's degree or a doctor of

nursing practice program.¹⁶ While some of these RNs continue to work part time, others need to be replaced. Our analysis that showed the growth of the NP workforce outpacing that of the RN workforce is aligned with these observations.

While it is unlikely that the increase in NPs will lead to such a reduction in RNs that hospitals face a deep and prolonged shortage of RNs, it could add to RN staffing tensions that are already high in many parts of the country. For example, an analysis of the impact of legislated staffing ratios in Massachusetts found that meeting the ratios would require an additional 2,286 RNs, representing roughly 2.8 percent of current statewide supply, and would lead to significant difficulty on the part of hospitals in finding these RNs and an estimated annual cost of \$646 million.¹⁷ This is similar in magnitude to the estimated nationwide reduction in the RN supply (up to 80,000 RNs, or 2.6 percent) that has resulted from the rapid growth in the NP workforce.

As noted above, because NPs are more likely to work in ambulatory care settings, compared to nurses who are not advanced practice RNs, this speedy RN-to-NP conversion entails a net transfer of providers away from hospital settings to ambulatory care settings. While this change is consistent with policy efforts to shift care out of more intensive settings, the mechanism described above does not necessarily accomplish this goal if the geographic areas in which RNs are shifting from acute hospital care to ambulatory care happen to be areas in need of more acute care providers.

Another implication of the recent growth of the NP workforce is the possibility that too many NPs are being produced relative to demand. In fact, the Health Resources and Services Administration projected a significant surplus of primary care NPs by 2025, suggesting that NP supply would exceed demand by 62 percent.¹⁸ An indicator of too-rapid growth is a depression of NP earnings. If earnings fall, then this could lead to fewer RNs seeking to become NPs and a reduction in the growth of the NP supply.

It should be kept in mind that the Health Resources and Services Administration's analysis did not fully account for the overlapping roles of NPs and physicians in meeting the growing demand for primary care—particularly due to population aging (that is, “surplus” NPs will provide care to patients who would otherwise be cared for by physicians, thus making up for the scarcity of primary care physicians). The

fact that inflation-adjusted earnings of NPs increased while unemployment remained very low suggest that NPs continue to be in demand. Should a surplus of NPs develop in the future, it is reasonable to expect rising unemployment of and falling earnings for NPs and to see more NPs employed in positions and providing nursing services that would otherwise be filled or provided by RNs.

A final issue associated with the unprecedented growth of the NP workforce concerns changes in the delivery of NP education. When the baby-boom generation was becoming nurses, it was typical for RNs to obtain their NP education in programs that provided in-person lectures and extensive hands-on clinical experience and training. Over the past fifteen years, however, many of these programs have adopted distance learning and online education formats, some of which are completed by RNs immediately or very shortly after they completed their initial RN education (as evidenced by the changing age distribution of NPs shown in exhibit 2).¹⁹ According to data from the American Association of Colleges of Nursing, 175 of the 376 NP education programs are offered mostly online (52 are offered completely online).²⁰ Studies are needed to assess the effectiveness of different modes of delivering NP education.

Conclusion

The period 2010–17 was characterized by both significant policy activity related to increasing the prominence of and investment in primary care and continued stagnation in the primary care and rural physician workforces. In this period the number of NPs more than doubled—which has helped fill critical gaps in health care delivery systems nationwide.²¹ As NPs continue to expand their profile in health care organizations and achieve greater prominence within the health care workforce, the potential loss of RNs to the NP workforce is likely to continue to cause employment ripples, particularly in acute care settings. Thus, even in an era of strong RN workforce growth fueled by Millennials in particular, hospitals must innovate and test creative solutions to contend with tight or fluctuating RN staffing—as they have during past disruptions in their RN labor supply. Meanwhile, researchers should monitor and assess any signs of oversupply and differences in NPs' effectiveness and quality of care by level and type of educational preparation. ■

Peter Buerhaus presented two slides of preliminary results at a meeting of the American Association of Nurse Leaders in San Diego, California, April 13, 2019.

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study, interpretation of the results, or preparation of the manuscript.

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