Regional Forecasts of the Registered Nurse Workforce in California

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Abstract / Overview

Statewide forecasts of the supply and demand for registered nurses (RNs) project a balanced RN labor market, but regional forecasts reveal large differences across regions. Substantial shortages are projected for the San Francisco, Central Valley, and Central Coast regions, while surpluses may emerge in the Sacramento and Los Angeles regions. The forecasts account for population growth, population aging, and anticipated changes in the numbers of new RN graduates.

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Background

Recent data suggest that a shortage of registered nurses (RNs) may be emerging in California. The Fall 2017 Survey of Nurse Employers found that many Chief Nursing Officers are experiencing difficulty recruiting RNs for specialized positions and that more than 85% of hospitals reported demand for RNs being greater than the available supply (Chu, Bates, & Spetz 2018). Hospital vacancy rates have been rising since 2013, reaching 6.3% in 2017. There also has been growth in the share of newly-graduated RNs reporting they are employed within 12 months of licensure, increasing from 59% in 2013 to 81% in 2017 (HealthImpact 2018). There is variation across regions in the reported difficulty of finding qualified staff, with some employers suggesting there is a surplus of recently-graduated nurses and others indicating severe shortfalls of nurses at all levels of experience.

Rising retirement rates contribute to the challenge of recruiting nurses, particularly those with specialized skills and experience (Buerhaus & Auerbach 2011). In addition, the implementation of the most significant components of the Affordable Care Act (ACA) – an expansion of Medi-Cal and the implementation of the Covered California health insurance exchange to facilitate insurance enrollment – reduced the share of nonelderly Californians without health insurance from 16.2% in 2011 (Charles 2015) to 8.1% in 2015 (Cohen et al. 2016). Growing numbers of insured people will demand more health care services, which in turn drives demand for health professionals, including RNs. Moreover, the ACA established programs to encourage improved care management in order to deliver health care more efficiently and effectively; this type of care provides incentives for health care systems to increase their utilization of RNs (Spetz 2014).

This report provides forecasts of RN supply and demand for each of the eight regions of California, based on a statewide projection model developed for the California Board of Registered Nursing (BRN).

The data used to construct the model were derived from the 2016 BRN Survey of Registered Nurses (Spetz, Chu, & Jura 2017), the 2015-2016 BRN Annual Schools Report (Blash & Spetz 2018), and BRN license records. The supply forecast is compared with several benchmarks of demand, including national ratios of RNs per capita, estimates of future hospital utilization, and projections published by the California Employment Development Department (EDD 2017).

Definition of the Regions

The eight regions of California are composed of counties that have interconnected economies and labor markets:

- Northern Counties: Butte, Colusa, Del Norte, Glenn, Humboldt, Lake, Lassen, Mendocino, Modoc, Nevada, Plumas, Shasta, Sierra, Siskiyou, Tehama, Trinity
- Sacramento: El Dorado, Placer, Sacramento, Sutter, Yolo, Yuba
- San Francisco Bay Area: Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Santa Cruz, Solano, Sonoma
- Central Valley & Sierra: Alpine, Amador, Calaveras, Fresno, Inyo, Kern, Kings, Madera, Mariposa, Merced, Mono, San Joaquin, Stanislaus, Tulare, Tuolumne
- Central Coast: Monterey, San Benito, Santa Barbara, San Luis Obispo
- Los Angeles: Los Angeles, Orange, Ventura
- Southern Border: Imperial, San Diego

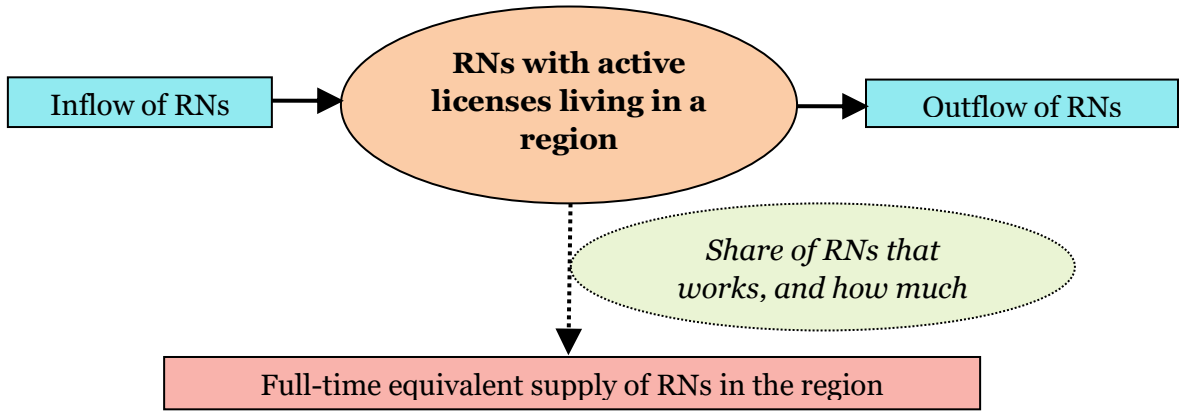
Modeling the Supply of RNs

The RN workforce constantly changes with the entrance of newly graduated nurses; migration of nurses from other regions, states, and countries; retirements; temporary departures from nursing work; and fluctuations in the number of hours that nurses choose to work. These factors can be grouped into three categories:

1) Inflows of nurses: Additions to the number of RNs in the region
    a) Graduates from regional nursing programs
    b) Graduates of nursing programs in other states and regions who obtain their first RN license in California and move to the region
    c) Internationally-educated nurses who immigrate to the region and obtain their RN license
    d) Inter-regional and interstate migration of RNs
    e) Changes from inactive to active license status
    f) Changes from lapsed to active license status
2) Outflows of nurses: The departure of RNs from the region
    a) Migration out of region (to another region, state or country)
    b) Movements from active to inactive or lapsed license status
3) Labor force participation factors: Decisions to work, and how much to work
    a) Share of RNs with active licenses that work in nursing
    b) Average number of hours worked per week by RNs working in nursing

The inflows are added to the number of RNs living in the region with active licenses, which is called the "stock" of nurses available to work, and the outflows are subtracted from the stock. Estimates of the labor supply of RNs are derived from the stock of RNs potentially available to work and how much they choose to work in nursing. This number is expressed as full-time equivalent (FTE) employment in order to

Figure 1. A model of the supply of RNs



account for differences in the work commitments of those employed full-time and part-time. Figure 1 illustrates this model of the supply of RNs, commonly called a "stock-and-flow model."

Method of calculating RN supply

As inflows, outflows, and employment decisions change over time, so does the RN workforce. The total supply of employed RNs is determined by the age distribution of the stock of RNs, as well as of each inflow and outflow component. In the supply model, the number of RNs with active licenses who reside in the region is divided into 13 age categories: under 25, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, 60-64, 65-69, 70-74, 75-79, and 80 and older. The model assumes that nurses are evenly distributed within each 5-year age group. Therefore, in each year, 20% of the RNs in each age group – or 1 in 5 RNs – moves into the next (older) age group, until they reach the oldest age group. The youngest age group (under 25) spans 7 years, but because there were so few RNs under 20 years old in 2018, the 20% assumption is used for this group as well.

For each year of the model, the inflow estimates are added to each age group and the outflow estimates are subtracted from each age group, resulting in a forecast of the new stock of RNs for the subsequent year. For each age category, the basic formula is:

Forecasted Supply of RNs next year
= Current supply of RNs in current year
+ Estimated total inflows
– Estimated total outflows.

Employment rates and hours worked per week in nursing are then applied to the estimated stock of RNs in each age group, resulting in an estimated FTE supply. This calculation is iterated through 2035 to obtain yearly forecasts of the region's RN supply.

It is important to acknowledge sources of variability and uncertainty in the supply model. For example, in 2010 and 2012, a greater share of nurses over age 60 was employed as compared with prior years. This increase was likely the result of older nurses delaying retirement due to declines in the value of their retirement savings (Buerhaus & Auerbach 2011). More recent data indicate that employment of nurses in this age group has returned to lower pre-recession levels (Spetz, Chu, & Jura 2017). However, it also is possible that "baby boomer" nurses have different intentions regarding retirement than did previous generations, and that higher rates of employment in older age groups will reemerge as a result. This variability in estimated employment participation rates contributes to uncertainty in the supply model. Thus, a range of estimates representing the highest and lowest plausible values is used. In the final models, the "baseline estimate" for each parameter is the average of the low and high estimates, unless otherwise noted.

The Demand for RNs

The demand for RNs can be measured and forecasted in many ways, reflecting disparate notions of what demand is or should be. Many policymakers and health planners consider population needs as the primary factor in determining demand for health care workers. For example, the World Health Organization has established a goal of countries needing a minimum of 2.28 health care professionals per 1,000 population in order to achieve the goal of 80% of newborn deliveries being attended by a skilled birth attendant (WHO 2006). Similarly, demand for RNs could be defined as a specific number of nurses per capita. It is important to recognize, however, that demand based on population needs is not the same thing as demand based on economic factors. Nurses and other health professionals are not free, and the cost of employing them must be weighed against other uses of resources. A nurse employer might want to hire more nurses but may not have sufficient income from its patient care services to afford more nurses. An employer might have resources that could be used to hire more nurses, but decide that investment in a new electronic health record will produce more value to patients. In this context, demand for nurses is derived from economic forces, which may not be aligned with population needs.

For this report, different measures of demand (or need) were considered in order to develop a range of plausible estimates of future demand for RNs. The approaches used were:

- Fixed benchmarks based on current RN-to-population ratios in the region
- Fixed benchmarks based on U.S. RN-to-population ratios
- Demand forecasts based on 2015 hospital patient days, employment in hospitals, and future population growth and aging
- Regional employment forecasts for 2024 published by the California Employment Development Department (EDD 2017)

Forecasts based on RNs per capita

One frequently-used benchmark of the need for RNs is the number of employed RNs per 100,000 population. For decades, California has had one of the lowest ratios of employed RNs per capita in the U.S., usually ranking in the bottom 5 nationwide. Many policy advocates have supported efforts to increase California's FTE employment of RNs per capita to be on par with that of other states, targeting either the current 25th percentile ratio (916 RNs per 100,000) or the national average ratio (1,038 RNs per 100,000). Data on the current and forecasted population of each region (California Department of Finance 2018) were used to calculate the number of RNs that would be needed to maintain the current RN-to-population ratios, reach the 25th percentile ratio, and reach the national average ratio.

The main shortcoming of targeting a fixed number of RNs per population, such as a national average, is that the target may not reflect the unique population and health care system of the state or region. An additional shortcoming is that fixed nurse-to-population ratios do not account for increased demand for health care services resulting from an increase in the number of persons with insurance coverage or an aging population.

Forecasts based on hospital staffing of RNs per patient day

A second approach to forecasting demand for RNs is to use current hospital utilization and staffing patterns to estimate growth in future demand for RNs. The first step in this process was to obtain the total number of hospital patient discharges in 2015 (the most recent data available) from short-term, acute-care hospitals in each region (Office of Statewide Health Planning and Development 2016). In order to estimate the total number of patient days per age group (10-year ranges), these data were multiplied by the average length of stay per age

group, as reported by Hospital National Inpatient Statistics (AHRQ 2014).

To calculate the rate of hospital utilization per age group, the total number of patient days per age group was divided by the estimated population of each age group in the region. Age-specific population estimates and forecasts were sourced from the California Department of Finance (2018). These rates of patient days per age group were then applied to the population projections to forecast total patient days by age group.

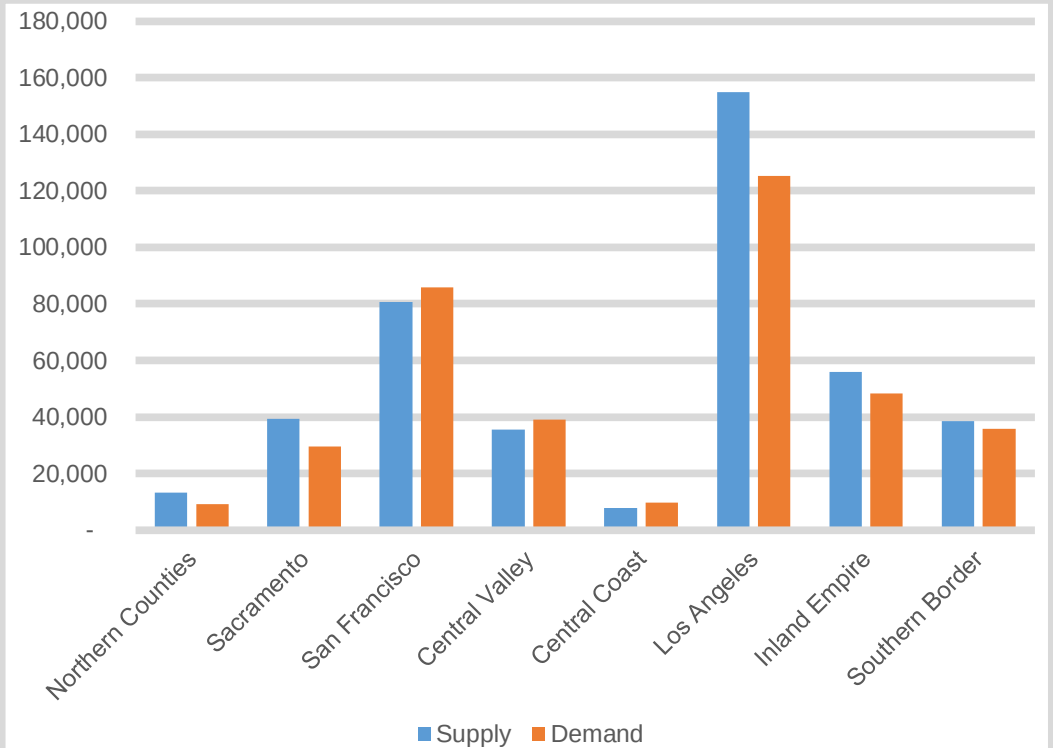
To produce forecasts of hospital demand for RNs, RN hours per patient day were calculated using OSHPD's Hospital Annual Financial Data (Office of Statewide Health Planning and Development 2017). The number of RN hours per discharge was calculated by dividing total productive RN hours by the number of patient days in 2017. Multiplying the number of productive RN hours per patient day by the forecasted total number of patient days produces an estimate of hospital-based RN hours needed in the future. To equate these estimates to FTE jobs, RN hours are divided by 1,768 (average annual productive hours per FTE).

The calculations described above provide demand forecasts for only one type of care setting (hospitals) and only for a subset of hospitals (long-term hospitals and federal hospitals are not included in the calculations). The 2016 BRN Survey of Registered Nurses report provides data on total FTE employment in each region (Spetz et al. 2017). This was divided by estimated FTE employment in hospitals to obtain the total-to-hospital ratio. To forecast total demand for RNs in future years, projected hospital demand was multiplied by the total-to-hospital ratio.

Comparing Supply and Demand for RNs

Figure 2 presents the baseline forecasts of FTE RN supply and the forecasts of FTE RN demand based on hospital patient days (OSHPD data) for each region of California. These projections indicate that the RN labor markets in the Northern Counties and Southern Border will be fairly well-balanced, surpluses may emerge in the Sacramento, Los

Figure 2. Forecasted full-time equivalent supply and demand for RNs, 2035



Angeles, and Inland Empire regions, and that shortages may develop in the San Francisco, Central Valley, and Central Coast regions.

Additional factors that affect regional RN shortages

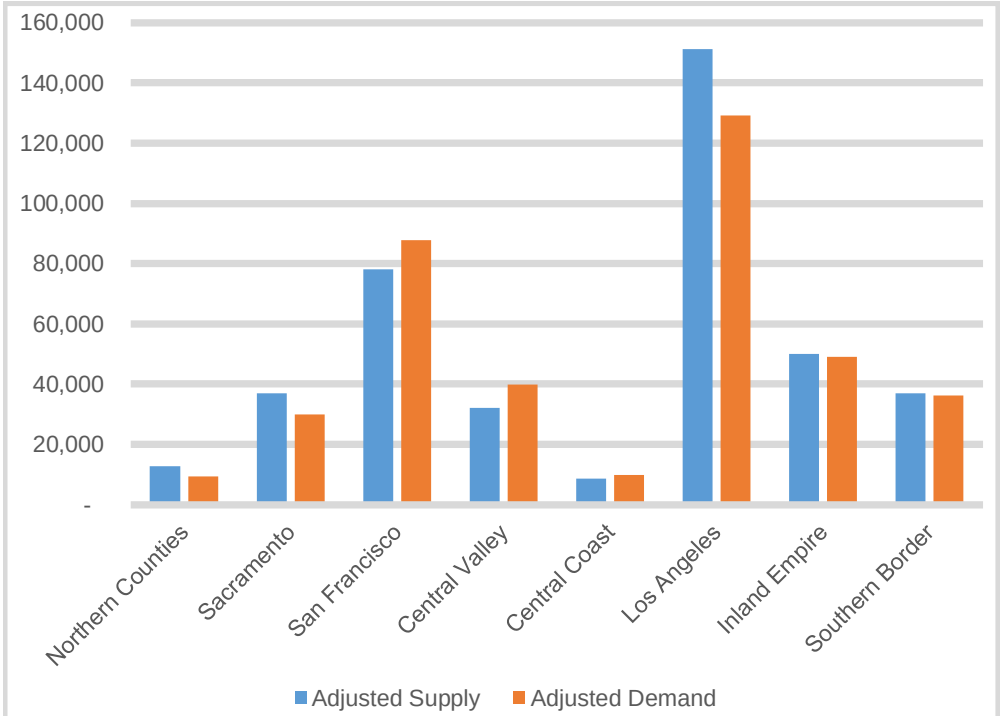
Some RNs travel across regions for work, which could result in fewer or more nurses working in each region. Data from the 2016 BRN Survey of RNs were used to estimate the numbers of RNs commuting across regions.

A second factor that may affect the supply of RNs is that some are also advanced practice RNs (APRNs) – nurse practitioners (NPs), certified nurse-midwives (CNMs), clinical nurse specialists (CNSs), and nurse anesthetists (CRNAs). Both the supply projections and the projections of demand for RNs based on RN-to-population ratios and hospital patient utilization treat all these APRNs as RNs. Data from the 2016 Board of Registered Nursing Survey of RNs were used to estimate the number of RNs in each region that might work in advanced practice roles. Some APRNs work in RN positions, so these figures are likely an overestimate.

Hospital employment data sourced from OSHPD were examined to identify the number of RN hours worked by contract personnel in 2016. Use of contract staff by hospitals may indicate the degree to which hospitals are experiencing a shortage of RNs with the skills required for open positions. However, since contract personnel are used to fill gaps during staff vacations and leaves of absence, as well as normal seasonal fluctuations in hospital utilization, this is not a perfect measure of the magnitude of RN shortage. The data indicated that the average share of regional hospital RN hours provided by contract staff ranges from 3.5% to 8.6%.

Figure 3 presents adjusted projected FTE supply and demand for RNs. The supply numbers are adjusted for inter-region commuting and the possibility that APRNs do not work as RNs. The demand numbers are increased by the estimated number of contract personnel employed in hospitals in 2017. These adjustments are total numbers rather than FTEs and thus likely overstate the changes in true supply and demand caused by these factors.

Figure 3. Forecasted full-time equivalent supply and demand for RNs, after adjustments to supply and demand for inter-region commuting, advanced practice, and contract personnel, 2035



After adjustments, the projected surpluses of RNs are smaller, and disappears entirely for the Inland Empire region. The projected shortages in San Francisco and the Central Valley are larger. The projected shortage in the Central Coast becomes slightly smaller.

Comparisons across regions in RNs per population

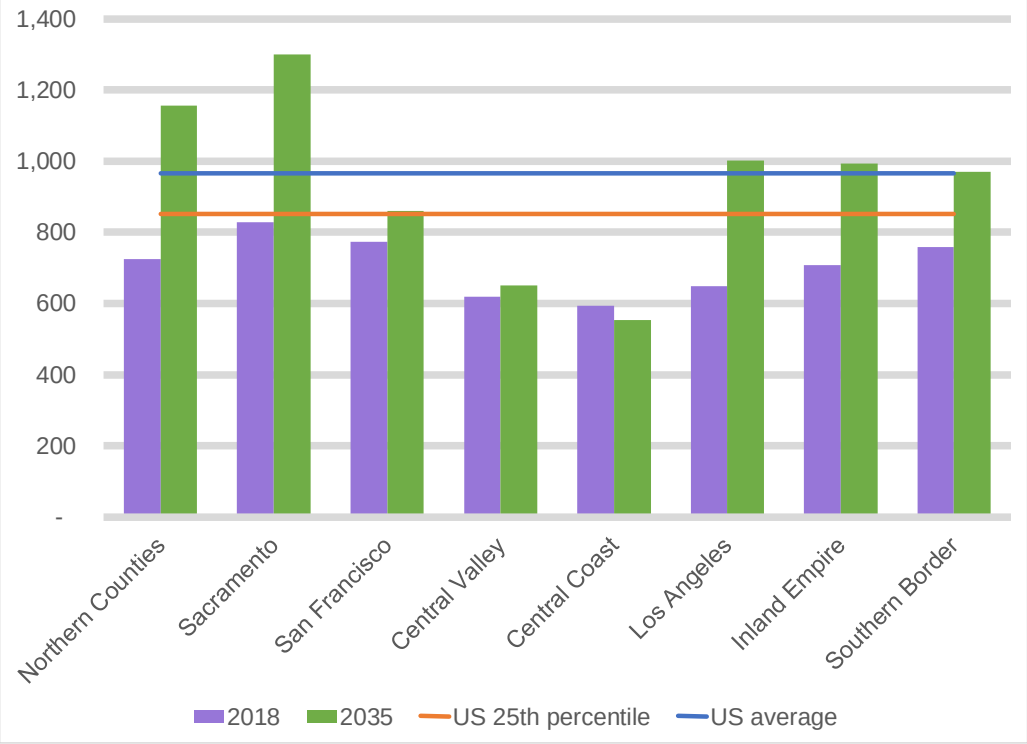
The demand forecasting model is based on current employment levels of RNs. However, current RN employment levels reflect both demand and supply, since employers cannot employ RNs who do not exist. It is possible that current employment levels are not adequate to meet population needs and do not indicate the number of RNs employers would hire if supply were adequate. A comparison of the current and projected number of RNs per 100,000 population in each region provides another perspective of the potential demand in each region. Figure 4 presents FTE RNs per 100,000 for 2018 and projected for 2035, and compares these ratios to the national 25th percentile and national average.

All regions of California now have FTE RN-per-100,000 ratios below the national 25th percentile, but there is notable variation across regions. The lowest RN-to-population ratios in 2018 are in the Central Coast, Central Valley, and Los Angeles regions, while the highest ratios are in the Sacramento, San Francisco, and Southern Border regions. By 2035, several regions are projected to have RN-to-population ratios that exceed the current national average: Northern Counties, Sacramento, Los Angeles, and Inland Empire; the ratio in the Southern Border region will nearly equal the national average and the ratio in the San Francisco region will reach the current national 25th percentile by 2035. However, the Central Valley and Central Coast will remain far below the national 25th percentile, and the RN-per-100,000 ratio is projected to decrease in the Central Coast region between 2018 and 2035.

Policy Implications

Statewide forecasts have projected a balanced RN labor market on average through 2035. However, regional forecasts reveal large differences across regions of the state. Some regions now have much lower supplies of RNs than other regions – notably

Figure 4. Full-time equivalent RNs per 100,000 population, 2018 and 2035



the Central Valley, Central Coast, and Los Angeles. These regions, as well as the Inland Empire, Sacramento, and Southern Border region, appear to have a shortage in 2018. In 2035, the Central Valley and Central Coast regions will continue to have shortages of RNs and a shortage will emerge in the San Francisco Bay Area region. Other regions that now have shortages – the Inland Empire, Sacramento, Los Angeles, and Southern Border regions – will experience substantial increases in the supply of RNs between 2018 and 2035, largely due to growth in RN education programs in their regions, thus mitigating the shortages that now exist. In these regions, the growth of RN supply will give health care systems the opportunity to employ nurses in a wide variety of roles that fully utilize their skills in direct patient care, care management, patient education, home health, and ambulatory care.

These projections could change if any of the variables in the model change. The most important changes that could change the projections are increases or decreases in: (1) the number of graduates from RN education programs; (2) inter-regional migration; and/or (3) employment rates of RNs. These factors, and any other potential influences on regional nursing supply, such as the limited pool of faculty, limited availability of clinical education placements, and faculty salaries that are not competitive with clinical practice positions, should be monitored continuously.

Regional health care and education leaders should track the employment paths of recent nursing graduates as they develop specialized skills to fill the roles of experienced nurses who will retire in the near future. Moreover, they should monitor new student enrollments in nursing programs, as well as the degree to which employers are reliant on contract personnel and commuters, to determine whether and the extent to which local RN education programs should expand.

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