

The San Joaquin Valley Registered Nurse Workforce: Forecasted Supply and Demand, 2016-2030

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Abstract / Overview

This report presents supply and demand forecasts for the Registered Nurse (RN) workforce in the San Joaquin Valley from 2017 through 2030. These new forecasts are based on data from the 2016 California Board of Registered Nursing (BRN) Survey of Registered Nurses, the 2015-2016 BRN Annual Schools Report, data extracted from the BRN license records, and other state and national data sources. The forecasts suggest that the total number of RNs in the San Joaquin Valley will decline between 2017 and 2030 in all but the most optimistic scenarios, and RN FTEs will decline in all scenarios. At the same time, demand for RNs is projected to grow more than 35%, leaving the San Joaquin Valley with a large projected shortage of RNs.

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Research Report

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Chapter 1 – Introduction

Concerns about shortages of RNs have been raised across much of California. The Fall 2016 Survey of Nurse Employers found that many Chief Nursing Officers are experiencing difficulty recruiting RNs for specialized positions and that more than 90% of hospitals reported demand for RNs was greater than the available supply (Chu, Bates, & Spetz, 2017). Statewide hospital vacancy rates have been rising since 2013, reaching 5.9% in 2016. 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). At the same time, 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 – 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 results in greater demand for health care services.

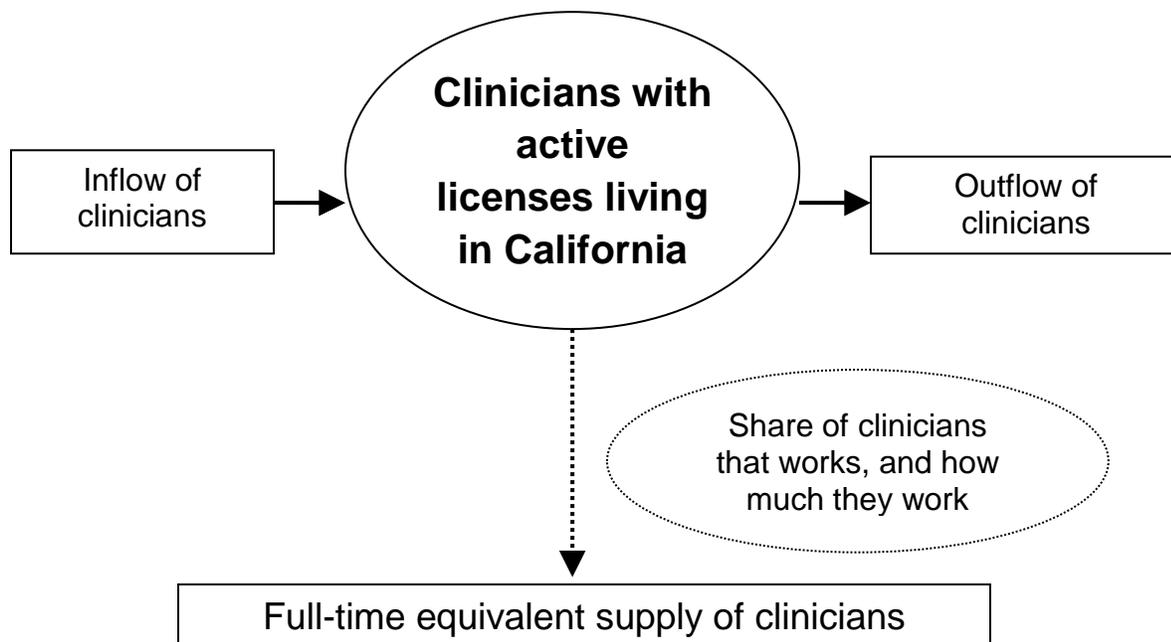
This report presents supply and demand forecasts for the Registered Nurse (RN) workforce in the San Joaquin Valley region of California from 2017 through 2030. The San Joaquin Valley is defined as encompassing the following counties: Fresno, Kern, Kings, Madera, Merced, San Joaquin, Stanislaus, and Tulare. The forecasting model has the same structure as the model used to generate statewide forecasts for California (Spetz, 2017). The supply forecasts are based on data from the 2016 California Board of Registered Nursing (BRN) Survey of Registered Nurses, the 2015-2016 BRN Annual Schools Report, data extracted from the BRN license records, and other state and national data sources. The supply forecast is compared with several benchmarks of demand for RNs, including national numbers of RNs per 100,000 population, estimates of future hospital utilization in California, and forecasts published by the California Employment Development Department (EDD, 2016).

Chapter 2 – Methods

Registered Nurse Supply

The supply forecasting method used for this report is commonly called a “stock-and-flow” model. The number of clinicians (in this case RNs) licensed and living in the San Joaquin Valley is the “stock” of clinicians. These are clinicians who could potentially provide health care services. Inflows of clinicians are added to the stock of clinicians, and the outflows of clinicians are subtracted from the stock. The estimated labor supply of clinicians is based on the stock of clinicians potentially available to work and how much they choose to work in primary care. This number is expressed as full-time equivalent (FTE) employment in order to account for differences in the work commitments of clinicians employed full-time and part-time. Figure 1 illustrates this model.

Figure 1: A Model of the Supply of Clinicians



The inflow of clinicians includes clinicians whose first California licenses are issued to addresses in the Central Valley and already-licensed clinicians who relocate from other regions to the San Joaquin Valley. The outflow is determined by migration out of the San Joaquin Valley (to another region, state or country) and individuals who allow their licenses to lapse so they leave the clinician workforce. Lapsed licenses can occur due to retirement, desire to pursue another occupation, death, or any other reason.

As inflows, outflows, and employment decisions change over time, so does the clinician workforce. At first glance, it seems clear that the workforce will grow over time as long as the inflow of clinicians is greater than the outflow. However, such a comparison between total inflow and outflow does not take into account changes in employment as clinicians age. Because the age distributions of the existing stock of clinicians and each inflow and outflow component affect the overall supply, the model incorporates age (described below) to capture its impact on the supply forecasts.

The San Joaquin Valley RN supply forecasts rely on the same age categories as used for the California Board of Registered Nursing's statewide forecasts of RN supply and demand (Spetz, 2017): under 30 years, 30-34 years, 35-39 years, 40-44 years, 45-49 years, 50-54 years, 55-59 years, 60-64 years, 65-69 years, 70-74 years, 75-79 years, and 80 years and older. We assume that every year 20% of RNs in each age group move to the next age group until they reach the oldest age group. We developed multiple forecasts of RN supply to reflect uncertainty about key variables such as the number of future graduates and employment rates.

Variables Used in RN Supply Forecasts

Table 1 summarizes the sources of data for each variable used to generate the RN supply forecasts.

Table 1: Sources of Data for Registered Nurse Supply Forecasts

Component of model	Variable	Source
Stock	Number of RNs residing in the San Joaquin Valley	California Board of Registered Nursing (BRN)
Inflows	New RN graduates from San Joaquin Valley programs	California BRN Annual Schools Report
	Graduates of non-California RN programs who get their first license and live in the San Joaquin Valley	California BRN
	RNs moving to the San Joaquin Valley from other regions of California or states	California BRN
	RNs converting from inactive or delinquent license to active license	California BRN
Outflows	RNs in the San Joaquin Valley moving to other regions of California or states	California BRN
	Lapsed/inactive licenses	California BRN
Employment Decisions	Percent of licensed physicians in primary care fields providing patient care	California BRN 2016 Survey of Registered Nurses
	Average hours worked per week	California BRN 2016 Survey of Registered Nurses

The initial stock of RNs in the starting year, 2017, is the number of licensed RNs residing in the San Joaquin Valley in 2017. These data were obtained from the California Board of Registered Nursing (BRN).

There are several sources of inflows of RNs to the San Joaquin Valley, the largest of which is new graduates from region's RN education programs. We used the Board of Registered Nursing Annual Schools Report to obtain data on numbers of RN graduates and their age distribution (Blash & Spetz, 2017). In the 2015-2016 academic year there were 1,097 graduates from the region's education programs (Blash & Spetz, 2017).

Growth in RN new student enrollments leads to growth in the number of graduates in future years. Associate Degree (AD) programs typically last two years, and the RN coursework in Baccalaureate of Science Nursing Degree (BSN) programs requires 2 to 3 years. The forecasts assume that enrollments will result in graduates two years in the future. To predict the number of future RN graduates, we compared annual new student enrollments over the period 2010-2011 through 2015-2016 with the number of graduates two years later. On average, each new student enrollment during this period resulted in 0.851 graduates two years later. This rate was used to estimate the number of graduates beyond the 2017-2018 academic year by applying it to projected new student enrollments for 2018-2019 and 2019-2020, which were provided by the region's RN education programs in the

BRN Annual School Survey. The baseline forecasts assume that nursing student enrollments will be stable after the 2019-2020 academic year. To test the impact of changes in RN education capacity, we also developed a “low” forecast in which RN graduations decrease 1% per year after 2019-2020, and a “high” forecast in which RN graduations increase 1%. Actual and predicted number of graduates from 2012-2013 through 2019-2020 are presented in Table 1. Note that there has been a declining trend in RN enrollments and graduates in the San Joaquin Valley.

Table 2: Actual and Predicted Number of Graduates Based on New Student Enrollments

Academic year	Actual/forecasted new student enrollments	Actual/forecasted number of graduates
2010-2011	1,411*	1,383*
2011-2012	1,663*	1,336*
2012-2013	1,515*	1,467*
2013-2014	1,398*	1,402*
2014-2015	1,283*	1,112*
2015-2016	1,276*	1,097*
2016-2017	1,099	1,092
2017-2018	1,122	1,086
2018-2019		936
2019-2020		955

* Actual number of student enrollments and graduates based on Annual Schools Report.

Note: Forecasts of student enrollments are provided by RN programs in the Annual Schools Survey. The forecasted number of graduates is 80.8% of enrollments two years prior. Source: Blash, L, Spetz, J., 2017. 2015-2016 Annual School Report: Data Summary and Historical Trend Analysis. Sacramento, CA: California Board of Registered Nursing.

Each year, some graduates of nursing programs in other states and countries obtain their first RN license in California and move to the San Joaquin Valley. According to the BRN, in 2016, 26 out-of-state U.S. graduates and 49 international graduates obtained their first license from California and reported an address in the San Joaquin Valley. We assumed the age distribution of U.S. graduates was the same as for San Joaquin Valley graduates. The age distribution for international graduates was obtained from the BRN.

RNs who are already licensed are another source of inflow to the San Joaquin Valley. These RNs include both RNs who move from other regions of California and those who move to California from other states. The inter-region movement of RNs for each age group was calculated by comparing the 2014 and 2016 BRN license files, and the number of RNs moving into the San Joaquin Valley from other regions of California was divided by two to estimate an annual number. The inter-state movement of RNs into the San Joaquin Valley was measured as the number of RNs in each age group who, in 2016, requested endorsement of an out-of-state license to California and who also had permanent addresses in the San Joaquin Valley. The numbers of RNs moving into the San Joaquin Valley were added together and then divided by the total number of licensed RNs residing in the San Joaquin Valley in 2017 to create a rate of movement into the region for each age group.

Each year, some RNs whose licenses are inactive or lapsed choose to reactivate their licenses. Using data obtained from the BRN, we determined that in 2016 there were 85 RNs with a San Joaquin Valley address who changed license status from inactive to active, and 422 RNs who changed from lapsed to active. The rate of reactivation was computed by dividing the number of RNs who reactivated their licenses by the total number of actively licensed RNs, for each age group.

There are two types of outflows of RNs from the San Joaquin Valley. RNs can move to another region of California or another state, or they can allow their license to become inactive or lapse. To measure inter-region

movements, we compared 2014 and 2016 BRN license files to identify the rate of RNs moving from the San Joaquin Valley to another region within California or another state, by age group.

Estimates of the rate at which actively-licensed RNs allow their licenses to lapse, by age group, were computed from California BRN license records. These estimates are very important to the model because they measure the loss of nurses due to relocation, change in employment plans, retirement, and death. The model does not distinguish among these reasons for allowing a license to lapse.

Registered Nurse Demand

We developed forecasts of the demand for RNs using the same methods used by the BRN for statewide RN forecasts. We began by estimating the number of RNs that would be required each year to maintain the current San Joaquin Valley RN-to-population ratio of 622 FTEs per 100,000, assuming the region's population grows as projected by the California Department of Finance (2013). Note that the statewide ratio of RN FTEs per 100,000 was 702 in 2016. Some policy advocates have argued that the ideal employment level of RNs is the national 25th percentile (916 FTE RNs per 100,000) or even the national average (1,038 FTE RNs per 100,000). Thus, we also calculated the numbers of RNs that would be required to attain each of these benchmarks.

We employed a second approach to forecasting demand for RNs using current hospital utilization and staffing patterns to estimate future demand. First, the 2015 total number of patient discharges from short-term acute-care hospitals in the San Joaquin Valley was obtained from the California Office of Statewide Health Planning and Development (OSHPD) Hospital Annual Inpatient Discharge Data (OSHPD, 2016) and organized into ten-year age groups (OSHPD, 2016). These data were then multiplied by the average length of stay for each age group as reported in the 2014 Hospital National Inpatient Statistics (AHRQ, 2014), to estimate the total number of patient days per age group. Next, the number of patient days per age group was divided by the total population (by age group) in the region. This provided the number of patient days per population, per age group. These rates of patient days were then applied to the projected population estimates to obtain a forecast of total patient days by age category. We then used OSHPD's Hospital Annual Financial Data (OSHPD, 2016) to calculate the average number of RN hours per patient day, which was then multiplied by the forecast of total number of patient days to produce a demand forecast for hospital-based RN hours. To equate the forecasted number of RN hours to FTE jobs, RN hours were divided by 1,768 (average annual productive hours per FTE). Finally, the OSHPD and BRN data indicate that 51.2% of jobs were in the types of hospitals included in the OSHPD data and thus the total number of RNs employed in all health care settings is 1.95 times the number of hospital-employed RNs. The hospital-based projections of future RN demand were thus multiplied by 1.95 to project total RN demand.

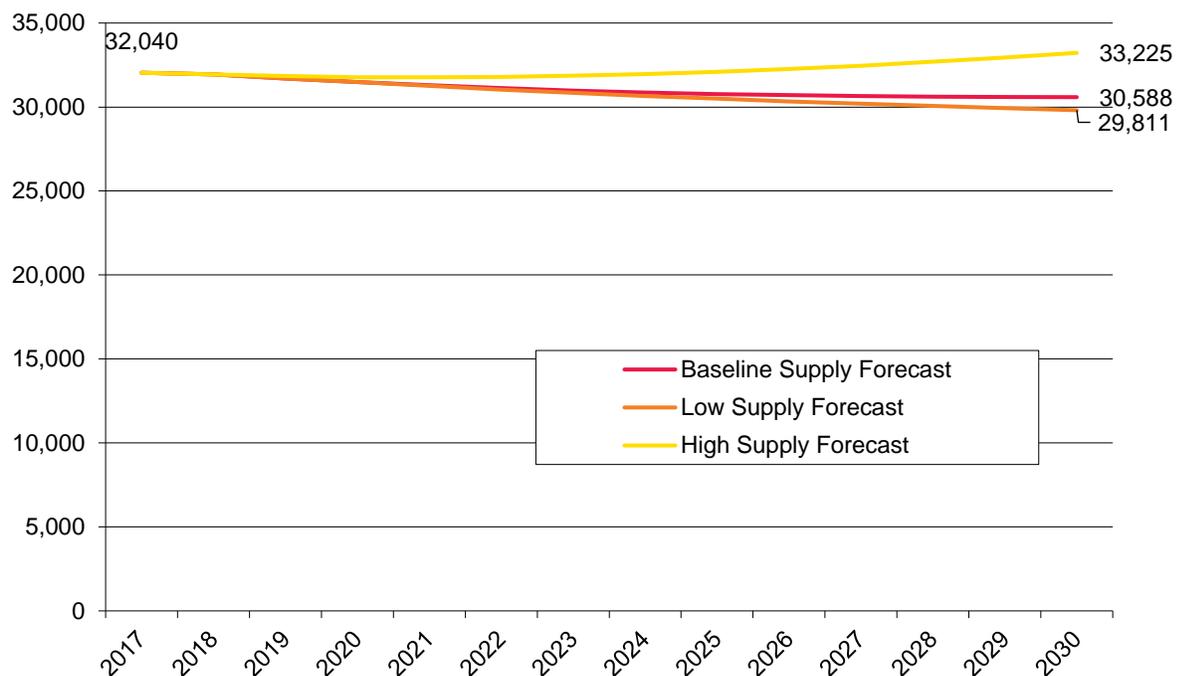
The California Employment Development Department (EDD) projects that there will be 26,810 registered nurse jobs in the San Joaquin Valley by 2024 (California Employment Development Department, 2016). The EDD projection does not distinguish between full-time and part-time jobs. To estimate the FTE employment implied by the EDD projection, applied an adjustment factor which was calculated by dividing the average number of hours worked per week by California RNs in 2016 (36.24) by 40, which is the number of hours per week typically used to denote full-time employment (Spetz, Chu, and Jura 2017). The EDD estimate of 26,810 RN jobs was multiplied by the adjustment factor (0.906) to produce an FTE projection of 24,290 in 2024.

Chapter 3 – Results

Registered Nurse Supply Forecasts

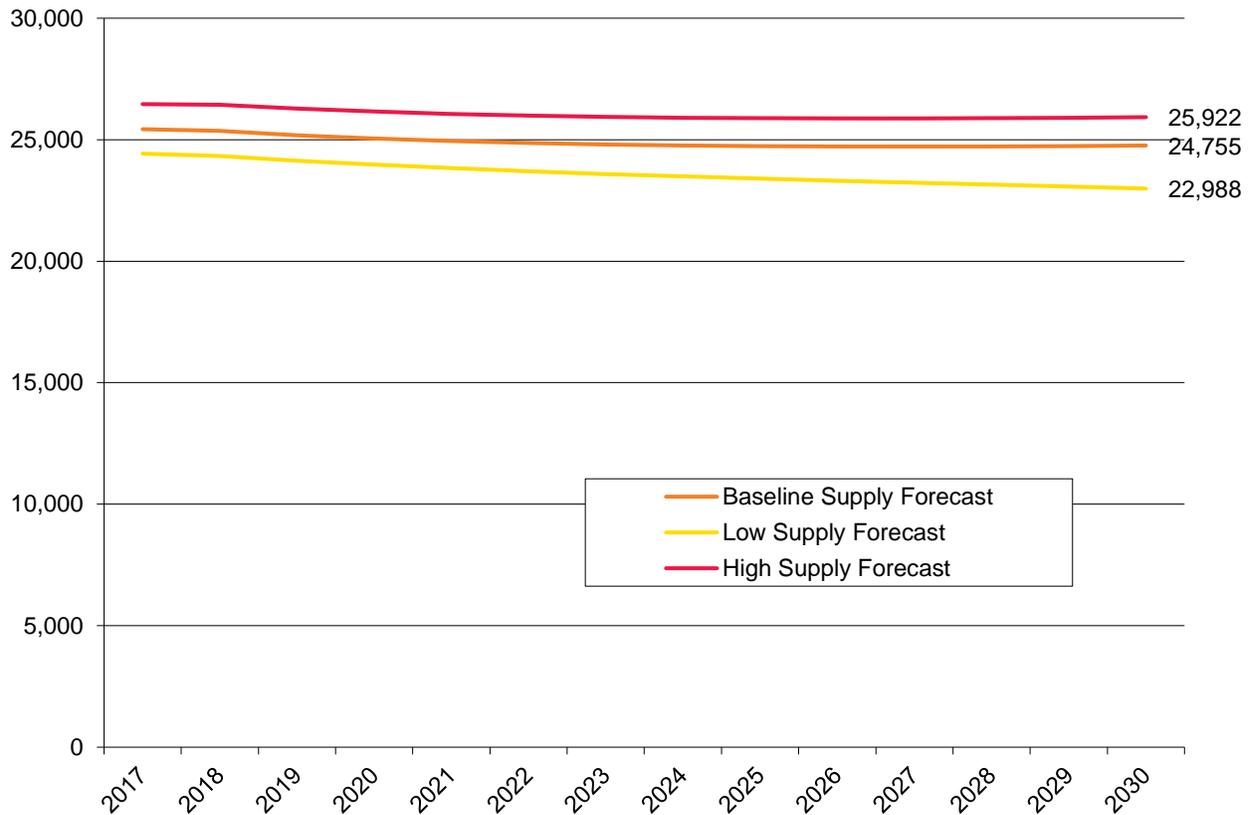
Projected supply of RNs is presented in Figure 2 for the baseline, low, and high scenarios. The baseline scenario assumes no change in the number of graduates from RN programs in the San Joaquin Valley, the low scenario assumes that RN graduations will decline 1% per year after 2019-2020, while the high scenario assumes 1% growth per year in RN graduations. In all three scenarios, there is little forecasted growth in the supply of RNs in the region between 2017 and 2030.

Figure 2: Forecasts of the Number of Registered Nurses in the San Joaquin Valley, 2017-2030



Because the forecasted number of RNs with active licenses does not account for the variation in hours worked by RNs and the fact that some RNs with active licenses do not work in nursing, data from the 2016 BRN Survey of RNs were used to generate estimates of the current employment rate for RNs, by age group (Spetz, Chu, & Jura 2017). Employment rates by age groups have varied since 2008. During the last economic recession, younger RNs were employed at lower rates and older RNs were employed at higher rates. Replicating the method used in the BRN’s statewide forecast of RN supply, we considered three scenarios for future employment rates by age group. The “low” scenario is based on the lowest employment rate for each age group over the five most recent biennial BRN Surveys. The “high” scenario is the highest employment rate for each age group of these five rates. The baseline scenario is the average of the low and high rates. The age-specific employment rates for each of these baseline, low, and high scenarios was multiplied by the projected numbers of licensed RNs (Figure 2) to calculate the projected number of employed RNs. To calculate full-time equivalent employment, these numbers need to be adjusted by the average number of hours worked each week. The 2016 BRN Survey of RNs was also used to generate estimates of hours worked per week in all nursing jobs for each age group (Spetz, Chu, & Jura, 2017), which were divided by 40 to calculate the average full-time equivalent employment (FTE) for each age group. Figure 3 presents forecasts of the full-time equivalent supply of RNs in the San Joaquin Valley, which ranges from 22,988 to 25,922 RNs.

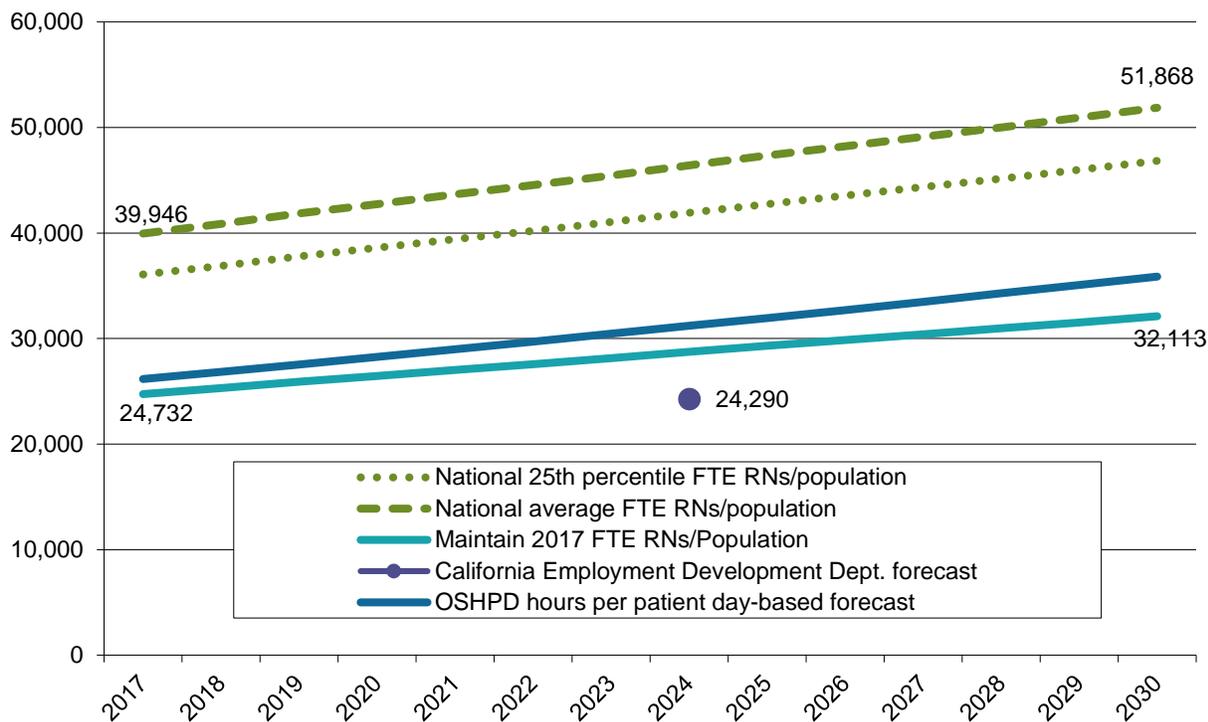
Figure 3: Forecasted Full-time Equivalent Supply of RNs in the San Joaquin Valley



Registered Nurse Demand Forecasts

Figure 4 compares five alternative FTE RN demand forecasts. The San Joaquin Valley would need 32,113 FTE RNs in 2030 to maintain the current ratio of 622 FTE RNs per 100,000. If current hospital utilization rates are used as a measure of demand, the region would need more than 35,000 FTE RNs (12% more). Attaining the national average of FTE RNs per population would require 51,868 FTE RNs by 2030. Note that the EDD projection of demand for 2024, which is lower than the other forecasts, is likely an underestimate because it is doubtful that fewer than the current ratio of FTE RNs per population will be required to meet future health care needs in the region.

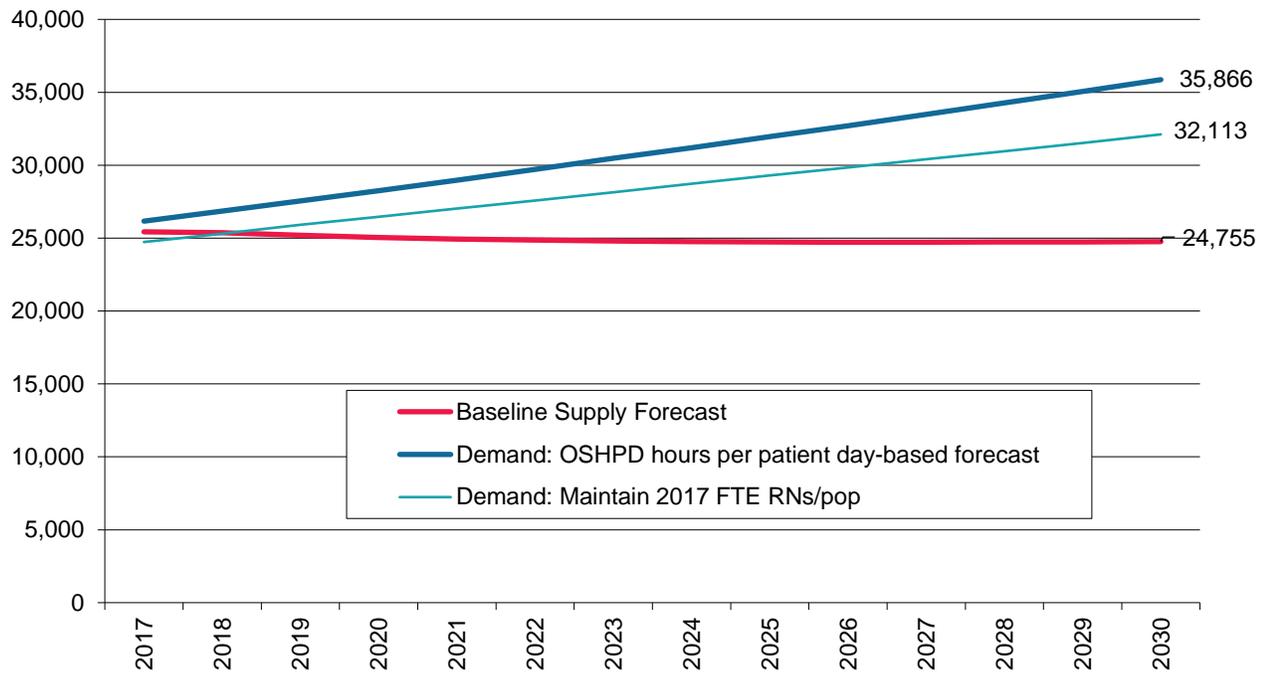
Figure 4: Forecasted Full-time Equivalent Demand for RNs in the San Joaquin Valley



Comparing Supply and Demand for Registered Nurses

Figure 5 compares the San Joaquin Valley FTE RN supply and demand forecasts. The demand forecast based on maintaining the region’s current ratio of FTE RNs per capita resulted in the smallest estimate of total FTE RNs. Still, this total is approximately 30 percent larger than the number of FTE RNs forecast under the baseline supply scenario. Maintaining the current number of FTE RNs per population would require 32,113 RNs in 2030, whereas the baseline supply scenario forecasts that the San Joaquin Valley will have only 24,755 FTE RNs in 2030. The high supply forecast (25,922 FTE RNs in 2030) would still result in the region having 6,191 fewer FTE RNs than the number needed to maintain the current FTE RN per population ratio. If the estimate of FTE RN demand derived from the hospital utilization model is used, the high supply scenario results in 9,944 too few FTE RNs in the San Joaquin Valley to meet demand in 2030.

Figure 5: Registered Nurse Supply and Demand Forecasts for the San Joaquin Valley



Chapter 4 – Conclusion and Policy Implications

Available data indicate that the supply of RNs is unlikely to be sufficient to meet future demand in the San Joaquin Valley. In all but the most optimistic scenarios, the data suggest that the total number of licensed RNs will decline between 2017 and 2030 and the number of FTE RNs is expected to decline in all scenarios. In contrast, demand for RNs is forecasted to grow more than 35%, leaving the San Joaquin Valley with a large projected shortage of RNs. This result is consistent with data from the Fall 2016 Survey of Nurse Employers, which reported that many Chief Nursing Officers were experiencing difficulty recruiting RNs in the San Joaquin Valley (Chu, Bates, & Spetz, 2017). There has been a decline in new enrollments in RN education programs in the San Joaquin Valley since the 2011-2012 academic year, which is an important contributing factor to the projected shortage of RNs. Even in the scenario in which the number of new RN graduates in the region is assumed to remain stable there is projected to be a large shortfall of RNs in the San Joaquin Valley.

Limitations

The forecasts presented in this report have several important limitations. First, changes in insurance coverage that could result from repeal or significant retraction of the Affordable Care Act would likely reduce demand for all health care services. Conversely, continued diffusion of value-based health insurance payment models such as expansion of accountable care organizations would likely increase demand for health care services in ways not easily predicted. In addition, the forecasts focus solely on the numbers of RNs needed and do not account for possible changes in the nature of care delivery or skills required to deliver care in the future. Regardless of the fate of the ACA, value-based payment models, or the nature of health care delivery, previous research suggests that demand for RNs will increase due to population growth and a rising share of the population that is elderly (Spetz, et al., 2014; Oberlin, et al., 2015).

Policy Implications

A large body of research demonstrates that patient outcomes are impacted by the level of nurse staffing in hospitals and other care facilities (Kane & Shamliyan, 2007; Institute of Medicine, 2011; Penoyer, 2010); periods of nursing shortage can have deleterious impacts on patients and the population. In addition, shortages drive up the cost of health care resulting from increased RN wages (Spetz and Given, 2003). For these reasons, it is essential that the policy actions be taken to address the likely shortage of RNs in the San Joaquin Valley.

The shortage projected for the San Joaquin Valley stands in contrast to statewide forecasts, which indicate that RN supply and demand are well-balanced in California as a whole. There are large differences in the number of RNs per capita across regions of the state, with counties in the San Joaquin Valley having among the lowest ratios. The San Joaquin Valley also has less RN education capacity compared with larger urban areas of California, and the region has a high rate of projected demand due to rapid population growth.

Although nursing is viewed as a highly mobile profession, research has found that more than half of RNs work within 40 miles of where they attended high school (Kovner, Corcoran, & Brewer, 2011). Thus, the primary policy solution for large projected RN shortages in the San Joaquin Valley is to increase the number of graduates from education programs in the region (Spetz & Dyer, 2005). This requires financial investment as well as the identification of qualified faculty. Many RN education programs in California report challenges recruiting faculty, and a large share of faculty is anticipated to retire over the next decade (Blash & Spetz, 2017). Education institutions will need to focus on faculty recruitment and retention, in order to maintain and grow their education programs.

Expanding RN education programs takes time, and in the interim regional employers will need to work with education institutions outside the San Joaquin Valley to recruit nurses to live and work in the region. They also will need to redouble their efforts to retain RNs currently working in the region, as well as to retain RNs nearing retirement age. Employers can also play a key role in supporting education expansion by offering clinical placements to nursing schools, offering scholarships and loan repayment for RN students and graduates, and providing grants to nursing schools.

References

- Blash, L, Spetz, J. 2017. 2015-2016 Annual School Report: Data Summary and Historical Trend Analysis. Sacramento, CA: California Board of Registered Nursing.
- California Department of Finance. 2013. State of California, Department of Finance, State and County Total Population Projections by Race/Ethnicity and Detailed Age 2010 through 2060 (as of July 1). Sacramento, CA: California Department of Finance. Available from: <http://dof.ca.gov/Forecasting/Demographics/Projections/>
- California Employment Development Department (EDD). 2016. California Occupational Employment Projections, 2014-2024. Sacramento, CA: Labor Market Information Division, California Employment Development Department. Available from <http://www.labormarketinfo.edd.ca.gov/data/employment-projections.html#Long>
- California Office of Statewide Health Planning and Development (OSHPD). 2016. Annual Financial Data Pivot Profiles, 2015. Sacramento, CA: California Office of Statewide Health Planning and Development. Available at <http://www.oshpd.ca.gov/HID/Products/Hospitals/AnnFinanData/PivotProfles/default.asp>
- Charles, SA. 2015. Adult Medi-Cal Enrollment Surges, Uninsured Rate Plummets in 2014. Los Angeles, CA: UCLA Center for Health Policy Research. <http://healthpolicy.ucla.edu/publications/Documents/PDF/2015/Medi-Cal-factsheet-aug2015.pdf>.
- Chu, L, Bates, T, Spetz, J. 2017. Survey of Nurse Employers in California, Fall 2016. San Francisco, CA: University of California, San Francisco.
- Cohen, RA, Martinez, ME, Zammitti, EP. 2016. Health Insurance Coverage: Early Release of Estimates from the National Health Interview Survey, 2015. Hyattsville MD: National Center for Health Statistics.
- HealthImpact. 2018. California Newly Licensed RN Employment Survey. Oakland, CA: HealthImpact.
- Institute of Medicine. 2011. The future of nursing: Leading change, advancing health. Washington, DC: National Academies Press.
- Kane, RL, Shamliyan, TA. 2007. The association of registered nurse staffing levels and patient outcomes: Systematic review and meta-analysis. *Medical Care* 45: 1195-1204.
- Kovner, CT, Corcoran, SP, Brewer, CS. 2011. The relative geographic immobility of new registered nurses calls for new strategies to augment that workforce. *Health Affairs* 30 (12): 2293-2300.
- Oberlin, S, Chapman, S, Waneka, R, Spetz, J. 2015. Impact of the 2010 Affordable Care Act on the California Health Care Labor Force. San Francisco, CA: University of California, San Francisco.
- Penoyer, DA. 2010. Nurse staffing and patient outcomes in critical care: A concise review. *Critical Care Nursing* 38 (7): 1521-1528.
- Spetz, J. 2014. Economics of Health Care and Nursing: How Will Health Reform Affect Demand for RNs? *Nursing Economics* 32 (1): 42-43.
- Spetz, J. 2017. Forecasts of the Registered Nurse Workforce in California. Sacramento, CA: California Board of Registered Nursing.
- Spetz, J, Dyer, WT. 2005. Forecasts of the Registered Nurse Workforce in California. Sacramento, CA: California Board of Registered Nursing.
- Spetz, J, Given, R. 2003. The Future of the Nurse Shortage: Will Wage Increases Close the Gap? *Health Affairs* 22 (6): 199-206.
- Spetz, J, Chu, L, Jura, M. 2017. 2016 Survey of Registered Nurses. Sacramento, CA: California Board of Registered Nursing.