

# **Forecasts of the Registered Nurse Workforce in California**

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## **Executive Summary**

This report presents supply and demand forecasts for the Registered Nurse (RN) workforce in California from 2009 through 2030. These new forecasts are based on data from the 2008 California Board of Registered Nursing (BRN) Survey of Registered Nurses, the U.S. Bureau of Health Professions (BHPr) 2004 National Sample Survey of RNs, and data extracted from the BRN license records. The 2009 forecasts indicate that the shortage of RNs identified in 2005 has narrowed, and will continue to narrow in the foreseeable future, provided that recent expansion of RN education programs is maintained.

The forecasts of RN supply take into account the aging of the RN workforce, new graduates (including those from out-of-state and international nursing programs), interstate flows of RNs, and changes in license status. The demand forecasts are based on national numbers of RNs per 100,000 population. The demand forecasts are compared to a forecast published by the California Employment Development Department (EDD), as well as an alternate forecast developed using data from the California Office of Statewide Health Planning and Development (OSHPD) and the California Department of Finance (DOF).

The demand for RNs can be measured and forecasted in many ways, reflecting disparate notions of what demand is or should be. Demand can be measured through benchmarks, such as the number of nurses per capita. Other demand forecasts may examine rates of population growth and population aging. Direct survey of employers can illuminate current demand for nursing positions. Demand may also be measured by researching unmet need for nurses. We developed several alternate forecasts of demand, using national RN-to-population data and estimating future hospital utilization in California. We also examined forecasts from other agencies such as the EDD and the BHPr. The demand estimates produced from these different strategies provide a range of possible scenarios for the future.

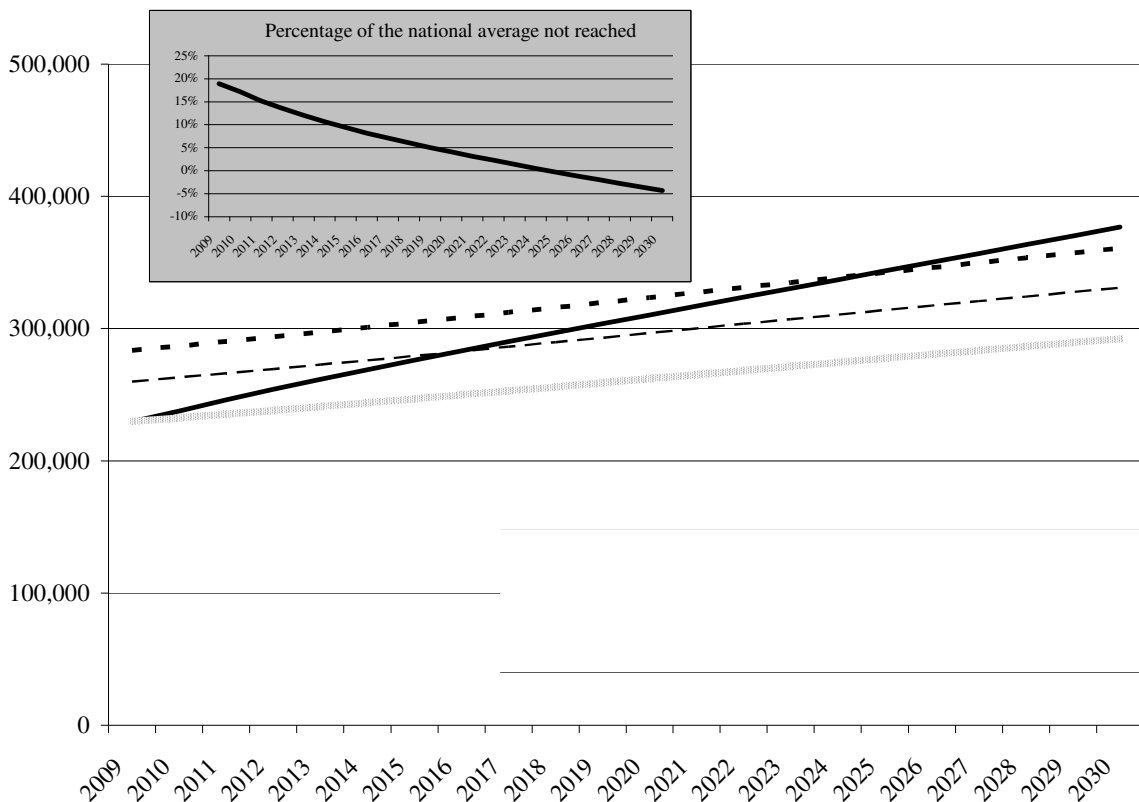
A comparison of the supply and demand forecasts indicates that the magnitude of California's shortage depends on the measure of demand. If current employment patterns of RNs are considered adequate, then California presently does not have a shortage of RNs. However, if the current employment levels are not perceived to be adequate, and California should target the 25<sup>th</sup> percentile of nationwide full-time equivalent (FTE) RNs per 100,000, then California faces a shortage of 30,276 FTE RNs. Some of California's shortage is being ameliorated by traveling nurses, who are estimated to have filled 4,336 FTE RN positions in 2008.

Between 2003-2004 and 2007-2008, nursing graduations increased 55 percent, reaching over 9,500 new RN graduates per year. This expansion is due to significant increases in state funding for expanded educational capacity of nursing programs, increased funding for equipment, use of updated instructional technologies, and other needed educational resources that have had a favorable impact on addressing the RN shortage in California. If the expansion of RN education programs and other program augmentations are maintained, immigration of internationally-educated nurses does not change, and inter-state migration rates are constant, this shortage will steadily narrow. California will reach the 25<sup>th</sup> percentile nationwide of the number of FTE RNs per 100,000 (756.5) by 2016, and California will near the national average of FTE RNs per 100,000 population (825) by 2025. If the number of new graduations from California

RN programs increases beyond currently estimated rates of growth, these benchmarks will be reached sooner.

Policymakers should be cautioned that the 2009 BRN forecasts are based on current data and trends; the factors that affect RN supply and demand are unlikely to remain static. Continuous tracking of factors that affect the nursing workforce allows the BRN to adjust supply and demand projections as needed, identify the degree to which California’s workforce strategies have been successful in reducing the nursing shortage, and pinpoint new approaches to sustain progress in narrowing the gap between RN supply and demand. California leaders also should observe closely the employment paths of recent nursing graduates who are entering a difficult job market and may choose to leave the nursing profession. Moreover, they should watch new enrollments in nursing programs, which could drop as state colleges and universities face tight budgets and as potential students hear there might not be enough nursing jobs. California will need to maintain the present number of nursing graduates in order to meet long-term health care needs.

**Executive Summary Exhibit: Projected full-time equivalent supply of and demand for RNs, 2009-2030. (Inset: Percentage of national average FTE RNs per 100,000 not reached)**



## **Introduction**

This report updates forecasts of the Registered Nurse (RN) workforce in California developed in 2005 and 2007 by the University of California, San Francisco, for the California Board of Registered Nursing (BRN) (Spetz and Dyer, 2005; Spetz, 2007). The new forecasts are based on data from the 2008 BRN Survey of Registered Nurses (Spetz, Keane, and Herrera, 2009), the 2004 U.S. Bureau of Health Professions (BHPr) National Sample Survey of RNs (Bureau of Health Professions, 2007), the 2007-2008 BRN Annual Schools Report, and data extracted from the BRN's license records.

The forecasts presented in this report focus on long-term trends in supply and demand. The current economic recession may change demand and supply in the short-term; as the economy recovers, however, the projected trends in supply and demand for registered nurses will revert to long-run expectations. In the long-term, the forecasts indicate that the shortage of RNs that has persisted for many years is likely to continue over the next decade, depending on the extent to which demand for health services grows with the economic recovery and the aging of the population. However, California's supply of RNs is on a trajectory to end the shortage, if the current levels of nursing program graduations and international migration are stable.

The forecasts of RN supply take into account the aging of the RN workforce, new graduates (including those from out-of-state and international nursing programs), interstate flows of RNs, and changes in license status. The demand forecasts are based on national numbers of RNs per 100,000 population. The demand forecasts are compared to a forecast published by the California Employment Development Department (EDD), as well as an alternate forecast developed using data from the California Office of Statewide Health Planning and Development (OSHPD) and the California Department of Finance (DOF).

This report explains the structure of the 2009 forecasting model, how the parameters of the model were estimated, and findings concerning the future supply of California's RN workforce relative to future demand.

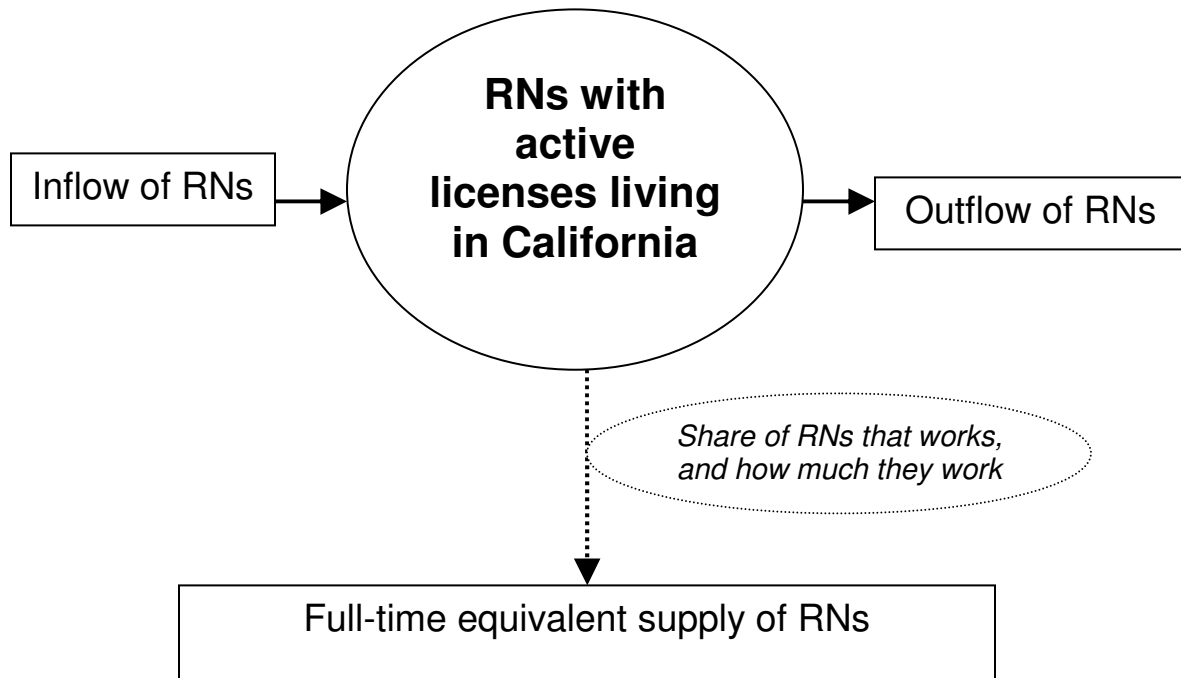
## **The Supply of RNs**

### ***Basic Structure of the Supply Forecast Model***

California's RN workforce constantly changes due to a variety of factors described as "inflows" and "outflows" of RNs. Inflows result in additions to the number of RNs in California, and outflows represent the departure of RNs from the California population. In the model used to forecast supply, the factors that drive the inflow and outflow of RNs are measured to develop estimates of the total numbers of RNs that will enter and leave the labor force each year. These inflows and outflows are added to and subtracted from the number of RNs with active licenses who were California residents as of March 26, 2009. The number of RNs with active licenses – 292,565 – is considered the "stock" of RNs potentially available to work. The supply forecast model incorporates age distribution of the RNs, and estimates the inflow and outflow of RNs for each age category. Estimates of the labor supply of RNs are derived from the total number of RNs potentially available to work and how much they work in nursing. This number is expressed as full-time equivalent employment, or FTEE, in the model. Figure 1

illustrates this model of the supply of RNs in California, commonly called a “stock-and-flow model.”

**Exhibit 1: A model of the supply of RNs.**



Factors that comprise the key parameters in this model are:

- Inflows
  - Graduates from California nursing programs;
  - Graduates of nursing programs in other states who obtain their first RN license in California;
  - Internationally-educated nurses who immigrate to California and obtain their RN license;
  - Interstate migration of RNs to California;
  - Changes from inactive to active license status; and
  - Changes from delinquent to active license status.
- Outflows
  - Migration out of California (to another state or country); and
  - Movements from active to inactive or lapsed license status.
- Employment rates
  - Share of RNs with active licenses and California residence that works in nursing; and

- Average number of hours worked per week by RNs working in nursing.

As the factors change over time, so does the RN workforce. At first glance, it seems clear that as long as the inflow of RNs is greater than the outflow, the RN workforce will grow over time. However, such a comparison between total inflow and outflow does not take into account the aging of the RN workforce. The age distributions of the stock of RNs and each inflow and outflow component affect supply. Thus, the model “ages” each age cohort to capture the impact of age on the supply forecast.

### ***Method of Calculating RN Supply***

In the supply model, the number of RNs with active licenses who reside in California is first 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, 70-79, and 80 and older. Second, we assume that one-fifth of RNs in each age category moves into the next (older) age category each year, until they reach the oldest age category.<sup>1</sup> Third, we add the inflow estimates to and subtract the outflow estimates from each age group of RNs. Fourth, we apply rates of employment and hours worked per week in nursing to the estimates of the number of RNs with active licenses to obtain FTEE supply. We do this for each year through 2030 to obtain our forecasts of California’s RN supply.

For some factors in the supply model, differing estimates are available, with no indication of which estimate is most reliable. In these cases, the highest and lowest estimates are identified, thus providing a range within which the “best estimate” resides. The “best estimate” is the average of the low and high estimates, unless otherwise noted.

### ***Estimates of Supply Model Factors***

#### **Baseline supply of RNs in 2009**

Data on the number of RNs with active licenses were obtained from the BRN. On March 26, 2009, 292,565 RNs had active licenses and a California address according to BRN records. Another 55,629 RNs had active California licenses but lived in other states or countries. Since the focus of this model is on the long-term supply of RNs in California, we use the number of active RNs residing in California as our initial stock of RNs. The potential for RNs with California licenses but non-California residence to supplement California’s supply as traveling nurses is discussed below.

The number of RNs with active licenses and California addresses was divided into 13 age groups, as seen in Exhibit 2. These age groups are used throughout the model. Exhibit 2 compares the 2009 data to that from 2007. The total number of licensed RNs living in California grew by 16,907. The number of actively-licensed RNs aged less than 35 years, and 45 to 54 years declined between 2007 and 2009, while the number of those in all other age groups increased. The largest increases were seen among nurses 60 to 64 years (7,319) and 55 to 59 years (6,772). There also was growth among nurses 35 to 44 years old (4,075).

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<sup>1</sup> All but one age group spans 5 years, so if nurses are evenly distributed across those five years, 20% - or 1 in 5 - would move to the next age group each year. The youngest age group spans 7 years, but there were no RNs under 20 years old in 2009; thus, the 20% assumption seems reasonable for this group as well.



**Exhibit 2: Counts of actively-licensed RNs living in California, by age group, March 26, 2009 and July 27, 2007**

Age Group	March 26, 2009		July 27, 2007	
	Count	% of Total	Count	% of Total
Under 30	--	--	21,003	7.62%
Under 25	2,401	0.82%	--	--
25-29	17,786	6.08%	--	--
30-34	25,419	8.69%	27,179	9.86%
35-39	35,104	12.00%	32,173	11.67%
40-44	31,335	10.71%	30,191	10.95%
45-49	34,188	11.69%	38,333	13.91%
50-54	43,281	14.79%	46,940	17.03%
55-59	43,386	14.83%	36,614	13.28%
60-64	30,212	10.33%	22,893	8.30%
65-69	16,569	5.66%	11,984	4.35%
70-74	8,069	2.76%	5,534	2.01%
75-79	3,360	1.15%	1,972	0.72%
80+	1,455	0.50%	842	0.31%
Total	292,565	100.00%	275,658	100.00%

Source: California Board of Registered Nursing license records

Graduates from California nursing programs

Data on new graduates from California nursing programs who receive their first RN license in California were obtained from the BRN. According to the 2007-2008 BRN Annual Schools Report, there were 9,580 new graduates from California nursing programs in the 2007-2008 school year (Waneka and Spetz, 2009). Over the past several years, there has been substantial growth in new enrollments in RN education programs. Exhibit 3 presents the numbers of enrollments and graduates from the past seven Annual Schools Reports.

**Exhibit 3: Enrollments and graduations from RN education programs, 2001-2002 through 2007-2008.**

Survey year	Number of new enrollments	Growth in enrollments	Number of graduations	Growth in graduations
2001-2002	6,422	4.8%	5,346	3.2%
2002-2003	7,457	16.1%	5,623	5.2%
2003-2004	7,825	4.9%	6,158	9.5%
2004-2005	8,926	14.1%	6,677	8.4%
2005-2006	11,131	24.7%	7,528	12.8%
2006-2007	12,709	14.2%	8,317	10.5%
2007-2008	13,157	3.5%	9,580	15.2%

Source: Waneka and Spetz, 2009, 2007-2008 Annual School Report Data Summary and Historical Trend Analysis.

Growth in RN program enrollments will lead to growth in graduations in future years. In order to estimate growth in RN graduates for the next few years, we assume most RN education programs last two to three years. Associate Degree Nursing (ADN) programs are designed so students can complete the nursing component of the degree in two years. In most Baccalaureate of Science Nursing Degree (BSN) programs, students are formally enrolled in nursing major courses during the last 2.5 to 3 years of the pre-licensure BSN degree program, unless the program is an accelerated BSN degree program. Thus, enrollment changes will translate to graduation changes two to three years into the future.

The Annual Schools Survey asks schools to forecast their new enrollments for future years; these forecasts are used to estimate new enrollments for 2008-2009 and 2009-2010. To predict future graduations, actual enrollments for each year of the Annual Schools Report were compared with graduations two years later. Graduations were, on average, 91.2 percent of the number of enrollments two years prior, which represents a slight decrease from the 93.3 percent “productivity rate” used in the 2007 forecasts. This rate was used to estimate future graduations, as presented in Exhibit 4. The forecasted number of graduations in 2008-2009 (11,597) is 91.2% of the known enrollments from 2006-2007 (12,709).

Graduations after the 2009-2010 academic year are more difficult to estimate, because enrollments for 2008-2009 are not yet known. For the 2007-2008 Annual Schools Report, schools were asked to estimate their enrollments for the next two years. They estimated their 2008-2009 enrollments to be 14,621, and their 2009-2010 enrollments to be 14,216. We multiplied these figures by 91.2% to obtain forecasted graduations for 2010-2011 and 2011-2012, as seen in Exhibit 4. Based on the Annual Schools Report estimates, we anticipate that nursing program enrollments will be relatively stable after the 2011-2012 academic year. In the forecasting model, the “low” estimate of growth in RN education after 2011-2012 is 0%, the high estimate is 2%, and the “best” estimate is 1%.

**Exhibit 4: Predicted growth in graduations based on known growth in enrollments.**

Academic year	Forecasted enrollments	Forecasted graduations
2006-2007	12,709*	8,317*
2007-2008	13,157*	9,580*
2008-2009	14,621	11,597
2009-2010	14,216	12,005
2010-2011		13,341
2011-2012		12,972

\* Actual number of enrollments and graduations based on Annual Schools Report.

Note: Forecasts of enrollments are provided by RN programs in the Annual Schools Survey. Forecasted graduations are 91.2 percent of enrollments two years prior. Source: Waneka and Spetz, 2009, 2007-2008 Annual School Report Data Summary and Historical Trend Analysis.

Graduates from nursing programs in other states who obtain their first license in California

Each year, some graduates of nursing programs in other states obtain their first RN license in California. According to the BRN, in the 2007-2008 fiscal year, 825 out-of-state graduates obtained their first license from California; this is the high estimate of out-of-state

graduates who move to California. BRN records also indicate that 695 of these nurses are living in California; this is the low estimate. The “best estimate” for the inflow of new licensees from other states is the average of the high and low estimates: 760 nurses.

Immigration of internationally-educated nurses

In the 2007-2008 fiscal year, the BRN reports that 3,116 internationally-educated nurses passed the NCLEX-RN exam and received initial licensure as an RN in California. In 2009, 2,085 of these nurses lived in California; the remainder lived in other states or countries. Since the 1997-1998 fiscal year, the number of first licenses issued to internationally-educated nurses has ranged from 1,145 to 4,107. In the supply model, we use total number of 2007-2008 international graduates as the high estimate of the number of immigrants. We use the number that lives in California as the low estimate. The best estimate is the average of the high and low estimates: 2,601 internationally-educated RNs immigrate to California each year.

Age distributions of new graduates

The ages at which new graduates enter the labor supply are an important component of the model. The BRN Annual Schools Report uses an uneven set of age groups for new California graduates, in that there are ten year age groups for graduates over age 30. To create consistent groups of graduates in the forecasting model, we divided the graduates into five year groups. Exhibit 5 shows the redistributed age breakdown of new graduates from California nursing programs. RN graduates from nursing programs in other states seeking initial licensure as an RN in California are assumed to have the same age distribution as California graduates.

BRN records of internationally-educated nurses who receive initial U.S. licensure in California include the birthdates of these nurses. The age distribution of internationally-educated RNs who lived in California and obtained licenses in 2007-2008 is presented in the last column of Exhibit 5; these data are used as the forecast of the age distribution for all internationally-educated RNs receiving first licenses in California.

**Exhibit 5. Estimated age distribution of new graduates from California RN programs**

Age group	Graduates of US RN programs	Internationally-educated graduates
18-25*	31.5%	7.7%
26-29*	27.1%	16.0%
30-34	12.8%	17.9%
35-39	12.8%	26.1%
40-44	6.5%	13.1%
45-49	6.5%	8.6%
50-54	1.4%	7.2%
55-59	1.4%	2.4%
60-64	0.2%	0.9%
65-69	0.0%	0.1%

\* The age groups for internationally-educated RNs are “Under 25” and 25-29.

Sources: Waneka and Spetz, 2009, 2007-2008 Annual School Report Data Summary and Historical Trend Analysis; 2007-2008 California BRN licensing records.

Interstate migration of RNs to California

Estimates of interstate migration to California were developed in two ways. The low estimate of interstate migration was computed from BRN records of nurses requesting license endorsement from another state into California. Exhibit 6 presents the number of RNs requesting endorsement to California who have permanent addresses in California. The table also presents the number of RNs living in states other than California, as reported in the 2004 National Sample Survey of Registered Nurses (Bureau of Health Professions, 2007), and the estimated rate of those RNs moving to California, which is the number requesting endorsement divided by the number of RNs in other states.

**Exhibit 6. Requests for license endorsement into California, 2007-2008 (Low estimate)**

Age Category	Number requesting endorsement & living in CA	Number of RNs in other states, 2003	Percent of RNs living in other states requesting endorsement
Under 25	60	50,732	0.118%
25-29	790	142,448	0.555%
30-34	732	192,940	0.379%
35-39	600	226,090	0.265%
40-44	399	318,611	0.125%
45-49	285	391,572	0.073%
50-54	234	348,207	0.067%
55-59	173	239,356	0.072%
60-64	95	126,687	0.075%
Over 64	29	70,738	0.041%

Sources: California Board of Registered Nursing license records, FY 2007-2008; Bureau of Health Professions, 2007.

The high estimate of interstate migration is based on data from the 2004 BHP National Sample Survey of RNs (NSSRN). The NSSRN asked respondents about their current and former state of residence with the following questions:

- (1) Where do you currently reside? (question 61);
- (2) Did you reside in the same city/town a year ago? (question 62); and if the answer to question 62 is “no,”
- (3) Where did you reside a year ago? (question 63).

Using the variables corresponding to these questions in the 2004 NSSRN and applying sample weights, we were able to estimate the number and age distribution of RNs who did not reside in California in 2003, but did so in 2004. The share moving to California between 2003 and 2004 is divided by the estimated number of RNs residing in other states in 2003 to obtain a rate of migration into California by out-of-state RNs. Note that no RNs 70 years or older in the NSSRN moved to California between 2003 and 2004; thus, in the models, no nurses are predicted to migrate to California after age 69 years. Exhibit 7 presents these estimates.

**Exhibit 7. Estimated movements from other states to California, 2003-2004 (High estimate)**

Age Category	Number moving to California, 2003-2004	Number of RNs in other states, 2003	Percent of RNs moving to California
Under 25	713	50,732	1.406%
25-29	1,178	142,448	0.827%
30-34	1,571	192,940	0.814%
35-39	742	226,090	0.328%
40-44	655	318,611	0.206%
45-49	605	391,572	0.154%
50-54	707	348,207	0.203%
55-59	834	239,356	0.348%
60-64	108	126,687	0.086%
65-69	160	70,738	0.228%

Source: Bureau of Health Professions, 2007.

Rates of migration to California are a function of the population of RNs residing in other states. Thus, an estimate of the future *national* RN population is required. Three sources of data were examined to obtain this estimate. The 2002 BHPr forecasts of RN supply and demand (National Center for Health Workforce Analysis, 2002), predict that the number of employed RNs in other states was 11.27 times the number in California in 2000. An analogous computation using the NSSRN allowed us to estimate that other states employed 11.37 times the number of RNs employed in California in 2005. The U.S. Bureau of Labor Statistics (BLS) forecasted the number of jobs in registered nursing in 2006 and 2016 (Bureau of Labor Statistics, 2007); these data estimate that the number of employed RNs in other states will be between 10.4 and 10.5 times the number employed in California.

The above estimates of the number of nurses residing outside California were used to estimate the total non-California population of RNs that might move to California each year. The low estimate is that the non-California RN population is 10.4 times the California population; the high estimate is 11.37 times the California population. These estimates are combined with each of the rates of movement presented in Exhibits 6 and 7 to obtain the estimated inflow of RNs from other states as a *rate* of the California RN population. These rates are presented in Exhibit 8. The “best estimate” is the average of the four rates, as presented in the last column of Exhibit 8.

**Exhibit 8. Rates of migration of RNs to California from other states as a function of the California RN population.**

	BLS Forecast National multiplier = 10.4		NSSRN Forecasts National multiplier = 11.37		Best estimate
	High estimate	Low estimate	High estimate	Low estimate	
Under 25	14.6%	1.2%	16.0%	1.3%	8.3%
25-29	8.6%	5.8%	9.4%	6.3%	7.5%
30-34	8.5%	3.9%	9.3%	4.3%	6.5%
35-39	3.4%	2.8%	3.7%	3.0%	3.2%
40-44	2.1%	1.3%	2.3%	1.4%	1.8%
45-49	1.6%	0.8%	1.8%	0.8%	1.2%
50-54	2.1%	0.7%	2.3%	0.8%	1.5%
55-59	3.6%	0.8%	4.0%	0.8%	2.3%
60-64	0.9%	0.8%	1.0%	0.9%	0.9%
65-69	2.4%	0.4%	2.6%	0.5%	1.5%
70-74	0.0%	0.0%	0.0%	0.0%	0.0%
75-79	0.0%	0.0%	0.0%	0.0%	0.0%
80+	0.0%	0.0%	0.0%	0.0%	0.0%

Sources: California Board of Registered Nursing license records, FY 2007-2008; Bureau of Health Professions, 2007; National Center for Health Workforce Analysis, 2002; US Bureau of Labor Statistics, 2007, <http://www.bls.gov/opub/mlr/2007/11/art5full.pdf>.

Movements from inactive to active license status

We obtained data from the BRN, by age category, on the number of RNs with California addresses changing from inactive to active license status for the most recent four fiscal years. The total has ranged from 189 nurses in 2002-2003 to 549 nurses in 2007-2008. The 2007-2008 data are used to estimate the number and age distribution of RNs changing from inactive to active license status (Exhibit 9).

**Exhibit 9. Number and age distribution of RNs changing status from inactive to active license status, 2007-2008**

Age Category	Number	Percent	Age Category	Number	Percent
<30	1	0.2%	55-59	94	17.1%
30-34	4	0.7%	60-64	85	15.5%
35-39	26	4.7%	65-69	60	10.9%
40-44	39	7.1%	70-74	40	7.3%
45-49	78	14.2%	75+	49	8.9%
50-54	73	13.3%	Total	549	100.0%

Source: California Board of Registered Nursing license records, FY 2007-2008.

### Movements from lapsed to active license status

The BRN provided data on the number and age distribution of RNs whose licenses were lapsed and later were reactivated. In the 2007-2008 fiscal year 1,136 RNs living in California reactivated their licenses. The rate of reactivation was computed by dividing the number of RNs reactivating their licenses in each age group by the total number of actively licensed RNs in the age group. These data are presented in Exhibit 10.

**Exhibit 10. Number and rate of RNs reactivating lapsed licenses, 2007-2008**

Age Category	Number of reactivated licenses	Population of Active RNs	Rate of reactivation
<30	11	20,187	0.05%
30-34	48	25,419	0.19%
35-39	108	35,104	0.31%
40-44	129	31,335	0.41%
45-49	169	34,188	0.49%
50-54	190	43,281	0.44%
55-59	187	43,386	0.43%
60-64	129	30,212	0.43%
65-69	81	16,569	0.49%
70-74	47	8,069	0.43%
75+	37	4,815	0.58%

Source: California Board of Registered Nursing license records, FY 2007-2008.

### Migration out of California (to another state or country)

Low and high estimates of migration out of California were created with data from the 2004 NSSRN and California BRN records of nurses requesting outgoing endorsement. The high estimate is based on analysis of the 2004 NSSRN data. The same variables used to calculate migration of RNs into California were used to calculate the high estimate of migration out of California. First, estimates of the number and age distribution of RNs who moved out of California between 2003 and 2004 were computed. Then, the number and age distribution of RNs who resided in California in 2003 were tabulated. Finally, for each age category, the estimated share of RNs who moved out of California between 2003 and 2004 was calculated by dividing the number who moved out of California by the total number in California in 2003.

The BRN provided information on applications for outgoing endorsements in 2007-2008, by age group. These numbers were divided by the numbers of RNs in each age group in 2009 to obtain the low estimate. Exhibit 11 presents the rates used in the model. As with other variables in the supply model, the best estimate is the average of the high and low estimates.

**Exhibit 11. Estimated annual rates of RNs migrating out of California.**

Age Category	High Estimate	Low Estimate	Best Estimate
Under 25	10.2%	3.5%	6.9%
25-29	10.2%	6.3%	8.3%
30-34	7.9%	5.3%	6.6%
35-39	6.0%	3.9%	5.0%
40-44	2.8%	3.0%	2.9%
45-49	2.8%	2.5%	2.7%
50-54	1.6%	2.3%	2.0%
55-59	0.8%	2.0%	1.4%
60-64	3.3%	1.6%	2.4%
65-69	2.5%	1.0%	1.8%
70-74	0.0%	0.6%	0.3%
75-79	0.0%	0.3%	0.2%
80+	0.0%	0.0%	0.0%

Source: California Board of Registered Nursing license records, FY 2007-2008; Bureau of Health Professions, 2007.

Movements from active to inactive or lapsed license status

Estimates of the rate at which actively-licensed RNs allow their licenses to lapse were computed from California BRN license records and the NSSRN. 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.

The BRN provided data on the number of RNs with California addresses who changed their license status to inactive or allowed their license to lapse in the 2007-2008 fiscal year. These data were provided in age groups up through “75 and older”. The number of RNs with a non-active license divided by the number of current active RNs to produce initial estimates of the rate at which nurses leave the pool of actively licensed RNs.

The 2000 and 2004 NSSRN were used to obtain an alternative estimate of movements from active to inactive license status, and to obtain estimates for age groups 65 years and older. First, the number of RNs who were U.S. residents in 2000 was calculated, by age category. The number of RNs (U.S. residents only), by age category, who responded in the 2004 survey that they received their first U.S. license between 2000 and 2004 was added to this figure. Then the number of RNs who were U.S. residents in 2004, by age category, was calculated for age categories four years older than those tabulated in 2000. The formula for estimating the number going “inactive” is:

$$\text{Number of inactive RNs (US residents only)} = \text{Number of RNs in 2004} - \text{Number of RNs in 2000} - \text{Number newly licensed between 2000 and 2004.}$$

The rate of inactivation is:

$$\text{Inactive Rate} = \text{Number of inactive RNs (US residents only)} / \text{Number of RNS in 2004}$$



This calculation was translated into a yearly rate with the following formula:

$$\text{Yearly Rate} = 1 - (1 - \text{Inactive rate})^{0.25}$$

If the yearly rate was negative (as it was for three age categories), it was assumed to be zero. For nurses under 65 years old, the average of the BRN-based estimate and the NSSRN-based estimate was used to compute the rate at which nurses' licenses go inactive or lapse. For nurses 80 years and older, the NSSRN estimate was averaged with the BRN estimate for the 75-79 age group. Exhibit 12 presents the rates used in the supply model.

**Exhibit 12. Estimated annual rates of RNs changing from active to inactive or lapsed license status, by age category.**

Age Category	BRN Estimate	NSSRN Estimate	Best Estimate
<30	0.73%	0.00%	0.37%
30-34	1.16%	1.04%	1.10%
35-39	0.89%	0.00%	0.45%
40-44	0.79%	0.00%	0.39%
45-49	0.85%	0.00%	0.43%
50-54	0.83%	0.00%	0.41%
55-59	1.03%	0.76%	0.89%
60-64	1.54%	4.83%	3.19%
65-69	3.57%	11.06%	7.32%
70-74	5.95%	14.31%	10.13%
75-79	7.71%	19.99%	13.85%
Over 79	N/A	27.61%	17.66%

Sources: California Board of Registered Nursing license records, FY 2007-2008; Bureau of Health Professions, 2007; Spratley et al., 2001.

***Supply Forecasts of California's RN workforce***

To create a forecast of the total number of RNs with active licenses in California, the model assumes that one-fifth of RNs in each age category moves into the next age category every year after 2009. In this manner, the workforce is "aged." For the 80 years and older category, 100% of the previous year remains and 20% of those 75 to 79 years older in the previous year enter. For each age category, the basic formula is:

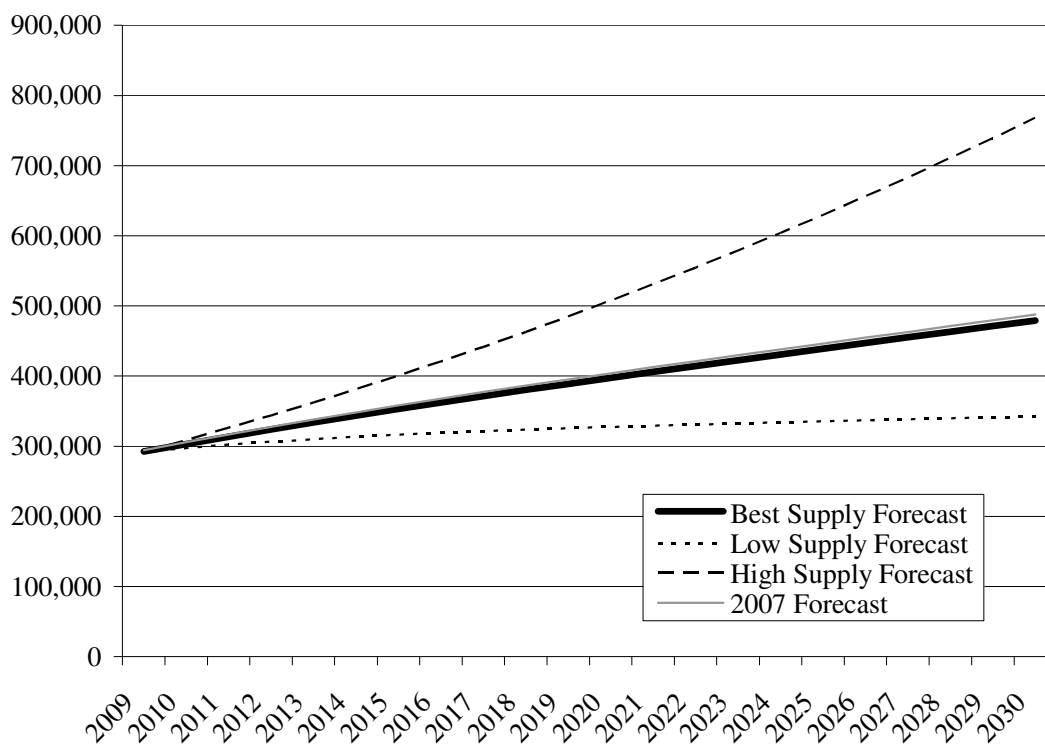
$$\text{Forecasted Supply of CA RNs} = \text{Current supply of RNs as of 2009} + \text{Estimated total inflows} - \text{Estimated total outflows.}$$

This formula is used to produce a forecast of the total active RN population residing in California through 2030.

We estimate that California will have 458,733 active resident RNs by 2030, as shown in Exhibit 13. This is a small drop from the 487,673 RNs forecasted for 2030 in the BRN forecast report published in 2007. As noted above, there was a range of plausible estimates for several inflow and outflow parameters of the model. Different sources of data provided different

estimates of migration to California, migration from California, changes from active to inactive license status, and the projected number of new nursing graduates. Exhibit 13 presents the range of supply estimates that result when the highest and lowest possible supply forecasts are calculated. The parameters underlying the highest forecast are likely implausible, as are those for the lowest forecast. Nonetheless, these forecasts are useful to provide a sense of the range of possible supply outcomes that could occur given potential changes in any or several of the variables identified above.

**Exhibit 13. Forecasted number of RNs with active licenses residing in California, 2009-2030.**



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; Using data from the 2008 BRN Survey of RNs (question 3), the proportion of RNs living in California with active licenses that are employed in nursing was estimated for each age category. The estimates range from 100% of RNs under age 25 to 23.3% of RNs 80 years and older. To account for variation in hours worked by RNs, the 2008 BRN Survey of RNs was used to estimate the average usual hours worked per week for each age category (question 4b) by active RNs who reside in California and were employed in nursing. These estimated hours per week are divided by 40 to obtain the average full-time equivalent employment (FTEE) for each age category. The data used for this calculation is presented in Exhibit 14. The projected FTEE supply estimates from these calculations are presented in Exhibit 15. The 2009 forecast is slightly higher than that of 2007.

The supply forecasts and U.S. Census Bureau projections of total population in the state can be used to calculate the number of employed RNs per 100,000 people in the population for the years 2007 through 2030 (Exhibit 16). The calculation method is comparable to that used by the federal government, and based on data from the NSSRN (Bureau of Health Professions, 2007). The report summarizing the 2004 NSSRN estimates that there were 825 employed RNs per 100,000 US residents in 2004. The calculated figure for California was 589 RNs per 100,000 population in 2004, placing California at the lowest level among all states. The supply model presented here estimates that there are 653 employed RNs per 100,000 population in California in 2009, ranking California as 4<sup>th</sup> from the lowest level of employed RNs per 100,000 population. The supply model presented here predicts that, in the long term, California's RN-per-100,000 ratio will rise to 724 by 2015 and to 833 by 2030 (a 27% increase over 2009).

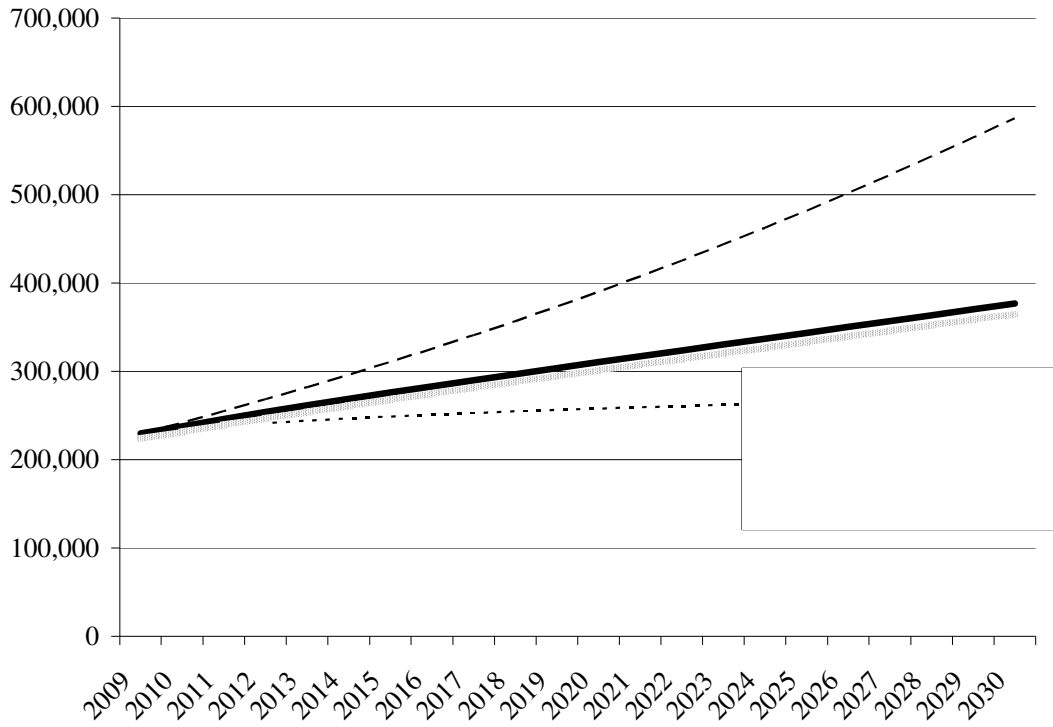
At the present time, there is some evidence that more California nurses might be working than reported in the 2008 Survey of RNs. A survey of hospitals conducted by the California Institute for Nursing and Health Care (2009) reported that a large share of hospitals are experiencing lower turnover and greater retention, delayed retirements of current employees, and current staff working more hours or converting from part-time to full-time employment. Most researchers anticipate that this increase in supply will revert as the economy recovers (Buerhaus et al., 2009); the forecasts presented here do not attempt to account for short-term changes in labor supply.

**Exhibit 14. Employment rates and average hours worked per week by RNs residing in California, 2008**

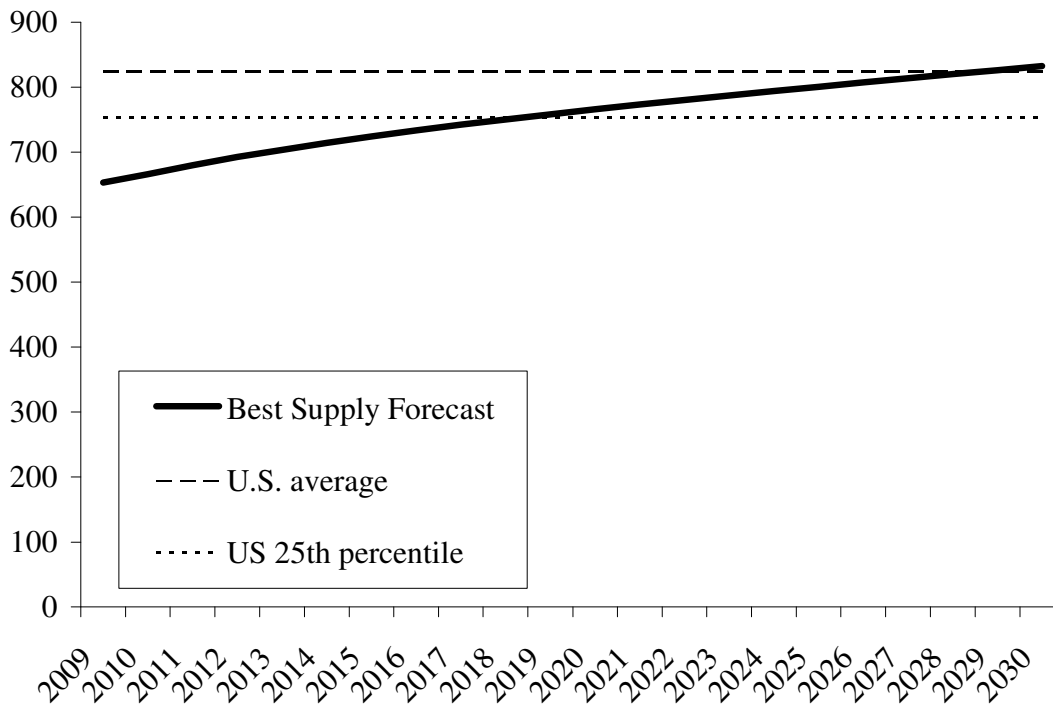
Age Category	Share Employed	Average Hours per Week
Under 25	100.0%	47.1
25-29	97.4%	35.8
30-34	95.5%	36.6
35-39	95.2%	36.2
40-44	89.7%	36.6
45-49	93.4%	37.3
50-54	89.8%	37.6
55-59	87.2%	36.7
60-64	75.5%	35.3
65-69	65.2%	33.4
70-74	42.6%	24.0
75-79	36.0%	24.5
80 or older	23.3%	31.1

Source: Spetz, Keane, and Herrera, 2009, BRN 2008 Survey of Registered Nurses.

**Exhibit 15. Forecasted full-time equivalent supply of RNs, 2007-2030.**



**Exhibit 16. Forecasted employed RNs per 100,000 population.**



## **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. Demand can be measured through benchmarks, such as the number of nurses per capita. Other demand forecasts may examine rates of population growth and population aging. Direct survey of employers can illuminate current demand for nursing positions. Demand may also be measured by researching unmet need for nurses.

The simplest demand forecasting method is to target a stable number of nurses per capita, which can be based on the current number of nurses per capita or a target drawn from an expert panel or data from other states. The main shortcoming of this approach is that the target is arbitrarily defined. The current number of nurses per capita may not be a large enough number if there is a shortage. Likewise a target number based on a national average or other source might not reflect the unique population and health care system of California. An additional shortcoming is that fixed nurse-to-population ratios do not account for increases in the demand for health services associated with population aging. However, this approach has the benefit of being easy to understand and adjust, and provides a clear indication of how California's supply compares to national levels of supply.

An alternate demand forecasting approach is to develop estimates of future need for nurses from current use of health services and employment of nurses. Population projections can be used to forecast future healthcare utilization, and then future need for nurses can be derived from healthcare utilization forecasts. The forecasts of the BLS and EDD most closely resemble this approach. This approach might more accurately measure likely growth in nurse demand as the population ages in California. However, this approach does not attempt to measure the unmet needs of the population.

Both of these forecasting methods can be useful in considering long-term trends in demand, but do not account for short-term changes in demand that might arise from changes in economic conditions. Since January 2008, the United States has been mired in a deep recession. A recent survey conducted by the California Institute for Nursing and Health Care found that in 2008 and 2009, there have been fewer jobs available for RNs than expected, due to the economy. Hospitals are treating fewer patients, both because more Californians are uninsured and people are delaying elective procedures due to economic uncertainty. In the first quarter of 2009, hospitals reported an average 4.9% vacancy rate, which is lower than the 7% rate of one year before. Moreover, many hospitals indicated that they were not recruiting to fill their vacant positions. In some cases, the lack of recruitment was due to a hiring freeze, contracting the job market even further.

Current demand for nurses may not reflect unmet need for nurses. However, there is no standard for defining unmet needs. Moreover, if funding is not available to hire more nurses, the "unmet need" definition of demand is meaningless. It would not be fruitful to expand supply of RNs if jobs are not available for them.

We developed several alternate forecasts of demand, using national RN-to-population data and estimating future hospital utilization in California. We also examined forecasts from other agencies such as the EDD and the BHP. The demand estimates produced from these different strategies provide a range of possible scenarios for the future.

### ***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 (California Institute for Nursing and Health Care, 2006). This metric is reported by the BHP in the NSSRN report (Bureau of Health Professions, 2007). For over ten years, California has had one of the lowest ratios of employed RNs-per-100,000 population in the United States. Many researchers and policy experts believe California's employed RNs-per-100,000 population ratio should be closer to the 25<sup>th</sup> percentile nationwide (756 employed RNs per 100,000),<sup>2</sup> or even the national average (825 employed RNs per 100,000). The number of employed RNs per 100,000 can be converted to FTEE using data from the NSSRN. In 2004, US nurses worked an average of 1,848 hours per year, which equates to 0.89 FTEs per working RN. The 25<sup>th</sup> percentile of FTEE RNs per 100,000 is thus 672, and the national average is 733. These benchmarks were compared with the current and forecasted population of California (California Department of Finance, 2007) to project need for RNs to remain at current RN-to-population ratios, to reach the 25<sup>th</sup> national ratio, and to attain the national average ratio.

### ***Forecasts based on hospital staffing of RNs per patient day***

A second approach to forecasting demand for RNs uses current hospital utilization and staffing patterns to estimate future demand. First, the number of hospital patient days per ten-year age group was obtained from the OSHPD Inpatient Hospital Discharge Data for 2006 (Office of Statewide Health Planning and Development, 2008).<sup>3</sup> Then, age-specific population forecasts were gathered from the California Department of Finance (2007). Dividing 2007 patient days by 2007 population provides the number of patient days per population, per age group. These rates of patient days can be applied to future population projections to get forecasts of patient days by age category. To produce forecasts of hospital demand for RNs, RN hours per patient day were obtained from OSHPD's Hospital Annual Financial Data for 2006-2007 (Office of Statewide Health Planning and Development, 2008). Average RN hours per patient day in 2005 were 10.55. Multiplying the RN hours per patient day figure of 10.55 by the patient day forecasts produces a forecast of RN hours needed in the future. To equate these hours to FTEEs, RN hours are divided by 1768 (average annual productive hours per FTE). This provides demand forecasts for only one type of employer (hospitals). Data from the BRN 2008 Survey of RNs were used to measure the share of RNs that work in hospital nursing positions represented in the OSHPD data. The share of RNs working in hospitals was computed (59.2%). This calibration forces demand in 2006 to be equal to FTEE supply in 2006. The forecasts of FTEE demand are adjusted to represent the full population of RNs with the formula:

$$\text{Total FTEE} = (\text{Hospital FTEE}) / 0.408$$

### ***Other demand forecasts***

The 2007 projections by the EDD indicate that there will be 298,000 registered nurse jobs in California by 2016 (California Employment Development Department, 2007). The EDD forecast does not distinguish between full-time and part-time jobs. To estimate the FTEE

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<sup>2</sup> At the 25<sup>th</sup> percentile, 12 states have employed RN-per-100,000 ratios that are lower, and 37 have RN-per-100,000 ratios that are higher.

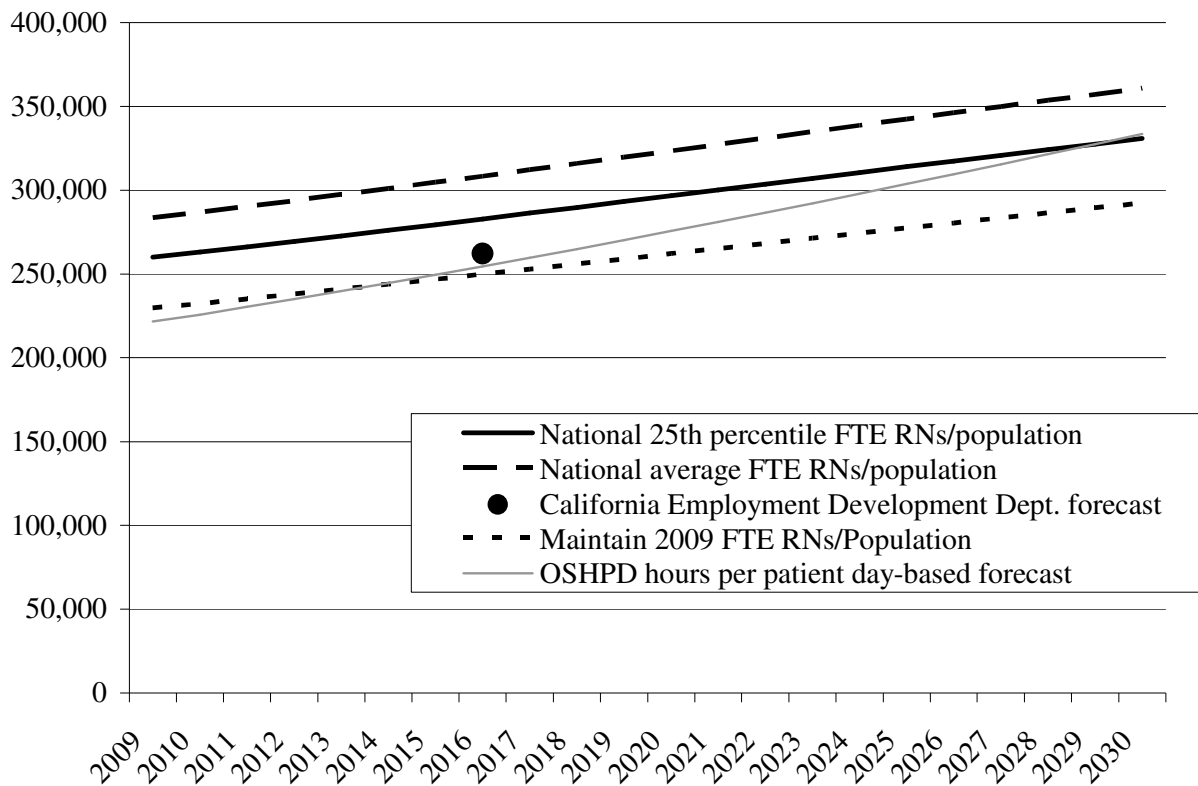
<sup>3</sup> The age groups are under 1, 1-9, 10-19, 20-29, 30-39, 40-49, 50-59, 60-69, 70-79, and 80 and older.

employment implied by the EDD forecasts, we use the adjustment of 0.88, which is the average number of hours worked per week by California RNs (35.2) divided by 40.

***Comparing the demand forecasts***

Exhibit 17 compares all aforementioned demand forecasts of full-time equivalent RNs. The forecasts estimate that the FTEE demand for RNs in 2009 ranged from 221,590 to 283,578. Demand in 2030 is forecasted to be between 292,424 and 360,926. These lower figures are not likely to accurately represent total demand, because they do not account for additional demand represented by vacant positions and jobs temporarily filled by registry or traveling nurses. The EDD forecast for 2016 is somewhat higher than that produced by the OSHPD-based forecast, but lower than the 25<sup>th</sup> percentile of national RN-to-population ratios.

**Exhibit 17. Forecasted full-time equivalent demand for RNs, 2009-2030.**



**Comparing Supply and Demand for RNs**

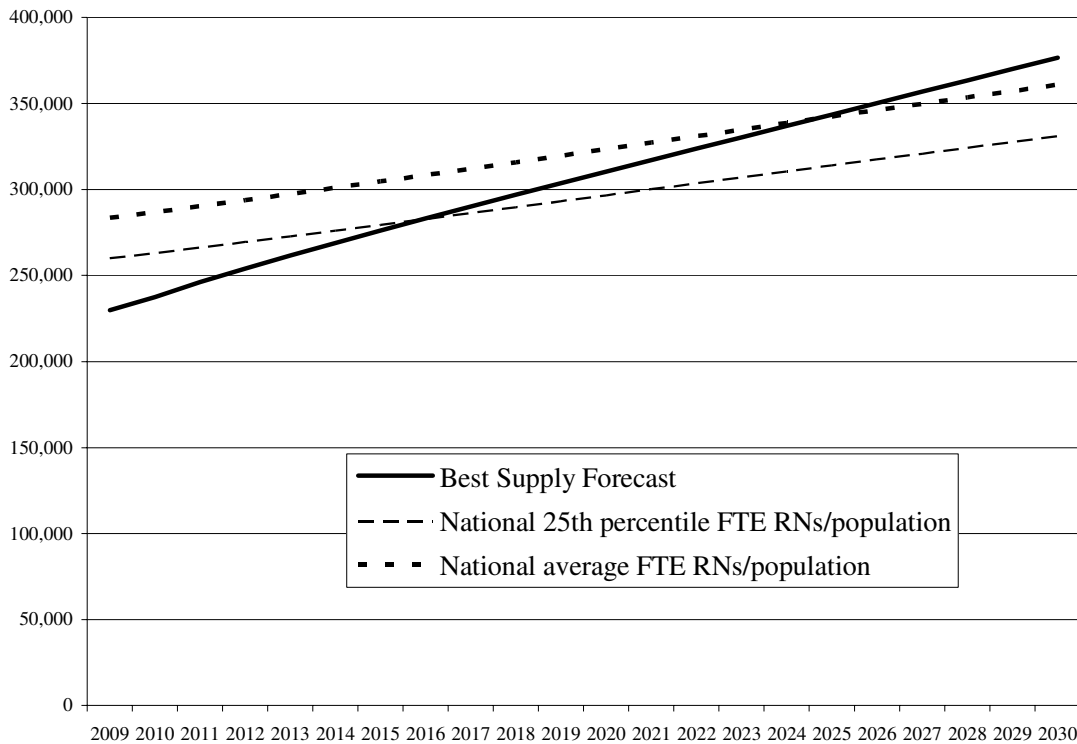
There is a widespread perception that California has faced a significant long-term shortage of RNs, and that this shortage will resume when the recession ends. Previous forecasts predicted that the shortage would worsen unless steps were taken to increase the supply of RNs. Since the 2005 forecasts were published, RN graduations have increased 43 percent. The national supply of RNs also has improved, largely due to increased graduations from RN education programs (American Association of Colleges of Nursing, 2006). The forecasts

published in 2007 reflected part of this improvement in RN graduations, and indicated that California was closing the gap between RN supply and demand.

Exhibit 18 presents the best supply forecast for 2009, and demand forecasts based on the goals of California reaching the 25<sup>th</sup> percentile of nationwide FTE RNs per 100,000, and the national average of FTE RNs per 100,000. If the 25th percentile is used as a goal, California faces a shortage of 30,276 FTEE RNs at this time. However, the forecasts based on 2007 OSHPD data – shown in Exhibit 17 – indicate that California presently has no shortage of RNs. This latter demand estimate may be appropriate for the present year, when a recession is dampening demand, but is not likely to be accurate as the economy recovers.

In the long-term, the forecasts predict that nurse supply will continue to rise, reaching the national 25<sup>th</sup> percentile in 2016. California’s RN supply will reach the national average of RN FTEs-per-population by 2025.

**Exhibit 18. Forecasted full-time equivalent supply of and demand for RNs, 2009-2030.**





The possibility that there is a shortage of over 30,000 RNs in 2009 raises the question of how patient care needs are met in the current environment. Some of the shortage is addressed by the employment of traveling nurses, who have California licenses, live outside California, and come to the state for short times to work. In 2008, 41,045 RNs had active California licenses but lived in other states or countries. The 2008 BRN Survey of Registered Nurses found that 19.5 percent of RNs who lived outside of California worked in California in the previous year. Thus, 9,953 RNs worked in California in 2008, for an average of 5.1 months and 41 hours per week. Thus, these traveling RNs filled 4,336 FTE jobs in 2008.

### **Comparison of the 2009 Forecasts with Previous Forecasts**

The forecasts presented here use a similar methodology to that used previously by Coffman, Spetz, Seago, Rosenoff, and O'Neil (2001), Spetz and Dyer (2005), and Spetz (2007). The magnitude of the projected shortage changed dramatically between the 2005 and 2007 forecasts. In 2005, the estimated shortage ranged between 6,872 and 21,161 RN FTEs; in 2007, the shortage is estimated to be at least 10,294 RN FTEs. However, while the 2005 forecasts predicted that the shortage would worsen continuously, reaching up to 122,223 FTEs by 2030, the 2007 forecasts predicted that the shortage will improve, and California would surpass the national average of RN FTEs per 100,000 population (825) by 2022.

The 2009 forecasts are similar to those published in 2007, although California is not expected to near the current national average of RN FTEs per 100,000 population until 2025. This later date is the result both of greater forecasted population growth in California over the next two decades, and slower than expected growth in RN enrollments over the past two years.

### **Policy Implications**

The 2005 forecast report advised that "The only plausible solution to the RN shortage, based on our preliminary analyses, appears to be continued efforts to increase the numbers of graduates from California nursing programs." This recommendation was acted upon by state leaders. Significant increases in state funding for expanded educational capacity of nursing programs, increased funding for equipment, use of updated instructional technologies, and other needed educational resources have had a favorable impact on addressing the RN shortage in California. Between 2003-2004 and 2007-2008, nursing graduations increased 55 percent, reaching over 9,500 new RN graduates per year.

Policymakers should be cautioned that the 2009 BRN forecasts represent long-term forecasts and are not intended to reflect rapidly changing economic and labor market conditions. They also are based on the most currently available data; the factors that affect RN supply and demand are unlikely to remain static. The most important possible changes include: (1) the number of graduations from RN education programs; (2) the number of foreign-educated nurses who immigrate to California; (3) inter-state migration; and (4) population needs for health services. These factors and any other potential influences on California's nursing shortage, 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. California leaders also should observe closely the employment paths of recent nursing graduates who are entering a difficult job market and may choose to leave the nursing profession. Moreover, they should watch new enrollments in nursing programs, which could

drop as state colleges and universities face tight budgets and as potential students hear there might not be enough nursing jobs. California will need to maintain the present number of nursing graduates in order to meet long-term health care needs.

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## **Acronyms**

BHPr – Bureau of Health Professions, part of the Health Resources and Services Administration in the U.S. Department of Health and Human Services

BRN – California Board of Registered Nursing

BLS – U.S. Bureau of Labor Statistics

CA – California

DOF – California Department of Finance

EDD – California Employment Development Department

FTE – Full-time Equivalent

FTEE – Full-time Equivalent Employment

NCLEX-RN – National Council Licensure Examination – Registered Nurses (NCLEX is a registered trademark and/or servicemark of the National Council of State Boards of Nursing, Inc.)

NSSRN – National Sample Survey of Registered Nurses

OSHPD – California Office of Statewide Health Planning and Development

RN – Registered Nurse

UCSF – University of California San Francisco