

# Forecasts of the Registered Nurse Workforce in California

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## **Executive Summary**

We developed a model of the supply of registered nurses (RNs) in California, and used this model to forecast the supply of full-time equivalent (FTE) RNs through 2030. We identified factors that increase the number of RNs (“inflow”) and those that decrease the number of RNs (“outflow”). Inflows include new graduates from U.S. nursing programs who obtain their first RN license in California, graduates of international nursing programs who immigrate to California and obtain their RN license, interstate migration of RNs to California, and movements from inactive to active license status. Outflows include movements from active to inactive license status and migration out of California (to another state or country). Our model takes into account the age distribution of the RN workforce, the variation in hours worked by RNs, and the fact that some RNs with active licenses do not work in nursing.

We obtained data on the RN population in California from the California Board of Registered Nursing. When actual numbers were not available, we obtained estimates from the 2004 California Board of Registered Nursing Survey of RNs and the 1996 and 2000 National Sample Survey of Registered Nurses. For each inflow and outflow category, we identified our “best estimate” and provided information about how we obtained the estimate.

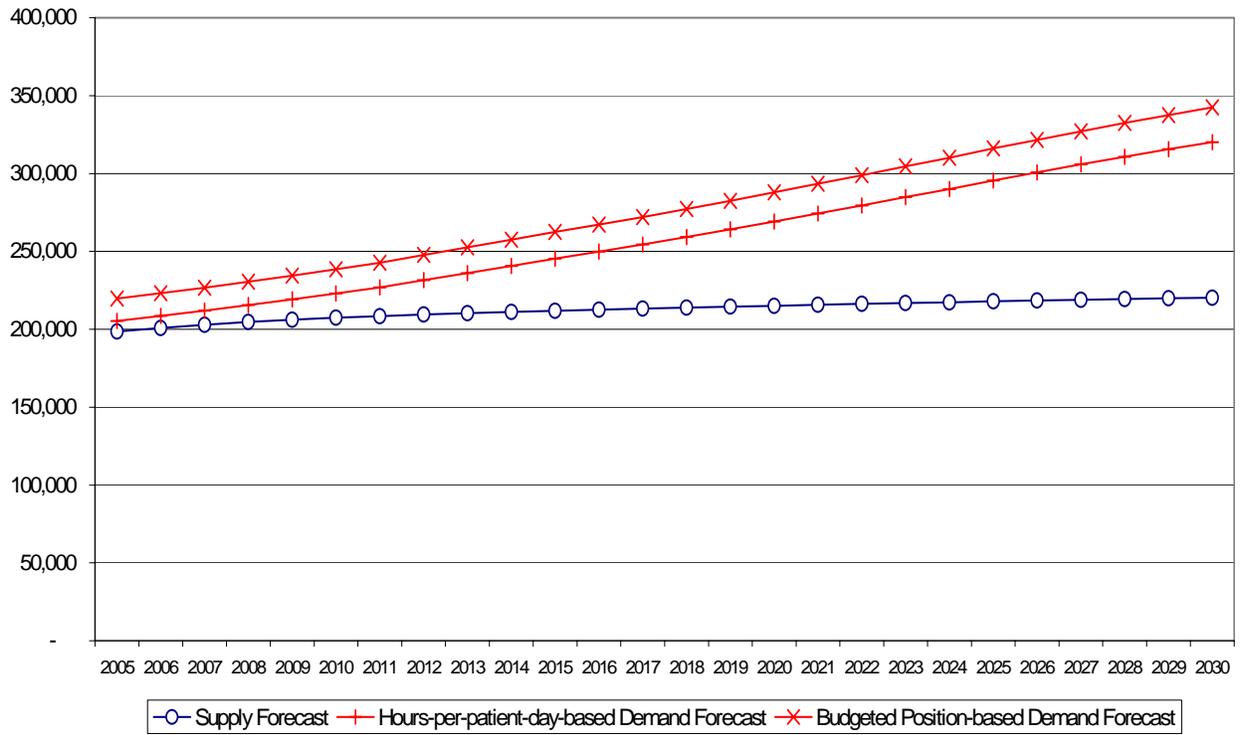
Our forecasts indicate that California will have 220,279 full-time equivalent RNs by 2030, which translates to 458 FTE RNs per 100,000 people in the population (based on population projections from the California Department of Finance). Currently, California has an estimated 198,530 total FTE RNs, which equates to 539 FTE RNs per 100,000 people in the population. Based on 2000 data, the U.S. Bureau of the Health Professions estimated that California had 454 full-time equivalent employed RNs per 100,000 population; thus, the supply of RNs in California has risen as compared with population growth in the past five years.

However, the growth rate of the supply of RNs is not projected to keep up with the growth rate of California's population. We compared our supply forecasts to previously published forecasts of demand for RNs, including those from the Health Services and Resources Administration (HRSA). In addition we produced our own forecasts of demand in order to take into account the impact of California's minimum nurse-to-patient ratio law and other changes in the health care environment not captured by national forecasts. Our demand forecasts were based on data from the California Office of Statewide Health Planning and Development (OSHPD), California Department of Finance (DOF), and a survey of Chief Nursing Officers (CNO survey) co-sponsored by California's Nurse Workforce Initiative, the Hospital Association of Southern California, and the California Institute for Nursing and Health Care.

We found that regardless of the demand forecast used, California's RN shortage will worsen each year through 2030, and will range between 99,945 and 122,223 FTE RNs. We estimate that the current shortage ranges between 6,872 and 21,161 FTE RNs. Even if employment rates of nurses with active licenses increase to 90% for all age groups under 65, there is a forecasted shortage of RNs. 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.

As part of this analysis, we developed an Excel workbook with which policymakers and other interested parties can modify the key parameters in the model to test the sensitivity of the forecasts to various assumptions. This workbook can be downloaded from the Board of Registered Nursing website, [www.rn.ca.gov](http://www.rn.ca.gov).

### Projected Shortage of Registered Nurses (FTEs) in California



## Introduction

At the request of the California Board of Registered Nursing, we developed a forecast of the registered nurse (RN) workforce in California. The primary sources of data for the forecast were the California Board of Registered Nursing (BRN) 2004 Survey of RNs and the U.S. Bureau of Health Professions<sup>1</sup> 2000 National Sample Survey of RNs. Our forecasts indicate a widening gap between the supply of and demand for RNs through at least 2030, with demand outstripping supply by between 99,945 and 122,223 full-time equivalent (FTE) RNs by 2030.

In forecasting the RN workforce, we take into account the aging of the RN workforce, new graduates (including those from international nursing programs), interstate flows of RNs, and changes in license status. We adopted estimates of the future demand for RNs from several sources including the U.S. Bureau of Health Professions (BHP) and U.S. Department of Labor (DOL), and take into account the estimated impact of California's minimum nurse-to-patient ratio law. In addition, we created two alternative demand forecasts using data from the California Office of Statewide Health Planning and Development (OSHPD), California Department of Finance (DOF), and a survey of Chief Nursing Officers (CNO survey) co-sponsored by California's Nurse Workforce Initiative, the Hospital Association of Southern California, and the California Institute for Nursing and Health Care.

What follows is a description of the basic structure of the forecasting model, how we estimated the individual components of the model, and our findings concerning the future supply of California's RN workforce relative to future demand.

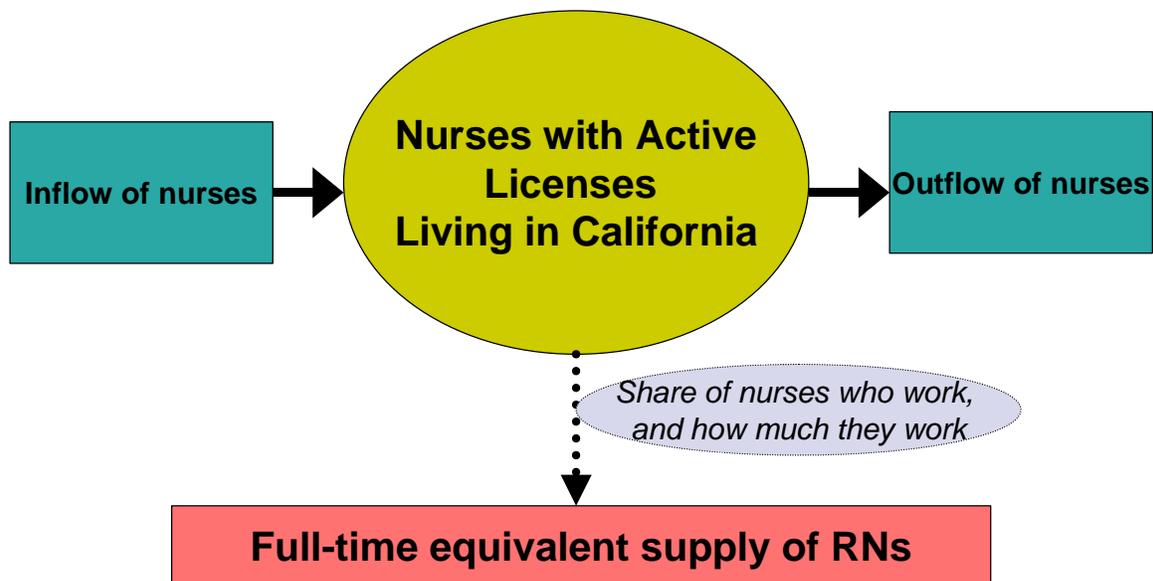
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<sup>1</sup> The Bureau of Health Professions is part of the Health Resources and Services Administration (HRSA) within the U.S. Department of Health and Human Services.

## Basic Structure of the Supply Forecast Model

California's RN workforce is under constant flux due to a variety of factors we characterize as inflows and outflows of RNs. In the forecasting model, we estimate the parameters driving the inflow and outflow of RNs in California, and apply these estimates to the number of RNs with active licenses who were California residents as of April 2005 (254,945). Furthermore, we explicitly take into account the age distribution of RNs with active California licenses, and estimate inflow and outflow parameters for each age category. Data on the current number and age distribution of California's active RN workforce was obtained directly from the BRN. Figure 1 illustrates our stock-and-flow model of the supply of RNs in California.

**Figure 1. A Model of the Supply of RNs**



Factors that comprise the inflow and outflow of active RNs in California are as follows:

### **Inflows**

- New graduates from U.S. nursing programs who obtain first RN license in California
- Graduates of international nursing programs who immigrate to California and obtain their RN license
- Interstate migration of RNs to California
- Movements from inactive to active status

### **Outflows**

- Movements from active to inactive status
- Migration out of California (to another state or country)

As these components 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 is increasing over time. However, such an obvious comparison between total inflow and outflow does not take into account the aging of the RN workforce. Simply put, the age distribution of RNs as well as the age distribution of each inflow and outflow component matters. Thus, our model “ages” each age cohort to address this point.

The total number of RN licenses in California was 298,513 in April 2005. However, some of these license holders do not live in California. Since our focus is on the long-term supply of RNs in California, we do not include these nurses in our forecast model. Instead, we use as our starting point the total number of RNs with active licenses who have a California address according to BRN records – 254,945 as of April 2005.

The forecast equation we use can be summed up in the following manner. First, we divide RNs with active licenses who reside in California into nine age categories: under 30, 30-

34, 35-39, 40-44, 45-49, 50-54, 55-59, 60-64, and 65 and older. Second, we assume that one-fifth of RNs in each age category moves into the next (older) age category each year after 2005. Third, we add the inflow estimates to and subtract the outflow estimates from the current supply of RNs. We do this for each year through 2030 to obtain our forecasts of California's RN workforce.

## **Estimates of RN Inflows and Outflows**

In this section, we describe how we estimated the inflow and outflow rates and figures, and the assumptions we made in obtaining our estimates. Each inflow and outflow component is addressed separately. For some components, we obtained multiple estimates of the potential inflow or outflow, with no indication of which estimate is most reliable. In these cases, we identified the highest and lowest estimates, thus providing a range within which our "best estimate" resides.

### **Inflows**

#### *New graduates from U.S. nursing programs who obtain first RN license in California*

Data on new graduates from U.S. nursing programs who obtain their first RN license in California were obtained from the BRN. According to the 2004 BRN Annual School Report, there were 6,158 new graduates from California nursing programs in the 2003-2004 school year<sup>2</sup>. We added 737 to this figure, which is the number of California RN licenses issued to new graduates from other states' nursing programs during the same fiscal year.<sup>3</sup> The sum of these two numbers – 6,895 – is our best estimate for this inflow category. We note, however, that we forecast graduations from California nursing programs in 2006-2007 that could be as high as 7,000, due to recent grants that have allowed nursing programs in California to enroll more

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<sup>2</sup> The 2003-2004 school year corresponds to August 1, 2003 through July 31, 2004.

<sup>3</sup> The fiscal year extends from July 1, 2003 to June 30, 2004.

students. Adding 737 out-of-state graduates to this number provides us with a high estimate for this inflow category, namely 7,737. At this time, however, we have no idea whether the grants supporting expansion of nursing programs in California will last more than one year. Since our model requires a constant number of graduates per year, we believe the lower estimate more accurately reflects the future, unless there is a concerted effort to extend the short-term expansions.

Since the BRN Annual Schools Report does not provide age distribution of new California graduates in the same age categories as our forecasting model, we used data on the active RN population from BRN's 2004 Survey of RNs to estimate the age distribution of new graduates from California nursing programs. The 2004 BRN Survey of RNs asked respondents to report the state or country in which they received their pre-licensure nursing education and the year in which they graduated from that program (questions 49 and 50). We estimated the age distribution of the 47 respondents who said they graduated in 2003 and who stated that they received their pre-licensure nursing education in California. The age distribution that resulted from this calculation was consistent with the age distribution available in the BRN Annual Schools Report. We assume new graduates from nursing programs in other states have the same age distribution. Table 1 shows the age breakdown of new graduates from U.S. nursing programs who obtained their first RN license in California.

**Table 1. Estimated Number and Age Distribution of New Graduates from U.S. Nursing Programs Who Obtain First RN License in California**

Age Category	Percent	Best Estimate - Number	High Estimate - Number
<30	42.55%	2933.82	3292.09
30-34	17.02%	1173.53	1316.84
35-39	17.02%	1173.53	1316.84
40-44	10.64%	733.63	823.22
45-49	8.51%	586.76	658.42
50-54	4.26%	293.73	329.60
55-59	0.00%	0.00	0
60-64	0.00%	0.00	0
65+	0.00%	0.00	0
<i>Total</i>	<i>100.00%</i>	<i>6,895</i>	<i>7,737</i>

*Graduates of international nursing programs who immigrate to California and obtain their RN license*

According to the BRN, 3,684 non-U.S.-educated candidates passed the NCLEX-RN exam in California and received a California nursing license during the 2003-2004 fiscal year. This figure may be used as an estimate of the number of graduates of international nursing programs who immigrate to California and obtain their RN license each year. However, California is a gateway state for non-U.S.-educated nurses seeking to practice in the U.S. This means that some of these nurses apply for endorsement to another state soon after obtaining their California license. These nurses are captured in our outflow estimates (specifically, migration out of California), and thus it is not necessary to account for them at this point in our model. However, we account for recent changes (as of January 1, 2005) in immigration rules that make it more difficult for internationally-educated nurses to immigrate. These rules include expiration of the visa category under which most nurses immigrated, as well as increasing scrutiny of applications for visas from the Philippines. At this time, it seems likely that more visa applications from the Philippines will be accepted in the second half of 2005, but it seems

unlikely that the backlog of applicants will be fully remedied. Thus, we believe 3,684 is not a realistic estimate for the future; we rounded this number down to an estimate of 3,400 to account for the tighter immigration rules.

To assess the age distribution of this inflow category, we relied on data from the BRN 2004 Survey of RNs. We restricted our sample to respondents who were active RNs, who reported that their home zip code was in California (question 65), who graduated from a nursing program outside of the U.S. (question 50), and who were first licensed as an RN in California between the years 2001 and 2003 (question 57). From this sample of 115 international graduates, we calculated the percent that fell into each of the nine age categories. Table 2 summarizes our estimates for this inflow category. Note that we did not have adequate information to produce a high and low estimate of this parameter.

**Table 2. Estimated Number and Age Distribution of International Graduates**

Age Category	Percent	Number
<30	13.91%	472.9
30-34	33.04%	1123.4
35-39	16.52%	561.7
40-44	7.83%	266.2
45-49	13.04%	443.4
50-54	8.70%	295.8
55-59	3.48%	118.3
60-64	2.61%	88.7
65+	0.87%	29.6
<i>Total</i>	<i>100.00%</i>	<i>3,400</i>

*Interstate migration of RNs to California*

We were able to create high and low estimates of interstate migration of RNs to California using data from the BRN and National Sample Survey of RNs. Our low estimate of

annual RN migration to California is based on endorsement<sup>4</sup> data from the BRN. Specifically, the BRN provided fiscal year 2003-2004 data on all active RN licenses obtained by endorsement and the age distribution of these RNs. Only those who had a California address in 2003-2004 were counted towards this estimate. We think this estimate is lower than the true number, because some RNs are likely to apply for endorsement before moving to California.

We do not include nurses with out-of-state addresses because we do not want to include traveling nurses, who work in California on temporary contracts, with the permanent resident supply of RNs. In April 2005, 43,568 RNs had active California licenses but lived in other states or countries. The 2004 BRN Survey of Registered Nurses found that 24.9 of RNs who live out of California reported working in California in the previous year.<sup>5</sup> If this rate is representative of all out-of-state RNs, we estimate that 10,848 RNs traveled to California for temporary work in 2004. The 2004 BRN Survey indicates that these RNs worked an average of 4.7 months and 41.5 hours per week. Thus, these traveling RNs filled 4,408 full-time equivalent jobs in 2004. We do not include these traveler FTEs in our model explicitly, but recognize that yearly shortages in the supply of RNs are at least partially filled by traveling nurses.

Our high estimate of interstate migration is based on data from the 2000 National Sample Survey of RNs. The National Sample Survey asked respondents about their current and former state of residence. Specifically, it asked the following three questions: (1) where were you living on March 22, 2000 (question 30); (2) did you reside in the same city on March 22, 2000, and on

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<sup>4</sup> A person who holds a current and active RN license in another state, has completed an educational program meeting all California requirements, and has passed the National Council Licensure Examination (NCLEX-RN) or the State Board Test Pool Examination (SBTPE) may apply for a California RN license. This is referred to as licensure by endorsement.

<sup>5</sup> This calculation is based on the share of nurses who reported they lived outside California in question 34 and answered any part of question 35, which asks about employment status of out-of-state nurses. The total number of respondents that meet these criteria is 425. 106 of these reported that they “Worked as an RN in California for a temporary or traveling agency or registry” (question 35a).

March 22, 1999 (question 31a); and (3) if the answer to 31a is “no,” where were you living on March 22, 1999 (question 31b). Using the variables corresponding to these questions in the 2000 National Sample Survey of RNs and applying sample weights, we were able to estimate the number and age distribution of RNs who did not reside in California in 1999, but did in 2000. This number is likely larger than the true number that will migrate in the future, because 1999-2000 was the peak of the last economic cycle, during which many people moved to California. Thus, these figures represent our high estimate of interstate migration of RNs to California.

Table 3 presents our estimates of the number and age distribution of RNs migrating to California from other states. Our best estimate is the midpoint (average) of the low and high estimates we obtained as just described.

**Table 3. Estimated Number and Age Distribution of RNs Migrating to California from Other States**

Age Category	Best Estimate		Low Estimate		High Estimate	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
<30	<b>1276.46</b>	<b>24.43%</b>	827	26.01%	1,661.5	22.85%
30-34	<b>1098.24</b>	<b>21.02%</b>	791	24.88%	1,247.2	17.16%
35-39	<b>846.38</b>	<b>16.20%</b>	474	14.91%	1,271.8	17.49%
40-44	<b>707.12</b>	<b>13.53%</b>	343	10.79%	1,183.5	16.28%
45-49	<b>523.85</b>	<b>10.03%</b>	284	8.93%	808.68	11.12%
50-54	<b>339.96</b>	<b>6.51%</b>	250	7.86%	374.17	5.15%
55-59	<b>176.95</b>	<b>3.39%</b>	140	4.40%	172.51	2.37%
60-64	<b>159.38</b>	<b>3.05%</b>	49	1.54%	331.28	4.56%
65+	<b>96.15</b>	<b>1.84%</b>	21	0.66%	219.52	3.02%
<i>Total</i>	<b>5224.50</b>	<b>100%</b>	3,179	100%	7,270.16	100%

*Movements from inactive to active 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 in the 2003-2004 fiscal year. This data is presented in Table 4 and is our only estimate for this inflow category.

**Table 4. Estimated Number and Age Distribution of RNs Changing Status from Inactive to Active**

Age Category	Percent	Number
<30	0.0%	0
30-34	0.0%	0
35-39	1.7%	5
40-44	3.0%	9
45-49	2.6%	8
50-54	5.0%	15
55-59	5.6%	17
60-64	9.2%	28
65+	72.9%	221
<i>Total</i>	<i>100.0%</i>	<i>303</i>

*Total Estimated Inflow*

The total number of RN inflows by age category is the sum of the estimated numbers of new graduates from U.S. nursing programs who obtain their first RN license in California, international graduates who obtain a California license, RNs who migrate to California from other states, and inactive RNs who change to active license status. We assume this number is constant from year to year in our supply forecasts.

**Outflows**

*Movements from active to inactive status*

We obtained a high and low estimate of the number of RNs moving from active to inactive license status each year. Our low estimate is based on data from the BRN. Specifically,

the BRN provided data, by age category, on the number of RNs with California addresses changing status in fiscal year 2003-2004. This data divided by the number of current active RNs is our low estimate.

We used the 1996 and 2000 National Sample Survey of RNs to obtain an alternative estimate of movements from active to inactive status. First, we calculated the number of RNs who were U.S. residents in 1996, by age category. We added to this figure the number of RNs (U.S. residents only), by age category, who responded in the 2000 survey that they received their first U.S. license between 1996 and 2000. Then we calculated the number of RNs who were U.S. residents in 2000, by age category.<sup>6</sup> The formula for estimating the number going “inactive” is: Number of RNs in 2000 – Number of RNs in 1996 – Number newly licensed between 1996 and 2000. (Note: recall, only U.S. residents are included in these calculations.)

To translate these estimates into rates of going inactive by age category, we assumed that the same number of RNs went inactive in each age category between 1996 and 2000. Thus, we ended up with four rates, one for each year between 1996 and 2000, for each age category. We took the average of these and the resulting percentages are estimated annual rates of going inactive for each age category. Rates that were negative or less than one percent we considered to be effectively zero. These rates are higher than those calculated from the BRN data, and thus comprise our high estimate.

Table 5 presents our low and high estimated rates of movement from active to inactive status, by age category. In this case, our best estimate is equal to the low rate when the high rate is 0%; otherwise, our best estimate is the average of the low and high rate estimates.

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<sup>6</sup> The survey item we used was q32\_yr, and we focused on cases where q32\_yr = 1996-2000. We “aged” the RNs from the 1996 National Sample Survey of RNs by 4 years, so the age categories for which we obtain estimates using the 2000 National Sample Survey are 4 years older.

**Table 5. Estimated Annual Rate of RNs Moving from Active to Inactive Status, by Age Category**

Age Category	Best Estimate	Low Rate Estimate (Source: BRN)	High Rate Estimate (Source: National Sample Survey)
<30	0.1%	0.1%	0%
30-34	0.4%	0.4%	0%
35-39	0.5%	0.5%	0%
40-44	0.6%	0.6%	0%
45-49	0.5%	0.5%	0%
50-54	1.0%	0.7%	1.4%
55-59	1.7%	0.9%	2.5%
60-64	3.5%	1.8%	5.1%
65+	9.0%	4.8%	13.2%

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

We generated low and high estimates of migration out of California. Our low estimate is based on analysis of the 2000 National Sample Survey data. We used the same variables to calculate migration of RNs out of California as were used to calculate migration to California. All estimates from the 2000 National Sample Survey of RNs were weighted using sample weights provided in the National Sample Survey. First, we obtained estimates of the number and age distribution of RNs who moved out of California between March 22, 1999 and March 22, 2000. Then, we estimated the number and age distribution of RNs who resided in California on March 22, 1999. Finally, for each age category, we divided the estimated number of RNs who moved out of California between 1999 and 2000 by the estimated number of RNs residing in California on March 22, 1999 to obtain rates of RN migration out of California. These rates comprise our low estimate of RN migration out of California.

The BRN provided information on applications for outgoing endorsements, and the 2003-2004 figure was approximately twice as large as the estimate produced by applying the rates obtained from analysis of the National Sample Survey data (our low estimate). Hence, we

decided that our high estimate of RN migration rates out of California would be double the low estimated rates. Table 6 summarizes these rates, and presents our best estimate, which is the average of the low and high rates.

**Table 6. Estimated Rates of RN Migration Out of California, by Age Category**

Age Category	Best Estimate	Low Rate Estimate	High Rate Estimate
<30	6.1%	4.06%	8.12%
30-34	4.6%	3.07%	6.13%
35-39	2.3%	1.54%	3.08%
40-44	2.5%	1.65%	3.29%
45-49	2.6%	1.71%	3.41%
50-54	2.2%	1.49%	2.99%
55-59	2.5%	1.69%	3.39%
60-64	3.3%	2.22%	4.44%
65+	2.7%	1.80%	3.61%

*Total Estimated Outflow*

We combined our estimated rates of movements to inactive status and migration out of California to obtain a total rate of outflow for each age category. Multiplying this by the current active RN population in California results in our estimated RN outflow figures for each age category.

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

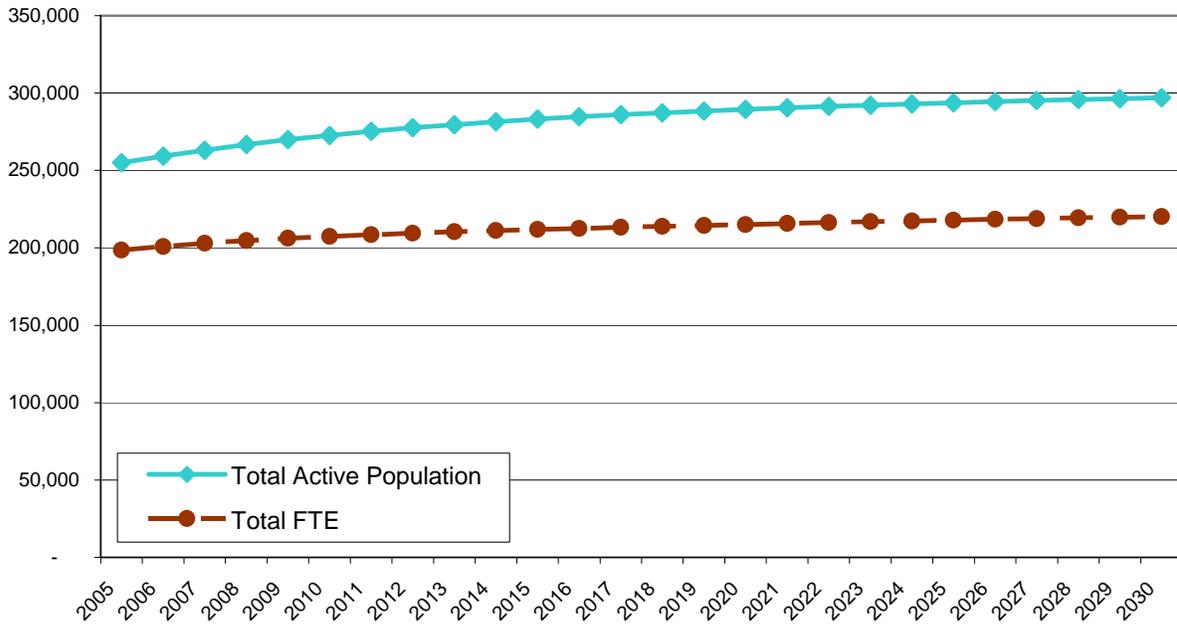
To create a forecast of the total number of RNs with active licenses in California, we began by assuming that one-fifth of RNs in each age category moves into the next age category every year after 2005. In this manner, we “aged” the workforce. For each age category, the basic formula is: Current supply of RNs as of April 2005 + Estimated total inflows – Estimated total outflows. For the population under 30, we assumed 80% remain in this age category in the following year. For subsequent age categories except those over 64, we assumed that 80% of the previous year remains and 20% of the younger cohort from the previous year enters. For the

over-64 cohort, 100% of the previous year remains and 20% of those 60-64 in the previous year enter.

Using this formula, we produce a forecast of the total active RN population residing in California through 2030. We estimate that California will have 297,024 resident active RNs by 2030. These forecast figures, however, do not account for the variation in hours worked by RNs and the fact that some RNs with active licenses do not work in nursing, and, hence, overestimate the supply of working RNs in California. Therefore, for each age category, we estimated the proportion of RNs living in California with active licenses that are employed in nursing using data from the 2004 BRN Survey of RNs (question 3). The estimates range from 96% of RNs under age 30 to 55% of RNs over the age of 64. Furthermore, to account for variation in hours worked by RNs, we used data from the 2004 BRN Survey of RNs to estimate, for each age category, the average usual hours worked per week (question 5) by active RNs who reside in California and are employed in nursing. We divided these estimated hours per week by 40 to obtain the average full-time equivalent (FTE) for each age category.

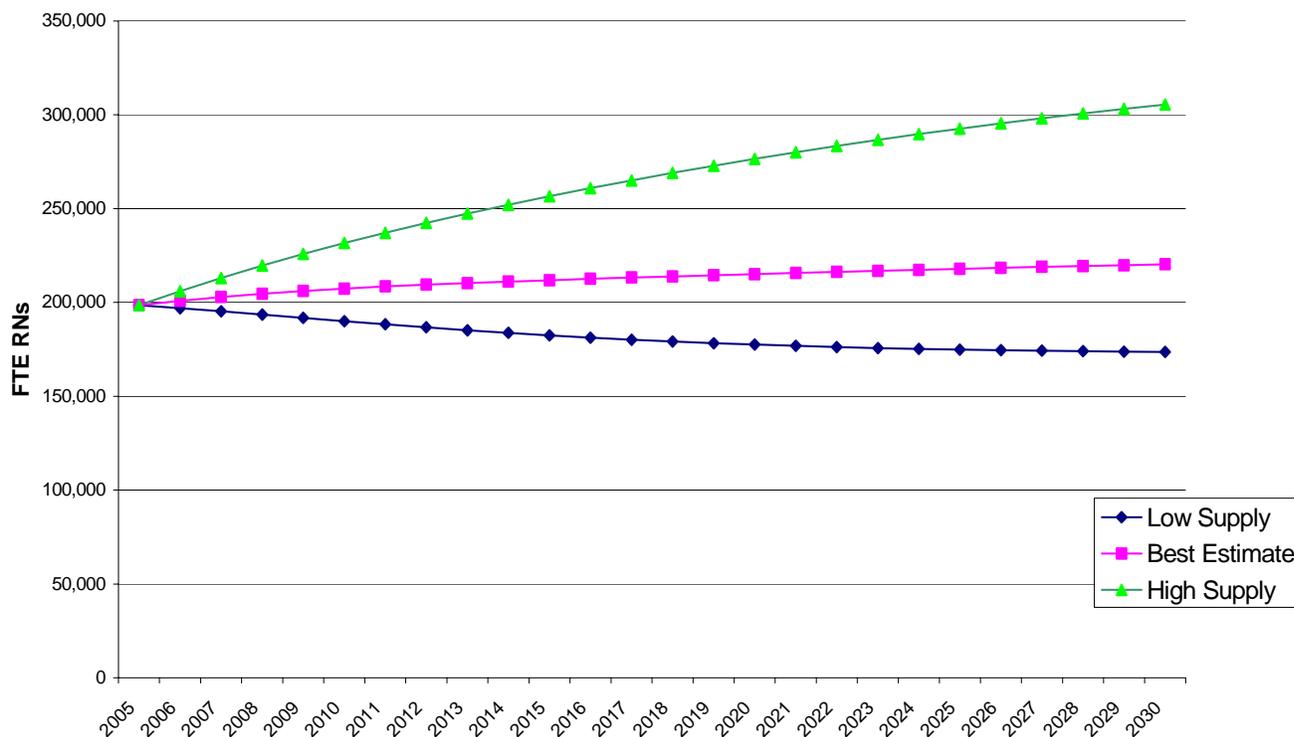
Combining rates of employment and average FTE for each age category and applying these to the active population forecasts, we produced a forecast of full-time equivalent RNs: 220,279 by 2030. Figure 2 summarizes our supply forecasts of California's RN workforce.

**Figure 2. Supply Forecasts of California's Registered Nurse Workforce, 2005-2030**



As noted above, we identified 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 number of new nursing graduates. Figure 3 presents the range of supply estimates that results when we calculate the highest and lowest possible supply forecasts. 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 under various scenarios.

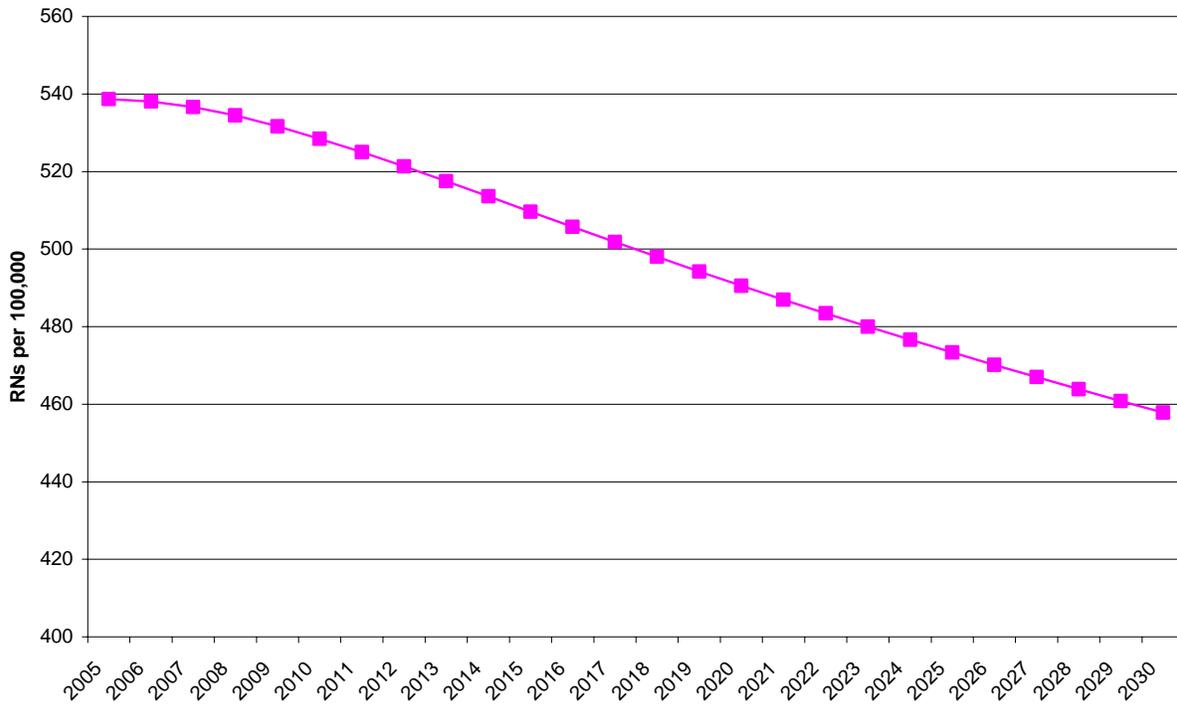
**Figure 3: Low, High, and Best Estimates of FTE RN Supply, 2005-2030**



We use our supply forecasts and California Department of Finance projections of total population in the state to calculate the number of FTE RNs per 100,000 people in the population for the years 2005 through 2030 (see Figure 4). Our calculation method is comparable to that used by the federal government (which is based on data from the National Sample Survey of RNs). We calculate that there are 539 FTE RNs per 100,000 people in California in 2005. This figure is higher than that estimated from the 2000 National Sample Survey.<sup>7</sup> Our forecasts indicate that the number of FTE RNs per 100,000 population declines steadily through 2030, as the growth rate of California’s population outpaces the growth rate of FTE RNs.

<sup>7</sup> The 2000 National Sample Survey of RNs estimated that California had 544 employed RNs per 100,000 population (Spratley et al., 2001), and 454 FTE RNs per 100,000.

**Figure 4: Forecasted RN FTE per 100,000 population**



## Forecasted Shortage

We compared our forecast of the supply of RNs in California to forecasts of the demand for RNs. We obtained forecasts of the demand for RNs in California from the Bureau of Health Professions<sup>8</sup> and used data from the U.S. Department of Labor, Bureau of Labor Statistics<sup>9</sup>; California Office of Statewide Health Planning and Development (OSHPD); and California Department of Finance (DOF) to create alternative forecasts of RN demand. All demand

<sup>8</sup> The Bureau of Health Professions published a report in July 2002 titled “Projected Supply, Demand, and Shortages of Registered Nurses: 2000-2020.” We used the demand forecasts from this report, which is available at the following web address: <http://bhpr.hrsa.gov/healthworkforce/reports/rnproject/default.htm>.

<sup>9</sup> The BLS data we used came from the 2002 Occupational Employment Statistics, and the February 2004 *Monthly Labor Review* (Hecker, 2004).

forecasts are in terms of full-time equivalent RNs. Thus, we compared these to our FTE forecast of supply.

The demand forecasts from BHPPr are in five-year increments from 2005 to 2020. The BHPPr forecasts were published in 2002, and were based on data collected in 1996 and 2000. The demand forecasts provided by BHPPr indicate there is a surplus of 12,596 RNs in 2005, which is not plausible given reported vacancy rates and continuing wage inflation. However, the BHPPr demand forecasts indicate a shortage will emerge by 2010. Subtracting the BHPPr demand forecasts from our best forecast of FTE RN supply we find that there will be a shortage of 3,347 RNs by 2010, increasing to 55,792 RNs by 2020.

The Department of Labor projects that by 2012, there will be 2,908,000 registered nurse jobs in the U.S. Using data from the Bureau of Labor Statistics 2002 Occupational Employment Statistics, we estimated that California's share of total U.S. employment of RNs is 9.2%. Assuming California's share remains the same in 2012, California is projected to have 267,665 RN jobs by 2012. We converted this figure to FTEs<sup>10</sup> and added 7,230 additional FTEs to account for the increased demand resulting from the minimum nurse-to-patient ratios.<sup>11</sup> From these calculations we obtained another forecast of demand for RNs in California – 230,598 FTE RNs by 2012. As our supply forecast indicates, California will have 209,476 FTE RNs in 2012. This translates to an anticipated shortage of 21,122 FTE RNs by 2012.

As an alternative to these demand projections we produced two sets of RN demand forecasts using data from OSHPD, California Department of Finance (DOF), and a survey of Chief Nursing Officers (CNO survey) co-sponsored by California's Nurse Workforce Initiative,

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<sup>10</sup> Our conversion factor is projected national demand in 2012 from BHPPr divided by projected number of RN jobs in 2012 from DOL ( $2,426,741/2,908,000=0.8345$ ).

<sup>11</sup> According to California Department of Health Services estimates, the ratios will initially increase demand by 4,880 FTE RNs, and then by 7,230 FTE RNs in 2005 when stricter ratios went into effect.

the Hospital Association of Southern California, and the California Institute for Nursing and Health Care. As a first step, we extracted length of stay information from acute care hospitals in OSHPD's 2003 Inpatient Hospital Discharge Data and calculated patient days for each of the five age categories in the data (i.e., under 1 year, 1-17 years, 18-34 years, 35-64 years, and 65 years and over). Then, we obtained California age-specific population forecasts from the DOF and organized the numbers to match OSHPD's age categories. Dividing 2003 patient days by 2003 population forecasts, we obtained patient days per population figures for each age category. We applied these ratios to the DOF population projections to get patient day forecasts by age category.

In our next step to producing RN demand forecasts for California, we calculated RN hours<sup>12</sup> per patient day (RN HPPD) in acute care hospitals<sup>13</sup> from OSHPD's Annual Hospital Disclosure Report in the corresponding year.<sup>14</sup> We found that the median RN HPPD was 9.25. We also had at our disposal a Los Angeles Times article<sup>15</sup> reporting on hospitals that had been inspected by the California Department of Health Services and which of these hospitals had met the minimum nurse-to-patient ratios upon inspection. Using the OSHPD data, we found that the median RN HPPD for the hospitals noted in the article as meeting the minimum nurse-to-patient ratios was 11.53. This number was close to the 75<sup>th</sup> percentile of all acute care hospitals: 11.79. Based on this information, we employed the assumption that hospitals will have to staff at this level to be in compliance with the minimum nurse-to-patient ratio law.

Applying the RN HPPD figure of 11.79 to our patient day forecasts, we projected RN hours in acute care hospitals through 2030. Since our supply forecasts are in terms of FTEs, we

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<sup>12</sup> RN hours are registered nurse productive hours plus registry nursing personnel productive hours.

<sup>13</sup> The following types of hospitals were considered acute care in this analysis: short-term general, short-term child, and short-term specialty.

<sup>14</sup> This data is for hospital reports ending between June 30, 2002, and June 29, 2003.

<sup>15</sup> Chong, J. (February, 6, 2005). "Some Hospitals Met Nurse Ratios." *Los Angeles Times*.

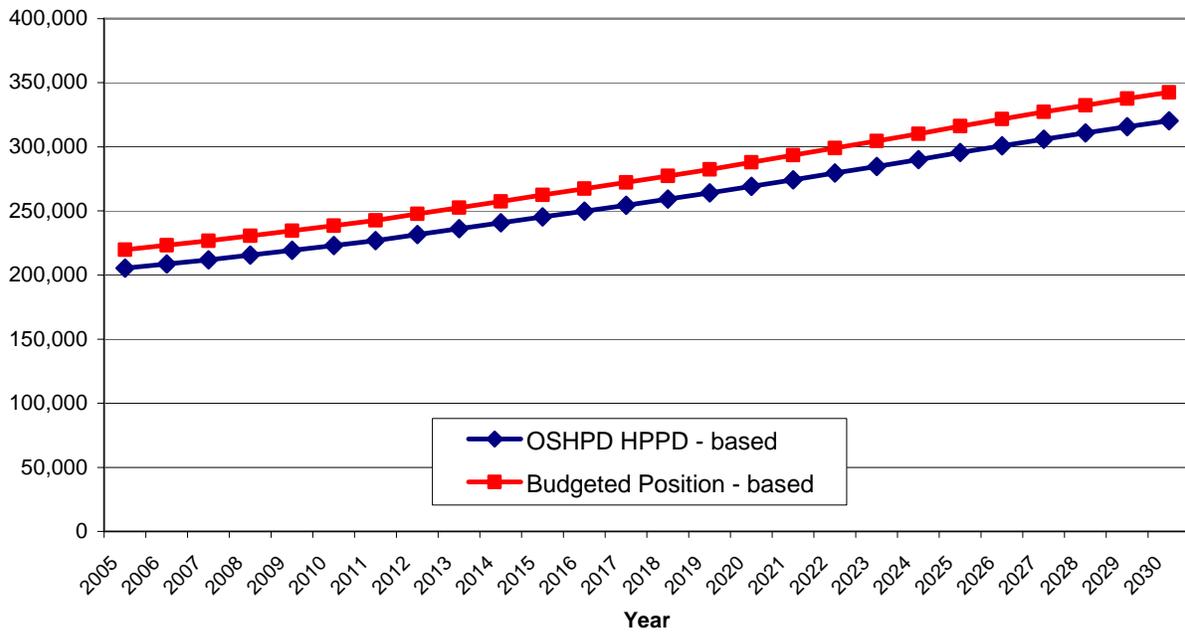
divided RN Hours by 1768 (average annual productive hours) to get forecasts of the number of FTE RNs demanded by acute care hospitals. While this only gives us demand forecasts for one type of employer, we were able to make demand forecasts for all employers of RNs in California using information from the 2004 BRN Survey of RNs and the BHPPr's National Center for Health Workforce Analysis (July 2002) that estimates that approximately 60% of RNs work in acute care hospitals. By assuming this percent will remain constant in the future, we were able to augment<sup>16</sup> our forecasts figures to get total FTE RN demand projections for California. We call these demand forecasts "OSHPD hours per patient day-based (HPPD) forecasts."

Our second set of demand forecasts used information from the CNO survey in combination with components of our first set of forecasts. Estimates from the CNO survey data indicated that average per hospital budgeted RN FTE was 332.90 in 2004. The number of acute care hospitals in the OSHPD data we used was 390. Multiplying these two figures gave us an estimate of the total number of RN FTEs budgeted by acute care hospitals in California in 2004. We divided this figure by the 2004 patient day forecast to get an estimate of the number of RN FTEs budgeted per patient day in the state's acute care hospitals. Next, we summed our acute care patient day forecasts across all age categories to get a total for each year, and multiplied these by the estimated number of RN FTEs budgeted per patient day to obtain demand projections of RN FTEs in acute care hospitals through 2030. Again, we augmented these projections to get demand forecasts for all RN employers in the state. We call these forecasts "budgeted position-based forecasts." Our two sets of demand forecasts are presented in Figure 5.

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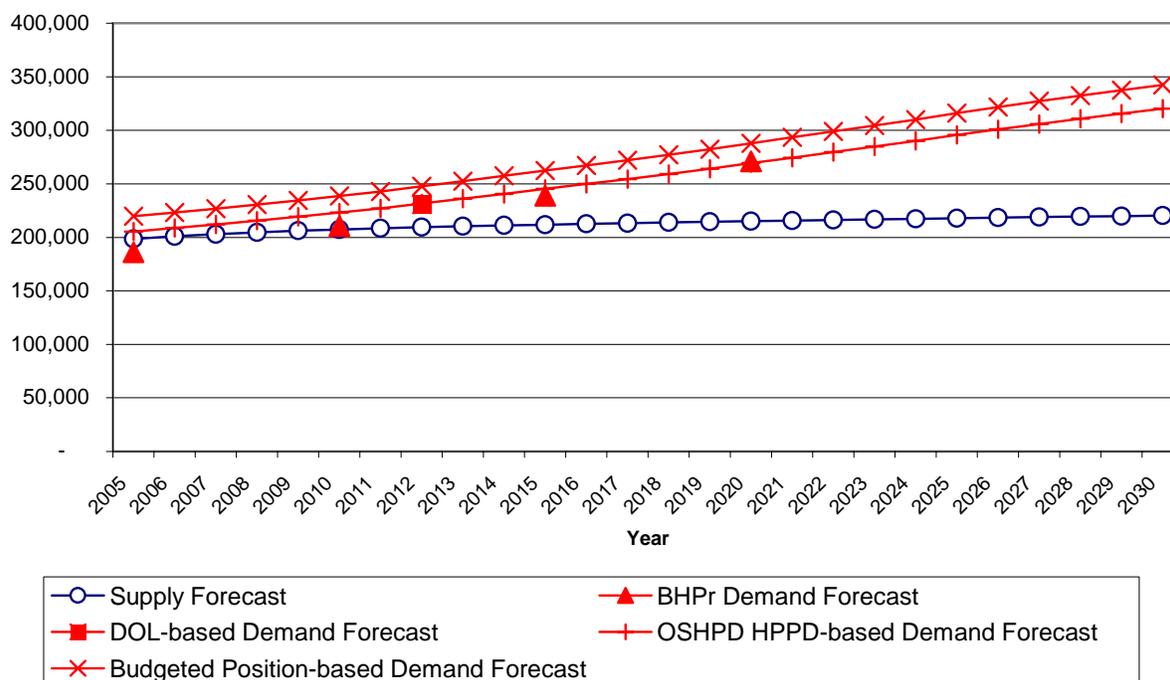
<sup>16</sup> Specifically, we divided the demand forecasts for acute care hospitals by 0.60 to obtain total RN demand across all employers.

**Figure 5. Demand Forecasts of Full-time Equivalent Registered Nurses in California, 2005-2030**



In Figure 6 we compare all aforementioned demand forecasts of full-time equivalent RNs to our supply forecast of FTE RNs. All but the BHP<sub>r</sub> demand forecasts are higher than supply (meaning a shortage) as of 2005. We estimate that the current shortage ranges between 6,872 and 21,161 FTE RNs. This predicted shortage worsens each year through 2030, and ranges between 99,945 and 122,223 full-time equivalent RNs in 2030 depending on which demand forecast is used. Furthermore, we used our high estimates of supply parameters to produce a high supply forecast, and compared this to our demand forecasts. Even the high supply forecast predicts a worsening shortage.

**Figure 6. Projected Shortage of Registered Nurses (FTEs) in California, 2005-2030**



### Directions for Future Analysis

The forecasts presented here use a more detailed methodology than those of Coffman, Spetz, Seago, Rosenoff, and O’Neil (2001), published in *Nursing in California: A Workforce Crisis*. However, the magnitude of the projected shortage is very similar in these two forecasts. Coffman et al. (2001) estimated that the gap between RN supply and demand would be approximately 73,000 by 2020. Since then, forecasted demand has risen due to the implementation of minimum nurse-to-patient ratios, and graduations from California nursing programs have increased approximately 500 per year (2,500 total over five years). Thus, the new forecast is similar to the previous forecast. However, California now has five fewer years to fill the gap.

Future work will examine the BRN 2004 Survey of Inactive RNs, to factor in the likelihood of those nurses returning to active nursing status. The intentions of currently active RNs to maintain their licenses and continue working also will be calculated and incorporated into the model.

An Excel workbook has been created so policymakers and other interested parties can modify the key parameters in the model to test the sensitivity of the forecasts to various assumptions. This workbook can be downloaded from the Board of Registered Nursing website. Even if employment rates of nurses with active licenses increase to 90% for all age groups under 65, there is a forecasted shortage of RNs. 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.

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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

CA – California

CNO – Chief Nursing Officers

DOF – California Department of Finance

DOL – U.S. Department of Labor

FTE – Full-time Equivalent

HPPD – Hours Per Patient Day

HRSA – Health Resources and Services Administrations

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

RN HPPD – Registered Nurse Hours Per Patient Day

SBTPE – State Board Test Pool Examination

UCSF – University of California San Francisco