# Washington State Licensed Practical Nurse Supply and Demand Projections: 2007-2026 

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## CONTENTS

Executive Summary ..... 3
Introduction and Overview of the Projections Model ..... 5
The Supply of LPNs in Washington ..... 5Projections of LPN Supply and Demand:2007 to 202612
Benchmarks: LPN Supply Comparisons to Population 2007 to 2026 ..... 16
Discussion ..... 17
References ..... 18

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## EXECUTIVE SUMMARY

This report describes trends in licensed practical nurse (LPN) supply and demand for Washington State from 2007 through 2026. Factors affecting supply include students completing Washington LPN education programs, in-migration from other states, re-activation of licensure after license expiration, deaths, license expirations due to individuals leaving nursing careers or pursuing other health care occupations, agerelated retirements, out-migration to other states, and LPNs not employed in nursing. LPN demand factors include numbers of employed LPNs and vacant LPN positions. Based on these factors, we estimated baseline supply and demand in 2007 as well as rates of change over time, and projected supply and demand to 2026 for licensed and practicing LPNs.

LPN education capacity is the factor under policy control that appears to have the largest impact on state LPN supply. Four policy scenarios for the projections were (1) maintaining annual education capacity at the current levels, (2) increasing annual capacity by 100 LPN education completions as of 2011, (3) increasing annual education capacity by 200 LPN completions as of 2011, and
(4) decreasing annual education capacity by 100 completions as of 2011.

- If the 2007 rate of completions from LPN schools in Washington is sustained, the projected supply of practicing LPNs in 2026 will be more than 3,500 LPNs ( $24 \%$ ) below estimated demand.
- If the LPN education completion rate increases by 100 LPNs in 2011 and this increase is sustained through 2026, the projected supply of practicing LPNs will increase over the next two decades but still be 3,000 LPNs (19\%) below estimated demand in 2026.

- If the LPN education completion rates increase by 200 LPNs in 2011 and this increase is sustained through 2026, the projected supply of practicing LPNs will increase over the next two decades but still be 2,300 LPNs (14\%) short of demand in 2026.
- If the LPN education completion rate declines by 100 LPNs in 2011 and this decrease is sustained, the number of LPNs is projected to be nearly 4,500 LPNs (29\%) less than estimated demand in 2026.
education for nurses at all levels and the impact of this on LPN education is unclear.

The registered nurse and LPN workforces are closely related, and growing RN demand may exacerbate the LPN shortage if hiring practices shift to replace RNs with LPNs. LPN education is a critical entry point into the nursing profession, and articulation paths between LPN education and other nursing education programs should be simple, clear and explicit. While encouraging

As Washington's population grows, the number of LPNs needed to maintain the same LPN-to-population ratio increases. None of the alternative LPN projection scenarios in this report, even those that increase education output, produce adequate numbers of LPNs to reach in 2026 the same LPN-topopulation ratio the state had in 2008.

Other states have determined that the gap between
current LPN supply and demand will grow over the next 20 years. Rural locations, including those in Washington, are likely to see greater shortages because their populations are older, on average, than urban areas. This growing elderly population has greater need for services, including long-term care, and LPNs are the primary nursing providers in elder care settings. Major changes in health care delivery systems or the economic environment could alter the rate of increase in LPN demand. In addition, there is growing support to increase

LPNs to pursue RN careers may shorten their tenure as LPNs, the potential for professional growth may encourage more people to enter nursing career pathways as LPNs.

This report is a planning tool to inform LPN workforce policy by providing information about the factors that affect LPN supply and demand. It is intended to help health care planners and policy makers develop strategies to reduce or avoid LPN shortages over the next decades.

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## INTRODUCTION AND OVERVIEW OF THE PROJECTIONS MODEL

This report describes analyses by the University of Washington Center for Health Workforce studies to project trends in the supply and demand of licensed practical nurses (LPNs) in Washington State from 2007 through 2026. This project was funded by the Washington Center for Nursing, through funding from the state Department of Health (DOH). The goals of this effort were:

- To estimate the extent to which LPN supply meets the demand for LPNs in the state over time,
- To identify the available data for Washington State that can be used for LPN supply and demand estimates at the time the report was prepared,
- To draw attention to the types of data that, if they become available, could be used to improve the accuracy of future projections, and
- To describe, and include in the projections, the policy and environmental factors that influence the rates of change of LPN supply and demand across the 20 years of projections.

The findings described in this report should be used as planning tools. Readers should place less emphasis on specific projected numbers of LPN supply and demand (especially those projected farther into the future) than on the direction of trends and the factors that have been identified as influencing growth or reduction in supply and demand. These projections are built with specific assumptions about "policy levers" (factors affecting LPN supply and demand that can be influenced through changes in policy or practice). We include alternative scenarios using different policy levers that demonstrate the flexibility of our projection model for further exploration of "what if...?" scenarios.

Much of the data that we used to establish the baseline estimates of supply and demand (such as the numbers of licensed LPNs and new completers) is highly accurate. Other baseline data (such as the number of LPNs migrating to other states or continuing their nursing education) come from data sources with small sample sizes, are incomplete, and/or are not sufficiently specific to be able to clearly separate variables of interest. The accuracy of workforce projections is dependent on the accuracy of the input data, and therefore a large amount of the time we spent in developing these projections was devoted to evaluating the quality of data available for baseline supply estimates. To project supply and demand over time, the models require estimates of the rates of change in each of the factors included in the model. Frequently, these rates are based on historical trend data, which may or may not represent future trends. But the power of a workforce projection model, such as we have created, is to clearly identify the factors that affect change in the workforce over time and to describe how they relate to each other. By displaying the components of LPN supply and demand, health planners and policy makers are better able to understand what factors have greatest future impact on the nursing workforce, and can test the impact that different decisions or environmental conditions will have on that workforce.

## THE SUPPLY OF LPNS IN WASHINGTON

We identified seven major factors that increase or decrease each year's supply of LPNs in Washington:

## Entrants to the state LPN supply:

- Completers of Washington LPN education programs.
- In-migration from other states.
- Re-activation of license after lapse in active licensure.

Exits from the state LPN supply:

- Deaths.
- License expirations due to individuals leaving nursing careers, moving to different health care careers, and age-related retirements.
- Out-migration to other states.
- Licensed LPNs not employed in nursing.

Figure 1 shows the relationship of these factors to LPN supply. We examined each factor at length, and assessed different data sources that potentially could be used for the estimates. Following are descriptions of each component of Washington's LPN supply.

## BASELINE SUPPLY OF ACTIVELY LICENSED LPNS IN WASHINGTON

Our projection of LPN supply builds upon the 2007 database of actively licensed LPNs from the Washington DOH Health Professions Quality Assurance Division. Among the license status categories for Washington LPNs, "active" represents an LPN whose license is up-to-date and who is available to work in the state. In October 2007, there were 14,776 actively licensed LPNs in Washington. Of these, 13,488 (92.0\%) had addresses in Washington State.

Because the goal of our projections was to estimate the supply and demand of LPNs in Washington State, we excluded all active licensed LPNs who had addresses outside of the state, thereby reducing the baseline supply for our model to 13,488 licensed LPNs. While this decision likely means we are undercounting LPNs who live a short distance across the Washington State border and commute into Washington for work, we are also over-counting the state workforce by including those who live in Washington but work in an adjoining state. This commuting is likely to occur in border urban areas such as the Spokane, Washington/Coeur d'Alene, Idaho corridor, as well as in the Portland, Oregon/ Vancouver, Washington corridor. For purposes of these analyses we are presuming the inflow and outflow occur at equal rates.
In addition to the licensee's address, Washington's LPN licensing data also include birthdate and gender. Birthdate, from which age can be calculated, is an important variable for workforce models because LPNs enter and exit our supply projection model according to age. Entrants to and exits from the model are estimated proportional to the ages indicated by the supporting data we use to inform the model. This allows an LPN

Figure 1. Conceptual Model of Factors Affecting State LPN Supply in One Year

who enters the workforce at age 25 , for example, to remain in our model state workforce longer than an LPN who enters the state workforce at age 45. Data on LPN gender allow the calculation of age-specific death rates (exits from the workforce) for men and women, and for tracking the progress of continuing efforts to bring more men into nursing, which has long been a female-dominated profession.

The available LPN licensing data thus provides basic demographic characteristics (with the exception of race and ethnicity) of the LPN workforce in Washington at the baseline of our projections and, to the extent multiple years of licensing data are available and can be analyzed, provides some information on how to calculate rates of change in the workforce. We included in the analysis LPNs who were ages 18 through 75. A small number of age outliers in the data more likely represented data entry errors than active LPNs. The overall number of LPNs in Washington in 2007, their average age, and percent male are shown in Table 1. Table 2 shows the distribution of LPNs in 2007 by age group.

Figure 2 shows how LPNs are distributed throughout the state in Workforce Development Areas (WDAs), as represented by the number of licensed LPNs per 100,000 population. WDAs are groups of counties that plan and carry out workforce development activities for which they receive state and federal funding.

## ENTRANTS TO THE STATE LPN SUPPLY

 Completers of Washington LPN Education Programs: Using data from the Integrated Postsecondary Education Data System (IPEDS), ${ }^{3}$ we added the estimated number of students completing LPN education programs in the state in 2006-2007. This added 1,054 LPNs to 2007, the base year of our LPN supply projections. IPEDS provided data on all community college-based LPN programs in the state. Table 3 shows the numbers of LPN program completions in Washington from 2003-2004 to 2007-2008.Rate of Change Over Time: In the 2004-2005 academic year there was a $13 \%$ increase in the number of LPN education program completers compared with 20032004. In each of the subsequent three years to 2006-2007, the number of program completers resembled the 2003-2004 level (see Table 3). Because the annual number of LPN education completers was relatively constant for the three years from 2004-2005 to 2006-2007, we used the average number of new completers over those three years $(1,047)$ in the model. Therefore, our basic projection (Scenario 1) of LPN supply adds 1,047 new LPN program completers each year, while alternative supply projections explore the impact of increasing and decreasing LPN education capacity over time.

To determine the age distribution of new completers, we obtained the age of completers in the 2007-2008 academic year from the Washington State Board for Community and Technical Colleges (SBCTC) (see Figure 3). We then applied the same distribution of ages to the new completers in subsequent years, which presumes that students in the future will be the same ages as students at baseline.

Figure 2. Washington LPNs with Active Licenses per 100,000 Population in 2007 by Workforce Development Area (WDA)*


* Location determined by license mailing address.

Data source: WWAMI Center for Health Workforce Studies, University of Washington, 2007.1
Counties comprising WDAs: 1 = Clallam, Jefferson, Kitsap; 2 = Grays Harbor, Mason, Thurston, Pacific, Lewis; 3 = Whatcom, Skagit, Island, San Juan; 4 = Snohomish; $5=$ King; $6=$ Pierce; $7=$ Wahkiakum, Cowlitz, Clark; $8=$ Okanogan, Chelan, Douglas, Grant, Adams; $9=$ Skamania, Klickitat, Yakima, Kittitas; 10 = Ferry, Stevens, Pend Oreille, Lincoln, Whitman, Walla Walla, Columbia, Garfield, Asotin; 11 = Benton, Franklin; $12=$ Spokane .

## Out-migration of New LPN Program Completers:

The model assumes that new completers from Washington LPN educational institutions receive a license in Washington and remain in Washington for the coming year, that is, no out-migration occurs for at least one year after obtaining a license.

## National Council of State Boards of Nursing

 (NCLEX) Exam Pass Rates: An LPN must pass the NCLEX-Practical Nurse exam (the entry-level nursing board examination) before she or he may become licensed. Statistics from the Washington State Department of Health ${ }^{4}$ indicated that $96 \%$ of Washington-educated LPNs pass the NCLEX in 2008. Therefore we advanced $96 \%$ of the number of stateLPN completers each year of the supply model to reflect NCLEX exam pass rates.

In-migration from Other States: We used data from the DOH to estimate the number of licensed LPNs who move into Washington from another state each year. The DOH has the authority to grant a Washington LPN license to a person who holds an LPN license in another state, a process called an endorsement. In 2008 there were 380 LPN licenses granted by endorsement. We did not have the age distribution of the LPNs receiving endorsement licenses. For purposes of allocating these LPNs to our model, we relied on an approximation by using the age distribution of the

Table 3. LPN Program Completions from Washington Educational Institutions, 2003-2004 to 2007-2008

| Institution | 2003-2004 | 2004-2005 | 2005-2006 | 2006-2007 | 2007-2008 |
| :--- | :---: | :---: | :---: | :---: | :---: |
| Bates Technical College | 49 | 68 | 78 | 71 | 39 |
| Bellingham Technical College | 79 | 81 | 79 | 64 | 61 |
| Big Bend Community College | 21 | 21 | 12 | 22 | 23 |
| Centralia College | 47 | 67 | 24 | 24 | 29 |
| Clover Park Technical College | 89 | 90 | 75 | 78 | 74 |
| Columbia Basin College | 36 | 50 | 43 | 36 | 36 |
| Everett Community College | 54 | 60 | 25 | 30 | 11 |
| Grays Harbor College | 27 | 35 | 31 | 65 | 21 |
| Green River Community College | 34 | 32 | 27 | 25 | 24 |
| Lake Washington Technical College | 64 | 43 | - | 9 | 14 |
| Lower Columbia College | 62 | 70 | 65 | 70 | 53 |
| Olympic College | 25 | 25 | 30 | 36 | 23 |
| Renton Technical College | 52 | 79 | 50 | 47 | 48 |
| Seattle Community College-North Campus | 43 | 40 | 69 | 65 | 63 |
| Seattle Community College-South Campus | 25 | 29 | 35 | 31 | 72 |
| Skagit Valley College | 56 | 80 | 61 | 66 | 84 |
| South Puget Sound Community College | 31 | 26 | 57 | 45 | 40 |
| Spokane Community College | 87 | 86 | 109 | 52 | 107 |
| Walla Walla Community College | 57 | 60 | 67 | 58 | 55 |
| Wenatchee Valley College | 66 | 101 | 56 | 86 | 53 |
| Yakima Valley Community College | 60 | 60 | 55 | 51 | 59 |
| Heritage University | - | - | 26 | 23 | 23 |
| Total | 1,064 | 1,203 | 1,074 | 1,054 | 1,012 |

Data source: Integrated Postsecondary Education Data System, National Center for Education Statistics. ${ }^{3}$

Figure 3. Age at Completion of LPN Education in Washington State, 2007-2008


Data source: personal communication, Washington State Board for Community and Technical Colleges.

RNs in Washington who obtained an RN license by endorsement (estimated from 2004 National Sample Survey of Registered Nurses data ${ }^{5}$ ). The numbers, by age group, of the 380 in -migrants we estimated for 2008, are shown in Table 4.
with a Washington address two years later. We divided the resulting number of re-activated licenses by two to obtain an annual estimate. This resulted in an estimated 107 license re-activations in 2008.

Rate of Change Over Time: After identifying the ages of LPNs with re-activated licenses, we added LPNs of the same ages as the baseline reactivations to subsequent years of the LPN supply projection in numbers proportional to total LPN supply for the projected year. Because the growth of overall LPN supply was relatively small, there was little variation in the number of re-activations added to the model each year.

## EXITS FROM THE STATE'S LPN SUPPLY

The percentage of licensed LPNs who indicate they practice in Washington decreases with age. ${ }^{2}$ We presume this is because many LPNs, like RNs, retain their licenses long after they leave active nursing. As a result, for the projection model, age-related retirement is difficult to estimate using licensing records alone. Our model attempts to estimate the combined number of LPNs who "retire" from LPN practice (i.e., allow their licenses to expire) because they quit working as an LPN,

Rate of Change Over Time: The number of future in-migrants is difficult to estimate. In the future, LPN shortages in other states may drive salaries sufficiently high that an LPN may be less tempted to move to Washington. Conversely, if those shortages were to occur in Washington, higher salaries and other factors could attract more LPNs into the state. The Washington State Office of Financial Management in its 2008 Long-Term Economic and Labor Force Forecast for Washington reported that net migration into the state declined in the early part of the decade, but rebounded as the economy strengthened in 2006 and $2007 .{ }^{6}$ They predict, however, that downturns in the economy will slow migration and annual migration into the state will decline in the coming 5-10 years. Because we could not predict whether LPN in-migrants will act like the general population, or if economic circumstances will encourage LPN in-migration, our projections use the same estimated number of in-migrants (380) in each year of the projection.

## Re-Activation of Licensure after License Expiration:

To estimate the proportion of LPNs who re-activated their Washington licenses after allowing them to expire, we compared all records with an expired license status in the 2006 state LPN licensing database with the active licenses in a database from the licensing records approximately two years later. We counted as re-activated all LPNs whose licenses had an expired status in 2006 and who had an active license status
including those who obtain RN education and move to that nursing profession, and then separately estimate the number of LPNs whose licenses expire due to death and due to out-migration. In a separate step we adjusted the licensed LPN supply numbers to remove the proportion of LPNs with active licenses who are not employed in nursing in-state, based on the findings reported by Andrilla et al. ${ }^{2}$ The latter adjustment is needed in order to estimate the working LPN supply that can be compared with demand estimates each year, and thereby project future LPN shortages or surpluses.
Deaths: To estimate deaths in the state LPN population over time, we used 2004 national mortality statistics based on U.S. Census and Medicare data. We considered both male and female death rates by age and weighted these rates to account for the female/male LPN ratio (88:12) currently found among Washington State licensees. For the base year of the projection, we applied these death rates by age group to the overall actively licensed supply of nurses in Washington, resulting in an estimated 56 LPN deaths among the licensed population in 2007.

Rate of Change Over Time: We applied the same rates of death by age group for each subsequent projection year. Because of the aging of the LPN population, the percentage of total LPN population estimated lost to deaths each year ranges from $0.42 \%$, or 56 LPNs, in 2007 to $0.53 \%$, or 75 LPNs in 2026.

License Expirations Because of Individuals Leaving LPN Careers, Age-Related Retirement and Outmigration to Other States: After estimating the rate of LPN license expiration by averaging annual rates from 2006 to 2008, and excluding the estimated deaths, we considered the remaining LPNs to be either those who allowed their licenses to expire because they decided to leave LPN careers or those who moved to another state. As shown in Table 5, our calculations estimate that, on average, approximately $10 \%$ of LPNs' licenses expire each year because they leave or pursue more advanced nursing practice, and that rate varies by age group. The large percentage of younger nurses with expired licenses may be due to the fact that many LPNs continue their education to become registered nurses (RNs). As demonstrated in the section below, "LPNs Employed in Nursing", many older LPNs keep their licenses active even after they quit working in the field. We did not have data to separately estimate the number of Washington's LPNs who migrate to another state. We assume that those that leave Washington to work elsewhere will be a subset of the expired licenses identified above.

Rate of Change Over Time: We calculated the proportion of total licensed LPNs that these "retired" LPNs represented by age. For each subsequent year of the projection we reduced supply by the same age-specific proportion.

## LPNS EMPLOYED IN NURSING

It is important to have an estimate of the percentage of actively licensed LPNs who are involved in the LPN workforce in order to be able to compare LPN supply with demand. A portion of actively-licensed LPNs are not in the state LPN workforce either because they (1) are employed, but not in an LPN capacity, (2) do not work in Washington, or (3) are not employed at all. Our model projects changes in the licensed LPN supply over time and estimates the percentage of actively licensed LPNs who are practicing and available to fill LPN jobs over time. In the 2007 survey of Washington State's LPNs, 79\% of LPNs with active licenses reported practicing as an LPN in Washington. ${ }^{2}$ As a result, we reduced the overall LPN licensed supply by the age-adjusted proportion estimated to be employed in nursing in each year of the projections. This percentage varies greatly by age group (see Table 6).

Rate of Change Over Time: Based on findings from the 2007 LPN survey, we applied the percentage of LPNs not practicing as LPNs, by five-year age group, to total licenses in each year of our projections. Because older LPNs are more likely to have licenses but not be employed in nursing, as the LPN population's average age
increases over time the total percentage of LPNs who will be employed in nursing drops slightly in later years of our projections. For example, in the basic LPN projection scenario (where LPN education completion rates are kept at 2007 levels), $20.3 \%$ of LPNs were employed in nursing in 2007 while by 2026 the percentage not practicing increased to $22.2 \%$.

## FULL-TIME AND PART-TIME EMPLOYMENT

While we recognize that many nurses work part time, we have not incorporated a full-time/parttime component into the model because our supply projections are compared with available demand estimates for LPN positions, not FTEs. The result is a

Table 5. Estimated Number of Individuals Leaving LPN Careers, Migrating Out of State, and Age-Related Retirements in Washington, by Age Group, 2007

| Age Category | Total Estimated <br> Number | Estimated Percent <br> of Age Group |
| :---: | :---: | :---: |
| $<30$ | 229 | $16.6 \%$ |
| $30-34$ | 161 | $10.0 \%$ |
| $35-39$ | 167 | $9.2 \%$ |
| $40-44$ | 146 | $7.1 \%$ |
| $45-49$ | 133 | $5.9 \%$ |
| $50-54$ | 133 | $5.5 \%$ |
| $55-59$ | 98 | $3.8 \%$ |
| $60-64$ | 105 | $3.9 \%$ |
| $65+$ | 93 | $3.3 \%$ |
| Total | 1,266 | $9.6 \%$ |
|  |  |  |

Table 6. Estimated Number and Percent of Licensed LPNs Practicing as an LPN in Washington State, by Age Group, 2007

| Age Category | Number | Percent of <br> Age Group |
| :--- | ---: | :---: |
| $<30$ | 1,133 | $83.1 \%$ |
| $30-34$ | 875 | $83.6 \%$ |
| $35-39$ | 1,174 | $83.3 \%$ |
| $40-44$ | 1,186 | $87.4 \%$ |
| $45-49$ | 1,522 | $83.7 \%$ |
| $50-54$ | 1,667 | $81.4 \%$ |
| $55-59$ | 1,573 | $77.0 \%$ |
| $60-64$ | 783 | $69.8 \%$ |
| $65+$ | 422 | $48.8 \%$ |
| Total | 10,354 | $79.1 \%$ |

projection of the number of individual LPNs needed in the state across time. If demand estimates were available as FTEs in the future, our supply estimates could be adjusted to FTEs using findings from the 2007 LPN survey.

## THE DEMAND FOR LPNS IN WASHINGTON

The demand for LPNs is affected by multiple factors. Changes in the general population, such as population growth and aging, will result in increased demand for health care services and, by extension, likely increased demand for LPNs to provide those services. LPN demand is also affected by changes in economic factors and social policy. These include changes in how health care is delivered (e.g., shifts in use of inpatient and outpatient services, substitution of practice tasks usually performed by LPNs to non-LPNs and vice versa), technological development, LPN salaries, insurance coverage rates, health care payment policies, and rates of part time versus full time employment. LPNs are employed in many sectors including longterm care, ambulatory clinics, hospitals, home health, public health, schools, and more. Social and policy factors can influence each sector independently. As a result, projecting the demand for LPNs is a daunting challenge, and given the paucity of data from which to develop these projections, we determined that the State's economic forecasts were reasonable estimates from which to base most of our demand projections.

## DEMAND ESTIMATES

We defined baseline LPN demand as the sum of employed LPNs plus the number of LPN vacancies (adjusted for LPNs working in multiple positions), discounted by a small percentage to reflect the continual rate of vacancies resulting from job turnover (and occurring even when there are no workforce shortages).

Baseline LPN Demand: For the basis of our LPN demand projections, we explored two approaches. First, the Washington State Employment Security Department (ESD), through it Job Vacancy Survey, provides data on the number of employed LPNs and LPN vacancies as reported by the businesses included in the survey. The ESD survey showed 2007 LPN employment at 10,180 with 887 vacant positions, on average. ${ }^{7}$ Using estimates from the 2007 survey of LPNs (where $82.5 \%$ reported working in a single location, $6.9 \%$ said they worked in two locations and $10.6 \%$ said they worked in more than two locations) we calculated that, on average, Washington's LPNs fill 1.28 positions. We used this position:person rate to estimate the number of LPNs the vacancies would represent, and then applied a $5 \%$ discount to the number of vacancies (to represent the normal ongoing
rate of vacancies). Our resulting baseline demand estimate using ESD survey numbers was 10,837 .

A second option for estimating baseline LPN demand was to use the estimate, based on the 2007 Washington survey of LPNs, of the percentage of licensees who were practicing as an LPN in the state, plus an estimate of vacancies. The survey found that $71.7 \%$ of LPNs with licenses in Washington reported that they were practicing in Washington (10,354 LPNs). ${ }^{2}$ Adding to that number the above estimated number of vacancies minus the $5 \%$ discount, the alternative estimate of LPN baseline demand using DOH survey results is 11,011 LPNs.

The ESD data probably undercounts the employment of licensed LPNs because an employer may code LPNs employed in management, education and other roles using an occupational code other than "licensed practical nurse". Therefore, we decided to use the slightly higher baseline estimate of LPN demand derived from the DOH survey findings.

Changes in Demand Over Time: There are several different estimates of the rate of change in the health care services labor sector. The Washington State Office of Financial Management estimated a $1.6 \%$ average rate of growth in the health sector from 2008 to 2030. ${ }^{6}$ The ESD's Labor Market and Economic Analysis Branch estimates health sector growth at $2.7 \%$ from 2007 to 2009 and $1.4 \%$ for 2010 to $2030 .{ }^{7}$ We used the ESD rates for our projections.

## PROJECTIONS OF LPN SUPPLY AND DEMAND: 2007 TO 2026

Many factors have an impact on the future supply of and demand for LPNs. We can make educated predictions of ways that health care delivery systems might use LPNs in the future, and how that in turn will affect the recruitment and retention of LPNs, but such predictions should be viewed with a very critical eye. We present LPN workforce projections under different scenarios in order to explore the impact of different policy options on the workforce. The factor that may be most modifiable by policymakers and have the greatest impact on LPN workforce supply is education capacity. Because of this, we developed four policy scenarios involving changes in LPN education capacity from which projections were generated:
Scenario 1. Annual education capacity maintained at current levels.
Scenario 2. Annual education capacity increased by 100 LPN completions as of 2011.

Scenario 3. Annual education capacity increased by 200 LPN completions as of 2011.

Scenario 4. Annual education capacity decreased by 100 LPN completions as of 2011.

There are two supply lines in each of the 4 projections. One reflects future licensed LPN supply and the second shows estimates of practicing LPN supply. Practicing LPNs (those employed in nursing) are the most relevant direct comparison to the demand estimates on each graph (because demand is for LPNs who practice). But tracking the projected number of licensed LPNs in the future workforce is important because it illustrates how, as the average age of the workforce increases over time, more licensed LPNs will be needed to compensate for the lower rates of workforce involvement by older nurses.

The LPN demand projections are the same in each scenario and use state ESD estimates of health workforce sector growth, as described above. To illustrate that the demand projection (like the supply projection) is an estimate, we have bounded the demand lines with dotted lines that broaden the demand projections to as much as $10 \%$ higher or $10 \%$ lower by 2026 . Because the estimates of demand are presumed to be more accurate for the first years of the model than for the final year, the upper and lower bounds of these estimates begin at $0 \%$ and increase to the maximum $+/-10 \%$ in 2026.

## SCENARIO 1. ANNUAL EDUCATION CAPACITY MAINTAINED AT CURRENT LEVELS

Figure 4 shows the projections of LPN supply and demand with the Washington education programs' input to supply as follows: for 2007, the actual number of completions $(1,054)$ was attributed, and for 2008 to 2026, 1,047 completions per year (the average number of actual completions from 2005-2007) was attributed to the supply each year. Under this scenario, across the 20 years of projections LPN demand increases by $33.6 \%$, licensed supply increases by $7.4 \%$, and practicing supply increases by $4.8 \%$. Practicing LPN supply in 2026 reaches 11,199 , or $23.9 \%$ ( 3,511 LPNs) short of projected demand (and well below the 10\% lower bound of the demand estimate).

Figure 4. Projected Washington LPN Supply and Demand: Scenario 1-Annual Education Capacity Maintained at the 2007 Levels


## SCENARIO 2. ANNUAL EDUCATION CAPACITY INCREASED BY 100 LPN COMPLETIONS AS OF 2011

Figure 5 shows the projections of LPN supply and demand from 2007 to 2026 with the Washington education input to supply increased by 100 more completers in 2011 and maintained at that rate until 2026. This scenario uses the actual completion number $(1,054)$ for 2007 , the average 2005-2007 completion number $(1,047)$ for 2008 through 2010, and adds 100 completions in 2011 (for a total of 1,147 ) and continues at this level through 2026. Under this scenario, across the 20 years of projections LPN demand increases by $33.6 \%$ (the same as in the other three scenarios), licensed supply increases by $13.7 \%$, and practicing supply increases by $11.6 \%$. Practicing LPN supply in 2026 reaches 11,928 . This number is $18.9 \%$ (2,782 LPNs) short of projected demand (and still well below the lower $10 \%$ bound of the demand estimate).

## SCENARIO 3. ANNUAL EDUCATION CAPACITY INCREASED BY 200 LPN COMPLETIONS AS OF 2011

Figure 6 shows the projections of LPN supply and demand from 2007 to 2026 with the Washington education input to supply increased by 200 more completers in 2011. This scenario uses the actual completion number $(1,054)$ for 2007 , the average 2005-2007 completion number $(1,047)$ for 2008 through 2010, and adds 200 completions each year beginning in 2011 and maintains this level (for a total of 1,247) through 2026. Across the 20 years of projections LPN demand increases by $33.6 \%$ (as in the other 3 scenarios), licensed supply increases by $19.9 \%$, and practicing supply increases by $18.5 \%$. Practicing LPN supply in 2026 reaches 12,658 . This number is $13.9 \%(2,052$ LPNs) short of projected demand. This scenario comes the closest to the $10 \%$ lower bound of the demand estimates in 2026 (within 655 LPNs).

Figure 5. Projected Washington LPN Supply and Demand: Scenario 2—Annual Education Capacity Increased by 100 LPN Completions as of 2011


Figure 6. Projected Washington LPN Supply and Demand: Scenario 3-Annual Education Capacity Increased by 200 LPN Completions as of 2011


## SCENARIO 4. ANNUAL EDUCATION

 CAPACITY DECREASED BY 100 LPN COMPLETIONS AS OF 2011Figure 7 shows the projections of LPN supply and demand from 2007 to 2026 with Washington State's education input to supply decreased by 100 completers in 2011. This scenario uses the actual completion number $(1,054)$ for 2007 , the average 2005-2007 completion number $(1,047)$ for 2008 through 2010, and decreases the number of completions by 100 (to 947) in 2011 and maintains this level through 2026. Across the 20 years of projections LPN demand increases by $33.6 \%$ (as in the other three scenarios), licensed supply increases by $1.2 \%$, and practicing supply decreases by $2.0 \%$. Practicing LPN supply in 2026 declines to 10,469 . This number is $28.8 \%$ ( $4,241 \mathrm{LPNs}$ ) short of projected demand for LPNs and far below the $10 \%$ lower bound.

Table 7 compares the four scenarios by the number of LPNs projected to be in demand, the licensed supply, the practicing supply, and the percent change of each, from 2007 to 2026.

Figure 7. Projected Washington LPN Supply and Demand: Scenario 4-Annual Education Capacity Decreased by 100 LPN Completions as of 2011

-=-=- = estimated range of accuracy of demand projections, to +/-10\% in 2026.

## Table 7. Comparison of Projected Demand, Licensed Supply, and Practicing Supply of LPNs Under Four Policy Scenarios

|  | Scenario 1: No Change in Education Capacity | Scenario 2: Increased Education Capacity (+100) | Scenario 3: Increased Education Capacity (+200) | Scenario 4: <br> Decreased Education Capacity (-100) |
| :---: | :---: | :---: | :---: | :---: |
| 2007:2026 demand | 11,011:14,710 | 11,011:14,710 | 11,011:14,710 | 11,011:14,710 |
| Percent change in demand 2007-2026 | 33.6\% | 33.6\% | 33.6\% | 33.6\% |
| Licensed supply 2007:2026 | 13,400:14,392 | 13,400:15,229 | 13,400:16,066 | 13,400:13,555 |
| Percent change in licensed supply 2007-2026 | +7.4\% | +13.7\% | +19.9\% | +1.2\% |
| Practicing supply 2007:2026 | 10,685:11,199 | 10,685:11,928 | 10,685:12,658 | 10,685:10,469 |
| Percent change in practicing supply 2007-2026 | +4.8\% | +11.6\% | +18.5\% | -2.0\% |
| Difference between projected 2026 practicing supply and demand | $-3,511$ | -2,782 | -2,052 | -4,241 |
| Percent difference between projected 2026 practicing supply and demand | -23.9\% | -18.9\% | -14.0\% | -28.8\% |

## BENCHMARKS: LPN SUPPLY COMPARISONS TO POPULATION 2007 TO 2026

An alternative way to explore potential LPN shortages or oversupply is to use a benchmark of the number of providers relative to the population for one geographic region compared to another, or for one point in time compared to another. Such benchmark comparisons are often used in health care workforce assessments using the ratios of providers per 100,000 population, population per provider, provider FTEs per population or the reverse. Here we use providers per 100,000 population. A high ratio does not necessarily reflect an adequate sized workforce (and conversely, low ratios do not necessarily reflect shortage), but they do provide a way to compare changes over time and among different settings. For example, examining how one region's ratios of LPNs per 100,000 population compares to other regions is a reasonable starting place for discussing why the ratios vary and whether major differences indicate problems. In 2001 Washington State had 220 licensed LPNs per 100,000 population. ${ }^{8}$ By 2009, this ratio was 209. Figure 8 shows how the supply of licensed LPNs per 100,000 Washington residents has declined since 2001. Few statistics are available for comparison with other states and the nation, but in 2000 Washington ranked 40th in the per capita employment of LPNs, with 170.7 employed LPNs per 100,000 population as compared to the national ratio of $241 .{ }^{11}$

Figure 9 shows the number of LPNs that would be required in Washington to maintain the same ratio of licensed LPNs per population from 2008 through 2026. Because the state population is expected to grow, more LPNs are needed each year to maintain the 2008 ratio of 209 licensed LPNs per 100,000 population (13,384 in 2008 and 16,967 in 2026). In the same figure, the number of licensed LPNs projected under each of the four scenarios is indicated. This graph makes clear that none of the scenarios we have explored in this report, even those that increase the number of LPN education completions, can produce enough LPNs to maintain the current LPN-to-population ratio to 2026.

Figure 8. Number of Licensed LPNs per 100,000 Washington State Population, 2001 to 2008


Data sources: WWAMI Center for Health Workforce Studies, University of Washington, 2001, 2006, 2007, 2008..$^{1,8-10}$

Figure 9. Number of LPNs Required to Maintain the Current LPN-to-Population Ratio in Washington to 2026 Compared with Licensed LPN Supply in Scenarios 1-4


LPNs needed to maintain current ratio of licensed LPNs/100K population

Licensed Supply
-- Scenario 1 (no educ. capacity change)

Licensed Supply

- Scenario 2 (educ. capacity +100 )

Licensed Supply Scenario 3 (educ. capacity +200 )

Licensed Supply
-- Scenario 4 (educ. capacity -100 )

## DISCUSSION

In recent years there have been several state-level projections of LPN supply and demand based in large part on the Health Resources and Services Administration (HRSA) RN supply and demand projections. ${ }^{12-14}$ In 2007 both Florida ${ }^{15}$ and North Dakota ${ }^{16}$ models supplemented the HRSA RN model with state LPN survey data as a starting point to estimate supply and develop projections. The Pennsylvania Center for Health Careers ${ }^{17}$ and Nebraska ${ }^{18}$ have also projected their future LPN supply and demand forecasts with the HRSA model as a starting point.

All four states have determined that there is a gap between current LPN supply and demand that will widen over the next 20 years as current nurses retire from the system and the baby-boom generation grows older. The aging of the baby-boom generation is an especially important consideration for LPN supply/ demand projections because LPNs are the primary nursing providers in elder-care settings. ${ }^{15}$ Another unique concern for LPN supply/demand models is the close interrelationship between LPN and RN supply and demand. RN demand is expected to increase over the next 20 years, and the growing RN demand may exacerbate the LPN shortage if hiring practices shift to replace RNs with LPNs as predicted. ${ }^{15}$

States with a high percentage of citizens above the age of 85 may also see their LPN supply problems increase at a faster rate than other states because of their greater need for long-term care. Although Washington State is unlikely to see the extreme challenges of an aging population that states like Pennsylvania and Florida anticipate, keeping an eye on state age distributions will be an important strategy consideration.

Potential solutions to the LPN supply gap suggested by other states include increasing the number of people completing LPN education programs, delaying the retirement of current LPNs, increasing the number of LPNs willing to work full time and improving the work environment to heighten current nurse retention. ${ }^{15}$ All of these strategies are worth consideration in Washington State.

Our analyses of LPN supply and demand in Washington State found the following:

- The average age of Washington's LPNs is 47 years, and more than a third are 55 years of age or older. As a result, the high rate of LPNs retiring from nursing practice over the next two decades will reduce LPN supply.
- LPN education capacity is a factor under policy control that has a large impact on state LPN supply.
- If the rate of completions from LPN programs in Washington does not increase above that of 2007, the supply of practicing LPNs in Washington will grow by less than $5 \%$ over the next 20 years. This will not meet the expected increase in demand due to population growth and aging. In this scenario, the projected practicing supply will be $24 \%$ less than the projected demand in 2026. By increasing the number of students who complete LPN education programs by 200 over the annual number in 2007, the projected shortage of LPNs relative to demand is decreased to a $14 \%$ shortage in 2026.

The demand for LPNs in Washington appears likely to increase steadily due to increases in, and aging of, the state's population. Major changes in health care delivery systems or the economic environment, however, could alter the rate of increase in LPN demand.

Despite the unknown impact of pending health care reform on the nursing profession, there is growing support to increase education for nurses at all levels. With national and state-specific population demographics showing increasing age and diversity, it is challenging to project accurately what the needs will be for the LPN workforce. We should anticipate that long-term care work settings will continue to rely on LPNs for care giving, even as the complexity of those patients is increasing.

As an entry point for many individuals into professional nursing, the LPN level of education is critical. Existing articulation agreements among nursing education programs in Washington State create a path for LPNs to move into higher levels of nursing education and practice. Continued efforts to expand the LPN workforce should make this path consistent, simpler, and more explicit. While encouraging LPNs to pursue RN careers may shorten their tenure as LPNs, the potential for professional growth may encourage more people to enter nursing career pathways as LPNs.

This report is a planning tool and not a precise prediction of the future. Most health care planners and policy makers agree that more LPNs are needed to meet demand over the next decades, and are considering ways to accomplish that goal. Better understanding of the factors that affect LPN supply and demand and which factors have the greatest impact are critical for making policy decisions to address the problem.

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