Supply and Demand Projections of the Nursing Workforce: 2014-2030

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Overview

This report presents projections of supply of and demand for registered nurses (RNs) and licensed practical/vocational nurses (LPNs) in 2030, with 2014 serving as the base year. These projections highlight the inequitable distribution of the nursing workforce across the United States, as recent research[1,2] shows that nursing workforce represents a greater problem with distribution across states than magnitude at the national level. Projections were developed using the Health Resources and Services Administration's (HRSA) Health Workforce Simulation Model (HWSM).

The HWSM is an integrated microsimulation model that estimates current and future supply of and demand for health workers in multiple professions and care settings. While the nuances of modeling supply and demand differ for individual health professions, the basic framework remains the same. The HWSM assumes that demand equals supply in the base year.[3] For supply modeling, the major components (beyond common labor-market factors like unemployment) include characteristics of the existing workforce in a given occupation; new entrants to the workforce (e.g., newly trained workers); and workforce participation decisions (e.g., retirement and hours worked patterns). For demand modeling, the major components include population demographics; health care use patterns (including the influence of increased insurance coverage); and demand for health care services (translated into requirements for full-time equivalents (FTEs)).

Important limitations for these workforce projections include an underlying model assumption that health care delivery in the future (projected until 2030) will not change substantially from

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[1] U.S. Department of Health and Human Services, Health Resources and Services Administration, National Center for Health Workforce Analysis. *The Future of the Nursing Workforce: National- and State-Level Projections, 2012-2025*. Rockville, Maryland, 2014.

[2] PI Buerhaus, DI Auerbach, DO Staiger, U Muench "Projections of the long-term growth of the registered nurse workforce: A regional analysis". Nursing Economics, 2013

[3] Ono T, Lafortune G, Schoenstein M. "Health workforce planning in OECD countries: a review of 26 projection models from 18 countries." *OECD Health Working Papers, No. 62*. France: OECD Publishing; 2013: 8-11.

the way health care was delivered in the base year (2014) and that there will be stability in the current rates of health care utilization. In addition, the supply model assumes that current graduation rates and workforce participation pattern will remain unchanged in the future (2030). Changes in any of these factors may significantly impact both the supply and demand projections presented in this report. Alternative supply and demand scenarios were developed to explore the impact of such changes. A detailed description of the HWSM can be found in the accompanying technical document available at http://bhw.hrsa.gov/healthworkforce/index.html.

Key Findings

Registered Nurses

Substantial variation across states is observed for RNs in 2030 through the large differences between their projected supply and demand.

- Looking at each state's 2030 RN supply minus its 2030 demand reveals both shortages and surpluses in RN workforce in 2030 across the United States. Projected differences between each state's 2030 supply and demand range from a shortage of 44,500 FTEs in California to a surplus of 53,700 FTEs in Florida.

- If the current level of health care is maintained, seven states are projected to have a shortage of RNs in 2030, with four of these states having a deficit of 10,000 or more FTEs, including California (44,500 FTEs), Texas (15,900 FTEs), New Jersey (11,400 FTEs) and South Carolina (10,400 FTEs).

- States projected to experience the largest excess supply compared to demand in 2030 include Florida (53,700 FTEs) followed by Ohio (49,100 FTEs), Virginia (22,700 FTEs) and New York (18,200 FTEs).

Licensed Practical/Vocational Nurses

Projected changes in supply and demand for LPNs between 2014 and 2030 vary substantially by state.

- Thirty-three states are projected to experience a shortage - a smaller growth in the supply of LPNs relative to their state-specific demand for LPNs. States projected to experience the largest shortfalls of LPNs in 2030 include Texas, with a largest projected deficit of 33,500 FTEs, followed by Pennsylvania with a shortage of 18,700 FTEs.

- In seventeen states where projected LPN supply exceeds projected demand in 2030, Ohio exhibits the greatest excess supply of 4,100 FTEs, followed by California with 3,600 excess FTEs.

Background

Health care spending is approximately 18 percent of the U.S. economy (GDP). Nursing is the single largest profession in the entire U.S. health care workforce with RNs and LPNs making up the two largest occupations in this profession.[4] RNs and LPNs perform a variety of patient care duties and are critical to the delivery of health care services across a wide array of settings, including ambulatory care clinics, hospitals, nursing homes, public health facilities, hospice programs, and home health agencies. Distinctions are made among different types of nurses according to their education, role, and the level of autonomy in practice.

LPNs typically receive training for a year beyond high school and, after passing the national NCLEX-PN exam, become licensed to work in patient care. LPNs provide a variety of direct care services including administration of medication, taking medical histories, recording symptoms and vital signs, and other tasks as delegated by RNs, physicians, and other health care providers.[5,6]

RNs usually have a bachelor's degree in nursing, a two year associate's degree in nursing, or a diploma from an approved nursing program. They must also pass a national exam, the NCLEX-RN, before they are licensed to practice.[7,8,9] RN responsibilities involve work that is more

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[4] U.S. Department of Labor, Bureau of Labor Statistics. (2012). *Occupational Outlook Handbook, 2012-13 Edition*. Washington, D.C.: GPO, U.S. Bureau of Labor Statistics. Retrieved from http://www.bls.gov/ooh/healthcare/registered-nurses.htm; http://www.bls.gov/ooh/healthcare/licensed-practical-and-licensed-vocational-nurses.htm

[5] Mueller, C., Anderson, R., McConnel, E. (2012). Licensed Nurse Responsibilities in Nursing Homes: A Scope-of-Practice Issue. *Journal of Nursing Regulation*. 3(1): 13-20.

[6] Lubbe, J., Roets, L. (2014) Nurses' Scope of Practice and the Implication for Quality Nursing Care, *Journal of Nursing Scholarship*. 46(1): 58-64.

[7] Sochalski, J., & Weiner, J. (2011). Health care system reform and the nursing workforce: Matching nursing practice and skills to future needs, not past demands. The *future of nursing: Leading change, advancing health*, 375-400.

[8] Pittman, P., & Forrest, E. (2015). The changing roles of registered nurses in Pioneer Accountable Care Organizations. *Nursing outlook*, *63*(5), 554-565.

[9] Anderson, D. R., & St Hilaire, D. (2012). Primary care nursing role and care coordination: An observational study of nursing work in a community health center. *Online journal of issues in nursing*, *17*(2), E1.

complex and analytical than that of LPNs. RNs provide a wide array of direct care services, such as administering treatments, care coordination, disease prevention, patient education, and health promotion for individuals, families, and communities. RNs may choose to obtain advanced clinical education and training to become Advanced Practice Nurses (who usually have a master's degree, although some complete doctoral-level training) and often focus in a clinical specialty area.[10],[11] Advanced Practice Registered Nurses are not included in the analysis presented here, but are covered in separate reports.[12] [13]

The historical relationship between nurse supply and demand in the U.S. has been cyclical, with periodic shortages of nurses where demand outstrips available supply, followed by periods of overproduction which lead to nursing surpluses. This cycle necessitates regular monitoring of the nursing workforce, and thus, periodic updates of HRSA's workforce projections. This report updates HRSA's estimates provided in the 2014 report on the nursing workforce.[14]

According to HRSA's 2014 report, state-level variation had been observed in projections of nursing supply relative to demand. Nurse shortage or surplus appear to reflect local conditions, such as the number of new graduates from nursing schools. Nurses tend to practice in states where they have been trained. The 2014 report demonstrated that nursing shortages represent a problem with workforce distribution across states rather than magnitude at the national level. As such, this report focuses on the inequitable distribution of nursing workforce across states as oppose to a national-level projections.

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[10] Blegen, M. A., Goode, C. J., Park, S. H., Vaughn, T., & Spetz, J. (2013). Baccalaureate education in nursing and patient outcomes. *Journal of Nursing Administration*, *43*(2), 89-94.

[11] Hamric, A. B., Hanson, C. M., Tracy, M. F., & O'Grady, E. T. (2013).*Advanced practice nursing: An integrative approach*. Elsevier Health Sciences.

[12] U.S. Department of Health and Human Services, Health Resources and Services Administration,. *National and Regional Projections of Supply and Demand for Primary Care Practitioners: 2013-2025*. National Center for Health Workforce Analysis. Rockville, Maryland, 2016.

[13] U.S. Department of Health and Human Services, Health Resources and Services Administration, National Center for Health Workforce Analysis. *Health Workforce Projections: Certified Nurse Anesthetists*. Rockville, Maryland, 2016.

[14] U.S. Department of Health and Human Services, Health Resources and Services Administration, National Center for Health Workforce Analysis. *The Future of the Nursing Workforce: National- and State-Level Projections, 2012-2025*. Rockville, Maryland, 2014.

Results

Future supply of and demand for nurses will be affected by a host of factors, including population growth, the aging of the nation's population, overall economic conditions, expanded health insurance coverage, changes in health care reimbursement, geographic location, and health workforce availability. The HWSM is an integrated microsimulation model that estimates supply of and demand for health workers in multiple professions and care settings, and accounts for these factors when adequate data are available to estimate their impact.[15]

For supply modeling, the major components include characteristics of the existing workforce in the occupation, new entrants to the workforce (e.g., newly trained workers); and workforce decisions (e.g., retirement, hours worked patterns, and migration across states); as well as common labor-market factors like unemployment and wage rates. For the national demand modeling, the HWSM assumes that RN and LPN demand at the national level equals supply in 2014, consistent with standard workforce research methodology, in the absence of documented evidence of a substantial imbalance between national supply and demand in the base year (2014).[16] The state-level demand estimates assumes state-level RN and LPN demand in 2014 equals supply, to project future demand for each state to provide a level of care consistent with what was provided in 2014 in that state. Over the projection period, the model assumes that current national patterns of supply and demand, such as newly trained workers, retirement, hours worked patterns and health care use, remain unchanged within each demographic group (as defined by age, sex, etc.).

All supply and demand estimates and projections are reported as FTEs, where one FTE is defined as 40 hours per week. This measure standardizes the definition of FTE over time and across health occupations. Previous nurse workforce projections define FTE as estimated average hours worked among nurses working at least 20 hours, which is 37.3 for both RNs and LPNs in

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[15] For additional information about the HWSM, please see "About the Model" on the last page of this report.

[16] HRSA's 2014 report modeled a scenario where each state was in equilibrium in the base year—which scenario models whether each state's future nurse supply will be adequate to maintain nursing care at a level of care consistent with the state's 2012 staffing levels.

this study. Consequently, the supply and demand numbers presented in this report are slightly lower than in previous nursing workforce projection reports.

Alternative supply and demand scenarios presented in this report show the sensitivity of projections to changes in key supply and demand determinants and assumptions. The alternative supply scenarios modeled include the impacts of graduating 10 percent more or 10 percent fewer nurses annually than the status quo. The alternative demand scenario reflects a potential change in health care delivery focusing on population health and preventive care.[17]

Trends in RN Supply and Demand

At the national level, the projected growth in RN supply (39 percent growth) is expected to exceed growth in demand (28 percent growth) resulting in a projected excess of about 293,800 RN FTEs in 2030.

The estimation of RN supply starts from approximately 2,806,100 RN FTEs that were active in the U.S. workforce in 2014. The number of graduates from U.S. nursing programs has steadily increased from approximately 68,800 individuals in 2001 to nearly 158,000 in 2015. Between 2014 and 2030, about 2,282,500 new RN FTEs will enter the workforce (assuming new RNs will graduate at the current rate), an estimated 1,043,500 RN FTEs will leave the workforce, and a decline in about 149,500 RN FTEs is associated with reduced work hours as the nurse workforce ages. This net growth of about 1,089,500 RN FTEs will result in a national RN workforce of 3,895,600 FTEs by 2030.

The demand for RNs is projected to be 2,806,100 in 2014 and will increase to 3,601,800 in 2030 (an increase of 795,700 FTEs between 2014 and 2030), based on current health care utilization and staffing patterns and assuming the national RN demand equaled supply in 2014. Growth in disease burden attributable to changing patient demographics contributes to an increased demand of about 776,400 RNs. HRSA's HWSM reflects increased insurance coverage associated with

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[17] IHS Markit Inc., *The Complexities of Physician Supply and Demand: Projections from 2013 to 2025*. Prepared for the Association of American Medical Colleges. Washington, DC: Association of American Medical Colleges; 2015.

Medicaid expansion and insurance marketplaces. This expanded insurance coverage accounts for projected demand of an additional 19,300 RNs between 2014 and 2030.

Across states, projected differences between supply and demand for RNs in 2030 vary considerably. The demand estimates for each state in Exhibit 1 reflect the number of RN FTEs required to provide a level of care consistent with what was provided in 2014 in that state, given each state's demographics and the prevalence of health risk factors.

Looking at each state's 2030 RN supply minus their 2030 demand reveals both state-level shortages and surpluses. The most severe shortage is seen in California, where the undersupply is estimated to be 44,500 RN FTEs, while the largest surplus is seen in Florida, with an estimated oversupply of 53,700 RN FTEs. Among the seven states that have estimated 2030 shortages, four states have shortages of more than 10,000 RN FTEs including California, followed by Texas (15,900 fewer FTEs), New Jersey (11,400 fewer FTEs) and South Carolina (10,400 fewer FTEs). Meanwhile, three states have a surplus of more than 20,000 RN FTEs, including Florida, followed by Ohio (with 49,100 more FTEs), and Virginia (with 22,700 FTEs).

Exhibit 1: Baseline and Projected Supply of and Demand for Registered Nurses by State: 2014 and 2030

Region and State	2014 Supply/ Demand [a]	2030			
		Supply	Demand	Difference [b]	Adequacy [c]
Northeast					
Connecticut	34,000	43,500	40,000	3,500	8.8%
Maine	14,600	21,200	16,500	4,700	28.5%
Massachusetts	73,200	91,300	89,300	2,000	2.2%
New Hampshire	15,500	21,300	20,200	1,100	5.4%
New Jersey	81,700	90,800	102,200	(11,400)	(11.2%)
New York	174,100	213,400	195,200	18,200	9.3%
Pennsylvania	133,200	168,500	160,300	8,200	5.1%
Rhode Island	11,000	15,000	12,500	2,500	20.0%
Vermont	6,000	9,300	6,800	2,500	36.8%
Midwest					
Illinois	116,300	143,000	139,400	3,600	2.6%
Indiana	62,900	89,300	75,300	14,000	18.6%
Iowa	32,500	45,400	35,300	10,100	28.6%
Kansas	29,500	47,500	34,900	12,600	36.1%
Michigan	91,600	110,500	104,400	6,100	5.8%

Region and State	2014 Supply/ Demand [a]	2030			
		Supply	Demand	Difference [b]	Adequacy [c]
Minnesota	56,200	71,800	68,700	3,100	4.5%
Missouri	59,600	89,900	73,200	16,700	22.8%
Nebraska	20,300	24,700	21,200	3,500	16.5%
North Dakota	7,600	9,900	9,200	700	7.6%
Ohio	122,800	181,900	132,800	49,100	37.0%
South Dakota	10,300	11,700	13,600	(1,900)	(14.0%)
Wisconsin	58,100	78,200	72,000	6,200	8.6%
South					
Alabama	68,000	85,100	79,800	5,300	6.6%
Arkansas	28,400	42,100	32,300	9,800	30.3%
Delaware	9,600	14,000	12,800	1,200	9.4%
Distr. of Columbia [d]	1,800	8,800	2,300	6,500	282.6%
Florida	170,600	293,700	240,000	53,700	22.4%
Georgia	77,200	98,800	101,000	(2,200)	(2.2%)
Kentucky	44,900	64,200	53,700	10,500	19.6%
Louisiana	40,600	52,000	49,700	2,300	4.6%
Maryland	58,700	86,000	73,900	12,100	16.4%
Mississippi	29,100	42,500	35,300	7,200	20.4%
North Carolina	90,000	135,100	118,600	16,500	13.9%
Oklahoma	32,500	46,100	40,600	5,500	13.5%
South Carolina	36,900	52,100	62,500	(10,400)	(16.6%)
Tennessee	61,000	90,600	82,200	8,400	10.2%
Texas	180,500	253,400	269,300	(15,900)	(5.9%)
Virginia	67,900	109,200	86,500	22,700	26.2%
West Virginia	18,800	25,200	20,800	4,400	21.2%
West					
Alaska	16,400	18,400	23,800	(5,400)	(22.7%)
Arizona	65,700	99,900	98,700	1,200	1.2%
California	277,400	343,400	387,900	(44,500)	(11.5%)
Colorado	41,900	72,500	63,200	9,300	14.7%
Hawaii	10,900	19,800	16,500	3,300	20.0%
Idaho	11,200	18,900	15,300	3,600	23.5%
Montana	9,600	12,300	12,100	200	1.7%
Nevada	18,300	33,900	25,800	8,100	31.4%
New Mexico	15,900	31,300	21,600	9,700	44.9%
Oregon	30,400	41,100	38,600	2,500	6.5%
Utah	20,000	33,500	29,400	4,100	13.9%
Washington	56,700	85,300	79,100	6,200	7.8%
Wyoming	4,200	8,300	5,500	2,800	50.9%

Notes: The model assumes increased insurance coverage associated with Medicaid expansion and insurance marketplaces, together with year 2014 health care use and delivery patterns. Numbers may not sum to totals due to rounding.
[a] The projections assume that each state's supply and demand are equal in 2014.
[b] Difference = 2030 projected supply – demand.

In addition to presenting RN shortages and surpluses by state, Exhibit 1 shows measures of adequacy (last column). For the purpose of this report, adequacy is defined as the projected 2030 state-level provider shortage or surplus expressed as a percentage of that state's 2030 provider demand. Adequacy is interpreted as follows:

- A negative adequacy indicates a 2030 shortage and reflects the percentage of 2030 demand that is unmet.
- A positive adequacy indicates a 2030 surplus and reflects the size of the projected surplus relative to the projected demand.

Expressing each 2030 state-level shortage or surplus as a percentage of the state's 2030 demand helps to inform comparisons of differences between supply and demand across states by considering how the size of each state's surplus or shortage relates to that state's underlying provider demand.

Based on the adequacies shown in Exhibit 1, the excessive 2030 supply for RNs is greatest in Wyoming (except Washington D.C.[18]), where the projected RN shortage is 51 percent of projected demand. The unmet 2030 RN demand is lowest in Arizona, where the projected shortage is about 1 percent of projected demand. As noted above, 2030 RN supply is lower than demand in 7 states, with shortage ranging from 2 percent of RN demand in Georgia to 23 percent of demand in Alaska.

Mapping the states with unmet demand in 2030 illustrates the geographic distribution of RN shortages projected across the United States (Exhibit 2).

[18] Washington D.C. shows the largest percentage of surplus. However, starting supply for Washington D.C. is based on small sample size in the American Community Survey so supply estimates might be unreliable.

Exhibit 2: RN Supply versus Demand, by State, 2030

Supply versus Demand ▢ Demand > Supply   ▨ Supply > Demand

Trends in LPN Supply and Demand

Approximately 809,700 LPN FTEs were active in the U.S. workforce in 2014. The number of first time LPN NCLEX-PN takers from U.S. nursing programs steadily increased from approximately 34,600 individuals in 2001 to a peak of slightly over 66,800 by 2010 before declining to about 47,000 in 2016. Trending forward to 2030 using current supply determinants (such as rates of entry and attrition from the profession) there will be 784,100 new LPN FTEs in the workforce and an estimated 493,500 LPN FTEs will leave the workforce. In addition, supply will decrease by approximately 83,600 LPN FTEs based on change in average hours worked. The net growth of about 207,000 new LPN FTEs by 2030 will result in a national workforce supply of approximately 1,016,700 LPN FTEs, an increase of 26 percent.

Assuming LPN demand equals supply in 2014 at the national level, by 2030 LPN demand is projected to reach 1,168,200 LPN FTEs, an increase of 358,500 (44 percent). Growth in demand is driven primarily by a growing and aging population, resulting in increased health service needs in nursing homes, residential care and hospital settings. The impact of expanded insurance

coverage associated with Medicaid expansion and insurance marketplaces is relatively small (4,100 FTEs).

At the national level, the demand for LPNs is projected to start growing faster than supply starting in about 2022. By 2030, a projected national shortage of about 151,500 LPN FTEs (13 percent of 2030 demand) could develop. That possibility notwithstanding, the risk associated with an LPN shortfall of this magnitude is limited because LPNs can be trained more quickly and at lower cost than RNs.

Exhibit 3 presents future state-level supply and demand for services if states were to continue providing a level of nursing care consistent with what the state provided in 2014. Under this scenario, substantial variation across states is observed in projected differences between supply and demand for LPNs. Overall, 33 states are projected to see that their LPN supply will be outpaced by demand by 2030 – including 14 states in the South, 7 in the Midwest, and 6 each in the West and Northeast. States with relatively large projected shortfalls are mostly in the South: Texas, with a largest projected deficit of 33,500 LPN FTEs, and other 6 states (North Carolina, Georgia, Florida, Alabama, Maryland, and Tennessee) with project deficits between 8,300 and 11,700 FTEs. Other states with larger projected shortfalls include Pennsylvania in the Northeast with a shortage of 18,700 FTEs and Indiana in the Midwest with a shortage of 7,000 FTEs. Among the other 18 states, Ohio exhibits the greatest projected excess supply of 4,100 FTEs by 2030, followed by California with 3,600 FTEs.

Exhibit 3: Baseline and Projected Supply of and Demand for Licensed Practical Nurses by State: 2014 and 2030

| Region and State | 2014 | 2030 | | | |
	Supply/ Demand [a]	Supply	Demand	Difference [b]	Adequacy [c]
Northeast					
Connecticut	9,600	11,000	13,200	(2,200)	(16.7%)
Maine	2,000	3,400	2,600	800	30.8%
Massachusetts	14,400	16,500	20,100	(3,600)	(17.9%)
New Hampshire	4,700	4,700	7,500	(2,800)	(37.3%)
New Jersey	19,400	30,500	27,400	3,100	11.3%
New York	52,400	58,900	62,500	(3,600)	(5.8%)
Pennsylvania	49,300	48,600	67,300	(18,700)	(27.8%)

Region and State	2014 Supply/ Demand [a]	2030 Supply	2030 Demand	2030 Difference [b]	2030 Adequacy [c]
Rhode Island	2,000	2,300	2,400	(100)	(4.2%)
Vermont	1,800	2,500	2,400	100	4.2%
Midwest					
Illinois	26,500	34,400	37,100	(2,700)	(7.3%)
Indiana	19,900	19,900	26,900	(7,000)	(26.0%)
Iowa	7,900	13,000	9,900	3,100	31.3%
Kansas	8,400	14,400	11,400	3,000	26.3%
Michigan	21,500	24,800	28,100	(3,300)	(11.7%)
Minnesota	16,200	24,700	23,000	1,700	7.4%
Missouri	20,000	23,200	28,100	(4,900)	(17.4%)
Nebraska	6,200	6,000	6,500	(500)	(7.7%)
North Dakota	2,500	3,900	3,400	500	14.7%
Ohio	42,500	54,900	50,800	4,100	8.1%
South Dakota	2,100	2,800	3,200	(400)	(12.5%)
Wisconsin	12,600	16,300	18,000	(1,700)	(9.4%)
South					
Alabama	22,200	20,500	30,100	(9,600)	(31.9%)
Arkansas	12,200	17,800	15,600	2,200	14.1%
Delaware	2,900	4,200	4,500	(300)	(6.7%)
Distr. of Columbia [d]	900	1,800	1,300	500	38.5%
Florida	54,200	73,600	83,900	(10,300)	(12.3%)
Georgia	26,300	25,800	36,300	(10,500)	(28.9%)
Kentucky	12,600	14,400	17,200	(2,800)	(16.3%)
Louisiana	18,400	20,700	25,500	(4,800)	(18.8%)
Maryland	13,300	11,300	19,700	(8,400)	(42.6%)
Mississippi	9,900	11,800	14,200	(2,400)	(16.9%)
North Carolina	22,900	24,400	35,100	(10,700)	(30.5%)
Oklahoma	14,800	18,400	20,800	(2,400)	(11.5%)
South Carolina	8,000	8,200	12,900	(4,700)	(36.4%)
Tennessee	24,000	29,600	37,900	(8,300)	(21.9%)
Texas	70,900	80,900	114,400	(33,500)	(29.3%)
Virginia	25,500	32,200	36,600	(4,400)	(12.0%)
West Virginia	7,600	10,900	9,800	1,100	11.2%
West					
Alaska	1,700	2,000	3,100	(1,100)	(35.5%)
Arizona	9,100	12,200	15,800	(3,600)	(22.8%)
California	72,000	121,000	117,400	3,600	3.1%
Colorado	6,900	10,400	12,500	(2,100)	(16.8%)
Hawaii	2,300	4,700	4,300	400	9.3%
Idaho	2,500	4,300	4,100	200	4.9%
Montana	2,300	2,800	3,400	(600)	(17.6%)
Nevada	3,200	4,200	5,200	(1,000)	(19.2%)

Region and State	2014 Supply/ Demand [a]	2030			
		Supply	Demand	Difference [b]	Adequacy [c]
New Mexico	3,000	4,900	4,900	0	0.0%
Oregon	3,100	4,900	4,600	300	6.5%
Utah	2,900	6,700	5,000	1,700	34.0%
Washington	11,200	13,600	18,700	(5,100)	(27.3%)
Wyoming	1,000	1,800	1,600	200	12.5%

Notes: The model assumes increased insurance coverage associated with Medicaid expansion and insurance marketplaces, together with year 2014 health care use and delivery patterns. Numbers may not sum to totals due to rounding.

[a] The projections assume that each state's supply and demand are equal in 2014.

[b] Difference = 2030 projected supply – demand.

[c] Adequacy = 100 * (projected supply – projected demand)/(projected demand); a negative adequacy indicates a shortage (i.e., supply is less than demand) while a positive adequacy indicates a surplus (i.e., supply is greater than demand); adequacies associated with 2030 projected shortages are highlighted in blue.

[d] Starting supply for Washington D.C. is based on small sample size in the American Community Survey so supply estimates might be unreliable.

As shown in Exhibit 3, 2030 adequacy for LPNs ranges from more than 34 percent surplus of 2030 demand in Utah (except Washington D.C.[19]) to about 43 percent shortage of 2030 demand in Maryland.

Exhibit 4 maps the 33 states with projected unmet LPN demand in 2030.

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[19] Washington D.C. shows the largest percentage of surplus. However, starting supply for Washington D.C. is based on small sample size in the American Community Survey so supply estimates might be unreliable.

Exhibit 4: LPN Supply versus Demand, by State, 2030

Supply versus Demand   Demand > Supply   Supply > Demand
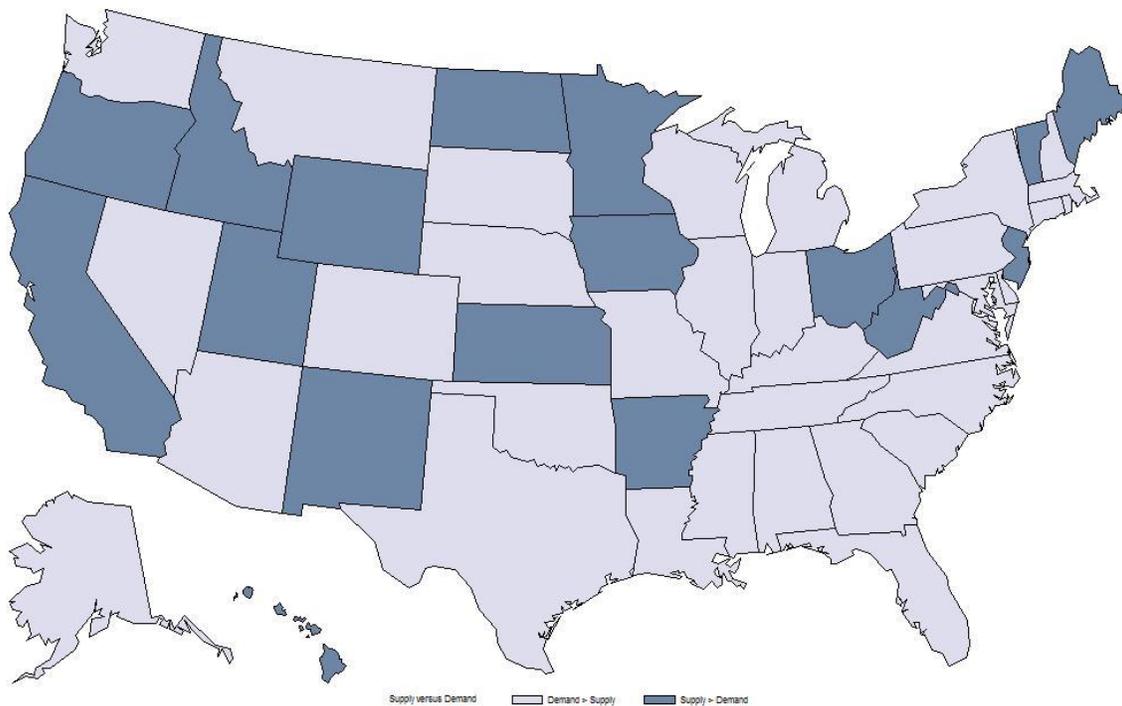
Strengths and Limitations

The model that was used to develop the supply and demand projections presented in this report relies on a microsimulation approach. Microsimulation techniques provide greater flexibility and granularity than the traditional cohort based approaches.

Major strengths of the current HWSM include:

- Application of a consistent approach to analyzing supply and demand across practitioner type, and U.S. state.
- Incorporation of current demographic and health data of sufficient size and representativeness to provide reliable estimates of key population characteristics.
- Consideration not only of population growth and changing demographics across the United States for both supply and demand, but also of the effects of changes in policy (such as expanded health insurance coverage) on demand.

HRSA's Health Workforce Simulation Model operates under many assumptions regarding the current status and future trends in health care utilization and workforce supply. The HRSA model, like most other health workforce projection models, assumes that the national labor market for nurses is currently in balance (i.e., supply and demand in the base year are equal) as indicated by the paucity of recent studies suggesting high vacancy rates and difficulties hiring nurses.[20] Therefore, the results in this report reflect future changes in the nursing workforce relative to a balanced 2014 baseline. The supply projections presented here illustrate what future supply is likely to be if the production of nurses from nursing programs remains consistent with the current level. However, there have historically been large swings in enrollment and the resulting labor supply, which, if repeated in the future, would affect the results reported here.

State-level projections require assumptions about the geographic mobility of nurses. Nurse migration patterns presented here suggest that nurses tend to practice in states where they have been trained. As a result, a number of states are projected to have a shortage of RNs in 2030 despite the fact that, on a national level, there is projected to be an excess of RNs. If migration were optimal (i.e., nurses were able and willing to migrate to states where the in-state supply did not meet demand), then the larger state-level nursing surpluses would be driven to areas of greater need and every state would show a relative surplus of RNs in 2030. This accentuates the fact that nursing shortages currently (and in 2030) represent a problem with workforce distribution rather than magnitude. Although there is evidence that some very specialized settings may be facing nurse shortages,[21] this report looks at the nursing profession as a whole and does not look at individual nursing specialty areas (e.g., public health, home health care, etc.) or sites of practice (e.g., hospitals, nursing homes, ambulatory settings, etc.).

The baseline demand projections account for increased utilization of health care services due to expanded insurance coverage. However, policy changes in this arena may have an effect on nursing demand not examined by this analysis, and that such changes are difficult to anticipate. Also, because of the uncertainties in its effects on staffing patterns and the evolving roles of different health professionals on care teams, changes in health care service delivery currently are

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[20] Ono, T., Lafortune, G., Schoenstein, M. (2013). Health workforce planning in OECD countries: a review of 26 projection models from 18 countries. *OECD Health Working Papers, No. 62*. France: OECD Publishing; 2013:8-11.
[21] American Association of Colleges of Nursing. (2014). *Nursing shortage fact sheet.* Retrieved from http://www.aacn.nche.edu/media-relations/fact-sheets/nursing-shortage.

not incorporated into the model. In addition, if the growing emphasis on care coordination, preventive services, and chronic disease management in care delivery models leads to a greater need for nurses, this report may underestimate the projected nurse demand. Likewise, improved care coordination could reduce demand for nurses in hospital settings.

Discussion and Conclusions

Using the most recent data available on the nurse education pipeline, labor supply, and retirement patterns, HRSA's Health Workforce Simulation Model projected a national RN excess of about 8 percent of demand, and a national LPN deficit of 13 percent by 2030. However, because these national estimates mask large geographic disparities in adequacy of supply, it is important to examine and focus on state-level projections.

For RNs, the state-level projections show both projected deficits of RNs in a number of states, and large variations in oversupply in other states. The variation ranges from a deficit of 44,500 FTEs in California to excess supply of 53,700 FTEs in Florida.

Similarly, national estimates of LPNs in 2030 obscure the considerable spread in state estimates, which range from a deficit of 33,500 FTEs in Texas to an excess supply of 4,100 FTEs in Ohio. These findings underscore the potential complexity of ensuring adequate nursing workforce supply across the United States.

While the projections presented here are directionally consistent with findings in recent studies on RN supply,[22, 23] historical experience demonstrates how sensitive enrollment in training programs and the resulting labor supply of nurses are to the job market and economic

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[22] Auerbach, D. I., Buerhaus, P. I., & Staiger, D. O. (2014). Registered nurses are delaying retirement, a shift that has contributed to recent growth in the nurse workforce. *Health Affairs*, *33*(8), 1474-1480.

[23] Auerbach, D. I., Buerhaus, P. I., & Staiger, D. O. (2011). Registered nurse supply grows faster than projected amid surge in new entrants ages 23–26.*Health Affairs*, *30*(12), 2286-2292.

conditions.[24, 25] Alternative supply scenarios modeled show that graduating 10 percent more/fewer RNs annually than the status quo would increase/decrease the RN supply in 2030 by slightly over 200,000 FTEs. Similarly, graduating 10 percent more/fewer LPNs annually than the status quo would increase/decrease the LPN supply in 2030 by around 58,000 FTEs

Looking to the future, many factors will continue to affect demand for and supply of nurses including demand for health services broadly and within specific health care settings.[26] To date, the insurance reform has expanded the number of people with health insurance coverage and encouraged new value-based models of care. With an emphasis on disease management and prevention and redirecting care from institutional to community- and home-based settings, these models are providing new opportunities and roles for nurses within the health care delivery system.[27] For example, under a scenario that reflects a health care delivery with increased focus on preventive care and population health such as a medical home model with appropriate counseling and improved adherence to medications (e.g., statins, antihypertensives, metformin and other medications), an increase in the demand for RNs could be seen. This scenario assumed a 2016 intervention that 1) sustained a 5 percent reduction in body weight for people who were overweight or obese; 2) improved uncontrolled hypertension, high cholesterol, and high blood glucose levels; and 3) eliminated smoking. Model outcomes suggest that achieving these lifestyle and clinical goals would result in significant reduction in disease prevalence by 2030. However, achieving these population health goals would also cause reduction in mortality such that a greater number of people would require care. Under such a scenario, HWSM estimates that the demand for RNs would be about 105,800 FTE higher than the current RN demand projected in 2030 (3,601,800 FTEs).

On the other hand, emerging care delivery models such as Accountable Care Organizations could change the way that RNs and LPNs deliver service, but there is currently insufficient information

[24] Buerhaus, P. I., Auerbach, D. I., & Staiger, D. O. (2009). The recent surge in nurse employment: Causes and implications. *Health Affairs*, *28*(4), w657-w668.

[25] Staiger, D. O., Auerbach, D. I., & Buerhaus, P. I. (2012). Registered nurse labor supply and the recession—are we in a bubble? *New England Journal of Medicine*, *366*(16), 1463-1465.

[26] Institute of Medicine (US). Committee on the Future Health Care Workforce for Older Americans. (2008). *Retooling for an aging America: Building the health care workforce*. National Academies Press.

[27] Rother, J., & Lavizzo-Mourey, R. (2009). Addressing the nursing workforce: A critical element for health reform. *Health Affairs*, *28*(4), w620-w624..

to project the extent to which these new delivery models will materially affect the demand for nurses.

As the health care system continues to evolve in response to shifting financial incentives and economic pressures, efforts to improve care access and quality, and changes in federal and state policies, the net effects of these and other factors on supply and demand projections will continue to be researched—with some policies and trends anticipated to increase nurse demand while others may decrease demand. HRSA will continue to update supply and demand projections as changes emerge in workforce supply and demand determinants.

About the Model

The results presented in this report come from HRSA's Health Workforce Simulation Model, which is an integrated health professions projection model that estimates the current and future supply of and demand for health care providers.

The supply component of the Model simulates workforce decisions for each provider based on his or her demographics and profession, along with the characteristics of the local or national economy and the labor market. The starting supply, plus new additions to the workforce, minus attrition provides an end of year supply projection, which becomes the starting supply for the subsequent year. This cycle is repeated through 2030. The basic file that underlies the supply analysis contains individual records of the RNs and LPNs in the workforce from the American Community Survey (ACS) and the state licensure data.

Demand projections for health care services in different care settings are produced by applying regression equations for individuals' health care use on the projected population. The current nurse staffing patterns by care setting are then applied to forecast the future demand for nurses. The population database used to estimate demand consists of records of individual characteristics of a representative sample of the entire U.S. population derived from the ACS, National Nursing Home Survey, and the Behavioral Risk Factor Surveillance System. Using the Census Bureau's projected population and the Urban Institute's state-level estimates of the impact of the healthcare reform on insurance coverage,[1,2] the Model simulates future populations with expected demographic, socioeconomic, health status, health risk and insurance status.

This Model makes projections at the state level, which are then aggregated to the national level. A detailed description of the Model can be found in the accompanying technical documentation available at http://bhw.hrsa.gov/healthworkforce/index.html.

[1] Holahan, J. & Blumberg, L. (2010 January). *How would states be affected by health reform? Timely analysis of immediate health policy issues.* Retrieved August 2013 from http://www.urban.org/UploadedPDF/412015_affected_by_health_reform.pdf.

[2] Holahan, J. (2014 March) *The launch of the Affordable Care Act in selected states: coverage expansion and uninsurance* Retrieved August 2013 from http://www.urban.org/uploadedPDF/413036-the-launch-of-the-Affordable-Care-Act-in-selected-states-coverage-expansion-and-uninsurance.pdf. Washington D.C., The Urban Institute.