

Wisconsin

Registered Nurse Supply and Demand Forecasts Results Report

2018-2040

May 2020

Disclaimer: *The information used in this report was collected prior to the onset of COVID-19 in the United States. However, the findings and conclusions presented are still relevant in the long-term view of the nursing workforce. Continued research and focus on the health care workforces will be essential for identifying structural impacts of the pandemic.*

Abstract

A close examination and focus on the Registered Nursing (RN) workforce is important for two reasons. First, it provides a good barometer for the challenges facing the health care workforce as a whole. Second, the size of the profession means that maintaining a strong nursing workforce is essential for providing quality health care. This key workforce faces challenges as the population ages. Along with losing nurses due to retirement, the RN workforce will need to accommodate growing and changing health care needs of Wisconsin's aging population.

The 2018-2040 Results Report reviews the trends seen in the nursing workforce since the first RN License Renewal survey was administered in 2010 and provides an update of previous modeling work. Growth in the number of RNs in Wisconsin has outpaced demographic expectations and overall labor force growth. Increased number of nurses graduating from colleges and universities in Wisconsin has been key factor in this growth. Two additional supply models were added based on trends observed over the past decade.

This forecasts provides guidance on what to expect going forward. However, results should be used in conjunction with the knowledge and collaboration among subject matter experts to inform decision making. Key points to consider going forward include: avoid complacency; maintain a strong educational structure; take a wholistic view of health care workforces; address varying needs within the state; and focus on demand as well as supply.

1. INTRODUCTION

Health Care jobs have exceeded Manufacturing and Retail jobs for the first time in United States history¹. Registered Nurses (RNs) make up the largest profession in the Health Care industry². A close examination on the RN workforce is essential for two reasons. First, it provides a good barometer for the challenges facing the health care workforce a whole. Second, the size of the profession means that maintaining a strong nursing workforce is essential for providing quality health care.

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The Health Resources and Services Administration (HRSA) released a study in 2004 that projected RN supply and demand for the nation and all 50 states, and signaled the challenges facing by the RN workforce³. The HRSA projections provided a basic summary of Wisconsin's future nursing shortage. However, the state specific projections relied on a small sample size of nurses and used national health care usage rates to forecast demand. The initial report served as a catalyst for improving data collection and forecasting efforts in Wisconsin. In 2009, Wisconsin legislature mandated a survey of RNs each even-numbered year to determine the employment characteristics of the nurses licensed in the state as part of their renewal license process⁴.

The first comprehensive survey was administered to all RNs in 2010. Data from the survey were used by the Office of Economic Advisors (OEA) to help project supply and demand for RNs from 2010-2035. The projected supply of nurses was flat while the demand for nurses was expected to grow rapidly. The model has been updated twice using data from the 2012 and 2014 licensure surveys. Supply and demand was assumed to be in balance for all versions of the model. Supply growth that has exceeded expectations since 2010 has been a key factor in maintaining this equilibrium assumption. However, the long term projected trend of flat supply growth and rapid demand growth have remained the same.

The demand trend is consistent with the age demographics of the population, which drive the model.

The ability to provide insight into the challenges facing the workforce becomes stronger as more information is available to examine changing trends. The 2018-2040 version puts emphasis on using available historical data from the RN survey to review the changing landscape of Wisconsin's RN workforce over the decade. Along with replicating previously used methodology, two alternative projections models for supply are included to provide a more complete picture of the future of the RN workforce.

2. REVIEW OF POPULATION AGE DEMOGRAPHICS

The working age population will decline by about 1% over the next two decades. The population aged 65 and older is expected to grow by 44% over the same timeframe.

Projected nursing shortages in Wisconsin projection models are driven by changing age demographics. The aging baby boomer population provides the context for the major challenges facing the RN workforce. The baby boomer population is characterized as those born between 1946 and 1964. The oldest baby-boomer reached the traditional retirement age of 65 in 2011. The youngest boomer will turn 65 in 2029, which means we sit at roughly the halfway point of this large demographic group's workforce exodus.

The impact of the aging population on the workforce was clearly evident by 2010 (Winters et al, 2009). Wisconsin's total population growth outpaced the labor force growth even as the economy improved drastically. The trend will accelerate going forward barring any unprecedented changes that shift population projections. The Wisconsin Department of Administration (DOA)⁵ projects that the population

between 20 and 64 years old, or the working age population, will decline by about 1% over the next two decades. The population aged 65 and over is expected to grow by over 44% over the same timeframe.

Shifting population demographics place a unique set of challenges on the nursing workforce. Along with senior nurses exiting the workforce, the aging population requires health care services at much higher rates. The Future of Nursing report (2010)⁶ highlighted 2020 as a "tipping point" for when these demographic pressures become more serious. The RN workforce has kept up with the challenges of an aging population so far as there have not been considerable workforce shortages (Buerhaus et al, 2009; Juraschek et al, 2012; Auerbach et al 2014; Johnson et al 2016; Buerhaus et al, 2017; Spetz, 2018; Condlife et al 2020). Continued efforts will be needed to address the demographic challenges that lie ahead.

3. THE EQUILIBRIUM ASSUMPTION

All model updates have started with a balance between supply and demand.

All of the RN forecasting model updates assume that there is an initial balance between the supply of and demand for RNs. Maintaining this balance has been a notable accomplishment given demographic challenges.

Determining if this "equilibrium assumption" can be used for modeling relies on three key points. First, unemployment rates are observed through our licensure survey. Rates dipping lower across different years of the survey would serve as evidence of a shortage. Unemployment rates among nurses maintaining an active license have been between 0.30% and 0.60% over the last decade.

The second point is vacancy rates of RNs in Wisconsin hospitals. The Wisconsin Hospital Association (WHA) conducts an annual Wisconsin Hospital personnel survey and reports the vacancy rates for selected health care professions. The va-

cancy rate for RNs was 5.5% in 2018. It reached 9.1% in 2008 when needs for RNs were considered more pressing.

Third, the Office of Economic Advisors is working with the Wisconsin Health Workforce Data Collaborative. The opinions of subject matter experts were solicited to determine whether or not major staffing issues exist in the health care system. The consensus was that variations in current needs for RNs exist across geographies and settings but needs for RNs are currently being met overall in the state.

The equilibrium assumption is important from a modeling perspective because it means that the RN survey can be considered both the supply and demand of nurses. Also, maintaining this balance would not have been possible without faster than expected growth in RNs over the past decade. The initial forecasting model (2010-2035) projected a shortage of about 8% by this time based on demographic drivers.

4. REGISTERED NURSE GROWTH AND EDUCATION

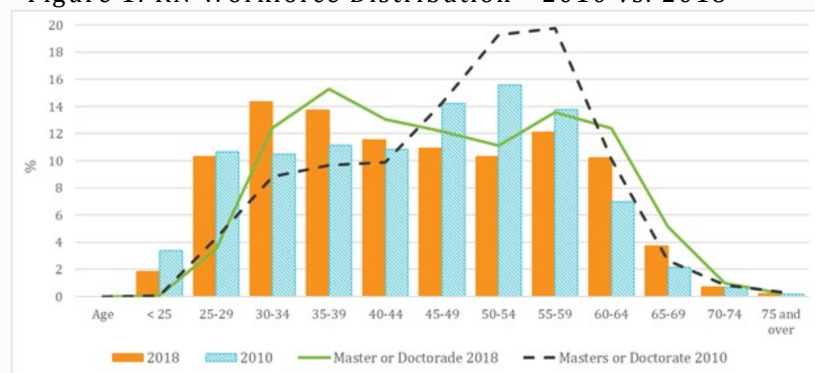
Increased educational capacity has contributed to faster than expected growth in the number of RNs and to a younger workforce.

Increasing the number of graduates from nursing schools is consistently recommended as one method for improving nursing shortages (Buerhaus et al, 2009; Johnson et al, 2016). Efforts to increase capacity and fill nursing programs around the state have been under-

way since the early 2000's. The number of graduates sitting for the National Council Licensure Examination (NCLEX) for the first time in Wisconsin rose from 1,795 in 2003 to 3,644 in 2018. This growth in first-time RNs is a key contributing factor in two observations about the RN workforce as a whole. First, Wisconsin's nursing workforce has grown at a much faster rate than the state's total labor force. Wisconsin's RN workforce grew by 11% between 2010 and 2018 according to the license renewals surveys. The total labor force grew by just 1.2% over the same timeframe. Second, the 2018 survey shows a higher share of young nurses when

compared to the first survey from 2010 (See Figure 1). The share of nurses under 40 increased from 35.7% to 40.2%

Figure 1: RN Workforce Distribution—2010 vs. 2018



Nurses, more specifically young nurses, around the country have been noted for their growing interest in seeking higher education and training for their career growth (Faller and Gogek, 2016). This proves true in Wisconsin as more nurses are attaining higher degrees when compared to 2010 (Figure 2 and 3). About 56% of the RN workforce held a bachelor's degree or higher in 2010. This share rose to 62.6% in 2018 with 71.3% of nurses under 35 holding a bachelors or higher. There has also been an increase in the percentage of nurses receiving master's or doctorate degrees through the years, and the age demographics of Wisconsin's nurses with advanced degrees has changed since 2010. Figure 1 shows that the age distribution of nurses with advanced degrees has shifted younger. This change and continued interested in career growth opportunities is important for the health of the future RN workforce. It will help alleviate the challenges created as more experienced nurses leave leadership roles, advanced practice positions, and post-secondary instructor positions.

Figure 2: Education and Age Distribution RN 2010

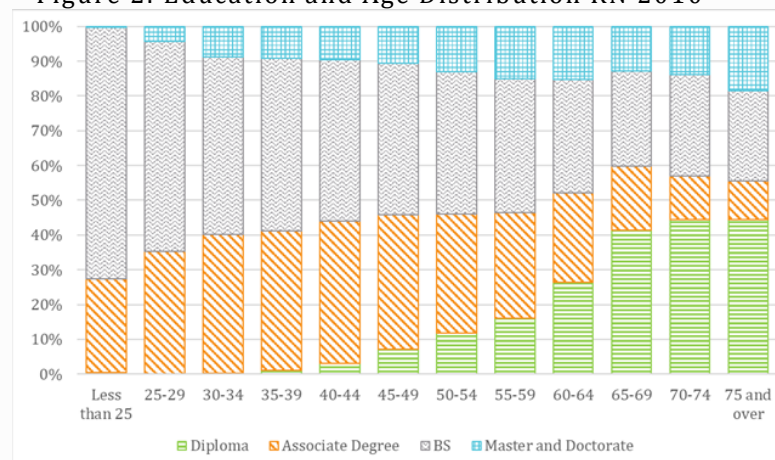
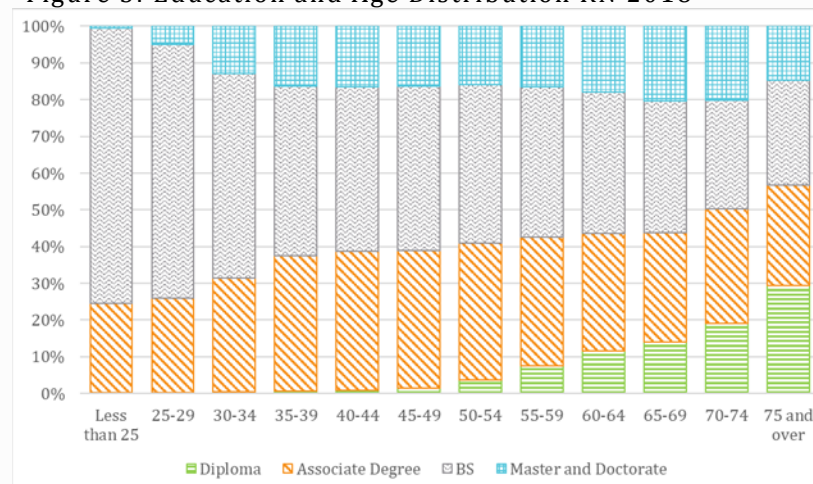


Figure 3: Education and Age Distribution RN 2018



5. MODELING RESULTS

The method used for projecting demand remained the same as the original model from 2011. Given the faster than anticipated growth of the RN workforce, the supply model was reviewed.

The method used for projecting demand remained the same as the original model from 2011. The Base Demand Model relies on two data elements: 1) nurse staffing intensity and 2) health care usage by employment setting by age. Both elements are

held constant, which means aging population and overall population growth are the only driving forces for the Base Demand Model. The Demand projections incorporate patient demographic data and staffing patterns by setting. The projections show growing demand, which is consistent with previous versions of the model and HRSA forecasting results of 2017⁷. A more detailed description of the Base model method and assumptions is provided in “Wisconsin Registered Nurse Supply and Demand Forecasting Model: Technical Report” (Walsh et al., 2011).

Given the faster than anticipated growth of the RN workforce, the supply model was reviewed. This update provides supply projections using the original model from 2011 and two basic regression models using the historical RN survey data collected since 2010.

Specifically, the three different models are:

- Demographically driven model (update of the previous versions of 2010, 2012 and 2014)
- Linear regression of RN workforce on year
- Linear regression of RN workforce on natural log of year (Logarithmic model)

5.1 Base Model: Demographically Driven

The demographically driven model works under the assumption that the nursing workforce will follow the age demographics of the entire population. This is essentially the "status quo" scenario and provides an outlook if population demographics were the only thing that changed going forward. The only data sources for the estimation in the base model are the most current survey, specifically the 2018 survey, and the most recent population projections produced by the Wisconsin Department of Administration. This model implicitly assumes that educational capacity for new RNs can remain at the current level.

Figure 4 and Table 1 show the forecasted supply and demand for RNs every 5 years, starting at 2020. The base model

projects flat supply and rapidly increasing demand. The estimated gap would be 32% by 2040.

Figure 4: RN Supply and Demand Projections: Base Model

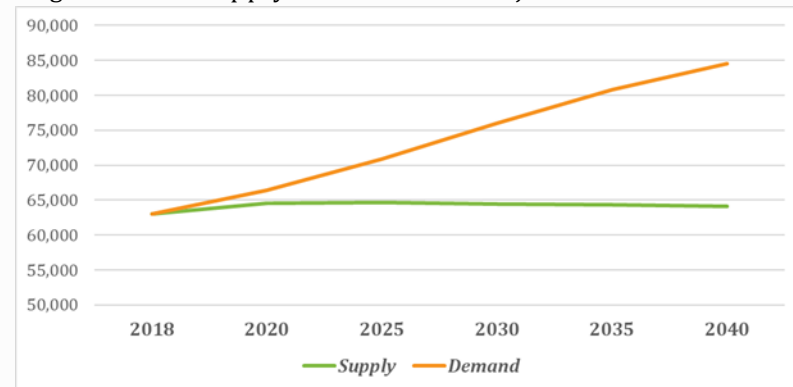


Table 1: RN Supply and Demand Projections: Base Model

	2018	2020	2025	2030	2035	2040
Supply	63,100	64,500	64,700	64,500	64,400	64,100
Demand	63,100	66,400	70,900	76,000	80,900	84,500
Gap	0	-1,800	-6,300	-11,600	-16,500	-20,400
% Gap	0%	-3%	-10%	-18%	-26%	-32%

5.2 Linear Regression

Ordinary Least Squares regression (OLS) is more commonly called linear regression. The supply for RN is estimated using the given linear regression formula.

$$Y_t = \alpha + \beta t + \varepsilon_t$$

Where:

Y_t : is the value of RN Workforce (the dependent variable) at time t ;

α : is the intercept at the vertical axis;

β : the trend coefficient;

ε : error term;

t : time (the independent variable): $t = 2010 \dots 2018$

The supply linear regression model assumes growth of RN's will follow the same trend that has been observed since 2018 and continue to grow at the same rate. The fundamental difference between the base model and the regressions is that in the last two cases (linear and logarithmic) we use

historical data from all the available licensure surveys since 2010.

Figure 5 and Table 2 show the supply forecast using linear regression and the base model demand for RNs every 5 years, starting at 2020. The results of this model largely match the supply and demand modeling provided by HRSA (2017). If supply continues to grow at a linear rate, supply will come close to keeping up with demand. Past trends show that this model is statistically a strong fit. However, this model is likely optimistic given the demographic pressures that will constrain supply growth. The estimated gap would be 5% by 2040.

Figure 5: RN Supply and Demand Projections: Linear Regression

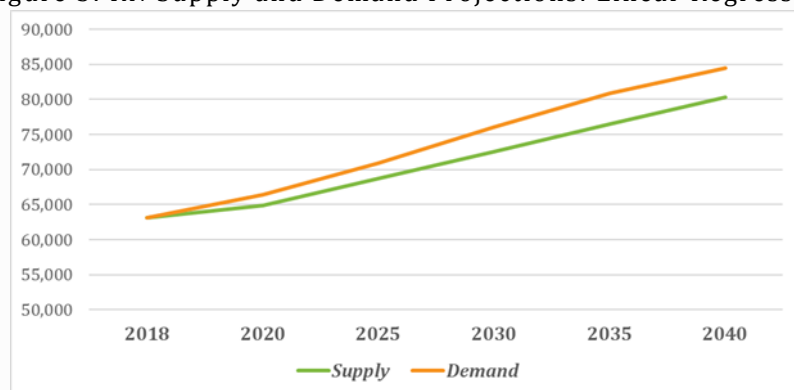


Table 2: RN Supply and Demand Projections: Linear Regression

	2018	2020	2025	2030	2035	2040
Supply	63,100	64,900	68,600	72,600	76,400	80,300
Demand	63,100	66,400	70,900	76,000	80,900	84,500
Gap	0	-1,500	-2,300	-3,500	-4,400	-4,200
% Gap	0%	-2%	-3%	-5%	-6%	-5%

5.3 Logarithmic Regression

The supply for RN using the logarithmic regression is estimated using the following equation:

$$Y_t = \alpha + \beta \ln(t) + \varepsilon_t$$

Where:

Y_t : is the value of RN Workforce (the dependent variable) at time t ;

α : is the intercept at the vertical axis;

β : the trend coefficient;

ε : error term;

$\ln(t)$: Natural log of time (the independent variable):

$t = 2010 \dots 2018$

The logarithmic regression uses historical data from the RN survey to project supply going forward. It assumes continued growth but at a decreasing rate.

Figure 6 and Table 3 show the supply forecast using logarithmic regression and the base model demand for RNs every 5 years, starting at 2020. This model is both a statistically strong fit and intuitively fits with demographic pressures facing the workforce. This model projects a substantial but less drastic shortage than the original demographically driven model. The estimated gap would be 25% by 2040.

Figure 6: RN Supply and Demand Projections: Logarithmic Regression

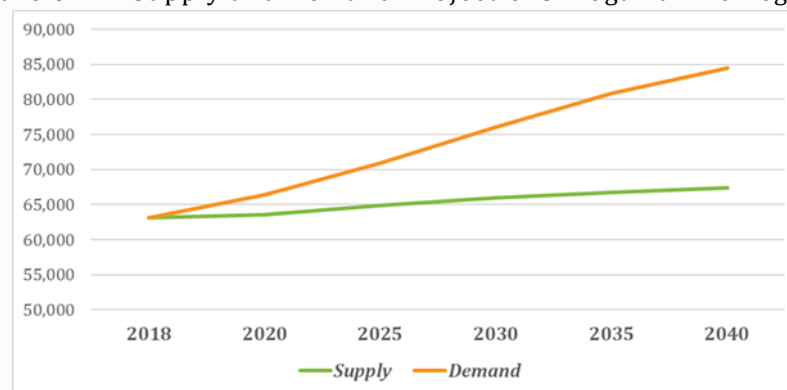


Table 3: RN Supply and Demand Projections: Logarithmic

	2018	2020	2025	2030	2035	2040
Supply	63,100	63,500	64,800	65,900	66,700	67,400
Demand	63,100	66,400	70,900	76,000	80,900	84,500
Gap	0	-2,800	-6,100	-10,100	-14,100	-17,100
% Gap	0%	-4%	-9%	-15%	-21%	-25%

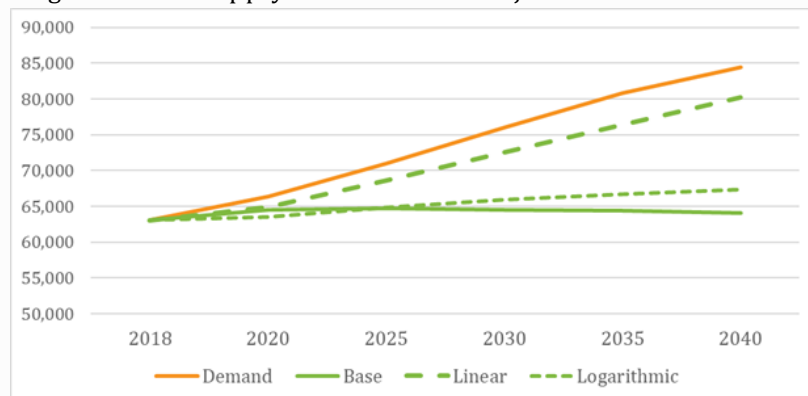
6. Interpretation and Final Discussion

The three supply models paint different pictures (See Figure 7). The demographically driven base model provides a good "status quo" scenario if nothing changes going forward. However, actual growth has exceeded demographic growth over the decade, and it is reasonable to think that will continue.

The linear growth model shows that supply would roughly keep up with demand if the current growth rate continued. Achieving this growth has taken a great deal of effort. Higher education systems, organizations like the Wisconsin Center for Nursing, and other groups have largely focused on creating interest in the occupation and expanding educational capacity. Maintaining this supply growth will be more difficult as the population gets older. A more limited total labor supply will likely make it more difficult to find new nurses since increased competition can be expected to draw students to other professions. Also, it will be difficult to find instructors as qualified RNs will be drawn to other positions in nursing

It is more likely that RN supply growth will begin to flatten and resemble the logarithmic regression model. A logarithmic model projects continued growth but at a decreasing rate. It accounts for faster than expected growth rates that have been achieved while also fitting with the intuition of what to expect with an aging population.

Figure 7: RN Supply and Demand Projections: All Models



Forecasts provide guidance on what to expect going forward. Collaboration among a variety of subject matter experts is needed to provide context to the results and use them to help make the best decisions for the health care workforce.

Maintaining a strong RN workforce will require continued and expanded efforts around workforce planning. Key points to consider going forward include:

Avoid complacency. A focus on the challenges facing the RN workforce and comprehensive strategies have helped to maintain an equilibrium. These challenges will be more pressing going forward.

Maintain a strong educational structure. This includes having enough qualified instructors to teach and getting into the classroom. Additionally, an aging population will lead to an increasing need for geriatric care. Post-secondary programs need to make sure the curriculum adapts to needs. This should also include assessing clinical placements to make sure nurses are being trained and gaining exposure to high need settings.

Take a wholistic view of the health care workforce. Decisions regarding one health care profession will affect other professions. The overall impact needs to be reviewed to find the balance that is best for the system as a whole.

Address varying needs within the state. Forecasts focus on the state of Wisconsin as a whole. Varying need substate geographies should also receive attention. Local shortages are in danger of increasing in severity as demand for health care increases.

Focus on demand as well as supply. Much of the policy and interventions to this point has been place on supply. There is a need to place more focus on demand. This could include strategies for lowering the need for health services or ways of leveraging technology to help the health care workforce expand its reach.

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NOTES

¹<https://www.theatlantic.com/business/archive/2018/01/health-care-america-jobs/550079/>

²Bureau of Labor Statistics, U.S. Department of Labor, The Economics Daily, Registered nurses have highest employment in healthcare occupations; anesthesiologists earn the most on the Internet at <https://www.bls.gov/opub/ted/2015/registered-nurses-have-highest-employment-in-healthcare-occupations-anesthesiologists-earn-the-most.htm> (visited March 10, 2020).

³What is behind HRSA's projected supply demand and shortage of nurses. <http://www.ohiocenterfornursing.org/PDFS/nursingworkforce/HRSAbehindshortage.pdf>

⁴Wisconsin State Statute 106.30: <https://docs.legis.wisconsin.gov/statutes/statutes/106/II/30>

⁵https://doa.wi.gov/Pages/LocalGovtsGrants/Population_Projections.aspx

⁶<https://www.nap.edu/catalog/12956/the-future-of-nursing-leading-change-advancing-health>

⁷https://bhw.hrsa.gov/sites/default/files/bhw/nchwa/projections/NCHWA_HRSA_Nursing_Report.pdf

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