Florida Nurse Workforce Projections: 2019 to 2035

Prepared for the Florida Hospital Association and the Safety Net Hospital Alliance of Florida

27 July 2021

Will Iacobucci
Senior Consultant

Tim Dall
Executive Director

Ritashree Chakrabarti, PhD
Senior Consultant

Ryan Reynolds
Senior Consultant

Kari Jones, PhD
Associate Director

Contents

Exhibits

Executive Summary

To support workforce planning efforts and help ensure an adequate supply of nurses in the future, The Florida Hospital Association and the Safety Net Hospital Alliance of Florida engaged IHS Markit to develop projections of future supply and demand for registered nurses (RNs), licensed practical nurses (LPNs), advanced practices nurses (APRNs), and physicians in the state. This report presents findings on the RN and LPN workforces; a companion report presents findings on the physician and APRN workforces. Projected nurse supply is compared to projected demand to determine base year (2019) and projected future adequacy of nurse supply through 2035.

Nurse workforce projections were generated using simulation models also used by the federal government and other states, using Florida-specific data and assumptions where available. Data on healthcare use and delivery patterns, and data on nurse workforce participation patterns were collected prior to the COVID-19 pandemic. Focus groups with nurses working in Florida and a literature review were conducted to provide insights into how COVID-19 might affect long-term supply and demand for nurses.

Nurse supply and demand are expressed as full-time equivalents (FTEs), unless otherwise noted, with an FTE defined as the estimated average hours worked by nurses working at least 8 hours per week. This equates to 37.8 hours/week for RNs and 38.1 hours/week for LPNs. The number of nurses licensed to work in Florida is substantially higher than FTE supply estimates, as some licensed nurses choose not to work or choose to work part time. Key findings from the study include:

- Estimated 2019 nurse supply was 234,800 RNs and 45,400 LPNs. Between 2019 and 2035, supply is projected to increase by 50,700 (22%) RNs and 4,000 (9%) LPNs.

- Nurse demand was estimated by applying national patterns of care use and delivery to the resident population in Florida and adjusting for the large number of visitors to the state. Between 2019 and 2035, demand is projected to increase by 76,600 (31%) RNs and 20,200 (40%) FTEs) LPNs. This growth is driven in part by projected population growth of 21%. Population aging also increases demand for nurses, with the population ages 65-74 projected to increase by 32% and the population ages 75 and older projected to increase by 74% over the projection period.

- In 2019, nurse supply was approximately 11,500 RNs lower than demand (5% shortfall) and 5,600 LPNs lower than demand (11% shortfall). If current trends continue, by 2035 there is a projected shortfall of 37,400 RNs and 21,700 LPNs. That is, in 2035, projected supply will be sufficient to meet 88% of projected demand for RNs and 70% of projected demand for LPNs.

- Alternative supply and demand scenarios were modeled to provide sensitivity analysis for estimates and assumptions regarding nurse workforce participation and what-if analysis regarding healthcare use patterns. These modeled scenarios did not materially change the projected 2035 nursing shortfall. A hypothetical scenario addressing health care utilization equity modeled the implications if there were reduced barriers to care for populations that traditionally have faced such barriers (uninsured, residing in non-metropolitan areas, and racial and ethnic minority populations). If barriers to accessing healthcare services could be reduced, demand for nurses would rise and by 2035 there would be a shortfall of approximately 65,400 RNs and 26,300 LPNs.

- There is considerable variation in projected nurse supply adequacy across the different regions within Florida. The plurality of Florida regions were estimated to have a base year (2019) and projected 2035 shortfall of both RNs and LPNs; several of the major population centers are projected to experience an adequate supply of RNs but a shortfall of LPNs, while some smaller areas projected to experience an adequate supply of LPNs but a shortfall of RNs.

To address projected shortages by year 2035, an additional 2,300 RNs and 1,700 LPNs would need to enter the workforce each year. Ensuring an adequate supply of nurses to meet current and future needs for Florida requires actions in several areas: nurse education, recruitment and retention, nurse scope of practice, geographic distribution, and data collection. Nine action items which can assist with reversing this projected shortage have been identified and are summarized below.

Nurse Education

- ***Action item 1:*** Increase availability of clinical sites for nurse training.
- ***Action item 2:*** Increase supply of qualified faculty and campus resources for nursing programs.
- ***Action item 3:*** Undertake a study to understand why some nursing programs have low NCEX pass rates and identify strategies and resources required to improve the state's overall NCLEX pass rates.
- ***Action item 4:*** Facilitate opportunities for nurses to enhance their education, including LPNs working towards a career as a RN, nurse-to-BSN programs, and RNs working towards a career as an APRN.

Recruitment and Retention of Nurses to Work in Florida

- ***Action item 5:*** Undertake a study to understand why nurses move to or leave Florida, and create innovative solutions to increase retention and improve recruitment from other states. (See Action item 9).
- ***Action item 6:*** Undertake a study to understand why Florida nurses have left the workforce or have chosen to work part time, and identify strategies to increase labor force participation rates. (See Action item 9).

Scope of Practice

- ***Action item 7:*** Implement policies and practices where all members of the healthcare team can practice at the highest level their license, education and training allows.

Geographic Distribution

- ***Action item 8:*** Focus expansion of nurse training programs in underserved communities, including options for training nurses in non-metropolitan areas.

Data Collection

- ***Action item 9:*** Implement a survey for nurses, like that implemented for physicians, at time of nurse license renewal.

Introduction

Nurses are at the forefront of patient care, and collectively comprise the largest healthcare occupation. To support workforce planning efforts and help ensure an adequate supply of nurses in the future, The Florida Hospital Association and the Safety Net Hospital Alliance of Florida engaged IHS Markit to develop projections of future supply and demand for registered nurses (RNs), licensed practical nurses (LPNs), advanced practices nurses (APRNs), and physicians in the state. This report presents findings on the RN and LPN workforces; a companion report presents findings on the physician and APRN workforces. Projected nurse supply is compared to projected demand to determine base year (2019) and projected future adequacy of nurse supply through 2035.

In 2019, there were an estimated 294,300 registered nurses (RNs) and 62,600 licensed practical nurses (LPNs) with an active license in Florida, though many of these nurses were not active in the workforce or working part time. Between 2019 and 2035, the period covered by this study, Florida's population is projected to increase by 21% with the population age 65 and older projected to increase by 51%.[1] Population growth and aging will increase demand for nurses.

An adequate supply of nurses is essential to providing high-quality patient care, and is also key to helping achieve health equity.[2] A 2017 report by the Florida Center for Nursing projected a full time equivalent (FTE) shortfall of 50,300 RNs and 12,500 LPNs by 2025 due to an aging nurse workforce, increased demand for nurses from the Affordable Care Act, and a growing and aging population.[3] This 2017 report identified trends with implications for Florida's nursing workforce, and along with the Florida Nurses Association articulated a strategy to balance the future demand and supply for RNs by addressing limitations in education and workforce policies.[4,5]

These concerns about a shortfall of nurses pre-dated the COVID-19 pandemic, and news reports and anecdotes from focus groups with nurses highlights how disruptive COVID-19 was to the nurse workforce and which has exacerbated the nursing shortage in Florida during the pandemic.[6–8] Many healthcare workers, including nurses, with risk factors for severe COVID-19 retired early from their occupation due to health concerns for themselves or family members. Some healthcare workers died. Some nurses were shifted from care settings where they had experience (e.g., pediatric units, surgical units) to settings facing surging demand (e.g., intensive care units). Nurse burnout rates surged due to long hours worked and stressful work environments.[9,10] Demand for nursing services changed, with some care delayed or cancelled while demand for other care surged.

The data used for modeling nurse supply and demand were collected pre-COVID-19. This includes data on nurse labor force participation patterns, population health characteristics and care utilization patterns, and nurse staffing patterns. Much of the disruption from COVID-19 on the healthcare system and nursing workforce is expected to be short-term, although, as the pandemic is ongoing, the long-term impacts of COVID-19 on the nursing workforce are still unfolding. In any case, COVID-19 underscored the importance of nurses in patient care and also brought to light many of the challenges faced by healthcare provider organizations and health workers to ensure access to high-quality care.

In recognition of the challenges facing Florida to ensure an adequate supply of nurses, the Florida Hospital Association commissioned IHS Markit to conduct a study on the current and projected future demand and supply of RNs and LPNs in the state. The workforce projections were generated using the same simulation models employed by the federal government and other states to model health workforce supply and demand, using Florida-specific data and assumptions.[11–15] The modeling work was supplemented with focus groups of nurses representing the diversity of nurses working in metropolitan and non-metropolitan hospitals across Florida.

The nurse workforce analyzed for this study excludes RNs who are licensed as an advanced practice registered nurse (APRN). Instead, these APRNs are modeled in a companion report, sponsored by the Safety Net Hospital Alliance of Florida, covering the physician and APRN workforces.

In the remainder of this report we first highlight study findings on the current and future projected adequacy of nurse supply in Florida from 2019 through 2035. Then, we summarize the modeling approach and findings pertaining to, respectively, nurse demand and nurse supply. The next section discusses geographic variation in nurse supply and demand by metropolitan and micropolitan statistical area. A discussion section summarizes key findings, recommendations, and study limitations. Throughout this report, charts depict projected nurse supply, demand, and adequacy over time. An appendix provides tables that contain numbers shown in the charts.

Projected Adequacy of Nurse Supply

This section presents statewide comparisons of supply and demand for RNs and LPNs starting with 2019, the latest year for which many supply and demand modeling inputs are available, and projected through 2035. Demand is projected by extrapolating national care use and delivery patterns to the population in Florida, adjusting for demographics, prevalence of disease, prevalence of health risk factors, and insurance coverage rates among the resident population. The demand projections also adjust for the large number of tourists and snowbirds who visit Florida each year and contribute to the state's provision of services to out-of-state patients. Demand for nurses is determined by demand for healthcare services and nurse staffing patterns that provider organizations employ to meet the projected demand for services.

Within this report, a nurse *shortfall*, or *shortage*, is defined as nurse demand exceeding nurse supply, and a nurse *surplus* occurs when nurse supply exceeds nurse demand. All supply and demand projections are reported as FTEs, unless otherwise indicated, with FTE defined as 37.8 hours/week for RNs and 38.1 hours/week for LPNs. These hours/week estimates reflects our calculations (discussed later) of average hours worked by nurses in Florida among nurses working at least 8 hours per week. In addition, the terms *adequacy* and *adequacy of supply* are also used to describe whether or not the nurse supply is sufficient to meet demand. Adequacy is calculated as supply divided by demand, and the resulting percentage can be interpreted as the percentage of projected demand that can be met with the projected supply.

When comparing supply and demand for nurses in Florida, it is important to consider the following factors:

- **Shortfall or surplus severity.** Given that forecasted demand and supply are modeled with some degree of imprecision, if supply is within ±5% of demand then one might conclude that the labor market is in equilibrium. This amount of deviation may potentially arise, for example, due to the forecast model not accounting for local or regional considerations related to provider productivity within Florida. Furthermore, this level of deviation is within the range of forecast error for the type of model used to generate the projections discussed in this report.

- **Geographic imbalances in statewide supply and demand.** While Florida supply adequacy results may show a statewide shortfall of nurses, there is substantial geographic variation in supply adequacy within the state. Supply and demand were modeled at the county level, but aggregated to metropolitan and micropolitan statistical areas for reporting purposes. These region-level projections are discussed in a later section. Demand is calculated as where patients reside, and for specialized care patients might need to travel to a county (or region) different from where they reside.

- **Substitution between RNs and LPNs.** In areas facing a shortage of RNs, providers may be inclined to employ LPNs to help address staffing needs. While adequacy of RN supply and LPN supply is projected separately, considering nurse adequacy projections for both professions provides a more complete understanding of nurse adequacy in the state.

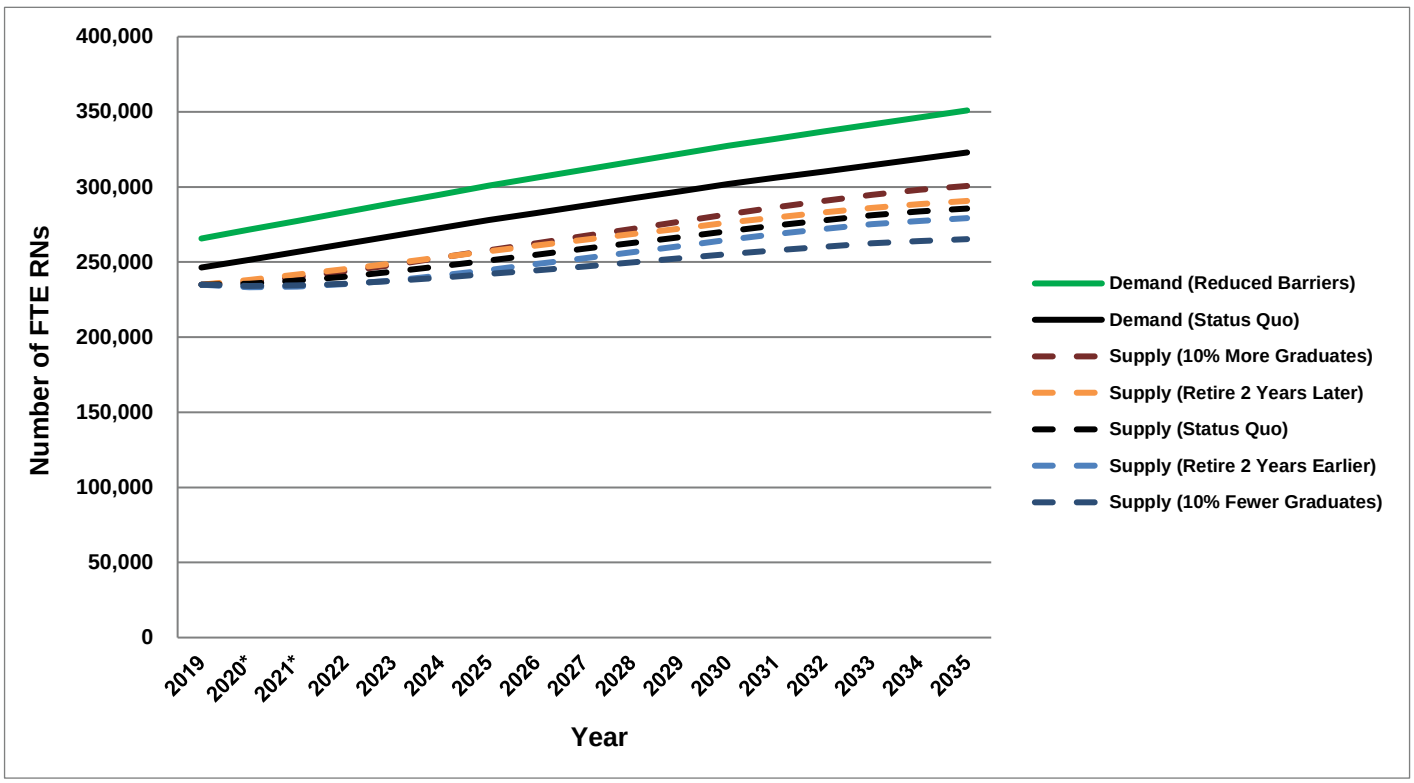
- **Productivity differences between newly trained and experienced nurses.** Nurse experience is yet another complicating factor when considering adequacy of nurse supply, given the potential productivity differences between experienced nurses and those who have recently entered the workforce. Overall supply adequacy can mask shortfalls in key areas that require certain experience—such as nursing in intensive care units.

Across all supply and demand scenarios modeled, demand for RNs is projected to exceed RN supply throughout the projection period (Exhibit 1). As discussed in later sections, we modeled two demand scenarios and five supply scenarios. The *Status Quo* demand scenario models the continuation of baseline national patterns of care use and delivery, adapted to Florida's population and projected demographics. The *Reduced Barriers* scenario models projected demand for RNs under a hypothetical scenario if people living in non-metropolitan areas had the same access to care as their peers in metropolitan areas, if people without medical insurance had the same access to care as their peers with medical insurance, and if minority populations had the same access to care as their peers who are non-Hispanic White. The Status Quo supply scenario models the continuation of annual baseline

numbers of new nurses being trained and nurse labor force participation patterns. Alternative supply scenarios model earlier or delayed retirement by two years, and training more or fewer annual nurse graduates by 10%.

Comparing the Status Quo supply and demand scenarios, in 2019 there was an estimated RN shortage of approximately 11,500 RNs (5% shortfall). This shortfall is projected to increase to 37,400 (12% shortfall) by 2035. These results suggest that 2019 nurse supply is sufficient to meet 95% of statewide demand, with this percentage decreasing to 88% by 2035. If barriers to accessing care were reduced, then demand would shift higher by an estimated 28,100 RNs in 2035—indicating 65,400 additional RNs would be required to meet that higher demand for services relative to projected supply in 2035. The projections reflect expected supply and demand in the absence of the COVID-19 pandemic, which has caused as-yet unmeasured short-term disruptions in nurse supply and demand. However, we project that long-term impacts on nurse supply and demand will be small.

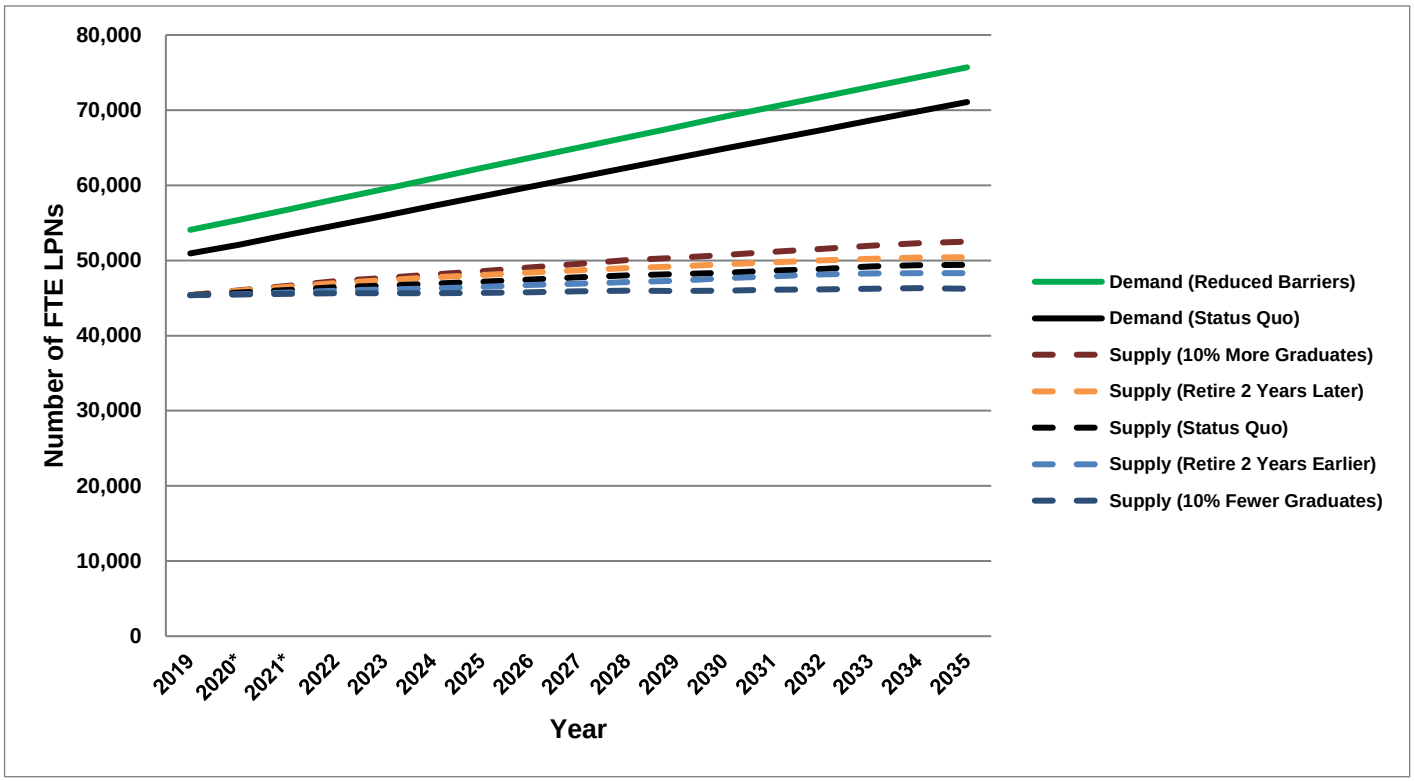
Exhibit 1. Projected Florida Registered Nurse Supply and Demand by Scenario, 2019 to 2035



Note: *The 2020 and 2021 projections reflect the projected supply and demand for nurses in the absence of the COVID-19 pandemic which has caused substantial short-term disruption to the healthcare system and the nurse workforce, but is projected to have minimal impact on long term supply and demand for nurses.

Estimated 2019 and projected future demand for LPNs exceeds projected supply under all the scenarios modeled (Exhibit 2). The Status Quo projections suggest an LPN shortfall of 5,600 (11%) in 2019, rising to 21,700 (31%) shortfall in 2035. These projections suggest that supply in 2019 was sufficient to meet approximately 89% of demand, but by 2035 the projected supply will be sufficient to meet only 70% of projected demand. Under the Reduced Barriers scenario, demand would shift higher by an additional 4,600 LPNs by 2035.

Exhibit 2. Projected Florida Licensed Practical Nurse Supply and Demand by Scenario, 2019 to 2035



Note: *The 2020 and 2021 projections reflect the projected supply and demand for nurses in the absence of the COVID-19 pandemic which has caused substantial short-term disruption to the healthcare system and the nurse workforce, but is projected to have minimal impact on long term supply and demand for nurses.

Projected Future Nurse Demand

Modeling Approach

Nurses work in many settings—including hospitals, ambulatory settings, long-term care settings, schools, public health departments, and various other patient care and non-patient care settings such as insurance companies and academia. To model current and future demand for nurses, we modeled where nurses are currently employed and the factors that will drive employment growth in each setting. The demand for nurses derives from the demand for the services that they provide. Consequently, the modeling approach first estimates demand for services.

This study estimates and projects *demand* in Florida for healthcare services and nurses, defined, respectively, as the amount and types of healthcare services patients are willing and able to purchase at prevailing prices and the number of nurses employers are willing and able to hire at prevailing salary levels. The concept of *demand* for services differs slightly from *need* for services, where need for services represents the services that patients would use based on solely clinical or epidemiological considerations combined with an assessment into the level of care that would be considered appropriate. In the base year (2019), at the national level there was little evidence of a national shortage of nurses—though there was evidence of both geographic imbalances between supply and demand and shortages of experienced nurses in some settings.

Demand for healthcare providers in this study is based on projected demand for healthcare services, accounting for patterns in healthcare delivery (e.g., nurse-to-patient ratios). A Healthcare Demand Microsimulation Model was used to estimate base year and projected future demand for healthcare services and providers in Florida. Florida's population demographics and health characteristics form the starting point for the demand estimates, and projections into the future are based on forecasted changes to Florida's population size and demographics. National patterns of healthcare use and delivery are used to estimate Florida's healthcare use, with some Florida-specific adjustments made to account for factors unique to the state (e.g., tourists and snowbirds who seek care in the state but are not residents). Estimates of healthcare demand are translated into the derived demand for nurses using observed ratios of nurses employed per service delivered or other indicator of demand.

The primary components of the Healthcare Demand Microsimulation Model include:

1. **Population Database.** The database contains information about the characteristics of the Florida population including information on demographics (age, sex, race/ethnicity), health conditions and health-related lifestyle indicators (arthritis, asthma, cardiovascular disease, diabetes, hypertension, history of heart attack, history of cancer, history of stroke, body weight status, and smoking status), socioeconomic factors and health insurance (household income, medical insurance status and type, in a managed care plan), and geographic location within Florida. The population database contains this information for each person in a representative sample of each county in the state. County-level construction of the population file allows projections of demand for healthcare services and providers to be done at the county-level and aggregated to region or statewide projections.

2. **Healthcare use prediction equations.** These equations are estimated from national data sources, and link the patient characteristics included in the population database to an individual's expected use of healthcare services. Applying these equations to the constructed population database produces projections of healthcare service demand for Florida's resident population (e.g., the number of office visits, number of expected hospitalizations and inpatient bed days), based on national patterns of healthcare use. Applying national utilization patterns to Florida's resident population resulted in a modest underprediction for inpatient and emergency department services compared to actual 2019 use of healthcare services in Florida. This under-predication likely reflects the large number of tourists and snowbirds who spend time in Florida and may use healthcare services while in the state. Multiplicative demand scalars were applied to adjust for this differential between predicted and actual use of healthcare services in 2019.

3. **Care delivery patterns.** Provider staffing patterns in Florida are assumed to be consistent with the national average level of staffing, in terms of the number of nurses required to provide a set amount of services by care delivery setting. For example, demand for nurses in the emergency department is calculated as the number of emergency visits estimated in Florida divided by the base year national ratio of emergency visits per nurses. These staffing ratios are calculated separately for RNs and LPNs and are applied analogously to estimate demand for nurses in the inpatient, outpatient, office, and home health settings. For residential care and nursing home settings, the factors expected to drive demand for nurses are the size of the population living in residential care facilities and nursing homes, respectively, while the age 6-17 population is assumed to drive demand for nurses in schools, and the total Florida population is assumed to drive demand for nurses in the public health and all other settings. The staffing ratios for these settings are calculated by dividing national estimates of the demand driver by national estimates of FTE nurses working in the setting. Staffing ratios are modeled as remaining constant throughout the modeling period.

4. **Projections of population growth, aging, and demographic shifts**. Population projections accounting for future changes to population size by age, sex, race/ethnicity, and Florida county were obtained from the University of Florida Bureau of Economic and Business Research.[1] These projections are used to project estimated Florida healthcare use into the future.

Additional information about modeling methods are detailed in the model's technical documentation which is available elsewhere.[16,17]

The demand projections discussed in this report are modeled under a Status Quo scenario, which assumes future continuation of base year healthcare use and delivery patterns; thus, projected changes over time reflect projected changes to the size and demographics of Florida's population. An alternative scenario, the Reduced Barriers scenario builds upon the Status Quo modeling assumptions that changes over time are associated with changing demographics but includes alternative assumptions around the population's use of healthcare services, described below.

The Reduced Barriers scenario is intended to reflect the growing national and statewide emphasis on achieving health equity, a goal that has recently been emphasized further given the disparities associated with COVID-19 outcomes. While efforts to reduce health disparities are complex and require multifaceted solutions, improving access to care is likely one core element that can help address the issue. To explore the potential nurse workforce implications from increasing access to care, the Reduced Barriers scenario assumes that historically underserved populations would have healthcare use patterns similar to populations not generally considered underserved, controlling for personal factors like disease prevalence and other personal characteristics. For the purposes of this scenario, historically underserved populations are defined as individuals who are 1) uninsured; 2) living in a non-metropolitan area; or 3) a racial/ethnic minority. These individuals are modeled as having healthcare use patterns similar to populations not historically considered underserved, defined as individuals who are 1) insured; 2) living in a metropolitan area; and 3) non-Hispanic White. It is important to note, however, that in reality some individuals considered underserved (or not underserved) for the purposes of this scenario do not face significant barriers (or do face significant barriers). Similarly, it is not clear that insured, non-Hispanic White individuals living in metropolitan areas, the group assumed to not be facing significant access barriers, use healthcare services at a level that is considered "appropriate" (i.e. this group may still overuse or underuse particular services compared to the services that are actually needed). Despite these limitations, this scenario can improve understanding of the potential workforce effects of reducing barriers in access to care.

Population Growth and Aging and Projected Demand for Healthcare Services

Population growth and changing demographics are likely to be key drivers of future demand for healthcare services in Florida. The aging effect in particular will have an outsized impact on future demand for services, as the oldest population cohorts generally use services at a higher rate than those in younger age groups. While

demand for nurses in this report has been modeled for both the Status Quo and Reduced Barriers scenarios, both scenarios assume the same projected population changes over time, though the Reduced Barriers scenario applies assumed changes to population healthcare use patterns.

Projected 2019-2035 population growth in Florida is 21%, which represents a net increase of approximately 4.5 million residents in the state (Exhibit 3). There is considerable variation in population growth rates by age group. Younger age groups are projected to grow at a rate below the state average with the under age 18, age 18 to 44, and age 45-64 populations projected to grow by 18%, 17%, and 5%, respectively. Older age groups are growing at a rate above the state average, with the population age 65 to 74 and the population age 75 and older projected to grow by 32% and 74%, respectively. Such a split suggests that while demand for most healthcare services are likely to grow due to the increasing size of the population, growth in care settings that disproportionately serve older patients (e.g., nursing homes and residential care facilities) will grow at a faster rate than other settings.

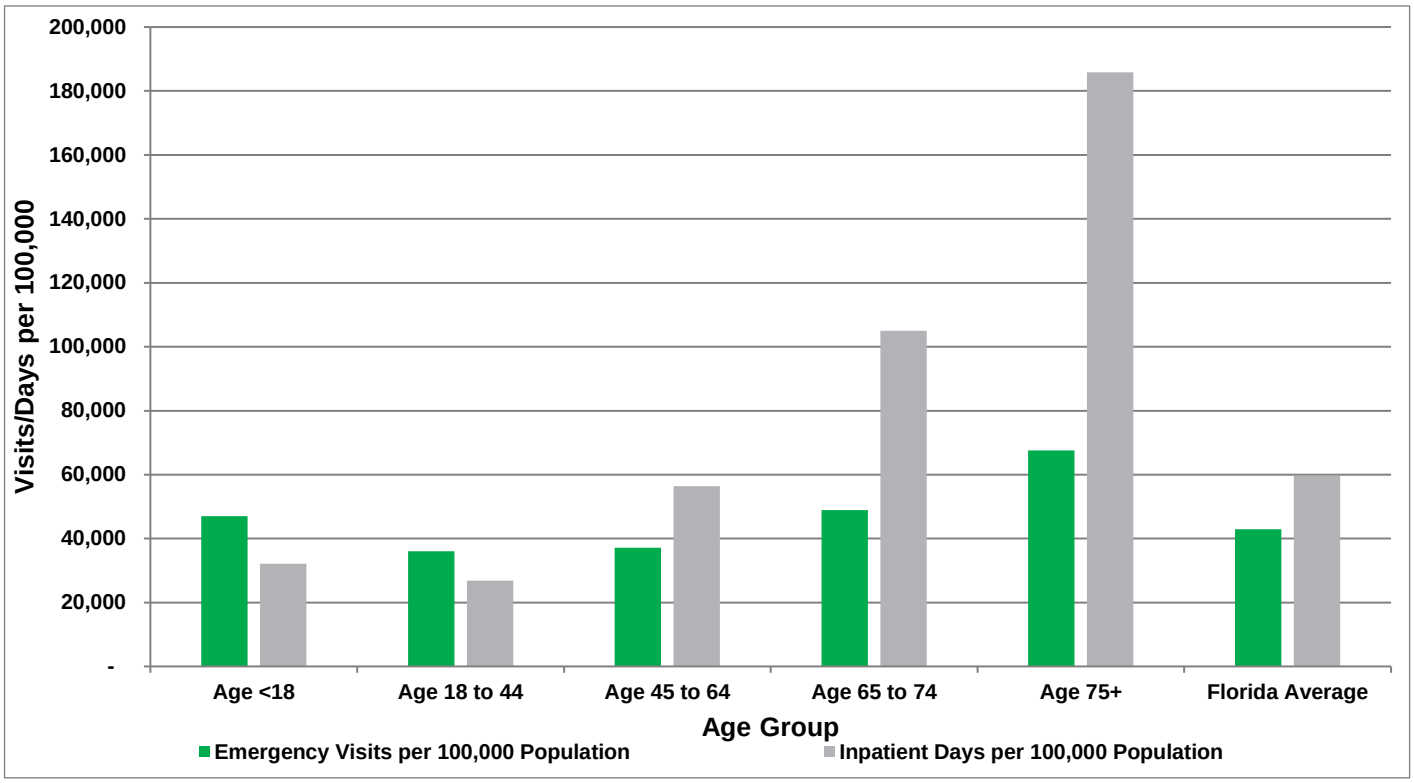
Exhibit 3. Florida's Projected Population Growth by Age Group, 2019 to 2035

Age Group	2019 Population	2035 Population	Growth	% Growth
Age under 18	4,213,000	4,982,000	769,000	18%
Age 18 to 44	7,159,000	8,383,000	1,224,000	17%
Age 45 to 64	5,608,000	5,867,000	259,000	5%
Age 65 to 74	2,465,000	3,248,000	783,000	32%
Age 75+	2,032,000	3,540,000	1,508,000	74%
Florida Total	**21,477,000**	**26,020,000**	**4,543,000**	**21%**

Source: Projected population growth rates from the University of Florida Bureau of Economic and Business Research were applied to 2019 population estimates from the American Community Survey to calculate the size of the future population.

The summary of Florida emergency visits and bed days per 100,000 population in Exhibit 4 illustrates the relationship between population aging and demand for services. Individuals age 75 and older use both emergency department and inpatient services at rates higher than all other age groups. Compared with a Florida average utilization per 100,000 population average of 43,000 emergency visits and 60,000 bed days, utilization within the age 65-74 cohort is 14% and 76% higher than the Florida average emergency department and inpatient utilization, respectively, while utilization within the 75 and older cohort is 57% and 212% higher for the respective settings. Thus, as the aging effect of the projected changes to the Florida population takes hold, it is likely to result in significant increases in demand for healthcare services (and consequently for nurses), in particular in care settings used disproportionately by older age groups.

Exhibit 4. Florida Emergency Visits and Hospital Bed Days per 100,000 Population by Age Group, 2019

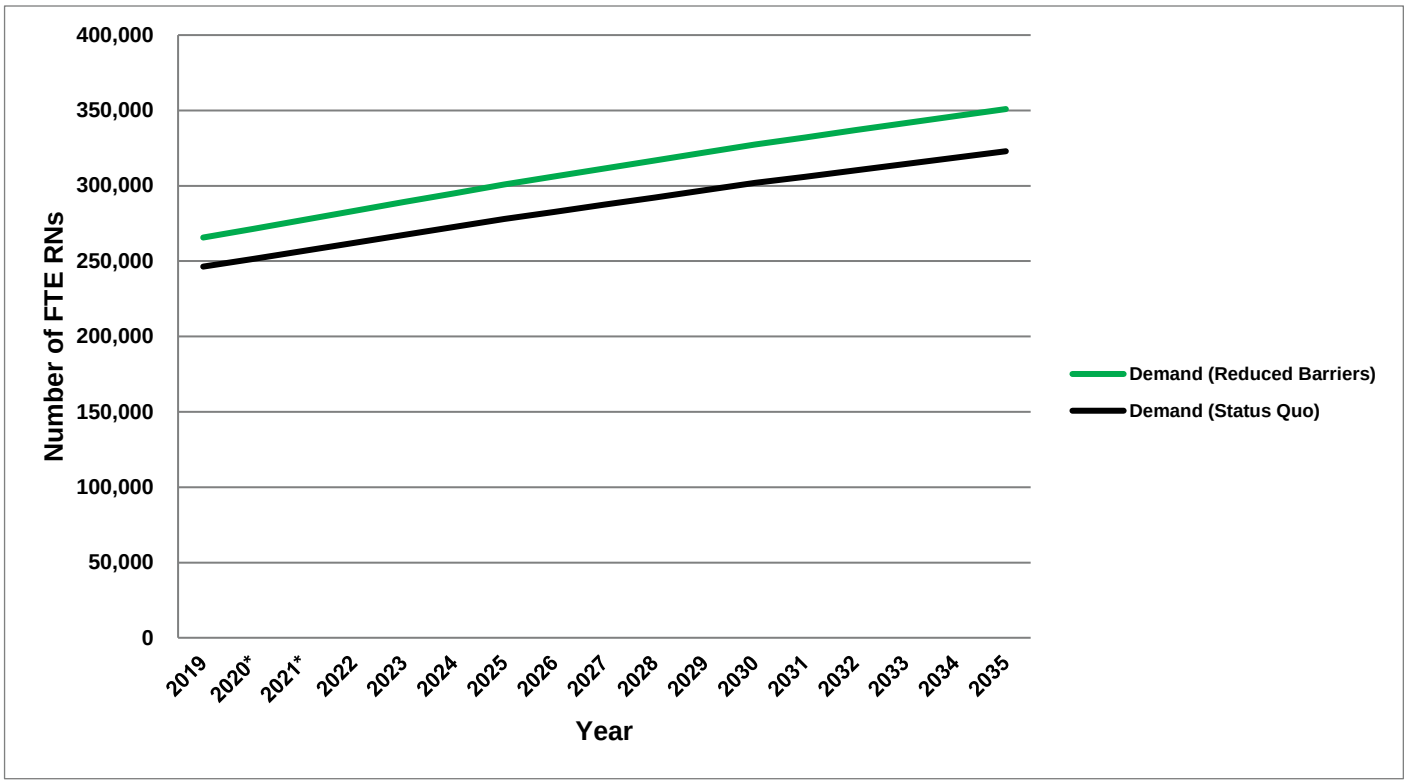


Source: Inpatient and Emergency Department Data: 2019 Florida Agency For Health Care Administration emergency department and hospital discharge data; Population Data: University of Florida Bureau of Economic and Business Research.
Note: Cited 2019 bed days exclude hospitalizations in psychiatric hospitals, intermediate residential treatment facilities, long term care hospitals, and rehabilitation hospitals.

Projected Demand for Nurses

Based on the data sources and methods described above, in 2019, estimated demand for RNs was approximately 246,000 FTEs statewide (Exhibit 5). Projected RN demand approaches 323,000 by 2035, which represents a projected growth of 31% over the modeling period. The rapidly increasing demand for RNs is primarily driven by the significant projected increase in the size of Florida's population, particularly the projected growth in the eldest population age groups. Reduced Barriers scenario results suggest that improved access would increase demand for RNs by an additional 19,400 FTEs (an increase of 8% compared to the status quo results) in 2019 and by 28,100 FTEs (an increase of 9% compared to status quo results) in 2035.

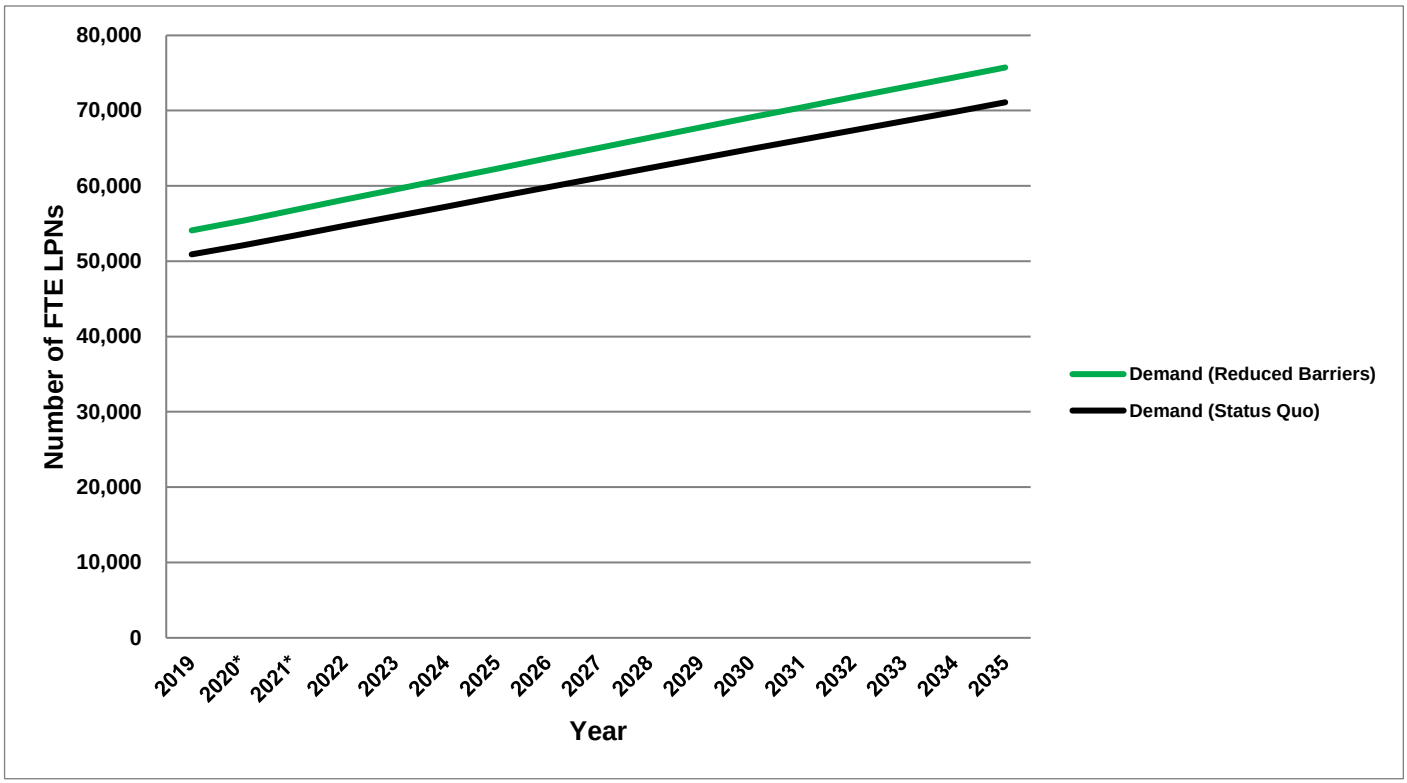
Exhibit 5. Projected Demand for Registered Nurses in Florida, 2019 to 2035



Note: *The 2020 and 2021 projections reflect the projected demand for nurses in the absence of the COVID-19 pandemic which has caused substantial short-term disruption to the healthcare system and the nurse workforce, but is projected to have minimal impact on long term demand for nurses.

Status Quo demand for LPNs is estimated to be approximately 51,000 FTEs in 2019 and is projected to increase to nearly 71,000 by 2035, a 40% increase over the projection period (Exhibit 6). The finding that LPN demand is projected to grow at a rate faster than the 31% estimated growth in RN demand aligned with the population projections showing fastest projected growth in the oldest age groups, given that LPNs tend to work in care settings disproportionally used by patients in these eldest groups. Achieving the goal of reducing barriers to accessing care would increase demand for LPNs by an additional 3,200 FTEs (6%) in 2019 and by 4,600 FTEs (6%) in 2035.

Exhibit 6. Projected Demand for Licensed Practical Nurses in Florida, 2019 to 2035



Note: *The 2020 and 2021 projections reflect the projected demand for nurses in the absence of the COVID-19 pandemic which has caused substantial short-term disruption to the healthcare system and the nurse workforce, but is projected to have minimal impact on long term demand for nurses.

Demand for nurses was also projected by employment setting, and these projections for both RNs and LPNs under the Status Quo scenario are summarized in Exhibit 7. The factors driving demand for both professions (office visits in the office setting, inpatient days in the inpatient setting, the projected size of the population living in nursing homes and residential care facilities, for nursing homes and residential care settings, etc.) across all settings are the same, and thus the relative projected nurse growth rate across settings are the same for both RNs and LPNs. Demand for nurses in academia is projected to remain constant over time, which is consistent with the supply modeling assumption (discussed later in this report) that the number of new nurse graduates will remain constant when projected into the future. The 2019-2035 projected nurse FTE growth rates in other settings range from 18% in school settings, due to the slower growth in the school-aged population, to 60% and 64% in the nursing home and residential care settings, respectively, reflecting the high projected population growth in the eldest age groups who use these services at above average rates. Over half (52%) of the projected growth in demand for RNs is expected to come from the hospital inpatient setting, for which demand is projected to increase by over 40,000 RNs. Nursing homes are the setting with the largest projected FTE growth for LPNs, accounting for 32% (7,302 FTEs) of the total LPN demand growth.

Exhibit 7. Projected Status Quo Demand for Registered Nurses and Licensed Practical Nurses in Florida, by Setting

Profession/Setting	2019 Demand	2035 Demand	Growth	% Growth
Registered Nurses				
Office	12,773	16,034	3,261	26%
Outpatient	29,651	36,228	6,577	22%
Emergency	13,872	17,270	3,399	25%
Inpatient	124,428	164,539	40,111	32%
Home Health	16,191	24,148	7,958	49%
Nursing Home	4,675	7,459	2,784	60%
Residential Care	8,802	14,426	5,624	64%
School	5,939	7,026	1,086	18%
Public Health	9,042	10,954	1,912	21%
Academia	2,430	2,430	0	0%
Other	18,501	22,414	3,913	21%
RN Total	**246,302**	**322,928**	**76,625**	**31%**
Licensed Practical Nurses				
Office	4,759	5,974	1,215	26%
Outpatient	3,750	4,582	832	22%
Emergency	-	-	-	-
Inpatient	14,233	18,821	4,588	32%
Home Health	5,797	8,646	2,849	49%
Nursing Home	12,262	19,564	7,302	60%
Residential Care	2,977	4,879	1,902	64%
School	456	540	83	18%
Public Health	678	822	143	21%
Academia	150	150	0	0%
Other	5,862	7,102	1,240	21%
LPN Total	**50,924**	**71,079**	**20,155**	**40%**

Source: IHS Markit

Exhibit 8 contains a detailed breakdown of the amount each individual Reduced Barriers scenario modeling assumption contributes to the scenario's total RN and LPN FTE impact. Insuring the uninsured would increase demand for RNs by approximately 3,100 FTEs and demand for LPNs by 500 FTEs. Assuming that those living in non-metropolitan areas in Florida have healthcare use patterns similar to those living in metropolitan areas would result in a demand increase of 130 FTE RNs and 30 FTE LPNs, while the assumption that minority populations have healthcare use patterns similar to non-minority populations would increase demand by 15,400 FTE RNs and 2,500 FTE LPNs. The sum of the effects of these individual assumptions do not equal the total Reduced Barriers impact due to unmodeled interactions between these assumptions, and the effect of these unmodeled interactions is reported in the table as the joint effect.

Exhibit 8. Reduced Barriers Scenario Impact by Assumption, 2019

Scenario	Registered Nurses	Licensed Practical Nurses
Demand (Status Quo)	**246,302**	**50,924**
Reduced Barriers: Insurance Alone	3,122	516
Reduced Barriers: Metropolitan Alone	127	33
Reduced Barriers: Race/Ethnicity Alone	15,365	2,500
Joint Effect*	808	125
Total Effect	**19,423**	**3,175**
Reduced Barriers	**265,725**	**54,099**

Notes: Jointly modelling expanded insurance coverage, reductions in barriers for those living in non-metropolitan areas, and reductions in barriers by race/ethnicity results in a different FTE impact than the sum of the impacts from modelling each assumption alone. The Joint Effect row of the table reflects the FTE magnitude of this difference.

Source: IHS Markit

Given that the demand scenarios presented, particularly for the Status Quo scenario, assume that 2019 healthcare use and delivery patterns are projected into the future, potential future shifts in care use and delivery may not be accounted for, especially any systematic shifts that may arise due to the COVID-19 pandemic. For example, if the pandemic has accelerated the trend of shifting hospital care from inpatient to outpatient settings, any staffing implications due to this acceleration would not be accounted for in these projections. Similarly, increased use of telemedicine services, more rigorous discharge planning and other changes to the way care is delivered due to the pandemic may not factor into these projections. In conversations with focus groups of Florida nurses, however, the general consensus among participants was that, while these adaptions may result in medium to long term changes in care delivery, they would have a neutral impact on demand for nurses.

Projected Future Nurse Supply

Modeling Approach

Modeling current and future supply of nurses starts with building a representative population of RNs and LPNs licensed and working in Florida, which constitute the baseline (2019) supply of RN and LPNs. Using simulation, during each subsequent year of modeling, nurses' age increases annually, weekly hours worked and retirement probabilities are calculated from the new age distribution, new entrants are added to the workforce, and in-state and out-of-state migration of nurses is applied. The data analyzed to inform assumptions regarding nurses' workforce decisions comes from a combination of Florida-specific and national data sources. Nurse licensure data maintained by the Florida Department of Health is the basis for the starting supply of nurses and nurses entering the workforce, while national sources, such as the National Sample Survey of Registered Nurses (NSSRN) and the American Community Survey (ACS), are used to fill in information about nurse workforce participation and career changes where Florida-specific data are not available.

The Florida nurse licensure data contains, for both RNs and LPNs, information regarding nurses' demographics, geographic work location, and whether they are recent entrants to the workforce. In 2019 there were approximately 294,300 RNs and 62,600 LPNs with an active license in Florida. Nurses are considered a part of the starting supply if their license is active, their work location is within Florida, and they are between ages 20 and 74. Nurses with both an active LPN and RN license were counted as RNs. We excluded from RN supply advanced practice registered nurses, as these nurses are modeled in a companion report, sponsored by the Safety Net Hospital Alliance of Florida, covering the physician and advanced practice nurse workforces.

Information about workforce participation and employment sector are unavailable in the licensure data. Therefore, we analyzed the 2018 NSSRN and 2019 ACS to estimate the probability of being employed in nursing for RNs and LPNs, respectively. Similarly, the survey responses from the 2018 NSSRN and the 2015-2019 ACS for Florida-based nurses were used to predict, respectively, RN and LPN weekly hours worked based on nurse age, sex, and race/ethnicity. The estimated base year Florida average weekly hours worked was 37.8 hours for RNs and 38.1 hours for LPNs, and these estimates form the basis for the calculation of a FTE nurse. That is, the simulation process tallies the weekly hours worked by Florida RNs and LPNs for each projection year and divides by 37.8 and 38.1, respectively, to estimate demand in terms of FTEs. Based on the above criteria and adjusting for hours worked patterns, FTE supply was approximately 234,800 RNs and 45,400 LPNs in 2019.

The number of new entrants to the nursing workforce was calculated by counting the number of new RN and LPN licenses (license issue date in the Florida licensure data in 2018 and 2019 divided by two for the annual 2018-2019 average). Given that some of the newly licensed nurses will not become active in the workforce, this number is then reduced based on the percentage of inactive nurses in the starting supply, 16% for RNs and 13% for LPNs. This results in 15,812 new RNs and 3,176 new LPNs added to the workforce each year, and this number is assumed to remain constant throughout the modeling period under the Status Quo scenario. Similarly, demographics of new RN and LPN entrants are assumed to be consistent with the demographics of newly licensed (licensed in 2010 or later) RNs and LPNs, respectively, and this demographic distribution is assumed to be constant when projecting into the future.

RN and LPN retirement patterns are derived from national survey responses from nurses in the 2018 NSSRN and 2015-2019 ACS, respectively, and probability of retiring is based on the age of the nurse. As the modeling process progresses from year to year, a nurse's probability of retiring will change based on his or her new age, and this probability generally increases with age. Included in this attrition process is the possibility that an LPN becomes an RN or an RN becomes an APRN. The number of new entrants to the RN workforce each year accounts for LPNs who become RNs.

Nurse migration probabilities are derived from 2015-2019 ACS data for both RNs and LPNs, and specifically account for the number of nurses leaving Florida each year. Based on Florida-specific ACS survey responses,

RNs have a 2.7% annual probability of leaving Florida, while LPNs have a 1.9% annual probability of leaving the state. In-migration is also accounted for in the model, but in-migrating nurses are tracked as new entrants to the Florida nurse workforce.

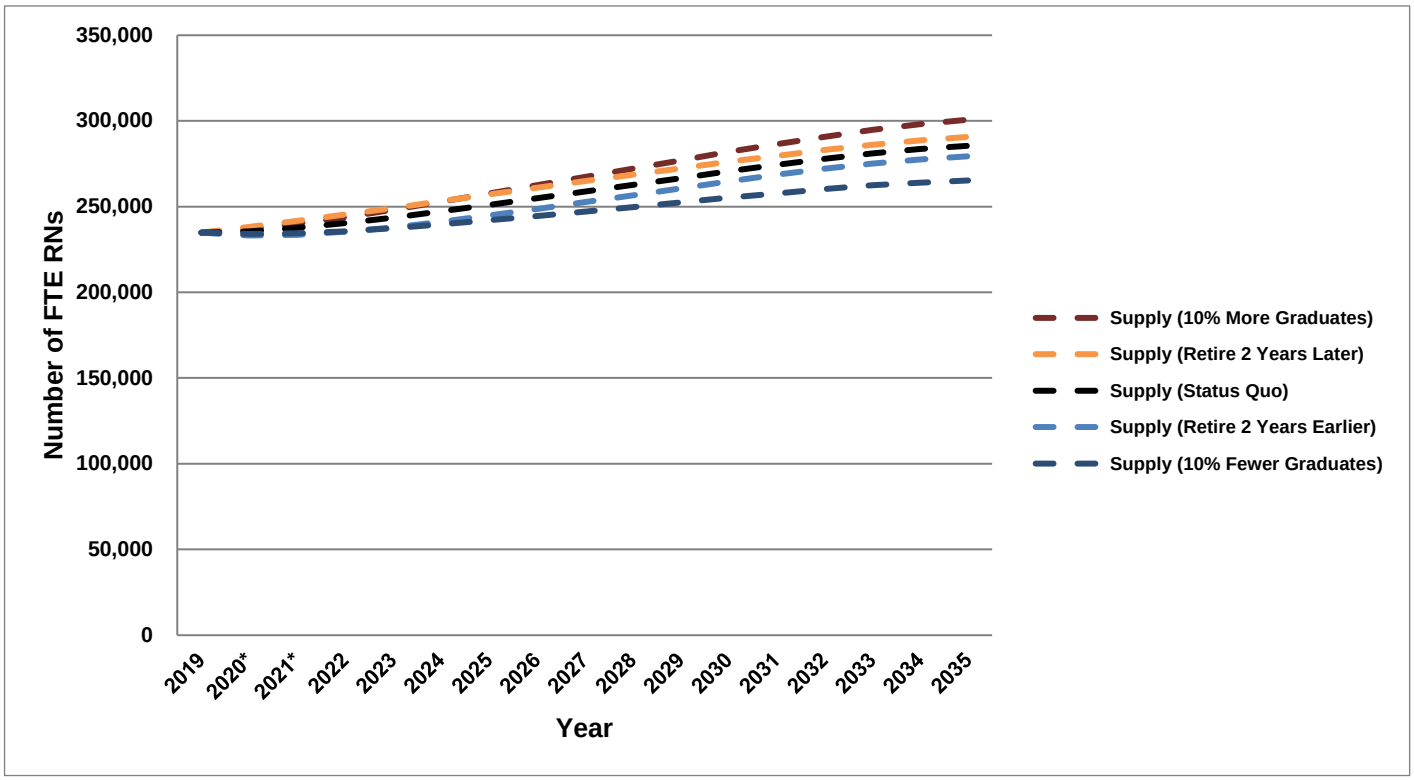
The supply modeling assumptions described above reflect the modeling assumptions for the Status Quo scenario. Several alternative scenarios were modeled, building on the Status Quo modeling assumptions, to account for uncertainties in future nurse workforce patterns. Two scenarios reflecting changing retirement patterns were modeled— one reflecting nurses retiring two years earlier than they do currently, and one reflecting nurses retiring two years later than they do currently. Such scenarios could reflect financial or health-related considerations or provider burnout influencing retirement decisions. Similarly, two scenarios were modeled which assume alternately a 10% increase and a 10% decrease in annual new graduates entering the workforce projected into the future. These scenarios could reflect, for example, increased efforts within the state to attract and recruit new nurses to the profession, or an increased or decreased desire for potential nurses to enter the profession.

Supply Estimates and Projections

Analysis of the nursing licensure data from the Florida Department of Health resulted in an estimated 234,800 FTE RNs in Florida in 2019. The average age of working Florida RNs is 45 years, with approximately 15% age 60 or older. Projected into the future, supply will reach 285,500 RNs by 2035, with 252,900 new RNs entering the workforce, 205,900 RNs retiring from the workforce over the time period, and RN increased by 3,700 FTEs due to slight increases in average RN hours worked due to changing nurse demographics. By 2035, average RN age is projected to remain at 45 years, though the percentage of RNs age 60 or older is projected to decrease to 10% of the RN workforce.

Projected RN supply modeling results from the Status Quo and alternative scenarios are summarized in Exhibit 9. Based on the 2019 RN supply along with anticipated new entrants and retirements over time, projected supply is anticipated to increase throughout the projection period for all modeled scenarios. Status Quo supply is projected to increase by 22% between 2019-2035, which translates to approximately 50,700 additional FTE RNs working in the state by 2035. The scenarios increasing and decreasing new graduates by 10% resulted in 2019-2035 projected supply increases of 28% and 13%, respectively, and the scenarios decreasing and increasing average retirement age by two years resulted in projected increases of 19% and 24%, respectively.

Exhibit 9. Projected Florida Supply of Registered Nurses, 2019 to 2035

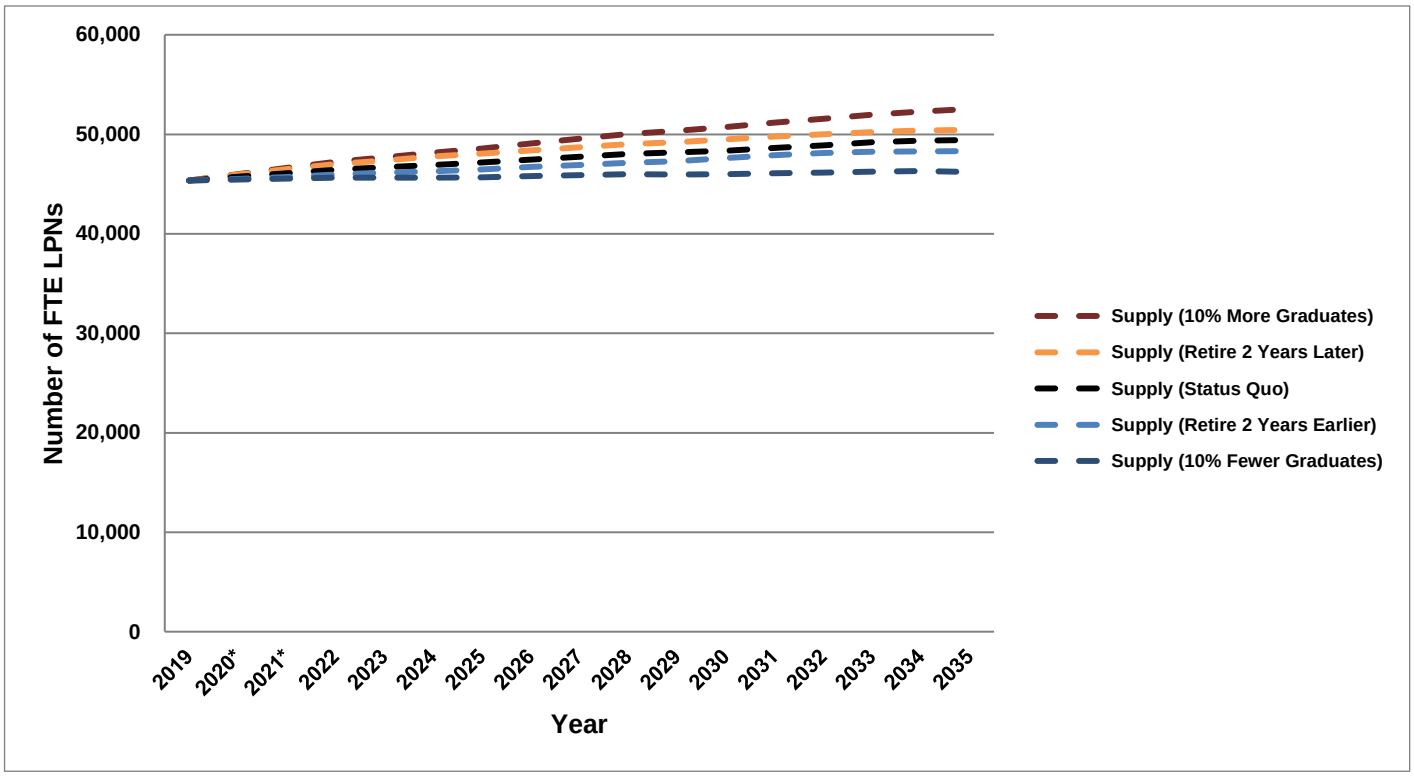


Note: *The 2020 and 2021 projections reflect the projected supply of nurses in the absence of the COVID-19 pandemic which has caused substantial short-term disruption to the healthcare system and the nurse workforce, but is projected to have minimal impact on long term supply of nurses.

In 2019, there were approximately 45,400 FTE LPNs in Florida, which is projected to increase to 49,400 LPNs by 2035. These projections factor in 46,800 LPN retirements and 50,800 new LPNs entering the workforce over the projection period. The 2019 average age of the workforce is 46 years, and the share of the workforce age 60 or older is approximately 15% and these estimates projected to be relatively constant over the projection period.

Projected supply of LPNs increases over the projection period, though growth rates are lower than RN growth rates for all modeled scenarios (Exhibit 10). Status Quo LPN supply is projected to grow 9% between 2019 and 2035, while the projected growth rates assuming increased and decreased new graduates are 16% and 2%, respectively, and projected growth rates assuming delayed and early retirement are 11% and 7%, respectively.

Exhibit 10. Projected Florida Supply of Licensed Practical Nurses, 2019 to 2035



Note: *The 2020 and 2021 projections reflect the projected supply of nurses in the absence of the COVID-19 pandemic which has caused substantial short-term disruption to the healthcare system and the nurse workforce, but is projected to have minimal impact on long term supply of nurses.

Florida Nurse Supply and Demand by Region

The workforce projections suggest a state shortfall of approximately 37,400 RNs and 21,700 LPNs by 2035, though there is considerable variation in projected workforce adequacy by geographic area within the state. The models used to estimate nurse supply and demand used counties as the smallest geographic unit, and county-level results were aggregated to metropolitan and micropolitan statistical areas to produce region-level projections (tables and charts summarizing projected adequacy of nurse supply by Florida Medicaid region are included in the appendix to this report). Regional variations in supply and demand for nurses can occur for a variety of reasons, including:

- **Differences in population demographics and characteristics across regions.** While Florida is a state with considerable overall diversity, population characteristics can vary significantly among the state's various regions. The Miami area, relative to the rest of the state, has a relatively young and healthy population, and has a large proportion of Hispanic residents. Other areas, like The Villages and Punta Gorda have older populations, where the proportion of the population age 65 or older is over 40%. Additionally, there is geographic diversity in the socioeconomic status statewide, with many of the lower-income counties located in northern Florida near the panhandle. These characteristics are correlated with population health characteristics like prevalence of chronic disease and health risk behavior, which in turn influence population demand for healthcare services and nurses. Thus, these geographic population differences result in diversity in population healthcare needs across the state. On the supply side, socioeconomic conditions within local areas can influence decisions to become employed within a particular region.

- **Differences in projected population growth across regions.** As mentioned previously, projections of population growth and demographic shifts by county were used to model healthcare demand. Some counties are projected to grow faster than others. Aggregated to metropolitan statistical areas (MSAs) and micropolitan statistical areas, 2019-2035 projected population growth ranged from 43% in the Villages to 1% in Palatka, with considerable variation around the state average of 21%. The geographic distribution of population characteristics also was projected to shift over time, influencing the population's projected health characteristics, such as prevalence of chronic diseases, and resulting healthcare demand.

- **Geographic variation in supply reflects, in part, where hospitals are located.** While demand for healthcare services and nurses is determined by where the population resides, geographic variation in demand for nurses is, at least in part, determined by where hospitals and other employers are located within the state. Thus, it is possible that patients are traveling outside of their home county to receive treatment and this situation would not be captured within the model's projected nurse supply adequacy by region.

Exhibit 11 contains a scatterplot of estimated 2019 RN supply adequacy (on the x-axis) and 2019 LPN supply adequacy (on the y-axis). Regions are plotted as bubbles on the chart, with each bubble sized according to size of the population of the region. Bubble color indicates the region's status as a MSA or Non-MSA (the non MSA regions include micropolitan statistical areas as well as one bubble reflecting all other areas within the state that do not qualify as metropolitan or micropolitan). Geographic areas below (above) 100% on the x-axis are areas where RN supply is not (is) adequate to meet RN Demand, and similarly areas below (above) 100% on the y-axis are areas where LPN supply is not (is) adequate to meet LPN demand. A plurality of regions are in the quadrant where neither RN nor LPN supply is adequate to meet base year demand, with The Villages, Key West, Naples-Immokalee-Marco Island, and Cape Coral-Fort Myers estimated to be some of the areas with the largest shortfalls. Many of the large population centers, including Miami-Fort Lauderdale-West Palm Beach, Jacksonville, Orlando-Kissimmee-Sanford, are estimated to have an adequate supply of RNs but a shortfall of LPNs. Conversely, many of the smaller areas, like the non-metropolitan areas, Wauchula, and Palatka are projected to have an adequate supply of LPNs but a shortfall of RNs.

Exhibit 11. Projected RN and LPN Supply Adequacy by Region, 2019

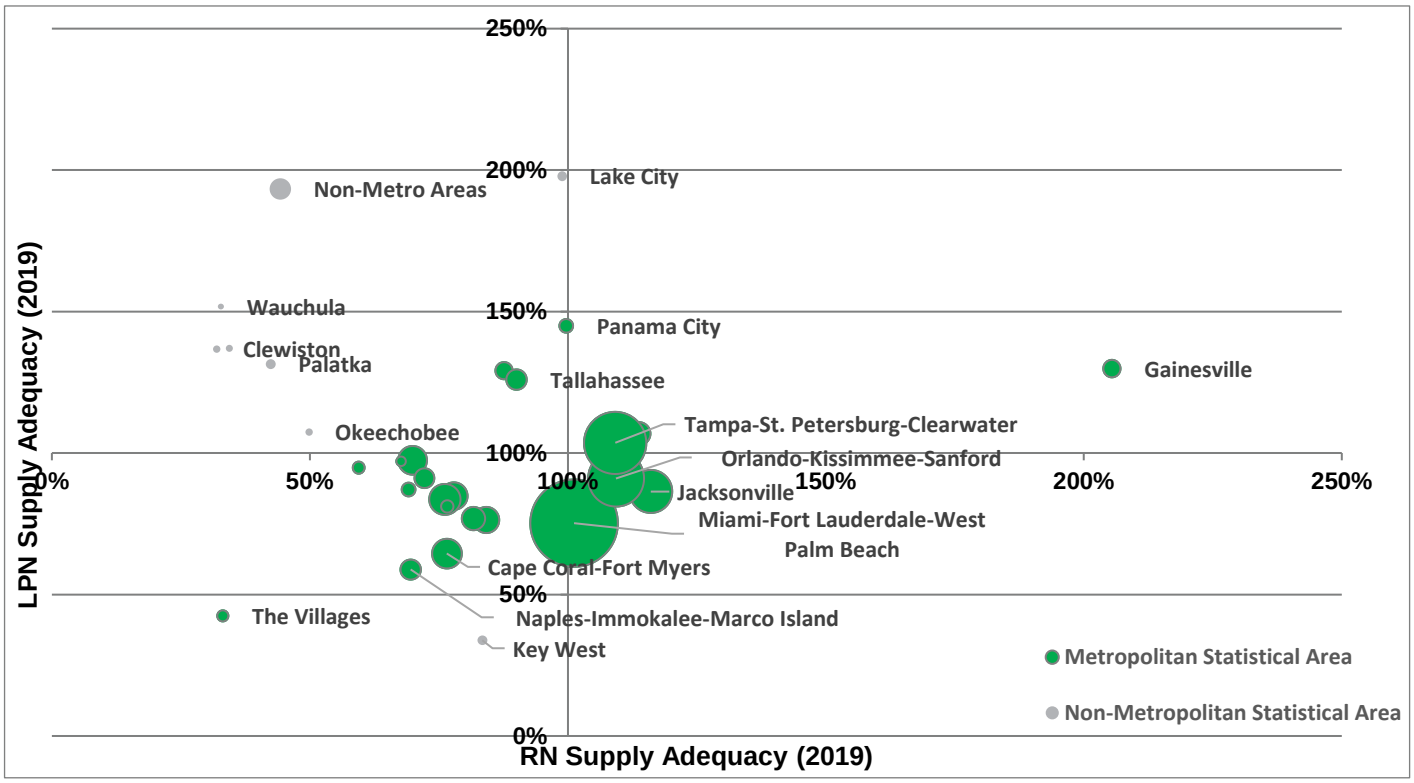


Exhibit 12 contains a similar plot of RN and LPN supply adequacy projected in 2035. On average, but with some exceptions, compared to 2019 many of the plotted counties shifted down and to the left (i.e., in the direction of less adequate supply for LPNs and RNs, respectively), which is consistent with the growing projected shortfall at the state level. Exhibit 13 and Exhibit 14 contain maps showing county-level RN and LPN supply adequacy within Florida. Many counties located in the Florida panhandle are among those with the lowest RN adequacy and the highest LPN adequacy, while the counties which include the large population centers (e.g. Miami, Tampa, Jacksonville, and Orlando) are among those with the highest RN adequacy but lower LPN adequacy.

As discussed previously, regional projections of supply adequacy may be affected by the modeling assumptions that regional demand is determined by the patients' place of residence, while supply is determined by where nurse employers are located. Therefore, some of the local supply adequacy findings reported here may be over or understated. The finding that many of Florida's smaller regions have an adequate supply of LPNs but a shortfall of RNs may reflect providers responding to the RN shortfall by seeking LPNs for help in roles that may have otherwise been done by an RN. Alternatively, this finding may reflect that hospitals and other facilities providing more intensive and complex care tend to employ a large number of RNs and increasingly are located in larger metropolitan areas. Physician offices, clinics, and other lower acuity settings often employ more LPNs, and in some instances can be the only facilities in more rural areas.

Exhibit 12. Projected RN and LPN Supply Adequacy by Region, 2035

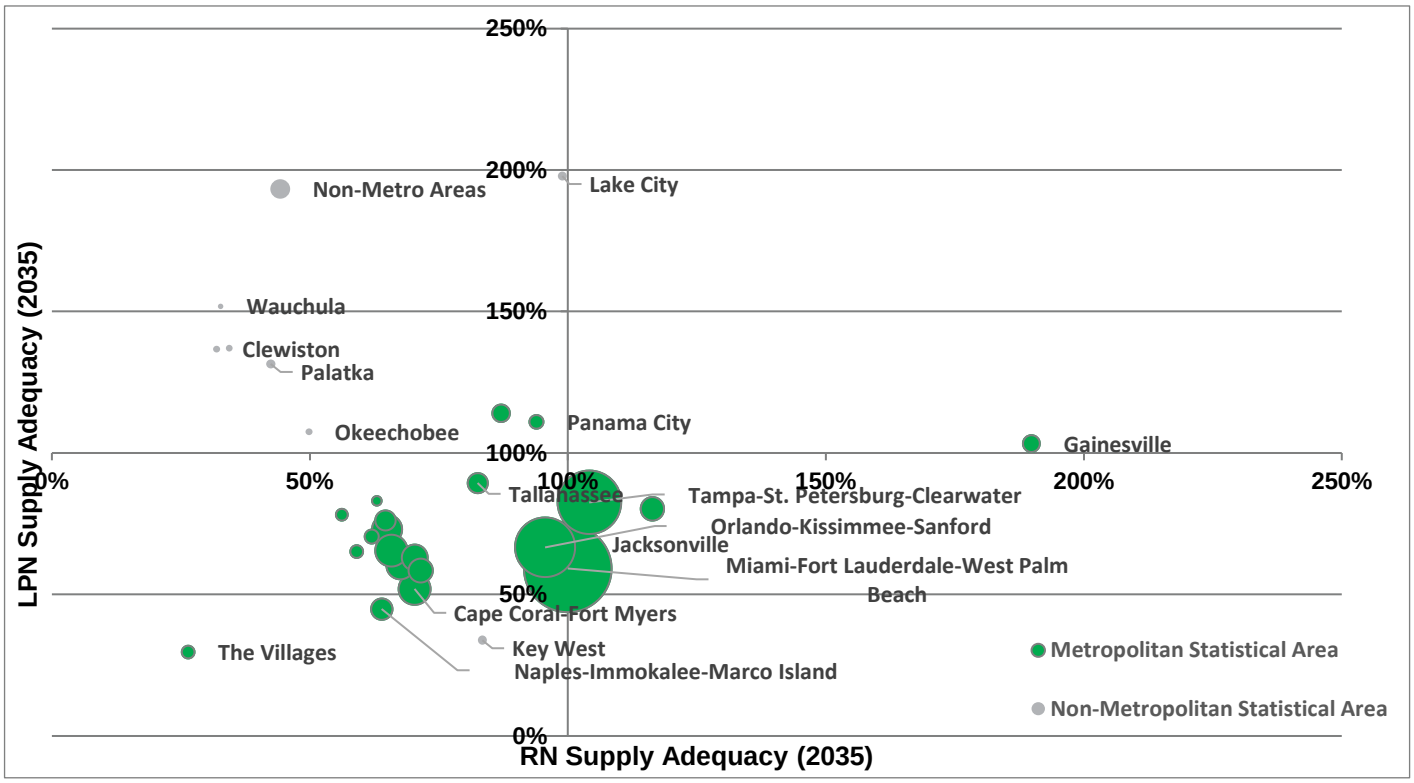


Exhibit 13. Map of Projected RN Supply Adequacy by County, 2035

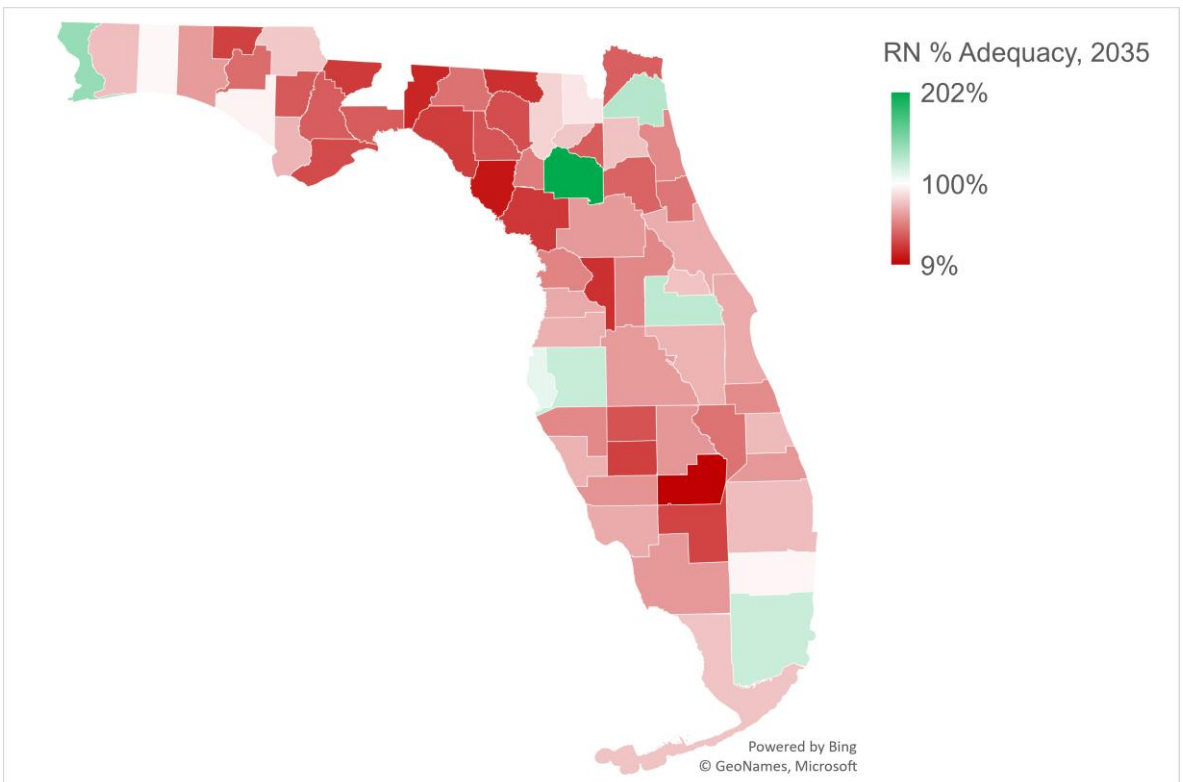
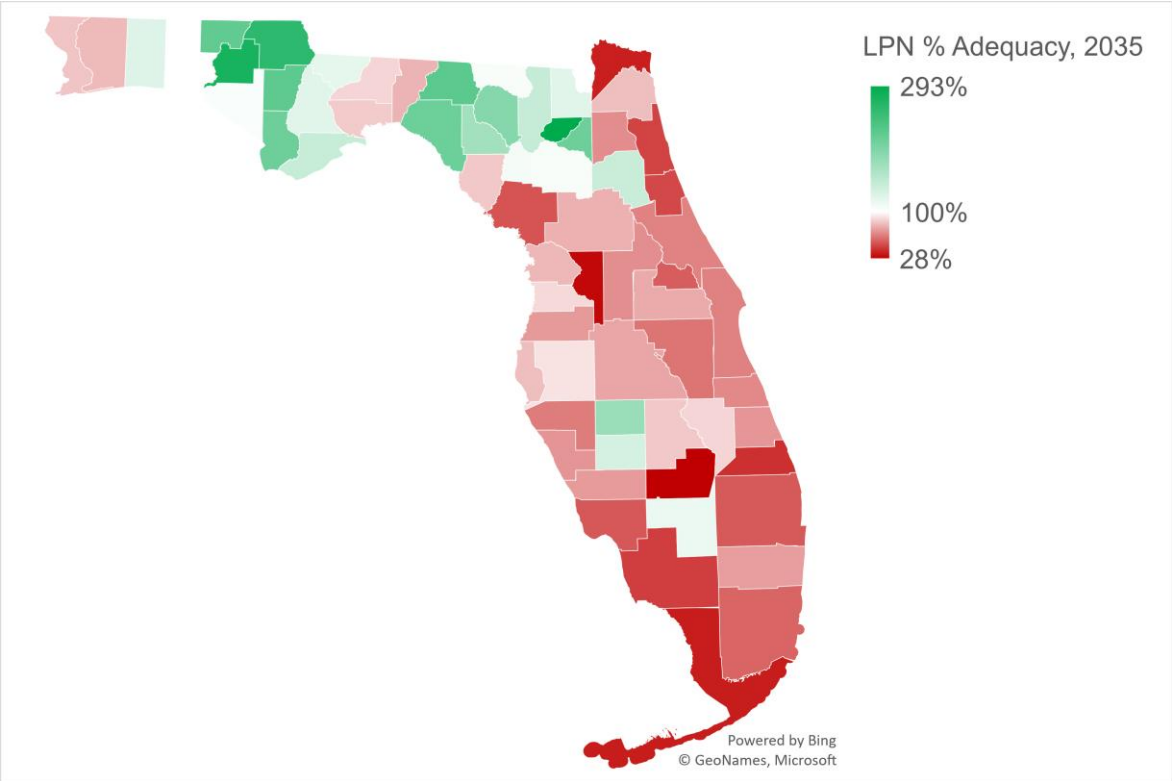


Exhibit 14. Map of Projected LPN Supply Adequacy by County, 2035



Discussion

Key Findings and Implications

Study findings suggest that the estimated 2019 shortage of both RNs and LPNs in Florida will continue to worsen in the future, with shortfalls by 2035 expected to reach 37,400 RNs (88% adequacy) and 21,700 LPNs (70% adequacy). Furthermore, estimated base year and projected future regional variation in nurse adequacy findings suggest that the projected shortage will continue to be experienced unevenly across the state. State shortfalls could place additional pressures on provider organizations in areas already struggling to attract and retain nurses.

As the pandemic is ongoing and much of the data used in the supply and demand models employed in this study are collected with a lag, the impacts of the COVID-19 pandemic are not yet fully quantifiable. As has been noted, given data limitations, the projections presented in this report do not account for the effects of COVID-19. They do not capture the spikes in demand for COVID-related care, and thus for healthcare workers providing that care, in 2020 and early 2021, nor the precipitous drop in demand for routine care and elective procedures, and the healthcare workers providing that care, during and following the lockdown in early 2020. Findings from the focus groups supplemented with a literature review underscore the physical, mental, emotional, and economic toll on the nurse workforce from COVID-19 is great. Nurses are the frontline interface with patients, and they suffered more COVID-19 related fatalities than any other classification of healthcare worker.[18] Burnout was higher than usual and national polls showed 30-40% of healthcare workers contemplating leaving their jobs.[7,9] Healthcare workers of color were disproportionately impacted.[18,19] Many other nurses faced unemployment due to medical office closures during the lockdown or because they had to care for their children who were out of school and day care.[20] While the human toll of COVID-19 was and continues to be devastating, the long-term impact on the overall supply of nurses is expected to be minimal.

Insights gleaned from focus groups of nurses working in Florida through the COVID-19 pandemic supported the notion that, while the pandemic had indeed resulted in a significant immediate disruption in workforce trends, this disruption is in large part expected to be short term. Short term workforce interruptions reported by nurses in the focus groups included accelerated retirement by some nurses already nearing retirement age, significant nurse interest in switching to travel nursing due to increased pay, and increased nurse burnout due to working in a higher stress environment, among other things. Many focus group participants, however, noted that they expected these types of shifts to be only short term, and some reported already noticing a reversal of some of the workforce interruptions brought about by COVID-19.

Recommendation Areas and Action Items

In alignment with national goals and as articulated in the Florida Department of Health's Strategic Plan and Health Improvement Plan, key goals for the state are to *protect, promote and improve the health of all people in Florida* by working to ensure access to high quality and affordable care.[21,22] As the largest component of the health workforce, nurses are an integral part of the care delivery system and provide care in hospitals, nursing facilities, health provider offices and clinics, schools, home health, and other settings. Having an adequate supply of nurses across communities in Florida is vital to helping people achieve their full health potential.[2]

Ensuring an adequate supply of nurses to meet current and future needs for Florida requires actions in several areas: nurse education, recruitment and retention, nurse scope of practice, geographic distribution, and data collection.

Nurse Education

Ensuring a strong pipeline of future nurses begins with nurse education programs. A 2018-2019 survey of Florida RN programs (97% response rate) found that there were 22,690 new RN students enrolled, while 6,408 seats were left vacant, implying a statewide vacancy rate of 22%.[23] Limitations related to clinical sites was the most

commonly cited barrier to maximizing program capacity, cited by 34% of responding programs, followed by a lack of qualified student applicants (cited by 30%), a lack of qualified faculty (cited by 16%), a lack of campus resources (cited by 14%), and a lack of funds to hire faculty (cited by 13%). Results from the Florida Center for Nursing's 2018-2019 LPN program survey (96% response rate) were similar, with an estimated statewide LPN program vacancy rate of approximately 26%, with 40% of programs citing a lack of qualified student applicants, 38% citing limited clinical sites, 23% citing lack of campus resources, and 23% citing a lack of funds to hire faculty as barriers to maximizing program capacity.[24] In 2019, there were approximately 13,784 RN program graduates statewide, up from 12,592 in 2018 and 10,810 in 2017.[23] To address projected shortages by year 2035, an additional 2,300 RNs and 1,700 LPNs would need to enter the workforce each year. Based on Florida Board of Nursing guidelines specifying "at least one faculty member directly supervising every 12 students" in practical and registered nurse education programs, this equates to an additional 333 nursing faculty positions required.[25]

Action item 1: Increase availability of clinical sites for nurse training.

Action item 2: Increase supply of qualified faculty and campus resources for nursing programs.

While maximizing the number of future nurses graduating from training programs in Florida is important, it is equally important to ensure that these nurses are getting a high-quality education and will continue on to practice in a nursing role. The Florida Center for Nursing's 2019 annual report cited that Florida RN education programs ranked towards the bottom nationally in terms of National Council Licensure Examination (NCLEX) first time pass rates – 68% Florida pass rate for associate degree programs and 89% for bachelor degree programs, compared to national average pass rates of 85% and 92% for the respective degree types.[4] Similarly, Florida LPN programs (76% pass rate) ranked second to last in the country (86% pass rate nationally).[4] A statewide effort to increase NCLEX pass rates may result in an increased future supply of nurses, helping to narrow the gap between nurse demand and supply. If Florida's overall pass rate were increased to the national average, an additional 770 RNs and 190 LPNs would be entering the nursing workforce annually—equivalent to about 33% of the additional RNs and 11% of the additional LPNs required to close the projected gap between supply and demand in 2035.

Action item 3: Undertake a study to understand why some nursing programs have low NCEX pass rates and identify strategies and resources required to improve the state's overall NCLEX pass rates.

Action item 4: Facilitate opportunities for nurses to enhance their education, including LPNs working towards a career as a RN, nurse-to-BSN programs, and RNs working towards a career as an APRN.

Recruitment and Retention of Nurses to Work in Florida

Our analysis of the American Community Survey indicates that over the past decade the average annual number of trained nurses who move to Florida (about 980 RNs and 220 LPNs) exceeds the number who leave Florida to work elsewhere (about 690 RNs and 140 LPNs). Hence, Florida is a net importer of nurses. This phenomenon might be due in part to Florida having a slightly higher population growth rate than the national average (2.8% growth for Florida versus 2.2% growth for the U.S. in 2019) with some nurses migrating across states as part of this general population shift. The Bureau of Labor Statistics reports that in May 2020 the average salary for RNs ($69,510) and LPNs ($46,710) in Florida was below the national average for RNs ($80,010) and LPNs ($50,090).[26,27] Florida's cost of living is approximately the same as the US average, and when adjusted for slight differences in cost of living RNs in Florida earn about $11,060 (14%) less and LPNs in Florida earn about $3,730 (7%) less than the U.S. average. These differences do not account for other forms of compensation (e.g., benefits packages), characteristics of nurse employment (e.g., distributions across employment settings or average experience level), or community amenities that might differ between Florida and the U.S., but highlight challenges that Florida might face to increase the size of its nurse workforce by recruiting from out-of-state. Despite these challenges, Florida may consider implementing a statewide campaign to attract out-of-state nurses to move to Florida, leveraging Florida's community amenities as a selling point for relocation to the state. In order to do so, however, it is critical to have an understanding of what motivates in-migrating nurses to come to Florida.

Nurse residency programs give newly graduated nurses an opportunity to ease the transition from the classroom into clinical practice. While research on this topic is still developing, some existing literature suggests that implementation of nurse residency programs can increase nurse retention rates.[28] Participants in the focus groups conducted as a part of this study noted that newly graduated nurses can be exceedingly difficult to retain. Thus, efforts to increase new graduate retention, to the extent that this initial retention may result in a significantly longer nursing career, may also be one component to a solution to help address the projected shortfall. Other innovative solutions to help retain nurses who are currently in the workforce may include career development opportunities, flexibility in scheduling and increased work-life balance. In addition, many nurses licensed to work in Florida have left the workforce or chose to work part time. Part of the challenge is high levels of nurse burnout.[9,10,29–32]

Action item 5: Undertake a study to understand why nurses move to or leave Florida, and create innovative solutions to increase retention and improve recruitment from other states.

Action item 6: Undertake a study to understand why Florida nurses have left the workforce or have chosen to work part time, and identify strategies to increase labor force participation rates.

Scope of Practice

To efficiently provide high quality care, all members of the healthcare team should be given the ability to practice to the highest level that their license, education, and training allows. These types of policies allow the care team to optimize the roles of each member in a way that provides the best possible care to the patient.

Action item 7: Implement policies and practices where all members of the healthcare team can practice at the highest level their license, education and training allows.

Geographic Distribution

This study found that many geographic areas have an insufficient supply of nurses to meet current demand, A growing shortfall of nurses statewide could exacerbate shortfalls in communities that already face challenges to recruiting and retaining nurses. Nurse training programs are most often located in metropolitan areas, putting rural healthcare providers at a disadvantage in nurse recruitment. Expanding nurse training programs into non-metropolitan areas may assist with teaching more new nurses about the unique aspects of working with a more rural population, as well as increase the chances nurses will choose to become employed in these types of areas. Other strategies to attract nurses to underserved communities include loan repayment options or incentives.

Action item 8: Focus expansion of nurse training programs in underserved communities, including options for training nurses in non-metropolitan areas.

Data Collection

A robust system for health workforce data collection is critical component of effectively planning for future health workforce needs. Many of the data sources used to create the nurse supply projections in this report were nurse workforce patterns derived from national surveys. While Florida responses from these surveys were used where the sample size was adequate, ideal data sources for such assumptions would come from Florida-specific survey data. Florida's Department of Health collects information on the physician workforce via a survey conducted at time of medical license renewal. Among other things, this survey collects information on physicians' current workforce participation patterns and intentions to remain working in Florida. No similar data source exists for the nurse workforce. Like physicians, nurses in Florida must renew their license biennially. Completing a workforce survey upon license renewal will facilitate state workforce planning efforts and provide insights on factors that contribute to nurses' intentions to leave nursing practice in Florida.

Action item 9: Implement a survey for nurses, like that implemented for physicians, at time of nurse license renewal.

Study Strengths and Limitations

Modeling and projecting into the future involve simplifying assumptions and data limitations that affect the veracity of the study results. The modeling approach, data, and study approach used in this study have many strengths. The microsimulation models used to produce the supply and demand projections have been developed and refined for over ten years and have been published in peer-reviewed journals and presented at national conferences. The results of these models have been trusted for health workforce and strategic planning by the federal government and state governments, hospitals and health systems, healthcare associations, and other stakeholders.

Where possible, Florida-specific data sources were used as modeling inputs. For supply modeling, nurse licensure data was obtained from the Florida Department of Health, including information on the base year supply of nurses, and the number and characteristics of new entrants to the workforce. For demand modeling, Florida-specific data were used to provide population characteristics (e.g. demographics, disease and health behavior prevalence, and socioeconomic information) by county, as well as information regarding the expected size and demographics of the future population in the state.

The model creates supply and demand projections at the county level, which allows for sub-state analysis of the adequacy of projected nurse supply. It allows the flexibility in adjusting modeling assumptions to assess both supply- and demand-side what-if scenarios and sensitivity analyses.

Focus groups were conducted with a diverse group of nurses working in Florida to provide insights into Florida nurses' experience, especially during the COVID-19 pandemic, and how the pandemic may or may not change the way nurses provide care or make workforce decisions. As the pandemic is ongoing and much of the data used in the supply and demand models employed in this study are collected with a lag, the impacts of the COVID-19 pandemic are not yet fully quantifiable. As has been noted, given data limitations, the projections presented in this report do not account for the effects of COVID-19. They do not capture the spikes in demand for COVID-related care, and thus for healthcare workers providing that care, in 2020 and early 2021, nor the precipitous drop in demand for routine care and elective procedures, and the healthcare workers providing that care, during and following the lockdown in early 2020.

Even with careful optimization of models, data, and study approach employed, the results must be interpreted within the context of necessary limitations. Study limitations reflect both data gaps and uncertainty of how care use and delivery patterns and how nurse career decisions might change in the future. Key limitations are the following:

- **National data used to fill gaps in Florida-specific data.** National data sources used in supply modeling include the ACS and NSSRN datasets which were used to provide information on nurse workforce hours worked, retirement, and migration patterns. While Florida responses were used from these sources where possible, the small sample size of the Florida data subset may produce estimates with limited reliability. National data sources were used for demand modeling to provide information population health care use patterns as well as information on nurse staffing. If the Florida population uses services at a different rate than the national average or Florida providers staff nurses at levels different from the national average, these sources may produce estimates that differ from the true health care use and staffing in the state.

- **Projections do not account for regional differences in staffing and service delivery.** Results were presented for sub-state regions within Florida, through data limitations necessitated modeling health care use and delivery patterns that are constant for all areas within the state. Thus, the state level workforce projections can be projected with a higher level of certainty compared to sub-state level projections.

- **Demand projections model the continuation of baseline levels of healthcare use and delivery patterns.** Projections into the future do not capture shifts in factors such as technological innovations, national or state-level health policies, patient preferences, or payer or provider policies which change the way care is consumed or delivered. In reality, these patterns will continue to evolve over time, however the effect these types of changes would have on the results of this study are unclear. Recently published work on the physician workforce indicates that some components of an evolving care delivery system increase demand for healthcare services (e.g., increased access to care) while other components decrease demand (e.g., increased access to preventive care and efforts to redirect inpatient care to appropriate ambulatory settings).[33] Thus, the net effect of evolving care delivery on demand might be small.

- **Workforce implications resulting from COVID-19 are still unclear.** The COVID-19 pandemic is still developing and thus it is impossible to know with certainty what workforce implications will arise as a result. The supply scenarios modeled reflecting early and delayed nurse retirement, and increased and decreased new graduates may provide insights into the potential effects of possible long-term pandemic-related changes to retirement and new graduates.

- **The number of RNs and LPNs entering the workforce annually is assumed to be constant over the projection period.** The assumption that the number of nurses entering the workforce will remain constant over time does not allow for market forces that otherwise may have corrected for any surpluses or shortages that may be present in the workforce. The shortfall projections model the implications in no additional resources are allocated to increase capacity at Florida's nurse education programs.

Despite these limitations, the workforce projections presented offer best estimates given the information available. Understanding that Florida's nurse supply is projected to grow slower than demand can inform nurse workforce planning and also highlight career opportunities for people considering nursing as a career.

Appendix: Additional Tables and Maps

Exhibit 15. Projected RN Status Quo Supply Adequacy

Year	Supply	Demand	Adequacy	% Adequacy
2019	234,821	246,302	-11,481	95%
2020	235,608	251,476	-15,868	94%
2021	237,554	256,765	-19,210	93%
2022	240,275	262,057	-21,782	92%
2023	243,546	267,355	-23,809	91%
2024	247,214	272,647	-25,433	91%
2025	251,026	277,936	-26,910	90%
2026	254,805	282,715	-27,911	90%
2027	258,763	287,502	-28,739	90%
2028	262,663	292,288	-29,625	90%
2029	266,568	297,075	-30,507	90%
2030	270,586	301,855	-31,269	90%
2031	274,253	306,067	-31,814	90%
2032	277,802	310,283	-32,480	90%
2033	281,033	314,500	-33,467	89%
2034	283,603	318,716	-35,113	89%
2035	285,542	322,928	-37,386	88%

Source: IHS Markit

Exhibit 16. Projected LPN Status Quo Supply Adequacy

Year	Supply	Demand	Adequacy	% Adequacy
2019	45,372	50,924	-5,552	89%
2020	45,728	52,107	-6,379	88%
2021	46,081	53,391	-7,310	86%
2022	46,449	54,676	-8,227	85%
2023	46,680	55,962	-9,282	83%
2024	46,928	57,247	-10,319	82%
2025	47,170	58,531	-11,361	81%
2026	47,465	59,805	-12,339	79%
2027	47,758	61,081	-13,323	78%
2028	48,016	62,356	-14,340	77%
2029	48,183	63,632	-15,449	76%
2030	48,358	64,905	-16,547	75%
2031	48,637	66,139	-17,502	74%
2032	48,884	67,374	-18,490	73%
2033	49,190	68,610	-19,420	72%
2034	49,353	69,845	-20,492	71%
2035	49,420	71,079	-21,659	70%

Source: IHS Markit

Exhibit 17. Projected RN Supply and Demand Growth and Adequacy by Scenario

Scenario	2019	2035	Growth	% Growth
Demand				
Status quo	246,302	322,928	76,625	31%
Reduced barriers	265,725	350,980	85,255	32%
Supply				
Status quo	234,821	285,542	50,721	22%
10% Fewer graduates	234,821	265,147	30,326	13%
10% Additional graduates	234,821	300,688	65,867	28%
Retire two years early	234,821	279,243	44,422	19%
Supply Adequacy vs. Status Quo Demand				
Status quo	-11,481	-37,386		
10% Fewer graduates	-11,481	-57,781		
10% Additional graduates	-11,481	-22,240		
Retire two years early	-11,481	-43,685		
Retire two years late	-11,481	-32,317		
Supply Adequacy vs. Reduced Barriers Demand				
Status quo	-30,904	-65,438		
10% Fewer graduates	-30,904	-85,833		
10% Additional graduates	-30,904	-50,292		
Retire two years early	-30,904	-71,738		
Retire two years late	-30,904	-60,369		

Source: IHS Markit

Exhibit 18. Projected LPN Supply and Demand Growth and Adequacy by Scenario

Scenario	2019	2035	Growth	% Growth
Demand				
Status quo	50,924	71,079	20,155	40%
Reduced barriers	54,099	75,731	21,631	40%
Supply				
Status quo	45,372	49,420	4,048	9%
10% Fewer graduates	45,372	46,221	849	2%
10% Additional graduates	45,372	52,530	7,158	16%
Retire two years early	45,372	48,326	2,954	7%
Supply Adequacy vs. Status Quo Demand				
Status quo	-5,552	-21,659		
10% Fewer graduates	-5,552	-24,859		
10% Additional graduates	-5,552	-18,549		
Retire two years early	-5,552	-22,753		
Retire two years late	-5,552	-20,645		
Supply Adequacy vs. Reduced Barriers Demand				
Status quo	-8,727	-26,311		
10% Fewer graduates	-8,727	-29,510		
10% Additional graduates	-8,727	-23,201		
Retire two years early	-8,727	-27,405		
Retire two years late	-8,727	-25,296		

Source: IHS Markit

Exhibit 19. Estimated 2019 RN Supply and Demand by Metropolitan/Micropolitan Statistical Areas

Metropolitan/Micropolitan Statistical Area	Supply	Demand	Supply-Demand	% Adequacy
North Port-Sarasota-Bradenton	8,939	11,739	-2,800	76%
Lakeland-Winter Haven	6,300	9,011	-2,711	70%
Non-Metropolitan/Micropolitan Statistical Areas	2,054	4,643	-2,588	44%
Cape Coral-Fort Myers	7,621	9,956	-2,335	77%
Deltona-Daytona Beach-Ormond Beach	7,056	9,059	-2,004	78%
The Villages	763	2,303	-1,540	33%
Naples-Immokalee-Marco Island	3,422	4,923	-1,501	70%
Ocala	3,758	5,207	-1,449	72%
Palm Bay-Melbourne-Titusville	6,651	7,899	-1,249	84%
Port St. Lucie	5,217	6,387	-1,170	82%
Homosassa Springs	1,339	2,252	-913	59%
Punta Gorda	1,972	2,852	-880	69%
Palatka	438	1,032	-594	42%
Sebastian-Vero Beach	1,720	2,244	-524	77%
Sebring	1,026	1,516	-490	68%
Tallahassee	3,780	4,198	-418	90%
Crestview-Fort Walton Beach-Destin	2,700	3,082	-382	88%
Arcadia	164	477	-313	34%
Clewiston	142	445	-303	32%
Okeechobee	259	520	-261	50%
Wauchula	104	316	-213	33%
Key West	664	795	-132	83%
Lake City	873	883	-10	99%
Panama City	2,165	2,173	-7	100%
Miami-Fort Lauderdale-West Palm Beach	63,923	63,182	741	101%
Pensacola-Ferry Pass-Brent	6,616	5,818	797	114%
Orlando-Kissimmee-Sanford	29,079	26,593	2,485	109%
Jacksonville	19,576	16,865	2,711	116%
Gainesville	6,216	3,026	3,191	205%
Tampa-St. Petersburg-Clearwater	40,287	36,906	3,381	109%
Florida RN Total	**234,821**	**246,302**	**-11,481**	**95%**

Source: IHS Markit

Exhibit 20. Estimated 2019 LPN Supply and Demand by Metropolitan/Micropolitan Statistical Areas

Metropolitan/Micropolitan Statistical Area	Supply	Demand	Supply-Demand	% Adequacy
Miami-Fort Lauderdale-West Palm Beach	10,100	13,419	-3,319	75%
Orlando-Kissimmee-Sanford	4,740	5,210	-470	91%
Tampa-St. Petersburg-Clearwater	7,827	7,555	272	104%
Cape Coral-Fort Myers	1,407	2,182	-775	64%
Jacksonville	2,805	3,245	-440	86%
North Port-Sarasota-Bradenton	2,220	2,655	-434	84%
Deltona-Daytona Beach-Ormond Beach	1,608	1,896	-288	85%
Naples-Immokalee-Marco Island	679	1,154	-475	59%
Palm Bay-Melbourne-Titusville	1,269	1,662	-393	76%
Port St. Lucie	1,067	1,388	-321	77%
Lakeland-Winter Haven	1,764	1,811	-47	97%
The Villages	227	534	-308	42%
Ocala	1,005	1,102	-98	91%
Pensacola-Ferry Pass-Brent	1,205	1,128	77	107%
Punta Gorda	575	659	-85	87%
Sebastian-Vero Beach	410	506	-96	81%
Homosassa Springs	470	496	-25	95%
Tallahassee	1,006	799	207	126%
Key West	47	138	-91	34%
Sebring	342	352	-10	97%
Okeechobee	96	89	7	107%
Clewiston	100	73	27	137%
Gainesville	766	590	176	130%
Arcadia	114	83	31	137%
Wauchula	81	53	28	152%
Panama City	631	435	196	145%
Palatka	229	174	55	131%
Lake City	292	148	144	198%
Crestview-Fort Walton Beach-Destin	782	606	177	129%
Non-Metropolitan/Micropolitan Statistical Areas	1,505	779	727	193%
Florida LPN Total	**45,372**	**50,924**	**-5,552**	**89%**

Source: IHS Markit

Exhibit 21. Projected 2035 RN Supply and Demand by Metropolitan/Micropolitan Statistical Areas

Metropolitan/Micropolitan Statistical Area	Supply	Demand	Supply-Demand	% Adequacy
North Port-Sarasota-Bradenton	10,499	15,955	-5,456	66%
Lakeland-Winter Haven	7,888	12,142	-4,254	65%
Cape Coral-Fort Myers	9,899	14,080	-4,181	70%
Deltona-Daytona Beach-Ormond Beach	7,909	11,713	-3,804	68%
Non-Metropolitan/Micropolitan Statistical Areas	2,339	5,523	-3,184	42%
Palm Bay-Melbourne-Titusville	7,258	10,319	-3,062	70%
The Villages	939	3,557	-2,617	26%
Naples-Immokalee-Marco Island	4,333	6,776	-2,443	64%
Port St. Lucie	6,112	8,552	-2,439	71%
Ocala	4,443	6,871	-2,428	65%
Orlando-Kissimmee-Sanford	35,999	37,656	-1,657	96%
Punta Gorda	2,317	3,739	-1,422	62%
Sebastian-Vero Beach	1,790	3,031	-1,241	59%
Homosassa Springs	1,563	2,782	-1,218	56%
Tallahassee	4,355	5,278	-922	83%
Sebring	1,141	1,813	-672	63%
Palatka	511	1,136	-625	45%
Crestview-Fort Walton Beach-Destin	3,519	4,042	-524	87%
Arcadia	180	557	-377	32%
Clewiston	185	551	-365	34%
Okeechobee	310	610	-301	51%
Wauchula	136	350	-214	39%
Key West	726	918	-192	79%
Panama City	2,670	2,843	-173	94%
Lake City	926	1,096	-171	84%
Jacksonville	23,089	23,169	-80	100%
Miami-Fort Lauderdale-West Palm Beach	79,010	79,015	-5	100%
Pensacola-Ferry Pass-Brent	8,512	7,314	1,198	116%
Tampa-St. Petersburg-Clearwater	49,674	47,690	1,984	104%
Gainesville	7,310	3,851	3,459	190%
Florida RN Total	**285,542**	**322,928**	**-37,386**	**88%**

Source: IHS Markit

Exhibit 22. Projected 2035 LPN Supply and Demand by Metropolitan/Micropolitan Statistical Areas

Metropolitan/Micropolitan Statistical Area	Supply	Demand	Supply-Demand	% Adequacy
Miami-Fort Lauderdale-West Palm Beach	10,590	17,911	-7,322	59%
Orlando-Kissimmee-Sanford	5,241	7,862	-2,620	67%
Tampa-St. Petersburg-Clearwater	8,500	10,297	-1,796	83%
Cape Coral-Fort Myers	1,701	3,278	-1,577	52%
Jacksonville	3,269	4,811	-1,542	68%
North Port-Sarasota-Bradenton	2,512	3,835	-1,323	66%
Deltona-Daytona Beach-Ormond Beach	1,561	2,594	-1,033	60%
Naples-Immokalee-Marco Island	762	1,700	-939	45%
Palm Bay-Melbourne-Titusville	1,453	2,307	-853	63%
Port St. Lucie	1,139	1,948	-810	58%
Lakeland-Winter Haven	1,889	2,589	-700	73%
The Villages	272	918	-646	30%
Ocala	1,173	1,540	-367	76%
Pensacola-Ferry Pass-Brent	1,209	1,506	-298	80%
Punta Gorda	645	916	-271	70%
Sebastian-Vero Beach	470	721	-251	65%
Homosassa Springs	503	643	-141	78%
Tallahassee	977	1,094	-117	89%
Key West	60	170	-111	35%
Sebring	368	444	-75	83%
Okeechobee	93	108	-15	86%
Clewiston	105	95	10	111%
Gainesville	846	819	27	103%
Arcadia	127	99	28	128%
Wauchula	105	61	44	172%
Panama City	672	605	66	111%
Palatka	273	200	74	137%
Lake City	267	192	75	139%
Crestview-Fort Walton Beach-Destin	965	846	119	114%
Non-Metropolitan/Micropolitan Statistical Areas	1,673	971	702	172%
Florida LPN Total	**49,420**	**71,079**	**-21,659**	**70%**

Source: IHS Markit

Exhibit 23. RN Supply Adequacy by Medicaid Region, 2019 & 2035

	2019				2035			
Medicaid Region	Supply	Demand	Supply-Demand	% Adequacy	Supply	Demand	Supply-Demand	% Adequacy
Region 1	9,315	8,900	415	105%	12,030	11,356	674	106%
Region 2	7,113	8,553	-1,440	83%	8,351	10,681	-2,329	78%
Region 3	20,041	24,863	-4,822	81%	23,466	33,028	-9,562	71%
Region 4	26,632	25,925	707	103%	30,998	34,882	-3,884	89%
Region 5	19,101	19,234	-133	99%	22,845	24,230	-1,385	94%
Region 6	30,200	31,107	-907	97%	37,900	41,774	-3,875	91%
Region 7	31,993	29,374	2,619	109%	38,981	40,556	-1,575	96%
Region 8	18,643	25,218	-6,575	74%	23,023	34,296	-11,273	67%
Region 9	22,714	27,983	-5,269	81%	26,350	35,896	-9,546	73%
Region 10	21,023	20,507	516	103%	24,584	25,387	-803	97%
Region 11	28,045	24,639	3,407	114%	37,015	30,843	6,172	120%
Florida Total	**234,821**	**246,302**	**-11,481**	**95%**	**285,542**	**322,928**	**-37,386**	**88%**

Source: IHS Markit

Exhibit 24. LPN Supply Adequacy by Medicaid Region, 2019 & 2035

	2019				2035			
Medicaid Region	Supply	Demand	Supply-Demand	% Adequacy	Supply	Demand	Supply-Demand	% Adequacy
Region 1	1,987	1,733	254	115%	2,174	2,352	-179	92%
Region 2	2,566	1,599	968	161%	2,637	2,147	490	123%
Region 3	5,064	5,063	2	100%	5,761	7,177	-1,416	80%
Region 4	4,413	5,142	-729	86%	4,830	7,405	-2,575	65%
Region 5	4,097	4,078	19	100%	4,153	5,439	-1,286	76%
Region 6	6,311	6,281	30	100%	7,111	8,924	-1,813	80%
Region 7	5,034	5,812	-778	87%	5,624	8,564	-2,940	66%
Region 8	4,178	5,676	-1,498	74%	4,779	8,212	-3,433	58%
Region 9	4,218	6,078	-1,860	69%	4,527	8,202	-3,676	55%
Region 10	3,789	4,148	-359	91%	3,914	5,519	-1,605	71%
Region 11	3,713	5,314	-1,602	70%	3,910	7,137	-3,227	55%
Florida Total	**45,372**	**50,924**	**-5,552**	**89%**	**49,420**	**71,079**	**-21,659**	**70%**

Source: IHS Markit

Exhibit 25. Map of Projected RN Supply Adequacy by Medicaid Region, 2035

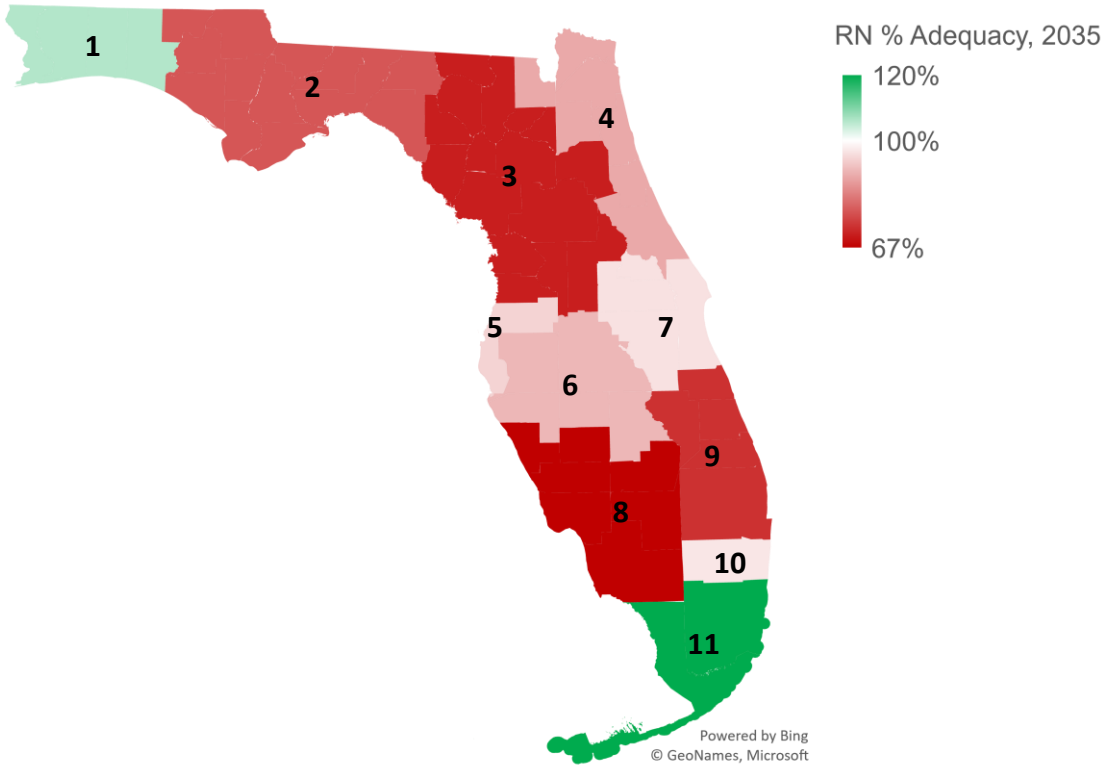
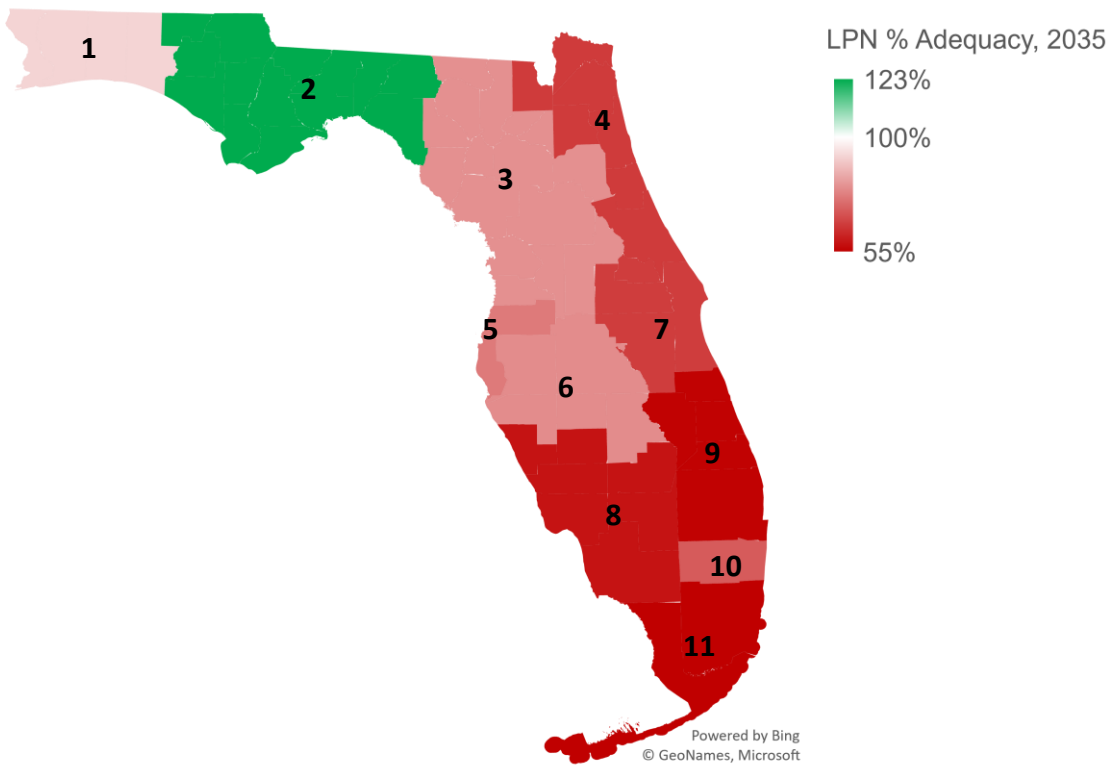


Exhibit 26. Map of Projected LPN Supply Adequacy by Medicaid Region, 2035



References

1. University of Florida Bureau of Economic and Business Research. Population Data Archive | www.bebr.ufl.edu. Accessed June 4, 2021. https://www.bebr.ufl.edu/population/data

2. Wakefield MK, Williams DR, Le Menestrel S, Flaubert JL. *The Future of Nursing 2020-2030: Charting a Path to Achieve Health Equity*. National Academy of Medicine; 2021. https://doi.org/10.17226/25982.

3. Florida Center for Nursing. *Florida Nursing Statewide Strategic Plan: Strategies to Successfully Provide Floridians an Adequate, Qualified Nurse Workforce*.; 2017. https://floridasnursing.gov/forms/2017-fl-center-strategic-plan.PDF

4. Florida Center for Nursing. *2019 Annual Report*.; 2019. https://floridasnursing.gov/forms/2019-fcn-annual-report.pdf

5. Florida Nurses Association. *FNA Policy Paper 2019*.; 2019. https://cdn.ymaws.com/www.floridanurse.org/resource/resmgr/Nursing_Workforce.pdf

6. KHN and Guardian. Lost on the frontline: US healthcare workers who died fighting Covid-19 | US news | The Guardian. Published 2020. Accessed January 25, 2021. https://www.theguardian.com/us-news/ng-interactive/2020/aug/11/lost-on-the-frontline-covid-19-coronavirus-us-healthcare-workers-deaths-database

7. Washington Post-KFF frontline health-care workers survey, Feb. 11-March 7, 2021. Washington Post. Accessed June 26, 2021. https://www.washingtonpost.com/context/washington-post-kff-frontline-health-care-workers-survey-feb-11-march-7-2021/ba15a233-9495-47a9-9cdd-e7fa1578b1ca/

8. Blazonis S. COVID-19 worsens pre-pandemic nursing shortage. *Bay News 9*. https://www.baynews9.com/fl/tampa/news/2021/06/03/covid-19-worsens-pre-pandemic-nursing-shortage. Published June 2, 2021. Accessed June 29, 2021.

9. Feedtrail and Holliblu. Nurse burnout in the wake of COVID-19 can cost up to $137B. PRWeb. Published 2020. Accessed February 8, 2021. https://www.prweb.com/releases/nurse_burnout_in_the_wake_of_covid_19_can_cost_up_to_137b/prweb17042783.htm

10. Sriharan A, Ratnapalan S, Tricco AC, Lupea D. Women in Health Care Experiencing Occupational Stress and Burnout during COVID-19: A Review. *medRxiv*. Published online January 1, 2021:2021.01.08.21249468. doi:10.1101/2021.01.08.21249468

11. Health Resources and Services Administration. Projecting Health Workforce Supply and Demand. HRSA Health Workforce. Published 2021. Accessed January 30, 2021. https://bhw.hrsa.gov/data-research/projecting-health-workforce-supply-demand

12. Streeter RA, Zangaro GA, Chattopadhyay A. Perspectives: Using Results from HRSA's Health Workforce Simulation Model to Examine the Geography of Primary Care. *Health Services Research*. 2017;52:481-507. doi:10.1111/1475-6773.12663

13. Texas Center for Nursing Workforce Studies. *Nurse Supply and Demand Projections, 2015-2030*.; 2016. file:///C:/Users/lum36407/Downloads/SupplyDemandReport_092916%20(1).pdf

14. Texas Department of State Health Services. *Texas Projections of Supply and Demand for Primary Care Physicians and Psychiatrists, 2017 - 2030*. Texas Health and Human Services; 2018. Accessed April 20, 2021. https://dshs.texas.gov/legislative/2018-Reports/SB-18-Physicians-Workforce-Report-Final.pdf

15. IHS Markit. *Current and Projected Future Health Care Workforce Demand in Vermont*. Prepared for the State of Vermont Agency of Administration; 2017. http://healthcareinnovation.vermont.gov/sites/vhcip/files/documents/Vermont%20Health%20Care%20Demand%20Modeling%20Final%20Report%206-16-17%20FINAL.pdf

16. Dall T, Reynolds R, Chakrbarti R, Iacobucci W, Jones K. *Health Workforce Microsimulation Model Documentation*. IHS Markit; 2020. Accessed January 30, 2021. https://cdn.ihs.com/www/pdf/1118/Health-Workforce-Microsimulation-Model.pdf

17. U.S. Department of Health and Human Services, Health Resources and Services Administration, National Center for Health Workforce Analysis. *Technical Documentation for Health Resources Service Administration's Health Workforce Simulation Model*.; 2019. Accessed June 14, 2021. https://bhw.hrsa.gov/sites/default/files/bureau-health-workforce/data-research/technical-documentation-health-workforce-simulation-model.pdf

18. KHN and Guardian. Lost on the frontline: US healthcare workers who died fighting Covid-19 | US news | The Guardian. Published 2020. Accessed January 25, 2021. https://www.theguardian.com/us-news/ng-interactive/2020/aug/11/lost-on-the-frontline-covid-19-coronavirus-us-healthcare-workers-deaths-database

19. Jewett C. Health Care Workers of Color Nearly Twice as Likely as Whites to Get COVID-19. Kaiser Health News. Published August 6, 2020. Accessed January 25, 2021. https://khn.org/news/health-care-workers-of-color-nearly-twice-as-likely-as-whites-to-get-covid-19/

20. Chotiner I. Why the Pandemic Is Forcing Women Out of the Workforce. The New Yorker. Published 2020. Accessed February 4, 2021. https://www.newyorker.com/news/q-and-a/why-the-pandemic-is-forcing-women-out-of-the-workforce

21. Rivkees SA. *Agency Strategic Plan: 2016-2021*. Florida Department of Health; 2021. Accessed July 21, 2021. http://www.floridahealth.gov/about/_documents/2016-2021-agencystrategicplan-final.pdf

22. FloridaSHIP.org. *Florida State Health Improvement Plan (SHIP) 2017-2021*. Florida Department of Health; 2020. Accessed July 21, 2021. http://www.floridahealth.gov/about/state-and-community-health-assessment/ship-process/_documents/Full_StateHealthImprovementPlan.pdf

23. Florida Center for Nursing. *Florida's Nursing Education Programs Academic Year 2018-2019 Pre-Licensure Registered Nurse (RN) Education*.; 2020.

24. Florida Center for Nursing. *Florida's Nursing Academic Programs Academic Year 2018-2019 Licensed Pactical Nurse (LPN) Education*.; 2020.

25. Florida Board of Nursing. Practical and Registered Nurse Education Program. Published 2021. Accessed July 28, 2021. https://floridasnursing.gov/licensing/practical-and-registered-nurse-education-program/

26. U.S. Bureau of Labor Statistics. *Occupational Employment Statistics: Registered Nurses*.; 2020. Accessed September 30, 2020. https://www.bls.gov/oes/current/oes291141.htm#nat

27. U.S. Bureau of Labor Statistics. *Occupational Employment Statistics: Licensed Practical and Licensed Vocational Nurses*.; 2020. Accessed September 30, 2020. https://www.bls.gov/oes/current/oes292061.htm

28. Asber SR. Retention Outcomes of New Graduate Nurse Residency Programs: An Integrative Review. *JONA: The Journal of Nursing Administration*. 2019;49(9):430-435. doi:10.1097/NNA.0000000000000780

29. Boamah SA, Read EA, Spence Laschinger HK. Factors influencing new graduate nurse burnout development, job satisfaction and patient care quality: a time-lagged study. *Journal of Advanced Nursing*. 2017;73(5):1182-1195. doi:10.1111/jan.13215

30. Brooks Carthon JM, Hatfield L, Brom H, et al. System-Level Improvements in Work Environments Lead to Lower Nurse Burnout and Higher Patient Satisfaction. *Journal of Nursing Care Quality*. 2021;36(1). https://journals.lww.com/jncqjournal/Fulltext/2021/01000/System_Level_Improvements_in_Work_Environments.2.aspx

31. Bakhamis L, Paul DP, Smith H, Coustasse A. Still an Epidemic: The Burnout Syndrome in Hospital Registered Nurses. *Health Care Manag*. 2019;38(1):3-10. doi:10.1097/HCM.0000000000000243

32. Dyrbye LN, Shanafelt TD, Johnson PO, Johnson LA, Satele D, West CP. A cross-sectional study exploring the relationship between burnout, absenteeism, and job performance among American nurses. *BMC Nurs*. 2019;18(1):57. doi:10.1186/s12912-019-0382-7

33. Association of American Medical Colleges. *The Complexities of Physician Supply and Demand: Projections From 2019 to 2034*. AAMC; 2021. Accessed June 30, 2021. https://www.aamc.org/media/54681/download