



Forecasting Supply, Demand, and Shortage of RNs and LPNs in Florida, 2007-2020

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Executive Summary

The Florida Center for Nursing (Center) used forecasting models developed by the Health Resources and Services Administration (HRSA) with Florida-specific nurse and general population data to produce projections of the state's nurse supply, demand, and shortage through the year 2020. This report details the results of our projections and presents simulated forecasts that show how much the shortage could be reduced if education capacity were increased and nurse retirement delayed.

Baseline forecasts – those assuming no additional effort to resolve the shortage – show that Florida may face a shortage of Registered Nurses (RNs) by 2020 that is capable of crippling our healthcare system and reducing access to or quality of care for Floridians:

- A shortage of just under 11,000 RN FTEs in 2007 is expected to grow to more than 52,000 FTEs in just 13 years.
- The number of RNs is forecast to increase each year, but demand for nursing personnel is projected to increase dramatically as Florida's general population grows older.
- The shortage is projected to increase at an increasing rate beginning in 2015, as the large Baby Boom cohort reaches typical ages for retirement and begins to require more healthcare for age-related conditions.

Simulated forecasts – those assuming that we increase the nurse supply by increasing the number of new graduate nurses and delaying nurse retirement – show that Florida's projected nursing shortage can be made less severe if *immediate* action is taken:

- If nursing program graduates are increased by 15 percent each year (beginning in 2010) and nurse retirement is delayed by 2 years (beginning in 2009), Florida will still experience a growing nursing shortage over the next five years.
- Immediate implementation of these interventions would have long-term success in resolving the shortage, however. After 2013, the shortage would begin to shrink and eventually (after 2020) be resolved.
- The unique demographic context of the projected shortage – an aging nurse and general population – means that the nursing shortage will likely remain critical for several years despite our best efforts.

This report, along with a Technical Report describing the forecasting process in more detail, presents recommendations for improving the accuracy of future forecasts:

- The Nurse Supply Model probably underestimates the number of nurses leaving the profession at young ages due to dissatisfaction with nursing or a specific employment setting, but at present we lack the data needed to evaluate this part of the model.
- Analysis of nurse licensure data over a number of years, and continued collection of data on the work behaviors of nurses, will allow future forecasts to incorporate information on the career paths of younger nurses.
- In addition to increasing education capacity and retaining older nurses, work environments in our state's healthcare facilities must be improved to retain *all* nurses in the profession.

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Background

Successful nurse workforce planning requires information about the anticipated demand for nursing labor as well as the future supply of working nurses that we can expect. Such forecasts, or projections of nurse supply and demand, help us to understand the timing and severity of predicted nursing shortages so that appropriate solutions can be implemented in a timely fashion. Accurate forecasts depend on making valid assumptions about the forces that drive supply and demand, but they also depend on detailed and accurate data. To forecast the nurse supply, for example, we need information on the number and age of our current nurses as well as data on their work habits. This includes whether they work in the field of nursing and how much they work at different ages of their lives. To forecast demand for nurses, we need to understand the extent of nursing shortage currently experienced by employers across different healthcare settings – our current level of demand for nursing labor.

Until recently, Florida suffered from a lack of detailed data on nurse supply and demand in the state. Although the number of licensed nurses was known, how many of them were working as nurses or how many hours they worked per week was not known. Data on current vacancies from the large variety of healthcare facilities and organizations that employ nurses has also been unavailable in settings other than hospitals. In the past two years, The Florida Center for Nursing has implemented a number of research projects that provided unprecedented data on current nurse supply and demand, including a statewide survey of nurse employers in five nursing-intensive industries, a survey of Registered Nurses (RNs) renewing their licenses, and recurring analysis of nurse licensure data collected by the Florida Board of Nursing (FBON). These recent projects provided the Center with the information needed to predict Florida's nurse supply and demand through the year 2020.

This report provides the results of the forecasts, which use models developed by the Health Resources and Services Administration (HRSA) with Florida-specific data on the nurse workforce and demand for nurses. In addition to baseline projections, which represent the likely supply, demand, and shortage if no action is taken to resolve the nursing shortage, the report presents the results of several simulations. These simulations incorporate interventions designed to increase the nurse supply. Finally, research and policy implications of the forecasts are discussed.

Methods

The HRSA Nurse Supply and Demand Models, revised and updated in 2004, are publicly-available forecasting models that come fully operational with input data on supply and demand for all 50 states and the District of Columbia. Because most of the input data elements for each state are derived from national surveys, often with small state-level samples, users are encouraged to seek better (and more recent) sources of data to make projections at the state level. We were able to replace most of the data fields within the Nurse Supply Model, and many within the Nurse Demand Model, with recent Florida data collected through our research projects.

The Nurse Supply Model is a “stock-and-flow” model in which nurses enter the state’s nurse supply through nursing program graduation or in-migration and leave the nurse supply through out-migration or failure to retain a nursing license (attrition). The supply model projects not only the licensed nurse population but also the number of full-time equivalent (FTE) nurses within the nursing workforce. It was designed to forecast RN supply only, but we found the model adaptable enough to use for Licensed Practical Nurse (LPN) supply forecasts as well. We used two main sources of data to implement the supply model: licensure data from the Florida Board of Nursing that were current as of January 2007, and survey data from nurses renewing their licenses in 2007 and 2008.

The Nurse Demand Model is a more complicated piece of software in which demand for healthcare services is projected based on population changes, trends in healthcare market conditions, economic conditions, and expected patient acuity in different settings. These trends also predict the amount of nursing labor that will be needed to provide each “unit” of healthcare (e.g., inpatient day or home health visit). The demand for healthcare and predicted nursing labor requirements are combined to generate an estimate of the number of FTE nurses demanded by employers in each year. The model is designed to project the demand for RN, LPN, and nurse aide FTEs. To replace input data elements with Florida-specific values, we used two main sources of data: the 2007 Nurse Employer Survey, and revised population projections from Florida’s Office of Economic and Demographic Research.

Our projection period begins in 2007, as most of our data sources were assembled during this year, and extends to 2020. Much more detail about the structure and limitations of the Nurse Supply and Demand Models, the input data we assembled, and differences in the baseline year (2007) estimates using default data provided with the model and Florida-specific data, can be found in the [Technical Report](#) for this project. We found that the default data for Florida were often inaccurate when compared with our data on the nurse and general populations in Florida. The differences in input data resulted in substantially different forecasts, highlighting the importance of evaluating all input data packaged with the Nurse Supply and Demand Models. We discuss these differences in detail in our Technical Report. Readers can also find in that report a description of how the supply model was modified for use with LPNs. To our knowledge, this is the first published LPN supply forecast using the HRSA Nurse Supply Model.

Baseline Forecasts for RNs and LPNs

State-level RN supply and demand forecasts using the default data provided with the model were published by Biviano et al. in 2004. This initial publication, widely cited by nursing leaders around the state, reported that Florida could expect a shortage of 81,200 RN FTEs by the year 2020.¹ Our results using the same models but more recent and accurate input data for the state provide only slightly less pessimistic projections. If rates of nurses leaving the workforce remain constant and the number of new graduates increases marginally (about 1-2% each year), we can expect a shortage of about 52,200 RN FTEs by 2020. Our results incorporate new information about recent expansions in the state’s nursing education system. The increased number of new graduate nurses we can expect each year largely accounts for the discrepancy between our results and those of Biviano et al. Our projection period begins in 2007 with a shortage of more than 10,800 RN FTEs, which we input directly into the demand model using FTE vacancy rates from our 2007 Nurse Employer Survey and the estimated number of RN FTEs employed in the state

that year. **A shortage of just under 11,000 RN FTEs in 2007 is expected to grow to more than 52,000 FTEs in just 13 years, if no new actions are taken to alleviate the shortage.** Figure 1 gives a visual depiction of the growing RN shortage we project under a baseline, or status quo, scenario in which no concerted efforts are made to resolve the nursing shortage.

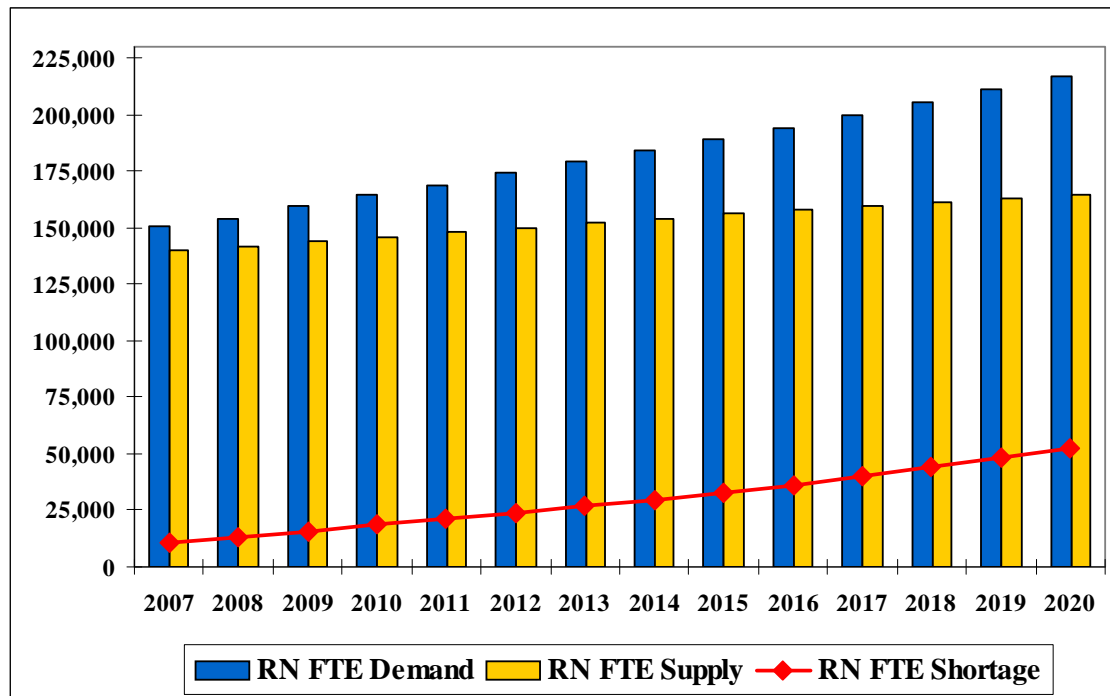


Figure 1. Baseline FTE Demand, Supply, and Shortage Projections for RNs

Figure 2 shows our baseline projections for LPNs. Florida begins the projection period in 2007 with a shortage of 2,644 LPN FTEs, again based on our Employer Survey FTE vacancy rates and the estimated number of LPN FTEs in the state that year. The shortage increases to just over 7,000 FTEs by 2020. **Although the LPN shortage is not predicted to become severe when compared with the RN shortage, this shortage will be felt disproportionately in the settings that provide elder care, where LPNs make up a larger component of the nursing labor force.** Skilled nursing facilities and home health agencies will suffer more acutely from a shortage of LPNs than will hospitals, for example.

It is important to note that our RN and LPN shortage projections are independent of one another, yet in reality RN and LPN supply can be interconnected. If a growing RN shortage causes the prevailing wage for RNs to rise dramatically, or if RNs are simply unavailable, some healthcare providers may choose to replace RN labor with LPN labor. **Replacement of RNs with LPNs could slightly reduce the RN shortage but might dramatically increase the shortage of LPNs.** Although this practice may be cost-effective, there are clear distinctions in scope of practice for RNs and LPNs, and a number of studies have demonstrated improved patient outcomes where the staffing mix includes a higher proportion of RNs.²

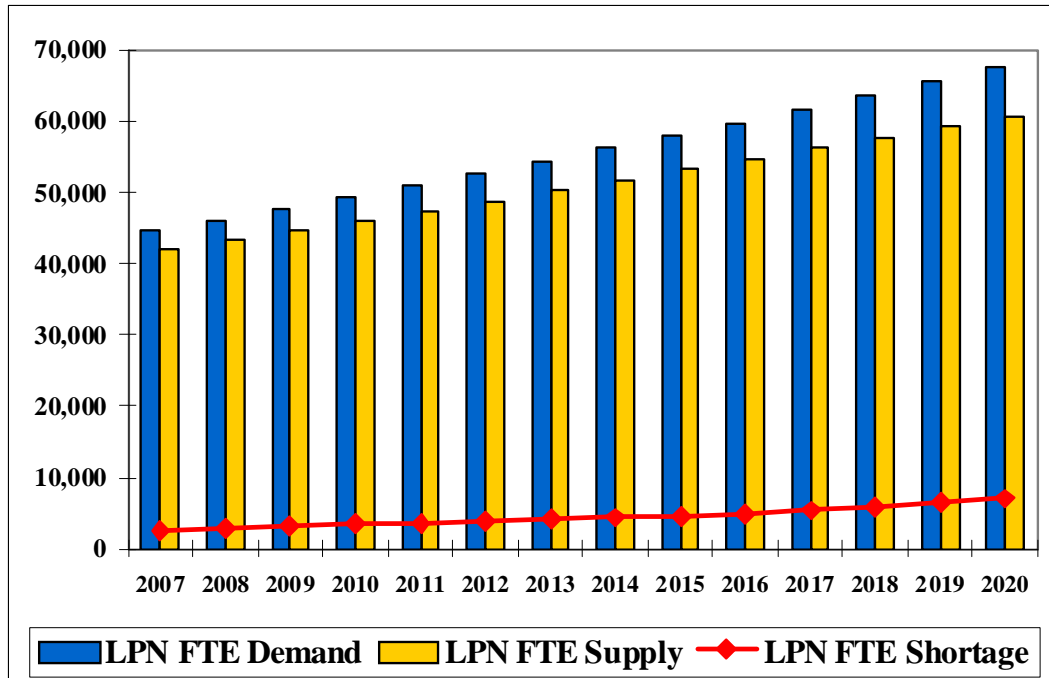


Figure 2. Baseline FTE Demand, Supply, and Shortage Projections for LPNs

Table 1 provides the precise estimates for FTE supply, demand, and shortage in each year for RNs and LPNs. As the table and figures show, the shortage increases steadily through the early years of the projection period *but begins to increase at an increasing rate in 2015*. This trend is a direct result of aging in both the nursing workforce *and* the general population. The large Baby Boom cohort that contributed a large number of nurses to the labor force will soon be reaching typical ages for retirement. In addition to reducing the size of the labor force, aging of Baby Boomers will increase demand for healthcare services provided by nurses.

Table 1. Baseline FTE Demand, Supply, and Shortage Projections for RNs & LPNs

Year	RN FTE Demand	RN FTE Supply	RN FTE Shortage	LPN FTE Demand	LPN FTE Supply	LPN FTE Shortage
2007	150,426	139,576	10,850	44,660	42,016	2,644
2008	154,265	141,563	12,702	46,053	43,320	2,733
2009	159,560	143,715	15,845	47,781	44,592	3,189
2010	164,318	145,899	18,419	49,480	46,031	3,449
2011	168,993	148,017	20,976	51,103	47,490	3,613
2012	173,970	150,119	23,851	52,753	48,847	3,906
2013	178,939	152,126	26,813	54,438	50,380	4,058
2014	184,033	154,194	29,839	56,180	51,812	4,368
2015	188,982	156,067	32,915	57,914	53,307	4,607
2016	194,251	157,976	36,275	59,724	54,780	4,944
2017	199,634	159,616	40,018	61,606	56,247	5,359
2018	205,247	161,323	43,924	63,532	57,760	5,772
2019	210,918	162,967	47,951	65,558	59,183	6,375
2020	216,803	164,594	52,209	67,694	60,676	7,018

Figure 3 presents age-sex population pyramids for Florida developed by the U.S. Census Bureau. The pyramids help to make clear why the nursing shortage is projected to reach such critical levels by the year 2020. The chart on the left – an estimate for the year 2000 – shows a large cohort aged 35-50, when the typical Floridian is working and consuming average amounts of healthcare. The chart on the right – a projection for the year 2020 – shows the same large cohort aged 55-70, when the typical resident is retired and may be consuming more healthcare.

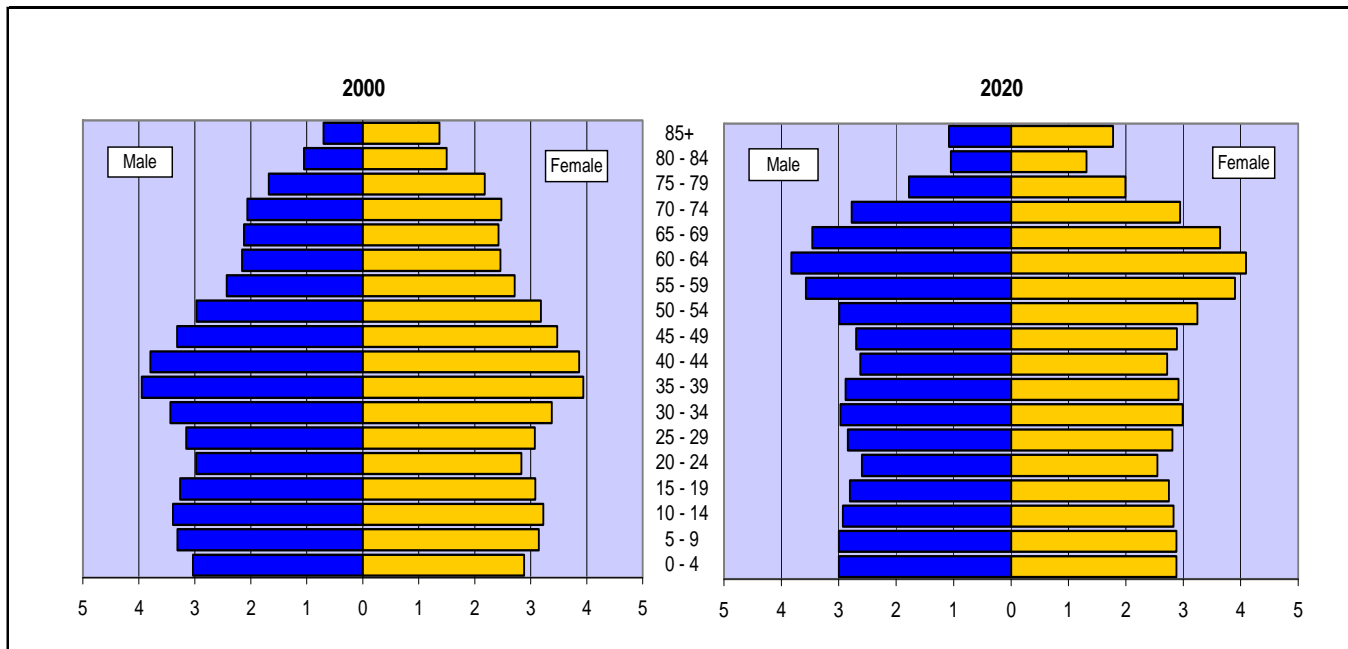


Figure 3. Population Pyramids for Florida, 2000 and 2020¹

The RN and LPN baseline supply, demand, and shortage forecasts show what Florida can expect if no concerted efforts are made to increase the supply of nurses. They represent a status quo scenario in which the number of new graduates increases modestly over time (1-2% each year) but no drastic increases in education capacity, or drastic decreases in workforce attrition due to delayed retirement or improvements in the work environment, are implemented. The projected RN FTE shortage building over the next 13 years, however, requires immediate action. If the status quo forecasts are realized, the state will suffer a crippling shortage of nurses that will undoubtedly compromise the quality of and access to care received by Floridians. Because of the severity of the projected RN shortage and the historically unique demographic context in which it will occur, it is likely that some degree of shortage will remain over the next 13 years despite our best efforts. With immediate action, however, it is possible to reduce the severity of the shortage. In the following section of this report, simulations are presented to show the likely effect of two interventions that may reduce the shortage: increases in new graduates and delays in retirement.

¹ Source: U.S. Census Bureau, Population Division, Interim State Population Projections, 2005

Simulated Forecasts of RN and LPN Supply

The Nurse Supply Model has the capacity to simulate changes in the nurse supply in response to increases in the number of new graduates and delays in retirement. We performed several simulations to determine the effects of these interventions on our nurse supply when implemented separately or together and at different levels of intensity.

Increasing RN Education Capacity

The baseline forecasts presented earlier incorporate marginal increases in the number of new graduates, shown in Figure 4. Each year, the supply of graduates from Florida nursing programs increases between 1 and 2 percent. While in 2007, nearly 6,000 new RN graduates and 3,400 new LPN graduates were produced in our state, by 2020 those figures are projected to be more than 6,800 and 3,900 annual graduates, respectively. To reduce the projected severe nursing shortage, it may be necessary to expand education capacity more rapidly. We implemented simulations to show the effect of increasing the annual number of nurse graduates by 30, 50, 70, and 90 percent over the baseline numbers shown in Figure 4.

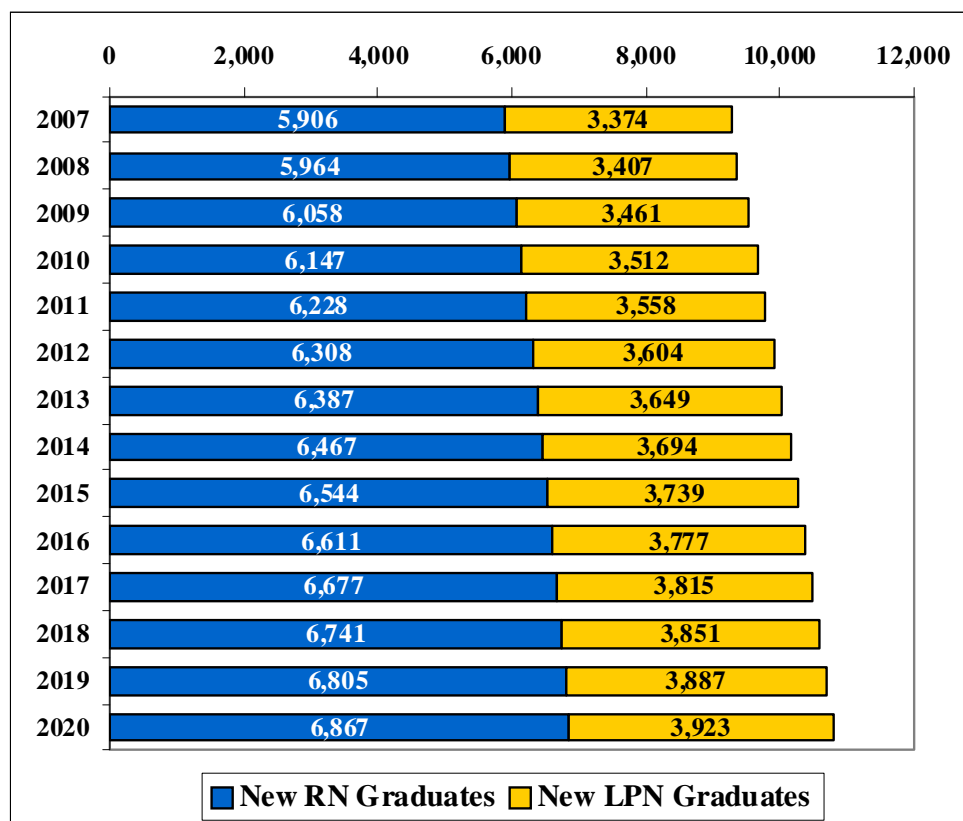


Figure 4. Baseline Projection of New RN and LPN Graduates

Figure 5 shows the supply implications of increasing the baseline projections of new RN graduates. Each simulation begins the new graduate increase in 2011, assuming that enrollment increases are enacted in 2009. **Note that if education program output of new graduates was nearly *doubled* in 2011, we would still experience a moderate nursing shortage that shrinks**

to its present level around 2015. After 2015, the shortage would continue to diminish and eventually (after 2020) be resolved. This simulation assumes that no other interventions are implemented.

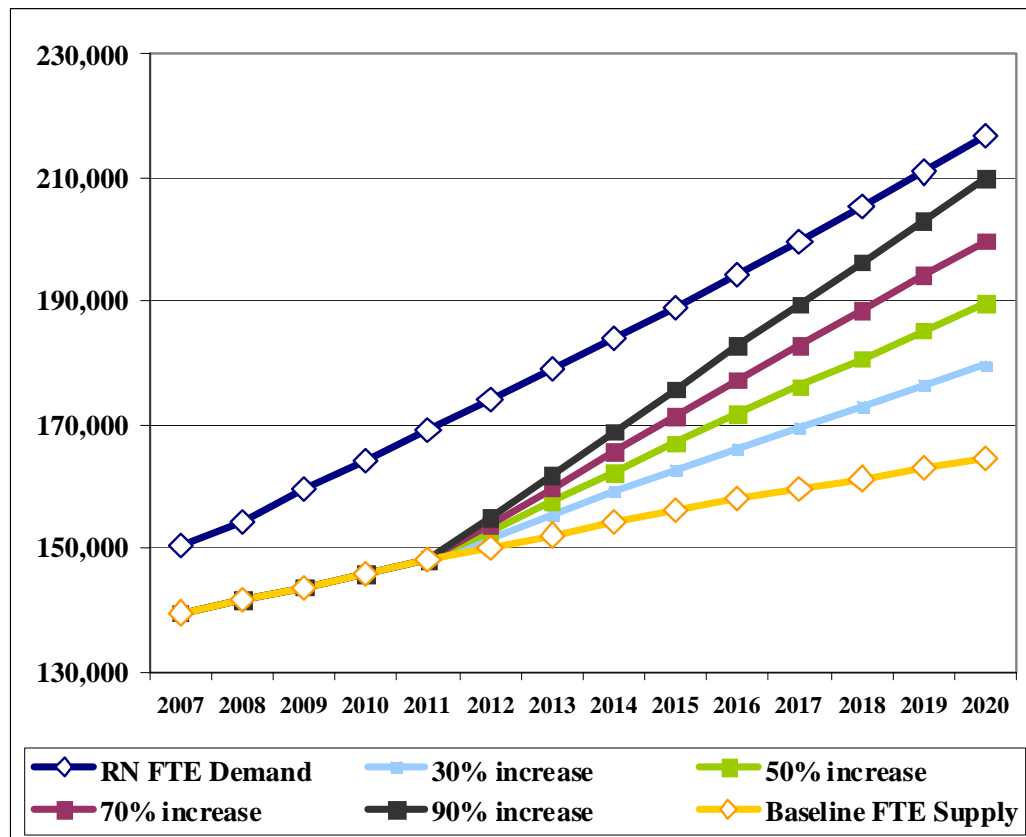


Figure 5. RN FTE Supply Implications of Increasing New Graduates

Delaying RN Retirement

Table 2 shows the workforce attrition rates used by the model. These rates are intended to capture permanent departure from the nursing workforce, but because very little data are available regarding the rate of attrition from the nursing profession at different ages, the model’s rates are based on mortality data from the Centers for Disease Control and workforce data on all college-educated women from the Current Population Survey.³ The rates are not nurse-specific, and they do not reflect the probability that a nurse will change careers due to dissatisfaction with nursing. They are not intended to capture attrition due to out-migration from Florida, temporary departures from the workforce, the probability of working in the field of nursing, or changes in the number of hours worked; these factors are measured in other fields. The rates in Table 2 are intended to represent the probability that a licensed nurse in Florida retires, permanently withdrawing from the nursing workforce.

Table 2. Nurse Supply Model Annual Attrition Rates by Age

Age	Annual Attrition Rate	Age	Annual Attrition Rate
<= 22	0.24%	44	0.38%
23	0.24%	45	0.39%
24	0.25%	46	0.41%
25	0.25%	47	0.42%
26	0.25%	48	0.45%
27	0.25%	49	0.57%
28	0.25%	50	0.80%
29	0.26%	51	1.19%
30	0.26%	52	1.38%
31	0.26%	53	1.42%
32	0.27%	54	1.54%
33	0.27%	55	1.59%
34	0.28%	56	1.55%
35	0.29%	57	2.09%
36	0.29%	58	2.16%
37	0.30%	59	1.44%
38	0.31%	60	4.83%
39	0.32%	61	4.91%
40	0.33%	62	25.16%
41	0.34%	63	6.91%
42	0.35%	64	6.91%
43	0.36%	>= 65	23.16%

The gold cells in Table 2 call attention to two prominent ages at which women leave the workforce: 62 and 65+. These ages are important because they are ages at which individuals become eligible for Medicare and/or Social Security benefits, either partial or full. Several studies of retirement behavior in the U.S. report that federal benefit eligibility is among the strongest predictors of retirement.⁴ Unfortunately, very little research specific to the retirement behavior of nurses has been done, explaining HRSA’s use of data on all college-educated women. Nooney and Unruh found in a very recent analysis of data from the 2004 National Sample Survey of RNs that benefit eligibility (as defined by age) was a strong predictor of nurse retirement and that nurses appeared to respond to eligibility similarly to persons in other professions.⁵ This finding strengthens our confidence in the attrition rates used by HRSA, but the study did not allow attrition rates to be calculated by age.

Many older, experienced nurses could be retained in the workforce if work environments and workloads were redesigned to reduce the physical burdens associated with direct care.⁶ We implement simulations that show the impact on supply by shifting these attrition rates up by one or two years – effectively delaying retirement as demonstrated in Figure 6.

The simulations assume that retirement delays begin in 2009. Although in 2010 and 2011, this strategy does reduce the nursing shortage, soon afterwards the shortage begins to grow again. This occurs because such a large number of nurses will move past the simulated retirement ages

as the Baby Boom cohort continues to age. **While delaying retirement will have a clear short-term impact on the nursing shortage, in the long run Florida will need to increase production of new nurses, attract more from out-of-state, or decrease attrition from the profession to resolve the shortage.**

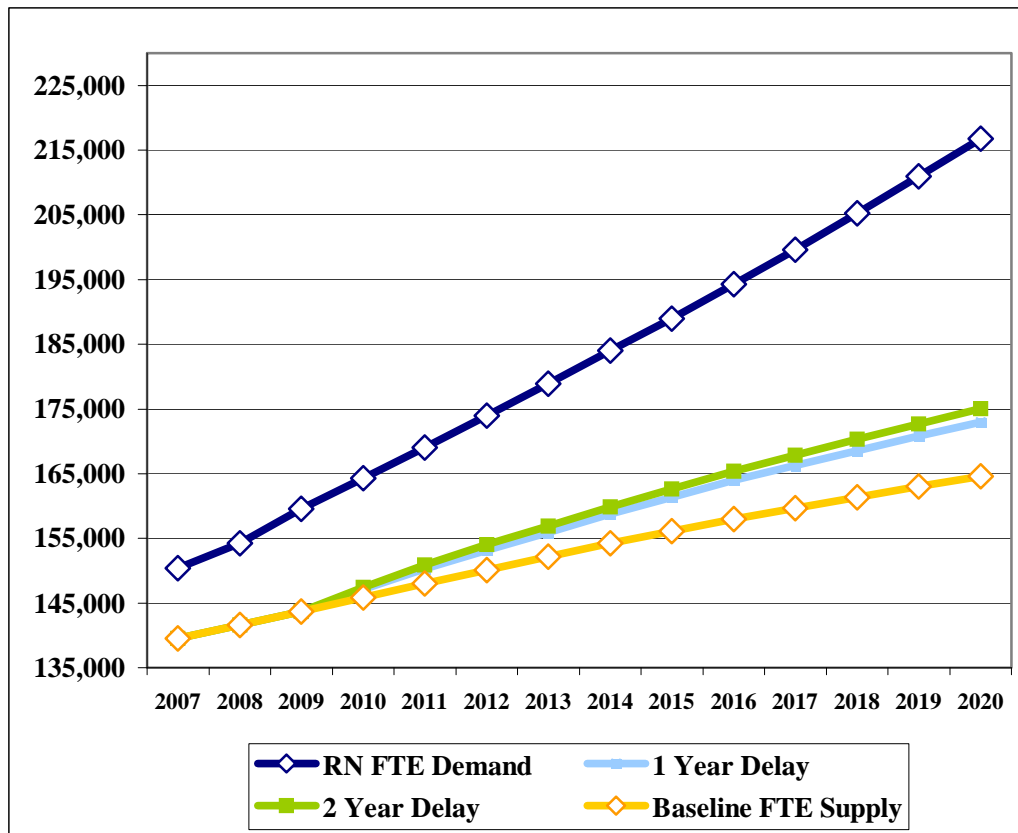


Figure 6. RN Supply Implications of Delaying Retirement

Increasing RN Education Capacity and Delaying RN Retirement

Figure 7 depicts a simulation that combines retirement delays with a staggered (and more realistic) increase in the number of new graduates produced in Florida. Retirement is delayed for two years beginning in 2009, and new graduates are increased in phases beginning in 2011, when the baseline projection of graduates is increased by 15 percent. Each year, an additional 15 percent is added to the baseline projection until new graduates have been increased by 90 percent over baseline projections (in 2016). This simulation presents the most realistic and achievable combination of interventions available in the nurse supply model to increase the supply and resolve the nursing shortage by 2020.

Note that even these interventions combined cannot prevent the nursing shortage from growing over the next five years, but their immediate implementation *can* have long-term success in resolving the shortage. Given the unique demographic shift affecting our country’s population for the next decade, it is important to take the long view of nursing workforce needs and available supply.

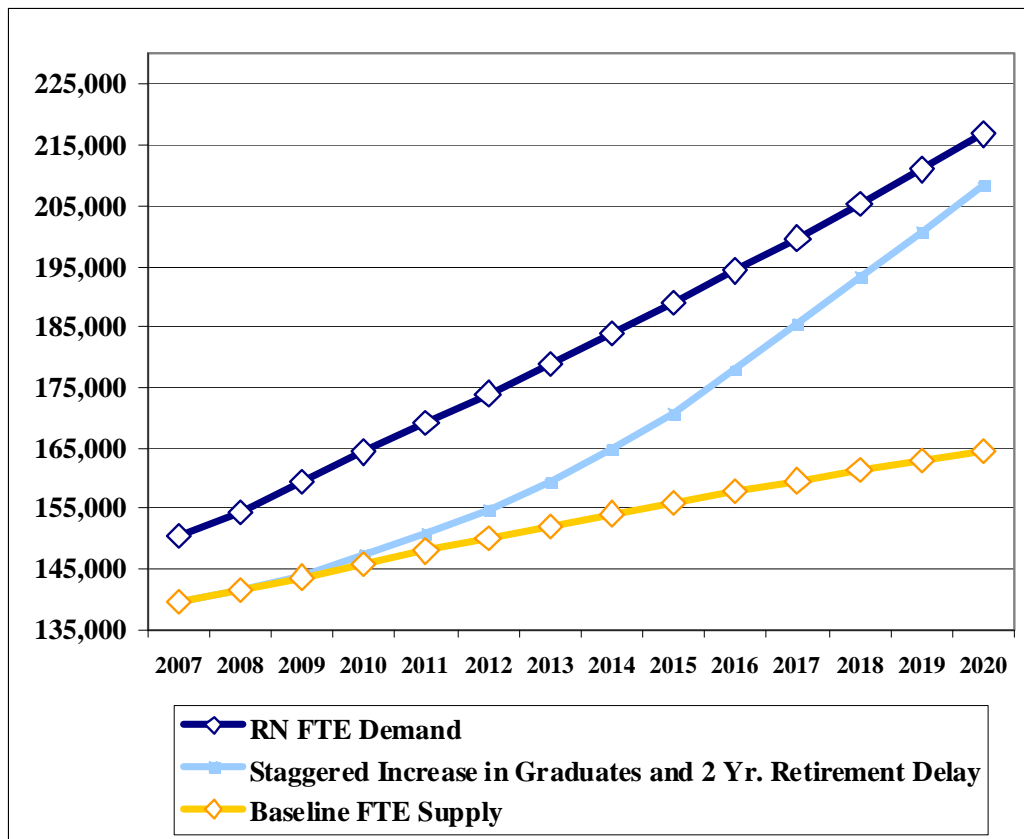


Figure 7. RN Supply Implications of Increasing Graduates 15 Percent Each Year and Delaying Retirement by Two Years

Increasing LPN Education Capacity and Delaying LPN Retirement

Figure 8 presents a combination simulation for LPNs. New graduates are increased by 15 percent over baseline projections of new graduates beginning in 2010 (assuming enrollment increases are enacted in 2009), and retirement is delayed by one year beginning in 2009. Because the LPN shortage is not projected to become as severe, these interventions are sufficient to keep the shortage from increasing over present levels. The LPN shortage is completely resolved by 2016. Again, however, the simulation assumes that the concurrent shortage of RNs will not artificially inflate the demand for LPNs due to employer substitution. As the RN shortage increases over the next five years, the impact on the LPN shortage – particularly in skilled nursing facilities and home health agencies – must be monitored carefully.

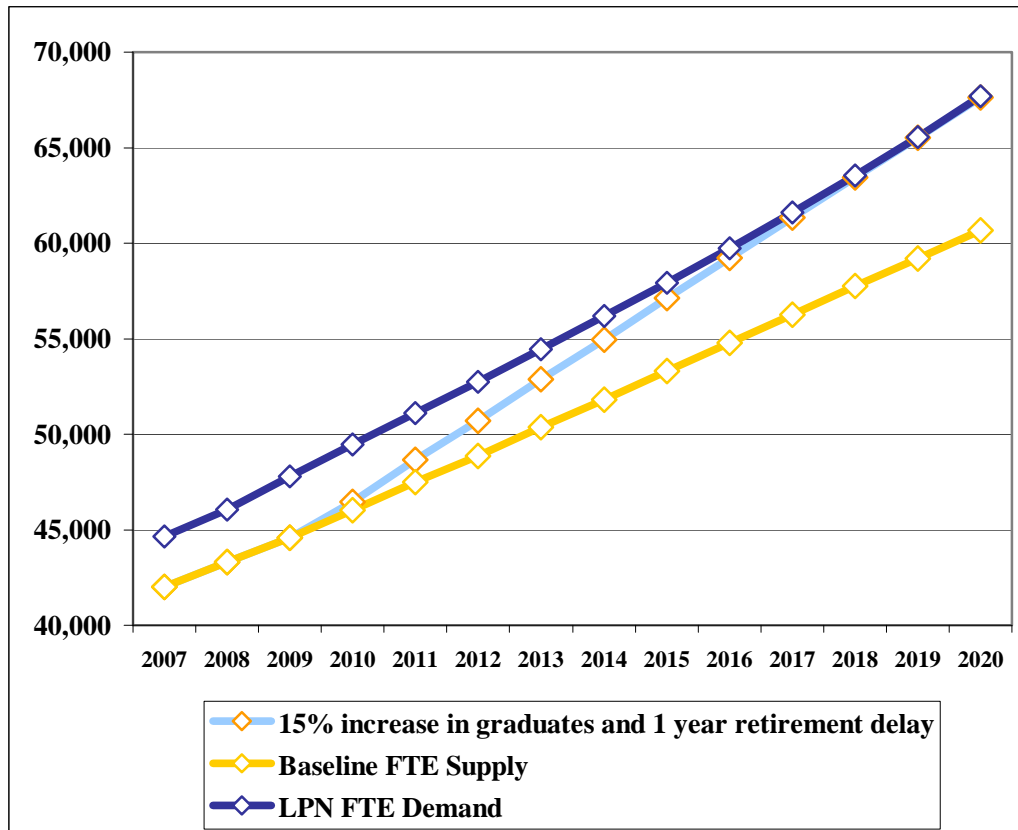


Figure 8. LPN Supply Implications of Increasing Graduates by 15% and Delaying Retirement by 1 Year

Discussion and Conclusions

The 2004 release of HRSA’s Nurse Supply and Demand Models provided state-level nurse workforce planners with a powerful tool for projecting nursing shortage timing and severity. As with any forecasting model, the accuracy of the HRSA models depends on the accuracy of input data used to determine the baseline levels of nurse supply and demand and the validity of assumptions about the forces that drive changes in supply and demand. A much more detailed discussion of both data accuracy and assumption validity can be found in the [Technical Report](#) accompanying these forecasts, but one should be mentioned here to provide context for Center recommendations regarding solutions to the nursing shortage.

The supply model’s attrition rates are very low at young ages, reflecting an assumption that career change among newly licensed nurses is minimal. It is possible to modify these attrition rates, as well as rates of in-migration and out-migration, to match the known patterns in a specific state. We suspect that the model’s rates underestimate licensed nurse attrition at younger ages, but at present we lack the data needed to construct rates characterizing the attrition of Florida nurses. Continued collection and analysis of licensure data files should provide us with a better understanding of the attrition patterns within Florida. If the model’s rates underestimate attrition due to career change among younger (or older) nurses, the nursing shortage could be more severe than we have estimated. Such a situation would also require different interventions than the supply model simulations presented here. Specifically, it would be necessary to address

the loss of nurses by emphasizing retention efforts and improving the work environment. It will be important to revisit these forecasts as new data become available in future years.

Unfortunately, the available data and simulations in the Nurse Supply Model do not allow us to model this scenario at the present time.

The severity of the RN shortage projected by these models is daunting, even though the shortage is projected to be somewhat less severe than original HRSA projections for Florida reported by Biviano et al. in 2004. Resolving the shortage will require multiple simultaneous interventions to

- 1) increase the number of new graduate nurses in Florida,
- 2) improve the work environment to retain all nurses, and
- 3) redesign work to accommodate the older nurse.

Such interventions must be implemented strategically and based on available evidence regarding best approaches. In addition, intervention efforts must be evaluated through continued collection of data on nurse supply and demand. **The Center published a report in 2007 titled “Addressing the Nursing Shortage in Florida: Strategies for Success” that describes our recommendations for maximizing education capacity, retaining nurses, and planning for nurse workforce needs in a strategic, data-driven fashion.⁷ The forecasts reported here do not alter those recommendations; rather, they highlight the need to begin work on each immediately to avoid a shortage of catastrophic levels.**

As the definitive source of information on nurse supply and demand in Florida, the Center will continue to collect the data needed to evaluate the progress of efforts to resolve the nursing shortage. Revised and extended forecasts of supply and demand will be published every two years as new data become available. We anticipate the availability of new versions of the HRSA Nurse Supply and Demand Models in future years, and these models may have increased functionality that allows for more accurate forecasting and more detailed simulations. It is hoped that future forecasts will be more optimistic owing to the concerted efforts to resolve the shortage by the Center, the Florida legislature, the state’s nursing education programs, and nurse employers across the spectrum of settings where Florida’s nurses work.

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