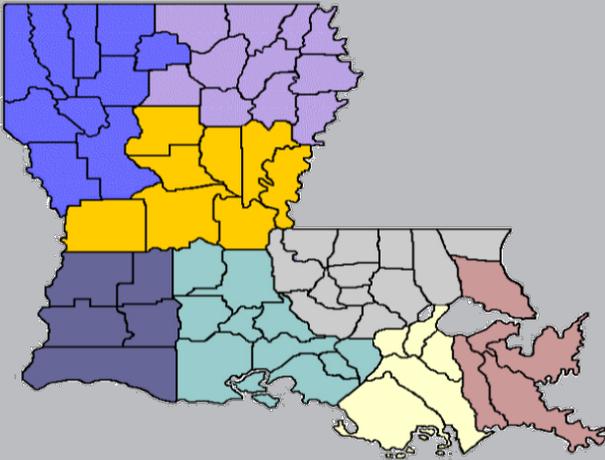


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Louisiana's Updated and Enhanced Multi-Regional Statewide Nurse Workforce Forecast Model



Technical Report 2020

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Louisiana’s Updated and Enhanced Multi-Regional Statewide Nurse Workforce Forecast Model and Simulation Tool Technical Report

Background and History of the Louisiana Multi-regional Statewide Nurse Workforce Forecast Model and Simulation Tool

The current Louisiana Nurse Workforce Forecast Model is still one of only a few multi-regional statewide models in the nation. It was created in 2013 using the 2010 Census of Population that was just available and projections were made out to 2020. State licensure data for nurses was a key element in building the model along with demographics based on the Census. As the first of its kind, it was groundbreaking. No other state model had regional elements. No other state model was designed to provide policy analysis using simulation... most were only simple forecasts at the state level. Several years have gone by since the Louisiana Nurse Workforce Model was launched. In the interim, Health Resources and Services Administration (HRSA) produced a new national model that was met with some skepticism. Other models have been built using the Louisiana template and during that process improvements were made in the user interface and the underlying engine that drives the model. And, of course, a lot has happened since 2010 as reflected in today’s data as well as changes in healthcare utilization and policy.

The Updated and Enhanced Model

Model Integration - The original Louisiana model consisted of twenty-seven separate programs. The analysis of the nurse workforce is broken down by three categories of nurses: registered nurses (RNs), advanced practice registered nurses (APRNs) and licensed practical nurses (LPNs). For each type of nurse, there are eight regional models and a statewide model. To navigate between models each of the twenty-seven models had to be opened individually. The new updated approach combines the eight regional models and the statewide model for each type of nurse together in one program. The user interface is a map of Louisiana showing each of the regions (Figure 1). To access any of the regional models for that type of nurse, just click on the name of the region on the map and it opens. This makes it easy to navigate between regional models and access the statewide model from the interface as well.

Regional Workforce Statistics and Demographics – Each model now has two background pages that describe the workforce in the region showing where nurses work and live as well as their employment status, earnings, and other statistics. The second page contains demographic trends in the region and graphs of the age structure of the nurse workforce in the region.

Diversity – For the first time there are both statistics and maps showing the racial gap or measure of disparity between the proportion of Black/ African American (B/AA) nurses and the proportion of B/AA residents at the parish/regional level. The Louisiana licensure data and the most current demographic projections for Louisiana were used to determine the racial gap. This is unique to the Louisiana model. The goal for the future is to identify the racial gaps for all minority groups in Louisiana.

Education – For the first time there are both trending statistics and graphs depicting the number of students enrolled in, and graduating from Louisiana’s nursing programs. The source of this data is the Louisiana Center for Nursing 2019 Nursing Education Capacity report and data obtained from the Louisiana State Board of Practical Nurse Examiners.

An improved Algorithm – The calculation of the supply of nurses is enhanced. There is now a more detailed analysis of where nurses live and work including in-state and out-of-state. The demand algorithm has been streamlined and is based on utilization of nurses in each healthcare setting which allows for more flexibility in creating simulations with the models.

A Regional Perspective

One of the unique aspects of the Louisiana model is that it is regional. While other models, including HRSA’s national model, are top down and make projections by allocating the aggregate workforce to states or regions, the Louisiana model starts with parish and regional level licensure data and adds the results to arrive at a state overview and forecast. This approach is more reliable and results in more accurate figures.

Figure 1 represents the graphic interface used in the updated model showing each of the regions. These regions were originally selected to conform with the state regional labor market areas (RLMA’s) identified by the Louisiana Workforce Commission. This allows for maximum data compatibility with their data for statistics on median earnings for example.

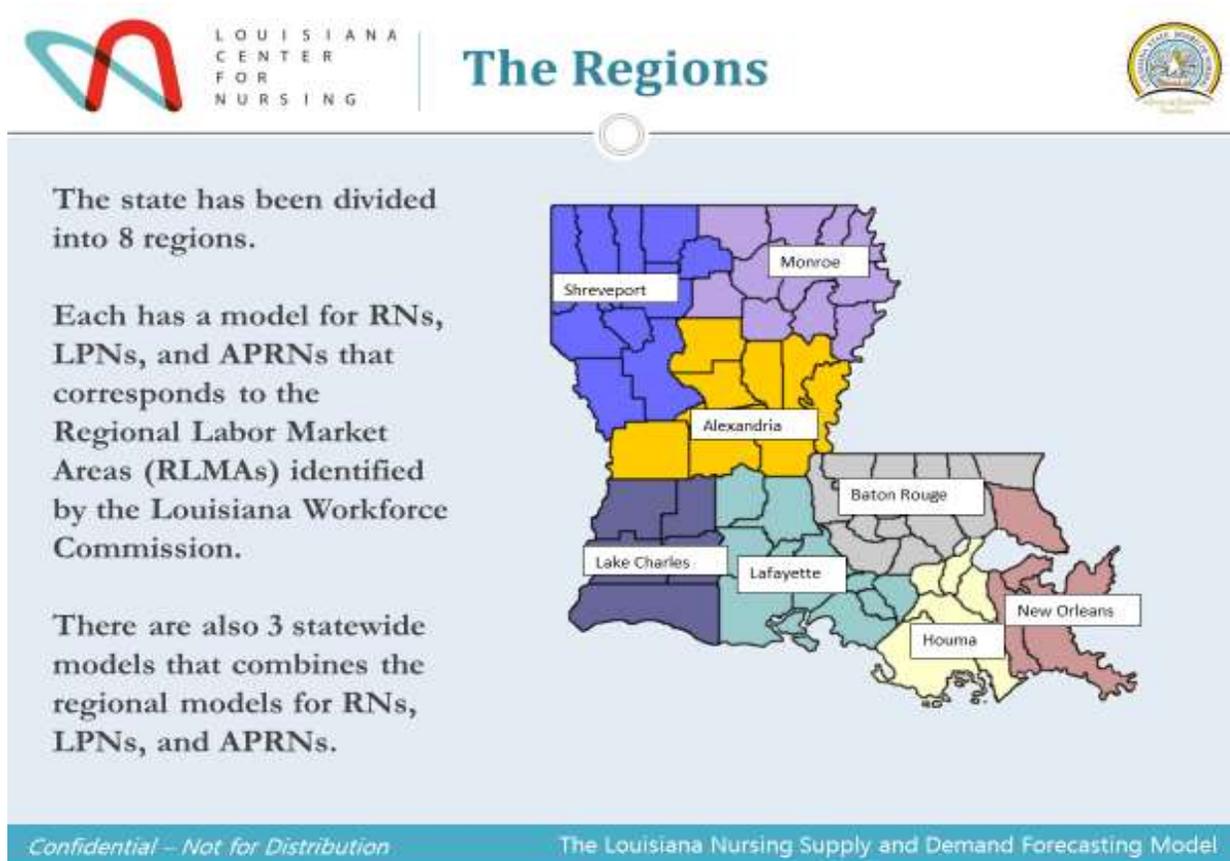


Figure 1. Louisiana Workforce Commission’s eight regional labor market areas.

Estimating the Supply of Nursing

Defining the Nurse Workforce

For the purposes of this model, the nurse workforce is first classified by the licenses held by different *types of nurses*: RNs, APRNs and LPNs.

Educational data and full-time equivalents (FTEs) for APRNs are broken down according to the type of role: certified nurse practitioner (CNP), certified registered nurse anesthetist (CRNA), clinical nurse specialist (CNS) and certified nurse midwife (CNM). The forecast of supply and demand for APRNs combines all categories.

For each of the three types of nurses, the workforce is first defined at the state level and then at the regional level. The nurse workforce includes all those licensed nurses working in the state of Louisiana if their employment *status is*: (1) full-time; (2) part-time; or (3) per diem. In addition, the workforce includes those nurses who are unemployed and seeking work in nursing and those who are licensed and live in Louisiana. This is determined by the region where primary employment is indicated in the licensure data (i.e., Region Employed). The step by step process that was used to determine the supply of nurses in each region from the state licensure data can be found in Appendix A.

Where nurses live and work

All nurses licensed in Louisiana do not live and/or work in Louisiana. Only those licensed nurses who are employed or seeking nursing jobs in Louisiana are included in the workforce model. Those licensed nurses who live in Louisiana but work in other states are not included in the definition of the workforce. This is a relatively small but significant number who work full-time, part-time or per diem in either surrounding states or in other parts of the country periodically.

Likewise, some of the nurses who are licensed and work in Louisiana live in other states. These nurses are included in the workforce and supply figures of the model. Again, this is a relatively small number of nurses who live in surrounding states or who travel to Louisiana periodically for per diem or seasonal jobs.

Nurses who are unemployed and looking for a job in nursing do not have an employment region in the licensure data. To include them in the workforce, they are assigned to the workforce in the 'Home Region' if they live in the state.

A breakdown of all licensed nurses is provided in each statewide model indicating where they live and work. This will include nurses who live in Louisiana and work in other states but are not counted in the workforce.

Breaking down regional supply

Once the nurses making up the state workforce for each type of nurse has been extracted from the licensure data, they are broken down into eight regional data sets – Alexandria, Baton Rouge, Houma, Lafayette, Lake Charles, Monroe, New Orleans and Shreveport. These data are then used to identify the nurse workforce in each regional model. A statewide model for each type of nurse is also created by linking the regional models. This provides regional comparisons as well as aggregate supply and demand statistics.

Navigation between all the models is done with a graphic interface using a map of Louisiana that shows the outline of the eight regions with labels. To access any of the regional models the cursor is simply hovered over the name of the region. The cursor changes to a small hand and the user would then right click the mouse. Once the regional model selected appears, the user can then navigate through it by clicking on the tabs across the bottom of the screen. To return to the state map, the user would hover the cursor over a box on the bottom left labeled “Return to State Map” on the first tab the model (Regional Workforce) and click it.

Healthcare settings

Within each regional model the supply of nurses is broken down into major healthcare settings. These include: inpatient care, ambulatory care, nursing facilities, home health, community/public health, nurse education, and other. They were originally established by HRSA when nurse workforce modeling began and have been adopted as a standard by most states and regions developing nurse workforce models. The state licensure data uses a longer and more detailed list of healthcare settings that include detailed categories such as school nurse, prisons, physician offices, insurance companies, dialysis centers, etc. Each of these designations have been included in one of the broader categories used by HRSA and the licensure data was recoded accordingly.

The nurses that make up the regional workforce are counted in FTEs. Nurses working full-time are assigned one FTE and are assumed to work 40 hours per week on average. Nurses working part-time are assigned .5 FTEs. Per diem nurses are assigned .6 FTEs. These weights are based on the average hours worked indicated in the licensure data. The final breakdown of the workforce for each type of nurse is broken down by the number of FTEs in each healthcare setting in each region.

The following flowchart (Figure 2) illustrates how the state licensure data is broken down to determine the nurse workforce for each type of nurse in each region by healthcare setting.

Breaking Down the Licensure Data

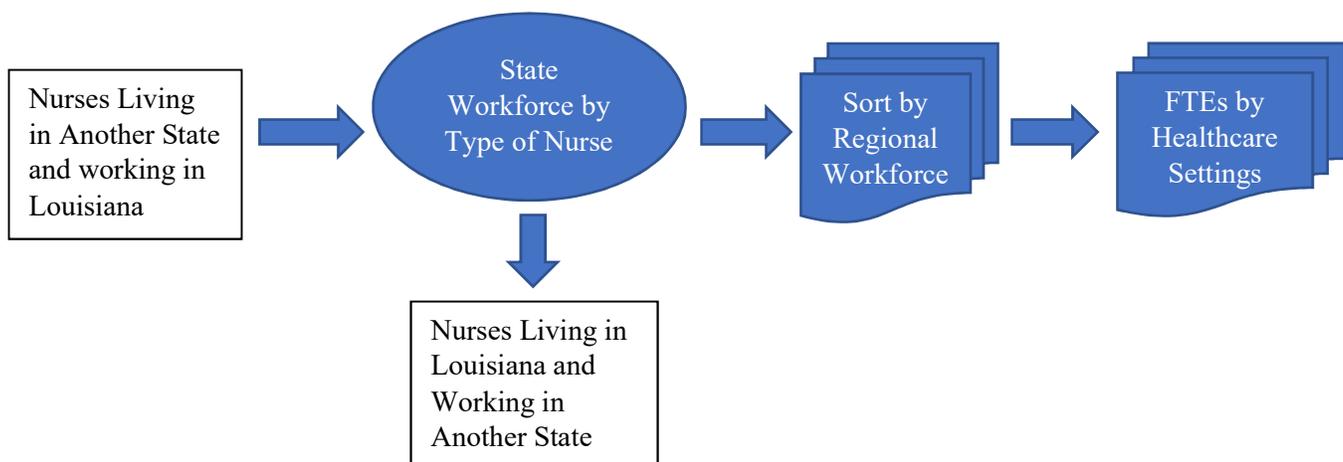


Figure 2. Nursing workforce by region and healthcare setting.

Estimating the Demand for Nursing

Demographics drive the demand for healthcare

The regional demand for nurses is based on population projections broken down by age and gender. Males and females have different needs for medical treatment and care during different times in their lives. The demand for nursing, therefore, varies depending on the relative size of age cohorts and the proportion of men and women in them. The population projections used in the Louisiana Nurse Workforce Forecast Model are the official state figures for each parish in the state by age and gender categories.¹

For each age and gender group in a region the demand for various types of healthcare is different. The type of care needed is broken into “healthcare settings” that are shown in Table 1. Demand will also vary between urban populations and rural communities.

Table 1. Primary Healthcare Settings for Nurses

Licensure Code	Licensure Data Category	Forecast Model Category
64	Ambulatory	Ambulatory Care
65	Community Health	Community/Public Health
66	Correctional Facility	Other
67	Home Health	Home Health
68	Hospital	Inpatient Care
69	Insurance	Other
70	Long-Term Care	Nursing Facilities
71	Occupational Health	Ambulatory Care
72	Other	Other
73	Policy and Planning	Other
74	Public Health	Community/Public Health
75	School Health Service	Ambulatory Care
450	Assisted Living	Nursing Facilities
612	Hospice	Home Health
614	Dialysis	Ambulatory Care

The expected number of days a person needs hospitalization each year, for example, will vary with their age and gender. The same is true for the number of visits a person will require for ambulatory care or the average number of times a nurse visits a patient in their home. Nursing facilities care for subacute care patients following hospitalization that requires skilled nursing as well as long-term care for the elderly. The expected number of days of care will vary by age and gender and so will the mix of RNs, LPNs and APRNs that will be needed to provide nursing care.

Demand Model Equations

The forecast model estimates the demand for care and treatment using the following general equations (the following example is used to estimate the demand for RNs).

¹ Population Projections of Louisiana Parishes through 2030, Troy C. Blanchard Associate Professor of Sociology Louisiana State University, Louisiana Department of Administration.

1. $Utilization_{ij} = (Percent\ of\ Demand_{ij} \times RNs_j) \div (Pop_i \div 1,000)$
2. $FTE\ Nurses_{ij} = Utilization_{ij} \times Pop_i^{t+1}$
3. $Demand = \sum_1^i \sum_1^j FTE\ Nurses_{ij}$

Percent of Demand is the percent of healthcare resources used by each age/gender group (i) in each healthcare setting (j),

RNs is the number of nurse FTEs employed in each healthcare setting (j),²

Pop is the number of persons in each age/gender group (i),

And the superscript *t* signifies the year where *t* is the base year followed by the number of years into the future.

Percent of Demand

Percent of demand is estimated by calculating the percent of total units of care demanded by each gender and age cohort based on HRSA data.³ The rationale is that while the number of units of care has changed over time, the proportion used by each age/gender group is very stable. Most of the variation in utilization is driven by age and then by gender. Those two variables are used to explain variation in the cost of healthcare in the population by the American Association of Actuaries in their studies, the Centers for Disease Control and Prevention, and other organizations.

This method uses the same ratio of FTE nurses per 1,000 people that HRSA has adopted from the classic Bureau of Labor Statistics (BLS) occupation projection models but adjusts for variation in age and gender. Most important, demand will adjust to changes in nurse utilization automatically as the model is updated using new licensure data. It becomes dynamic and reflects the changing roles of each type of nurse, changes in treatments, new technology, and the impact of public policy and health insurance coverage.

Utilization

Utilization is estimated by dividing the appropriate measure of demand in each healthcare setting by the number of FTE nurses employed in that setting in each region. For example, the demand for inpatient patient care is measured by the number of patient days demanded based on the demographic profile of the region. The ratio of FTE nurses to the measure of current patient demand reflects the current **utilization** of nurses in each healthcare setting in the region. For inpatient care the ratio is the number of FTE nurses per 1,000 patient days. For ambulatory care it is the ratio of FTE nurses to visits per 1,000 people. The utilization ratio can then be applied to future changes in the demographics of the region to estimate the number of FTE nurses that will be needed in each healthcare setting. This assumes that the current utilization of nurses will be constant over the time horizon of the model forecast.⁴ If there is a projected increase in the number of patient days demanded by 1,000 then one more nurse would be required. The factor that links demand and supply is *utilization*. At any given point in time there exists a ratio of nurses employed to patients being cared for or treated in each healthcare setting. The model assumes that the current pattern of employment of nurses in each setting will remain the same in the near term. As new licensure data becomes available,

² One can substitute LPN or APRN for RN in the equation depending on which type of nurse is being modeled.

³ This data was compiled by HRSA from the American Hospital Association, Outpatient records, the American Community Survey, and other sources over 10 years ago and then updated about 6 years ago. That is the data used in our previous model.

⁴ The utilization ratio can be modified by the user to carry out alternative scenarios. One could increase the ratio of FTE nurses for each setting to see what the impact would be on the future demand for nurses.

the model will automatically adjust by calculating new measures of utilization in each healthcare setting in each region. It will become dynamic.⁵

Example: Inpatient Care

Percent of Demand_{ij} for inpatient care is shown in Table 2:

Table 2. Percent of Healthcare Resources Utilized by Age and Gender

Age Category	Female	Male	Total
0-4	4.5%	4.7%	9.2%
5-17	0.4%	0.4%	0.8%
18-24	1.9%	0.7%	2.6%
25-44	2.1%	1.3%	3.3%
45-64	2.8%	3.2%	6.0%
65-74	7.0%	7.1%	14.2%
75-84	10.3%	12.6%	22.9%
85+	18.8%	22.2%	41.0%
	47.8%	52.2%	100%

If the number of FTE nurses employed in inpatient care equals 25,000 (as an example) then a breakdown of the number of FTE nurses that serve each age and gender group during a given year can be determined as shown in Table 3:

Table 3. FTE Nurses Needed by Age and Gender

Age Category	Female	Male	Totals
0-4	1,124	1,183	2,308
5-17	106	92	198
18-24	475	183	658
25-44	521	313	834
45-64	695	792	1,488
65-74	1,762	1,776	3,538
75-84	2,583	3,147	5,730
85+	4,693	5,555	10,248
Totals	11,958	13,042	25,000

Next, the FTE nurses employed in inpatient care (RN_{s_j}) is divided by the population in each age/gender category (POP_i), then divided by 1,000 population = Utilization Ratio: the number of FTE nurses needed per 1,000 people in each age and gender cohort (Table 4).

⁵ The model can also change utilization for simulating different patterns of demand – nurse to patient ratios - as is explained below in the section on Modeling and Simulation.

Table 4. Utilization ratio

Age Category	Female	Male
0-4	2.5634	2.4138
5-17	0.2414	0.1870
18-24	1.0826	0.3741
25-44	1.1871	0.6391
45-64	1.5853	1.6166
65-74	4.0169	3.6230
75-84	5.8884	6.4198
85+	10.6992	11.3321

To estimate the number of FTE nurses that will be demanded in inpatient care in any future year, the utilization ratio for each age/gender category is multiplied by the number of people in each age and gender cohort in the future year and divided by 1,000. Then the results are summed across all age/gender categories to arrive at a total regional demand for nurses in inpatient care.

When this is done for every healthcare setting, the results are added to arrive at the total demand for FTE nurses in the region in any year.

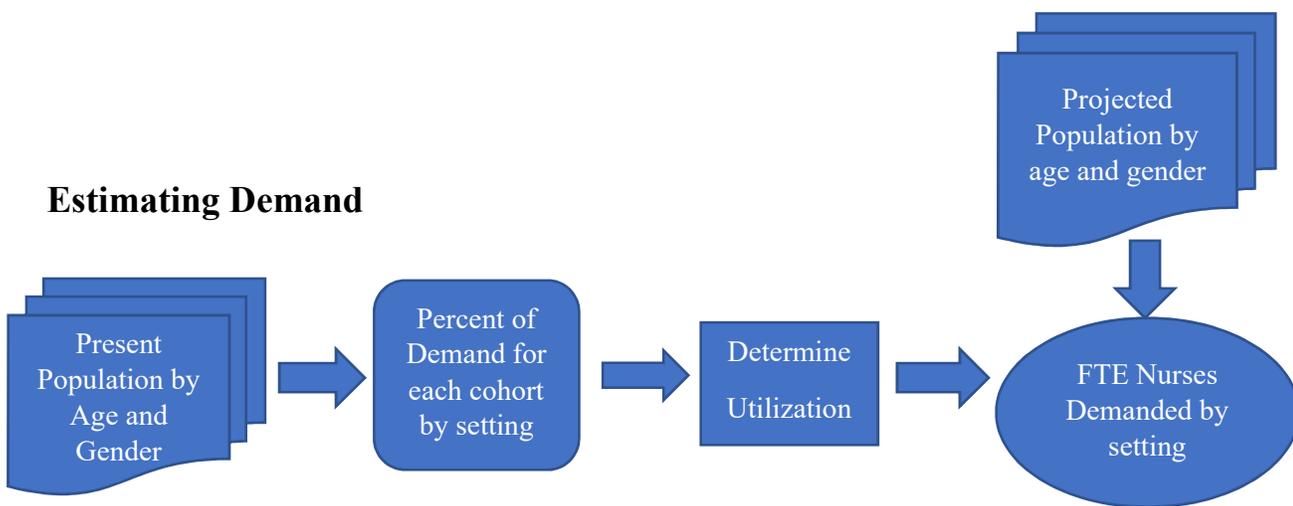


Figure 3. Total Demand for full time equivalent nurses by region per year.

Forecasting the Future Demand for Nursing

Given some measure of the demand for healthcare services for each setting based on regional demographics and a breakdown of the regional nurse workforce by healthcare setting, the model can forecast the future demand for nursing in detail. This is done by updating the number of FTE nurses in each healthcare setting for both urban and metropolitan parishes in the region. When these updated figures are entered in each model, the utilization of nurses is recalculated and all of the demand numbers in each model change.⁶

⁶ A detailed description of this process is included in the Appendix.

Anticipating Changes in the Supply of Nurses

One of the dynamic aspects of the forecast model is the aging of the nurse workforce. For each regional model there is a Master Supply tab. It has a spreadsheet that indicates the number of licensed nurses working in the labor force in that region and the FTEs they represent broken down into one-year increments. The figures are advanced one year at a time and the FTEs in each year are moved to the next year as nurses age. As nurses advance toward their later years, their capacity to generate FTEs is reduced. The licensure data shows that as nurses of each type get older, they work less hours and a greater number of them go from full-time to part-time and even per diem jobs. By age seventy-five they are assumed to be working very little; many are actually volunteering or are retired according to the data. This adjustment is made on the Master Supply tab and then automatically entered in the Supply and Demand tab to estimate any surplus or gap in nursing capacity going forward in the region.

There is also an assumption made concerning the addition of new nurses to the regional workforce in each year that is made on the Supply and Demand tab based on the average size of the nurse cohorts in the licensure data for each region between the ages of 22 and 27. This can be varied for simulation purposes to judge the impact of increasing the supply of nurses joining the labor force.⁷

Identifying Gaps in Supply and Demand in the Future

The Supply and Demand tab in each model is where the forecast or the results of any simulation are viewed. The graph clearly shows any years in which the supply of and demand for nurses is out of balance. The larger the gap between the supply (shown as a bar chart for each year) and the top of the demand surface (shown as a solid wall behind them) the greater the shortfall or surplus. The table above the graph shows the actual number of nurses that are needed to fill any shortfall or the number of nurses that are part of a surplus on the bottom line.

A breakdown of the number of nurse FTEs demanded in each healthcare setting for each year is also available on a separate tab labeled Demand Numbers.

Workforce and Demographic Information

The first three worksheets in each model provide information about the workforce for that region. The first has a tab labeled Regional Workforce. It shows tables and graphs breaking down all the licensed nurses in the workforce by status and setting. It also includes tables with figures showing the number of nurses living in the region who work outside of the state and the number of nurses living outside the state who work in the region. It is notable that all the figures, while close, are not exactly consistent. That is because some nurses enter more than one status if they are working at more than one job. Also, the nurses who are unemployed have no healthcare setting. These discrepancies have no adverse impact on the model or on the forecasts that the models provide. The fact that some nurses are working more than one job and because FTEs are calculated based on status (full-time, part-time, and per diem), those who are working more than one job have their hours included for both jobs. This makes the number of FTEs in the supply data more accurate.

⁷ This is especially useful in looking at the demand and supply of nurse practitioners in ambulatory care. This is an area where utilization is shifting as more NPs are replacing physicians as primary care providers.

Analyzing the Diversity of Louisiana’s Nursing Workforce

One unique feature in the updated and enhanced Louisiana Multi-regional Nurse Workforce Forecast Model is its ability to depict differences in the number and proportion of racial groups working in the nurse workforce when compared to parish, regional and state level population data. Each model has a tab called “Diversity” that presents tables and maps of the region broken down by parish. The number and proportion of nurses in the following racial categories is shown by parish in the region: White, B/AA, and Other. In addition, there is a map of the region showing parish boundaries with shading that reflects the relative number of B/AA nurses working there. When conducting workforce planning, it is helpful to see how similar or different the racial balance among nurses in a community is to the racial composition of the people living there. As previously stated, the goal for the future is to identify the racial gaps for all minority groups in Louisiana.

The tables in this tab compare the proportion of B/AA nurses in each parish in the region with the proportion of B/AA people in the population. By looking at the difference, one can calculate an index where zero would indicate the proportions were identical and a positive or negative number would indicate there was a “Gap” present. The size of the gap represents the number of B/AA nurses that would have to be in the workforce of each parish to bring the proportion of B/AA nurses in line with the proportion of B/AA people living there. It is not meant to suggest that this number should become a policy goal. It is provided to give some perspective regarding the degree of racial integration present. There are considerable differences in the Gap between parishes within regions as well as between regions. The maps give an overview of racial balance within each region.

Modeling and Simulation

The Louisiana Nurse Workforce Multi-Regional Statewide Forecast Model generates a baseline forecast showing the expected supply of and demand for nurses of each type by region and breaks them in to healthcare settings. The forecast helps identify any shortage or surplus of nurses in each region and across the state. This is the primary focus of the model.

But being a model, it has the capacity to be changed... to examine what the impact would be if policy changes were implemented or if external market forces or technology impacted the future. This allows the model to be used as a powerful policy tool as well as a source of information. There are two approaches to using the model in this way: (1) Simulation and (2) Sensitivity Analysis.

Simulation

Simulation is used to do “What If Analysis”. By changing the assumptions or the parameters in the model, one can see the impact on the future nurse supply and demand in the region, as well as statewide. There are many ways this can be done. On the Demand Dashboard in each model there are three tables across the top. The user can change the numbers in the cells of the tables.

For example, one table lets the user enter future changes in the hospital capacity in the region by entering the number of beds that will become available in a future year. This is very helpful when there is discussion in the region of expanding facilities or closing facilities. When the number of beds is entered, the model automatically adjusts the forecast to include the change and shows the impact on all the graphs and tables.

Another table lets the user adjust the proportion of patients treated in the region who reside outside of the region. The payments received for treating these patients represents a net cash inflow to the region. Some regions, especially along the borders with other states, have significant numbers of patients from out of

state. Another possibility is that a healthcare provider is planning on offering specialized medical treatment in a region as part of its marketing and strategic plan. The number of additional patients drawn by this new service can be simulated by changing the percent of out of region patients.

Another example of how simulation can be used involves the utilization of nurses. One can ask what would happen if the ratio of nurses to patients treated changed? This has been the focus of proposed legislation in California, Massachusetts, and other states. By changing the utilization rates in the table, one can simulate various proposals and see the consequences.

If there is a proposal to shift nurses from the bedside to community health to prevent illness and promote healthier lifestyles, one can simulate what a shift would do to the supply and demand for nurses across healthcare settings.

Sensitivity Analysis

A second way the model can be used is to ask: “By how much would something have to change to make a significant difference?” This approach involves a series of simulations where a parameter is set to different levels and the results observed.

For example, one might ask how many new nurses would have to join the regional workforce to close an anticipated shortage in the future? By changing the number of nurses being added to the workforce in the table at the top of the Demand and Supply worksheet, one can try out different values and the graph below will reflect the change. One can also add new nurses as recruits from outside the region in the table and see the impact on supply and demand, or even do a combination of each.

Another possibility is changing demand in the table on the Demand and Supply worksheet in increments to find out how many additional patients could be cared for if some excess nursing capacity exists in a region. This could also be done by changing the utilization rate as discussed earlier.

Updating the model with the 2020 Census data

Sometime in 2022 the new 2020 census data will become available. When it does, the demographics in the model can be updated. This is not as simple as updating the model with new licensure data, which may also be done at the same time the census data comes out. This will be a more complex task.

2020 Census Demographic data

The demographic data used in the forecast model is based on the population of each parish broken down by gender and age. The new base year for the model will become 2020 and the licensure data for 2020 will drive the model’s supply figures.

For each parish a table will have to be produced showing the number of people in each gender and age category or cohort. Projections will then have to be made showing the number of people in each cohort as they age out to 2030. This is done using a Cohort Survival Model (“CSM”). The CSM applies death rates in each cohort as they get older using survival statistics either from Louisiana parish vital statistics records or national actuarial tables. Births are added in each year by multiplying the net reproduction rate in each parish to the number of females between the ages of 16 and 45 years. The one element that is missing is migration. There are communities and regions in Louisiana that have lost population during the past decade and some that have actually grown. There is also migration from rural areas to more urban and suburban

areas. These either have to be assumed based on anecdotal evidence or established by looking at the trends since the last census.

It is likely that there will be a set of population projections put out by LSU following the release of the 2020 Census. This will become the official population forecast for the state government and may be adopted for use in the forecast model. This is preferable to making an independent set of projections.

Once a forecast of future population for each parish by gender and age is established, it can be used to calculate the demand for care in each healthcare setting using the HRSA demand factors described earlier. These are entered in a table for each setting for each region.

Once the licensure data for 2020 is updated and in the model, the supply figures will also be available, and utilization can be determined as described earlier.

Resources

A consultant will be needed to guide and help interpret the new census data. The mechanics of creating the demographic tables needed in each parish is a large and time-consuming job and requires someone familiar with census data and how to manipulate it. Once that is done, however, placing the demand data into the model is straight forward and only requires a few steps.

Appendix A

Technical Details

Step by Step Instructions to Determine the Regional Workforce

The following describes the step by step process that should be used to determine the supply of nurses in each region from the state licensure data. These steps should be carried out for each type of nurse using their respective master licensure files:

1. Begin by making a copy of the licensure file. Never work on the original file. Always have a clean licensure file available as a backup.
2. The first task is to convert the Date of Birth in each record to the nurse's age on a benchmark date you choose during the year the licensure data was updated. Create two new columns to the right of the Date of Birth variable (column B) using the Insert command in Excel. Next, type "2019-07-01" (the actual date will depend on the benchmark date that is selected) in the second cell of the first new column that was created. Copy and Paste this date down the column into each record in the file. In the second new column, type "Age" in the top cell (D1) to create a new variable. You can calculate the age of each nurse on July 1, 2019 (or the selected benchmark date) by entering the Excel formula DATEIF(C2,B2,"y") where the value in column B is the date of birth and the value in column C is now July 1, 2019. The age of the first nurse in the file will appear in cell D2. Double click on the bottom right corner of the cell (look for the small black box) and all the cells in the Age column will fill in for each nurse in the file.
3. The second step is to sort the licensure data by Employment State. Segregate any records that are not Louisiana (that do not have LA in the field). These include other states, foreign countries, and blank values. The remaining records should all indicate LA as the Employment State. They include all the nurses employed full-time, part-time or per diem in Louisiana – these records should be copied into a new spreadsheet called "Workforce File".
4. Sort the non-Louisiana records by those records indicating "Seeking" employment (having a value of 1 under the seeking column). These records will not have a value for Employment Parish. Fill in the Employment Parish (it will indicate Null) using the Home Parish indicated in each record. Add these records at the end of the Workforce File.
5. The nurse workforce for the state is now complete: full-time, part-time, per diem, and unemployed. It also includes those nurses living outside of Louisiana who work in the state. They are included because their records indicate LA as their Employment State.
6. The third step is to create a new column next to Employment Parish in the Workforce File (using the Insert command) and enter "Region" in the top cell. Using a crosswalk file and the VLOOKUP command in Excel, fill in the name of the region associated with the Employment Parish in each record.⁸
7. Now, sort the Workforce File by Region and separate each region by inserting three blank rows between them using the Insert command in Excel. Now, create a series of regional workforce files

⁸ See the Appendix for specific directions on setting up a crosswalk file in Excel and applying it.

by copying and pasting each set of regional records on to a new spreadsheet. Label the tab of each spreadsheet with the name of the region.

8. Sort each regional workforce file by Primary Setting using the code for each setting (Table 1 in the report). The codes can be converted to names which are easier to work with: School of Nursing (613), Ambulatory (64), Community Health (65), Correctional Facility (66), Home Health (67), Hospital (68), Insurance (69), Long-Term Care (70 or 450), Occupational Health (71), Other (72), Policy and Planning (73), Public Health (74), School Health Service (75), Assisted Living (450), Hospice (612), and Dialysis Center (614). The records with these designations are then grouped into the 7 major healthcare settings (Model Category shown below) in a new variable you create called “Setting”.⁹
9. For each Setting you should now sort the records by (1) full-time, (2) part-time, (3) per diem, and (4) unemployed. Within each setting the supply of nurses is measured in FTEs using the weights discussed above (1 FTE for full-time, .5 FTE for Part-Time, and .6 FTE for Per Diem), to calculate the total FTEs for each setting in each region. Unemployed nurses have an FTE value of zero.
10. The ratio of FTE nurses in each setting to a measure of patient demand is then calculated as an estimate of *utilization*... this is discussed in the next section - Estimating the Demand for Nursing.
11. **Status** - Included in the non-Louisiana workforce file are nurses who do not have a setting code (N/A) because they are not in the workforce. They include nurses working outside of nursing, retired nurses, volunteers, or nurses not seeking a job in nursing. This is evident by their **status** code in the licensure data. They are not included in the workforce unless their status is unemployed and seeking a job in nursing. This data can be used later to create a breakdown of the nurses who are no longer in the workforce and reasons for their absence.
12. The final element is updating the Master Supply Sheet in each model. To do this you have to generate an age profile of the nurses in each regional workforce file. This is just comprised of the number of licensed nurses from ages 20 to 75 that are listed in the second column of the Master Supply Sheet in each regional model. Copy the age profile from the Regional Workforce File for each region and Paste it in Column C using Paste Special and select Values.¹⁰

These steps describe the general process of breaking down the licensure files. It is worth noting, however, that while the licensure files for RNs and APRNs are identical in format, the LPN licensure file is structured differently. In particular, many of the variables are recorded using codes that have to be used to count the number of nurses in categories while the RN and APRN files have many of these in separate columns that can be totaled. The categories for healthcare setting and employment status are among them. There are also some additional columns that contain descriptions that provide details about what an LPN does if they are in the “Other” category. These differences are easily handled using the same fundamental commands described in the Appendix.

⁹ See the Appendix for detailed instruction under Crosswalks...

¹⁰ See the Appendix for specific directions on creating an age profile for the regional workforce.

How to Create Crosswalk Files and Apply Them to the Forecast Model

Creating a crosswalk file is not hard. Click on the tab to the far right to open a new blank spreadsheet. In the first two columns, enter the name of each Parish in the first column and the name of the region it is in next in the second column.

Parish	Region
Acadia	Lafayette
Allen	Lake Charles
Ascension	Baton Rouge
Assumption	Houma
Avoyelles	Alexandria
Beauregard	Lake Charles
Bienville	Shreveport
Bossier	Shreveport
Caddo	Shreveport
Calcasieu	Lake Charles
Caldwell	Monroe
Cameron	Lake Charles
Catahoula	Alexandria
Claiborne	Shreveport
Concordia	Alexandria
De Soto	Shreveport
E Baton Rouge	Baton Rouge
East Carroll	Monroe
East Feliciana	Baton Rouge
Evangeline	Lafayette
Franklin	Monroe
Grant	Alexandria
Iberia	Lafayette
Iberville	Baton Rouge
Jackson	Monroe
Jefferson	New Orleans
Jefferson Davis	Lake Charles
Lafayette	Lafayette
Lafourche	Houma
La Salle	Alexandria
Lincoln	Shreveport
Livingston	Baton Rouge
Madison	Monroe
Morehouse	Monroe
Natchitoches	Shreveport
Orleans	New Orleans

Parish	Region
Ouachita	Monroe
Plaquemines	New Orleans
Pointe Coupee	Baton Rouge
Rapides	Alexandria
Red River	Shreveport
Richland	Monroe
Sabine	Shreveport
Saint Bernard	New Orleans
Saint Charles	New Orleans
Saint Helena	Baton Rouge
Saint James	New Orleans
Saint John the Baptist	New Orleans
Saint Landry	Lafayette
Saint Martin	Lafayette
Saint Mary	Lafayette
Saint Tammany	New Orleans
Tangipahoa	Baton Rouge
Tensas	Monroe
Terrebonne	Houma
Union	Monroe
Vermilion	Lafayette
Vernon	Alexandria
Washington	Baton Rouge
Webster	Shreveport
West Baton Rouge	Baton Rouge
West Carroll	Monroe
West Feliciana	Baton Rouge
Winn	Alexandria

Go to the “Formulas” menu and, using “Name Manager”, create a new variable called “Table1”. Click on the “Refers to” box. Then highlight the two columns with the Parish names and their Regions and click OK. Table 1 will now be available on every spreadsheet in the entire workbook.

Return to the Workforce File and in the top cell under Region and enter:

VLOOKUP (AE2, Table 1,2, False)

where AE2 is the cell address of the first Employment Parish name. Hit enter and the name of the Region where that Parish is located will appear. Now double click the bottom right corner of the cell (look for the little black box) and all the cells under Region in the Workforce file will fill in.

This same technique is also used to assign the name of each healthcare setting to the healthcare setting code listed under the column labeled “PrimeSettingID”. Create a new column to the right of it using the Insert command. Label it “Setting” in the top cell.

Create another crosswalk file on a new spreadsheet as above with the following information.

Licensure Code	Forecast Model Category
64	Ambulatory Care
65	Community/Public Health
66	Other
67	Home Health
68	Inpatient Care
69	Other
70	Nursing Facilities
71	Ambulatory Care
72	Other
73	Other
74	Community/Public Health
75	Ambulatory Care
450	Nursing Facilities
612	Home Health
614	Ambulatory Care

Go to Formulas, Name Manager, and create a new variable called “Table2” by highlighting cells A3 to B16 and clicking OK. In the new Settings column use the VLOOKUP function to fill in the name of each model category based on the licensure code. VLOOKUP (A3,Table 2,2,False)

How to Create An Age Profile

The first thing that was done to the Licensure File was the creation of a new variable “Age”. That variable appears in each Regional Workforce File that was subsequently created in the workbook. To make an age profile, follow these steps:

First, Insert two columns next to Age. In the first one, type 20, 21, 22, ... 75 in each cell beginning in row 2 (the titles of these column will be blank). In the next column position your cursor in the second cell (Row 2) and look in “Formulas” in the Excel toolbar. Click on it and then go to the right under “More Functions”. Click on this choice and a drop-down menu will give you choices that include “Statistical”. From that list find the COUNTIFS function and click on it. A dialogue box will appear with two ranges to be filled in. Click the first range and highlight the age of every nurse that is in the Age column. Then click on OK. Now click on the second range and highlight the figures in the column that contains 20, 21, 22, ... 75 and click OK. The second column will now have the frequency (number of) nurses in each age cohort given. You now have an age profile for the nurses in the regional workforce.

Now Copy the cells from row 2 down the cell adjacent to age 75. Open the corresponding regional model and go to the Master Supply Sheet. Place the cursor in C2 and Paste Special the values you copied.

The Master Supply Sheet will automatically make all the necessary calculations and adjustments to project the supply of nurses by age in the region’s workforce and will update the model.

How to Update Utilization in Each Healthcare Setting

Utilization is calculated in each region's healthcare settings automatically, but they must then be updated on the "Demand Dashboard" manually. Each region has a list of Parishes that are considered "urban" except for Houma. They are shown below:

	Urban
Region	Parishes
Alexandria	Rapides
Baton Rouge	Ascension
	East Baton Rouge
	Livingston
	Tangipahoa
Houma	None
Lafayette	Lafayette
Lake Charles	Calcasieu
Monroe	Ouachita
New Orleans	Orleans
	St. Tammany
	Jefferson
Shreveport	Bossier
	Caddo

For inpatient care, ambulatory care, nursing facilities, and home health the number of FTEs employed in urban parishes are entered. The FTEs for metropolitan parishes are calculated by entering the total FTEs for the region and subtracting the figure entered in the Urban box. This requires tabulations in each Regional Workforce File for each Setting for the Urban Parishes and for the total FTEs for the whole region.

Once these figures have been entered, the demand for nurses in both urban and metropolitan parishes is automatically calculated. The total in the column for each year is the total FTE demand in the region in that setting. Below the first year (base year of the model) is a ratio of the FTEs to demand. This is the estimate of utilization.

The figure for each setting is entered in the Demand Dashboard table. Once it is entered, all the demand figures are automatically calculated. This is done for each of the four major healthcare settings listed above. In the "Remainder of Settings" tab in each model the total FTEs are entered for community health, nursing school, and other. These do not differ by urban and metropolitan areas. Thus, they do not require separate tabulations by parish like the other four.

The Demand Numbers table is now automatically updated and total demand for FTE nurses is used in the Supply and Demand tab to show the balance between supply and demand in each year.

Counting Nurses and Calculating FTEs

The RN and APRN licensure files have a separate column for each category of ethnicity, employment status, and healthcare setting. They are easily totaled after the data are sorted by region or grouped by a particular setting. The LPN licensure file uses codes for each category of ethnicity, employment status, and healthcare setting and are recorded by nurse in each record of the file. This row orientation calls for more sorting and grouping and the use of crosswalks as described above. Once the data is sorted, however, determining totals in each category is made easy using the COUNTIFS command as described above.