**Background**

My research question is what is the association between nurse-to-patient ratios and job satisfaction, burnout, and turnover among registered nurses that work in hospitals throughout the 50 States and DC in 2019? Following this thought, a secondary research question that I have is to see whether there is and if so what is the association between nurse-to-patient ratios and a nurse’s perception of his/her own nursing ability? Finally, I am also interested in observing whether the associations between nurse-to-patient ratios and these constructs differ based on the length of a nurse’s career. For example, is the association between nurse-to-patient ratios and job satisfaction insignificant for older nurses, but meaningful for younger nurses?

According to the American Nurses Association, “14 states currently address nurse staffing in hospitals in law/ regulations: CA, CT, IL, MA, MN, NV, NJ, NY, OH, OR, RI, TX, VT, and WA” (American Nurses Association, n.d.). With the inclusion of Washington D.C. into the analysis, this means that there are currently 36 states and one district (D.C.) that do not address nurse staffing issues. When there are no federal or state regulations for nurse-to-patient ratios, the probability that one nurse can be handling more patients than favorable becomes high.

While the literature has addressed the association between high nurse-to-patient ratios and poor patient outcomes, it is sparse on the relationship between high nurse-to-patient ratios and nurses’ job satisfaction, burnout, and turnover. This study seeks to bridge this gap

**Ideal Sampling Plan**

My study is cross-sectional, as surveys will be sent during a single time point across a five-month period during 2019. The target population of interest is registered nurses that work in United States hospitals, 50 states and DC, in 2019. Both full-time and part-time nurses will be considered in the study. As previously stated, states can either have legislation that regulates nurse staffing or not, therefore states can be divided into two strata, those that have regulation and those that do not. For this design, it is possible to collect nursing licensure and contact information for all actively registered US nurses through each states’ (including DC) Board of Nursing. To construct the frame, a group of research assistants can contact each Board of Nursing within the 50 states and DC and obtain a list of currently registered RNs and their contact information. Stratifying the frame by the presence of state legislation will account for nurses from all states.

This frame suffers from over-coverage on a variety of accounts. The first way it suffers from over-coverage is that it includes nurses that work in different care settings not just hospitals. Another issue of over-coverage is that nurses can be registered in more than one state; however, to rectify this problem, we can use the contact information to cross check double counted entries and eliminate one from the frame. Finally, some nurses may have both an advanced nursing license and a basic RN license, which allows them to be double counted in the frame, if their basic license did not expire yet. Again, to rectify this problem, we can match nurses based on their contact information and for those that have advanced nursing licenses, we will eliminate both records from the frame because we only care about RNs and not nurse practitioners (NPs) or other advanced practice nurses. Even with these modifications, over-coverage may still be an issue and we must admit to this in the study design and acknowledge that it can bias the estimates for the statistics of interest. While over-coverage is the major problem with this frame, there may be under-coverage if a nurse’s license has not been reported to the Board of Nursing within their state.

Following the enumeration of the sampling frame and the modifications to address over-coverage, a census of the sampling frame will be taken. Before sending out the surveys, each nurse will be assigned a unique identifier that will connect them to their responses. To increase the response rate, as large-scale surveys often succumb to non-response bias, a packet will be sent via mail to each participant. The packet will contain a cover letter explaining the survey’s purposes and instructions for completing the survey. The packet will also contain: a paper version of the survey, a sheet that provides a link to a web version of the survey in order to give participants the option to complete it online, and a return envelope for those that complete the paper survey. The packet and paper survey itself will be created using the guidelines of the Dillman method to increase response rates. The construction of the sampling frame will take place from November to December 2018, while the survey will be sent out on January 1, 2019 and the timeline for survey responses will be from January to May 31, 2019.

Each version of the survey, paper or electronic, will be equipped with a screener question in order to eliminate responses from those not in our target population, the nurses that do not work in hospital settings. For those nurses that do not work in a hospital setting, the online survey will stop automatically. While for the paper version of the survey, there will be a note on the screener question that directs participants to stop completion of the survey if they do not work in a hospital setting. However, the note will inform them that they will still have to send the survey back in the provided return envelope.

Overall, while the survey does suffer from non-response bias, sampling error is not an issue because all people in the target population are being contacted for response. Therefore, the issue lies with nonresponse and not with sampling error. To further address non-response, a $25 dollar gift card to Allheart: America’s Medical Superstore will be sent with each packet.

**Realistic Sampling Plan**

My study remains cross-sectional, as surveys will be sent during a single time point across a five-month period during 2019. The target population of interest is still registered nurses that work in United States hospitals, 50 states and DC, in 2019. While nursing licensure data is made available through the National Nursing Database offered by the National Council of State Boards of Nursing (NCSBN), it does not differentiate registered nurses (RNs) based on the type of care facility of their employment. Therefore, it would be impossible to distinguish the target population, RNs that work in hospitals, from RNs that work in other care settings. Also since an important variable of interest is nurse-to-patient ratios and it is known that certain states have legislation and others do not, I will stratify the United States (50 states and DC) by whether or not they have regulations in place that address nurse staffing. Therefore, there will be two strata and from these strata, I will use proportionate allocation and randomly select states based on the stratification criteria. **Table 1** shows the resulting sample size of each stratum based on a

**Table 1: Stratification of States**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Stratum** | **Number of States** | **Wh (Proportion of Population** | **nh Sample Size from Stratum** | **fh (Stratum Sampling Fraction)** |
| Law/Regulations | 14 | 0.274509804 | 2.8 | 0.2 |
| Nothing | 37 | 0.725490196 | 7.4 | 0.2 |
| **Total** | **51** | **1** | **10** | **0.05** |

20% stratum sampling fraction (fh). The random sample would result in three states that have laws/regulations for nurse staffing and seven states that do not have these regulations. After selecting these states, I will obtain a list of hospitals within each selected state that will serve as a frame.

Obtaining a list of hospitals for each selected state in the United States is a particularly daunting task. The American Hospital Directory is an open data source: (<https://www.ahd.com/state_statistics.html>) that presents the number of hospitals within each state, as well as a list of hospitals located within a selected state. This creates a fairly comprehensive list, however it does suffer from under-coverage as it only covers non-federal, short-term, and acute care hospitals for a total of 3,920 hospitals in their directory. To rectify the under-coverage, I can also obtain a list of hospitals from the 2018 American Hospital Association’s (AHA) Hospital Statistics report, which states that there are 10,374 hospitals in the United States. This number is divided into the following categories of hospitals: community hospitals, nongovernment not-for-profit community, investor-owned (for-profit) community hospitals, state and local government community hospitals, federal government hospitals, nonfederal psychiatric hospitals, and other hospitals (long term care and hospitals in striations, such as prisons). Therefore, for each selected state we can compare the state list from the American Hospital Directory to that from the American Hospital Association and add hospitals that are not already on the list. This can reduce under-coverage, however it is not necessarily a complete fix, as the AHA may also miss hospitals. Therefore, in the study design we will have to admit under-coverage.

After creating a list of hospitals for each selected state, the hospitals become the primary sampling units of the cluster, while nurses inside the hospital are the secondary sampling units, the elements of interest. I will take a simple random sample of the hospitals from the enumerated frame described in the preceding paragraph. For the selected hospitals, I will do a one stage clustering procedure, thereby all nurses in each selected hospital will be included in the sample. This implies that nurses from all floors/units within a selected hospital will be represented in the sample. The reason for using clustering instead of a census is because it allows for cost-effectiveness.

However, the downfall to clustering is that sampling error is present. Stratification of states based on those that have laws/regulation versus those that do not, narrows the confidence interval width for the statistics of interest. However, clustering techniques widen the confidence interval. Likewise, amongst nurses we are also not controlling for demographic variables, such as gender that may produce differences in measures of the constructs of interest. Finally, another problem with this study is that single stage clustering is prone to high homogeneity within the cluster, which can further be reduced with a two stage clustering method. However, because we are interested in all floors/units within a hospital, the design works well and in the survey we can ask for the nurse’s floor/unit.

After obtaining approval from each hospital’s institutional review board, the hospitals’ human resources departments will release the contact information of their employed nurses. Each nurse will be assigned a unique ID and similar to the ideal plan, a packet will be sent via mail to each nurse. The nurses will have the option to complete and return a paper survey or complete an online version of the survey via a link sent with the packet. Depending on whether email addresses were provided, follow up reminders will be sent via postcard or email every two weeks until the end of collection. Constructing the frame will take place from November to December 2018, and surveys will be sent out January 1, 2019 and open until May 31, 2019.

**Comparison of Ideal and Realistic Plans**

If the realistic plan is implemented over the ideal plan, the major loss is the gain in sampling error. The ideal plan had no sampling error in theory because we took a census of a sampling frame that was comprehensive enough to include all nurses with active licenses in 2019 throughout the 50 states and DC. In the realistic plan, there is sampling error because we are selecting states and then subsequently selecting hospitals within those states, we are exposed to homogeneity. Although we are controlling for hospitals located in sates with regulations and those that do not have regulations, we are making assumptions that all nurses within a particular hospital are representative of the population. The sampling error will bias the estimates in the case of the realistic plan.

**Sources**

American Nurses Association. N.d. Nurse Staffing. Retrieved from <https://www.nursingworld.org/practice-policy/advocacy/state/nurse-staffing/>.