

# An Exploratory Analysis of the Nursing Workforce in US Hospitals: Findings from the 2020 Release of the American Hospital Association Database

Submitted in partial completion for the Bachelor of Science Degree in Management with a  
Concentration in Health Analytics at The University of Alabama

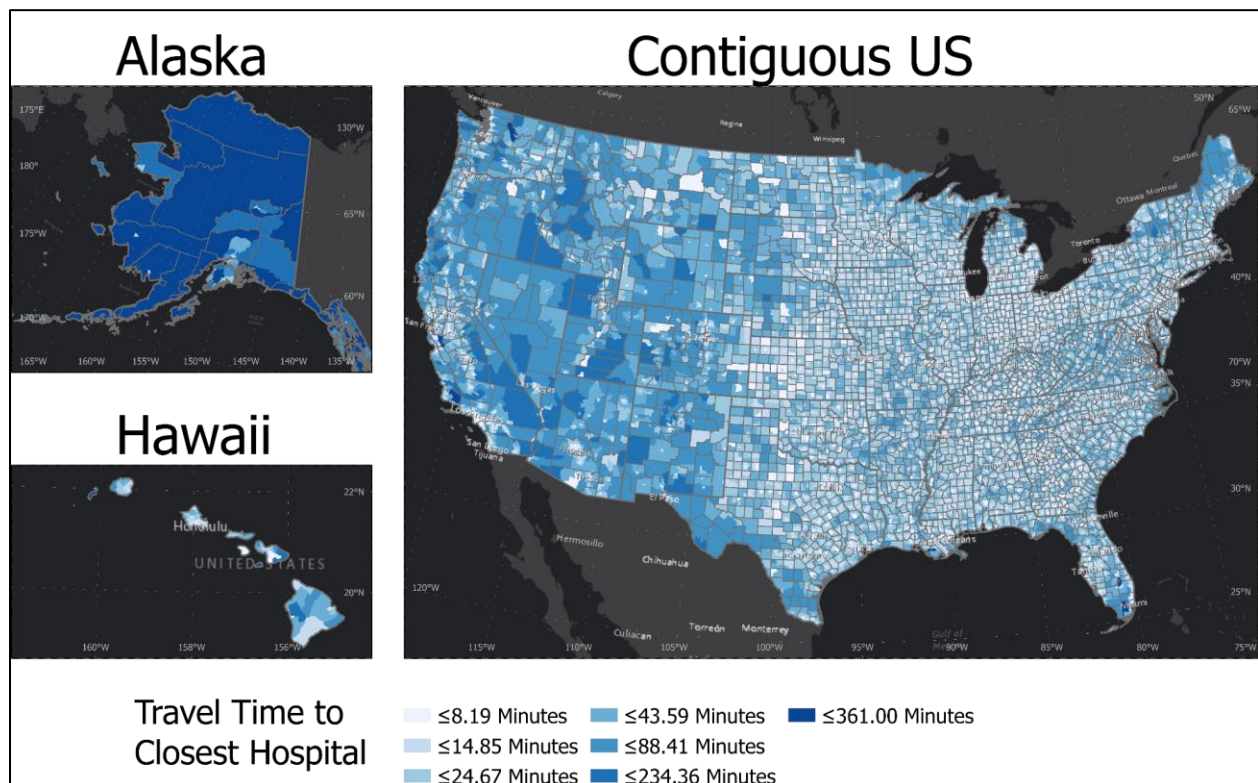
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Health disparities has a long and historical presence in Rural America with factors such as life expectancy, all-cause mortality, and disability plaguing the affected areas (1-5). The healthcare workforce in these communities, especially nurses, play a significant role in mitigating these disparities (6). According to the University of North Carolina's Cecil G. Sheps Center for Health Services Research (7), a little under 50% of acute care hospitals in the US are in rural areas. Nevertheless, sociological issues such as poor public education for family members, low insurance rates, and other social determinants does little to encourage individuals to work in rural areas (8, 9).

According to the CDC (10), rural communities have some of the highest rates of uninsured patients in the country. Uninsured patients, in general, remunerate hospitals at a far lower rate than their commercial insurance, Medicaid, or Medicare counterparts. Intuitively, these revenue strains influence hospital administrators to cut costs, which may include staff downsizing, despite public health challenges facing rural communities (11). These administrative decisions in turn "have had a negative effect on patient safety and quality of care" according to a 2008 study in The Lancet (12).

Physical access, as defined by automobile travel, is another important barrier to consider for both patients and personnel. **Figure 1** displays estimated travel time to the closest hospital from the centroid of census tracts in the US. Rural communities, by their nature, are sparsely populated, which means patients are likely to travel greater distances to receive equal care due to reluctance to place fully serviced hospitals in their community. Going to the primary focus of this report, what if the existing hospitals in place at rural communities are not fully accessible due to limited staffing? Though a hospital may have a high number of beds to treat patients, what good is it if the staffing size is inadequate to care for patients occupying the beds?

Figure 1. Estimated travel time to closest hospital in US.



A viable nursing workforce is critical to the population health of communities (13), as they make up the largest section of the health system in the US (6). That being stated, the literature (6, 14-16) recognizes the following issues as barriers to an adequately staffed nursing workforce in the US: 1) aged workforce nearing retirement, 2) workforce burnout, and 3) family-career balance to name a few. While these issues influence patients' ability to receive optimal care in the US at large, it is intensified in rural areas where many providers in rural areas are the sole healthcare clinician or one of few. It is job stressors like this and others that contribute to a high rate of provider burnout. One study found that rural Japanese physicians experience a higher rate of burnout than their peers and that 10.4% planned to resign in the near future (17). Given these

considerations, the objective of this report is to examine the geographical distribution of the nursing workforce in US hospitals.

### **Methodology**

Key data sources used in analyses go as follows: 1) American Hospital Association Database (18), 2) US Census Bureau American Community Survey (19), and 3) vehicle routing information from ESRI's StreetMap Premium (20). The full details of the organization of the database server used in analyses can be found here: <https://bit.ly/3aNxrRJ>. Using the studio management platforms Microsoft SQL Server Management Studio © and Azure Data Studio ©, we used the T-SQL programming language to query findings based on this analysis' objectives. Thereafter, we used Tableau © to internalize findings from our queries. A faculty mentor assisted in re-rendering maps and enhanced queries not covered in course lectures.

More specifically, we examined staffing and bed levels in US census area tracts, in an effort to compare rural and urban areas. The American Hospital Association Database allowed us to identify locations of hospitals, as well as the number of staffed beds and nursing workforce within each listed hospital. The US Census Bureau American Community Survey allowed us to quantify anticipated demand for these hospital services through counts of individuals in each census tract in the US. Rurality was operationalized using HRSA's Rural Health Area (21). This data source categorizes a census tract as rural and non-rural. With the assistance of a faculty mentor, ArcGIS Pro © was used to geocode and route data using its StreetMap Premium © dataset. The previously mentioned outcomes were used to create ratios of interest in our analyses.

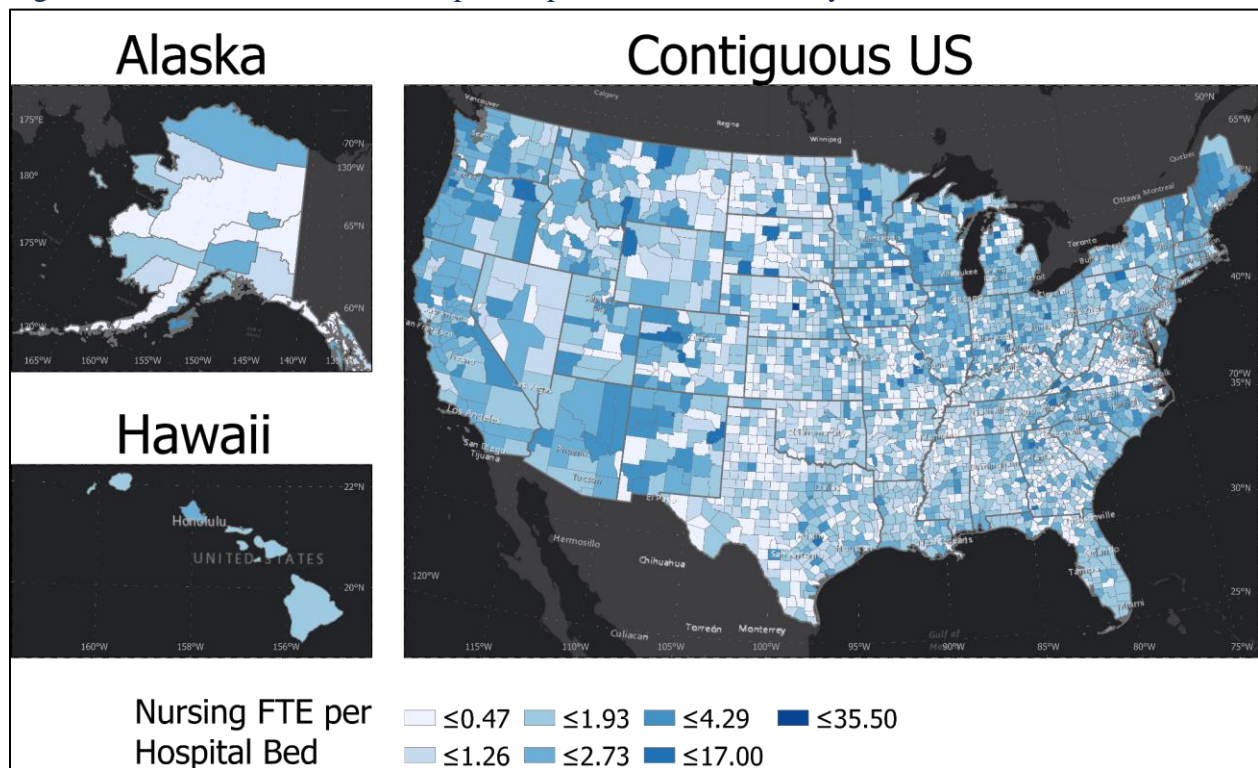
## Analysis

For group two's final project, we researched and analyzed data concerning the healthcare disparities in the rural United States. We specifically focused on full time nurses per bed, average total population per full time nurses, average total population per full time staff, full time staff per bed, and average beds per 1,000 population. The data we received from the database allowed us to compare and contrast between urban and rural areas.

The first disparity we analyzed (**Figure 2**) was the average full-time nurses per bed. While researching the average full-time nurses per bed we concluded that many rural communities had a slight advantage over urban communities due to the higher turnover rate among urban hospitals. The rural areas had a 15.2% advantage over urban areas in nurses per bed. This data aligns very similar to other data sources nationally because many university hospitals are in urban locations. Which has a larger population of younger aged nurses that are starting their career. Statistically younger nurses tend to choose urban areas because of the freedom they still possess at that age. Urban hospital locations offer younger aged nurses experience due to the high demand and opportunity for growth.

Another one of the key components our group investigated was average population per full time staff. This is very important information to collect because especially in rural communities, hospitals and health clinics are most likely understaffed compared to urban areas. Also, urban areas are more likely to have better access to resources necessary to properly run a health center.

Figure 2. Estimation of nurse FTE per hospital beds at the county level in the US.



After researching and collecting data, we found that on average urban areas have a much higher population per full time staff. The final numbers came out to be 26.48 people per one staff member in urban areas compared to 2.76 in rural areas. These numbers aligned with our original hypothesis because urban areas are much more heavily populated. Nurses and doctors would much rather work in urban areas because of better job advancement opportunities and better pay.

One of the biggest differences in data points we found was in the total average population per full time staff. We found that there was an almost 8.5x difference in ratio among rural and urban full-time staff. In rural areas there were .68 patients per one full time staff member compared to 5.83 patients per full time staff member in urban areas. This data is very spread apart due to

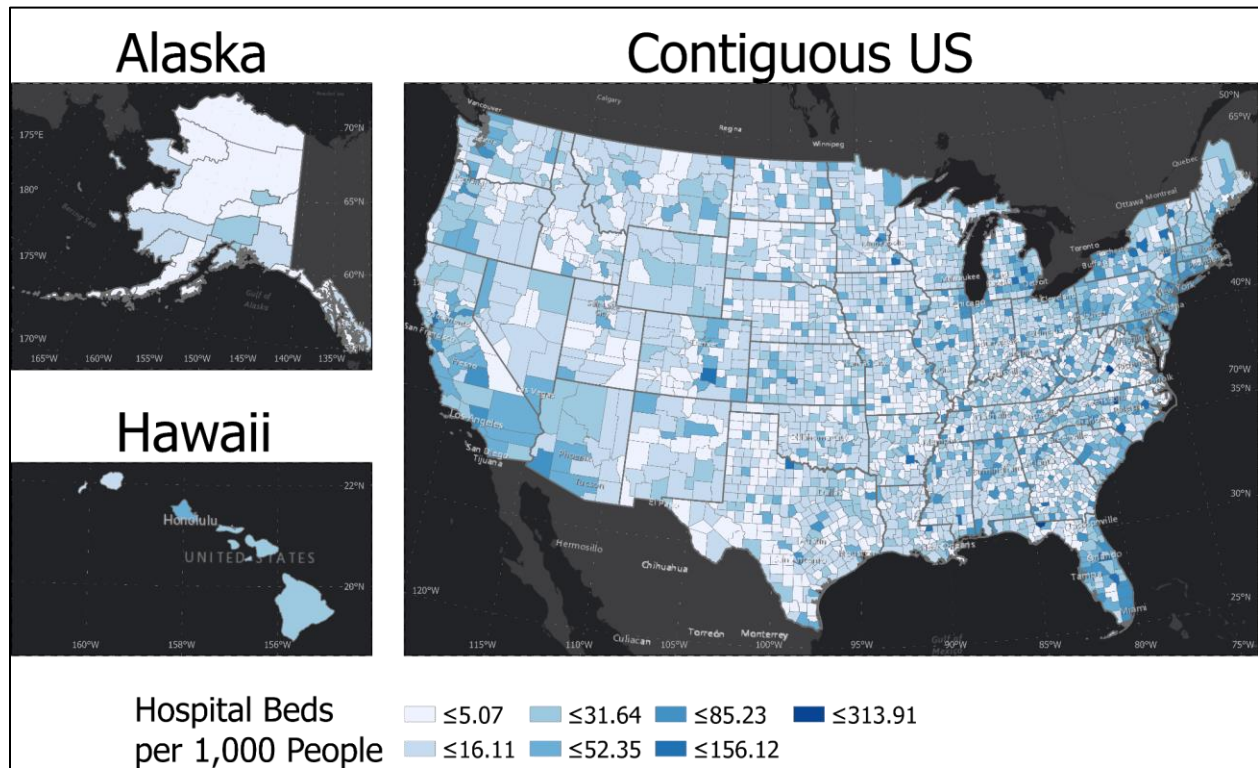
higher population densities in urban areas. Many hospitals in urban areas have high turnover rates which causes instability among staffing. This in return causes the total population per full time staff member to be higher.

Another key data point we researched was full time staff per bed in rural and urban areas. After conducting our research, we found that this statistic was evenly distributed for rural and urban populations. The numbers came out to 4.8 full time staff members per hospital bed in rural areas compared to 4.7 in urban areas. The number is greater in rural areas due to lower population density. Also, in rural areas those beds may never be used, but in urban areas there is a much higher chance that each bed will be in use.

The last data points we analyzed were the average beds per 1,000 population (**Figure 3**). The rural areas had a total of 335 beds per 1,000 compared to the 27 beds per 1,000 in urban areas. These numbers were very skewed compared to outside sources but showed that in rural areas there are an overabundance of beds. That being said, this does not mean that every bed in rural hospitals were adequately staffed. This has caused many rural hospitals to be run out of business by larger urban hospitals. Urban area hospitals have more power that help them better manage their total beds needed. Overall, the data heavily differed from outside sources making this data point the most interesting.



Figure 3. Estimation of hospital beds per 1,000 people at the county level in the US.



## Conclusion

Overall, the numbers we gathered for this project did provide compelling evidence corroborating the hypothesis that there are healthcare disparities in rural areas compared to urban areas. While there may be more beds available in rural areas, that does not mean the quality of care will be better. Urban areas attract better talent, and an overwhelming majority of workers would rather work in urban areas due to quality of life, pay, and job advancement. This issue needs to be addressed by our government, and more incentives need to be given for workers in rural areas because rural Americans need the same quality of care at the same price as Americans who live in urban areas.



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