Examination of Critical Access Hospitals in Alabama and its Impact on Rural Healthcare: 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

Rural Healthcare and Critical Access Hospitals

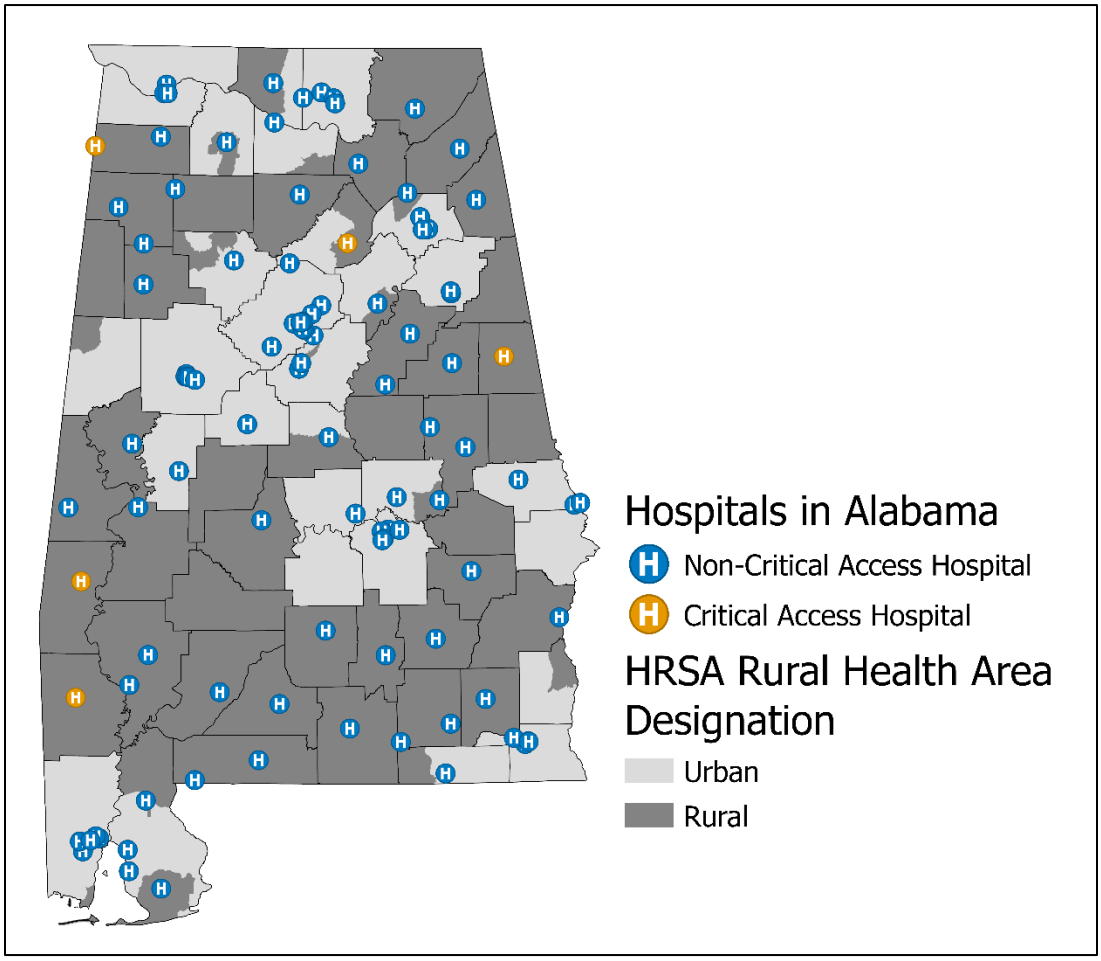
There are varying definitions of rurality in the literature, but the most common characteristic connecting each definition relates to population density where rural areas have sparser populations compared to urban communities (1). This basic, yet fundamental, difference between rural and urban communities has a heavy influence on the revenue streams of rural hospitals as asset potential is positively correlated with utilization (2). As such, among rural hospital administrators, there is a bit of "tug of war" in the decision making between the promotion of services to increase revenue and the conservation of expenses through reducing labor costs. The latter of the two, often wins out based upon the extensive documentation of the hospital workforce literature (3-5).

Analysis by the researchers at Headwaters Economics using data from the US Department of Homeland Security and US Commerce Department (6, 7), highlight rural areas in the western United States that have more hospital beds per person than some urban areas. A surface examination of the interactive data suggests that this surplus of hospital beds is due in part to critical access hospitals (CAHs). CAHs was created by the Balanced Budget Act of 1997 to ameliorate the financial vulnerability of rural hospitals (8). This designation provides federal funding to support hospitals in underserved rural areas that appear to have challenges with access to healthcare. Findings from the literature suggests that rural hospital's financial margins become more favorable (on average) when they achieve a CAH status (9). The Office of the National Coordinator for Health Information Technology website states that CAHs are effective mediators, which are vital to transitioning care coordination to resource intensive urban healthcare systems (if needed) (10).A critical access hospital must 1) provide 24-hour emergency room service that has a maximum of 25 beds with 2) access to rehabilitation and psychiatric beds and an average length of stay that is no 3) longer than 96-hours inside the facility. Ideally, critical access hospitals are within 35 miles of another critical access hospital. As of August 2020, there are 1,353 CAHs nationwide (11).

Why Alabama?

One of the main reasons this report focuses on the state of Alabama is due to the disparity in overall health throughout the state. According to the Alabama Department of Public Health (12), hospitals in rural Alabama counties had 25.1 general hospital beds per 10,000 residents in 2009 compared to 45.0 general hospital beds per 10,000 residents in urban counties. As previously mentioned, this trend is not consistent in other areas of the US. Moreover, nine rural counties in Alabama do not have a hospital located in their respective county borders. This is a population health concern for the state given that rural areas are reported to experience a two-fold increase in ambulance response times compared to urban areas (13).**Figure 1** highlights an overlay map displaying rural health areas as designated by HRSA (14), and the spatial distribution of hospitals participating in the American Hospital Association (AHA) database (15).

Figure 1. Rurality and Hospital Locations



Some areas of Alabama such as the Black Belt Region has historically been one of the most challenging regions in the US with respect to health disparities (16-18). Various social determinants to health such as poverty, household education, under-employment are challenges that has been difficult for some rural areas of Alabama to overcome. The literature recognizes the aforementioned social determinants to be correlated with increased odds of cancer (19), diabetes(20), and other forms of cardiovascular disease (21) to name a few.

Lastly, a significant number of rural areas in Alabama do not provide labor and delivery services for women (12), which has negative implications on the health of Alabama's youth and maternity populations. Given these considerations along with the fact that Alabama is consistently ranked toward the bottom of the nation in terms of health (22), we want to see if CAHs are having an impact on the access to hospital beds and if there is a disparity in access between rural and urban counties.

Study Methods

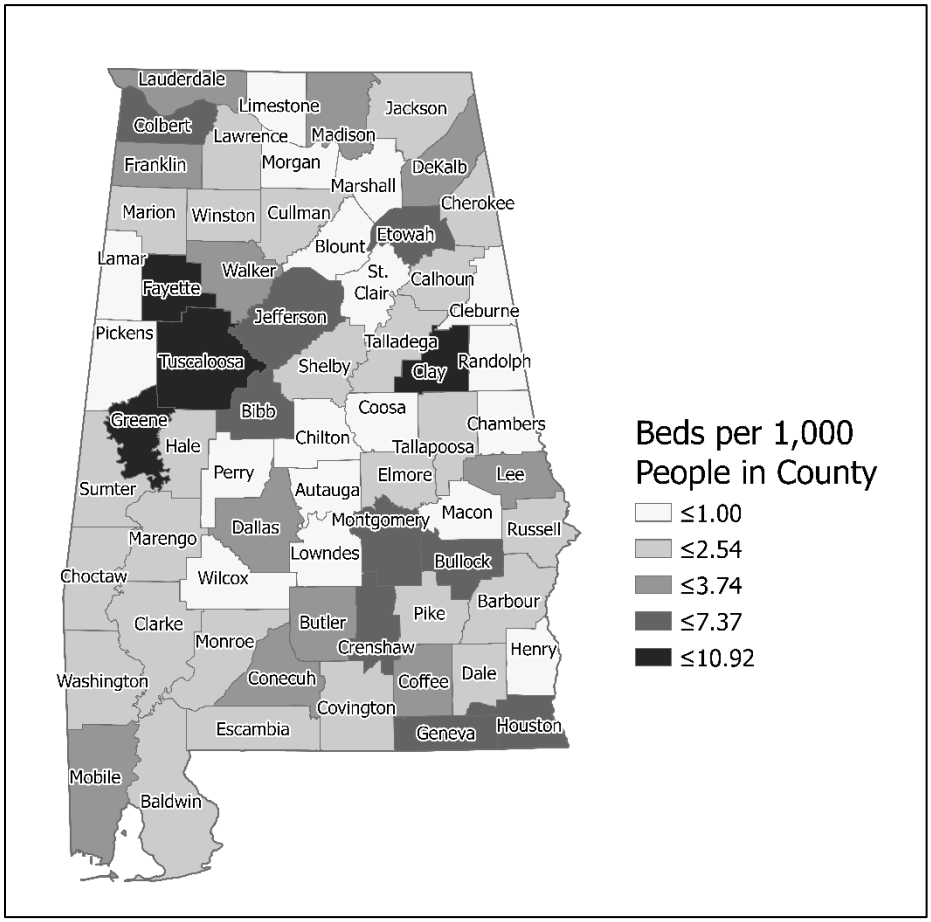
Data from the AHA Database (15), American Community Survey (23), and generated tables produced from vehicle routing models (24) were used in this analysis. Full details regarding the

design and schema of database used in this analysis are available here: https://bit.ly/3aNxrRJ. We used T-SQL programming language in Microsoft SQL Server Management Studio © and Azure Data Studio © to build queries that generated findings from our analysis. As a team, we based our conclusions from maps we generated in Tableau ©. To be complicit with cartographic standards (25), maps were regenerated by a faculty mentor with a map projection appropriate for the state of Alabama. We also received additional mentoring from faculty regarding advanced queries not covered in course lecture.

Numbers in Alabama

A more detailed look into the numbers within the rural and urban counties in the state of Alabama shows there are 38 counties that are predominantly considered to be rural by HRSA standards. Though roughly 20% of Americans live in rural areas across the US (26), 43.6% of the population within the state of Alabama live in rural areas. With our data, we analyzed the number of hospital beds in both rural and urban areas. There are 14,548 rural beds within the state, while only 3,025 beds in rural counties. Jefferson County is considered the most populated area with the greatest number of hospital beds. As displayed in **Figure 2**, when population demand is accounted for, there are other counties that appear to have a higher rate of beds to population.

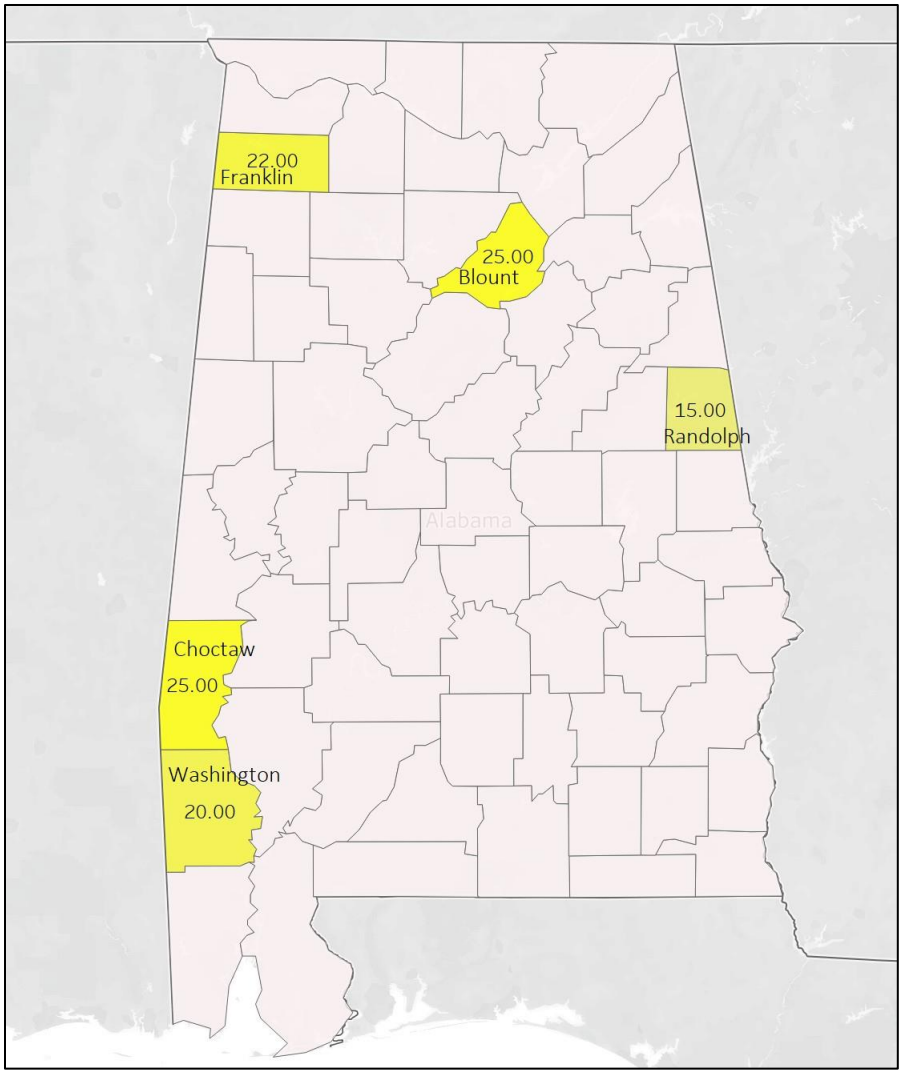
Figure 2. Hospital Beds per 1,000 Residents at County Level



Critical Access Hospitals in Alabama

In the state of Alabama, there are a total of five CAHs (previously displayed in **Figure 1**). They are in the Alabama counties of Franklin, Blount, Choctaw, Washington, and Randolph. Existing evidence suggest that these locations are less than twenty years old, with the most recent being certified in 2019(11). In total CAHs provide the state of Alabama with 107 beds out of the total 17,573 beds in the state. **Figure 3** displays location and bed counts of counties with CAHs.

Figure 3. Bed Counts of Counties with CAHs

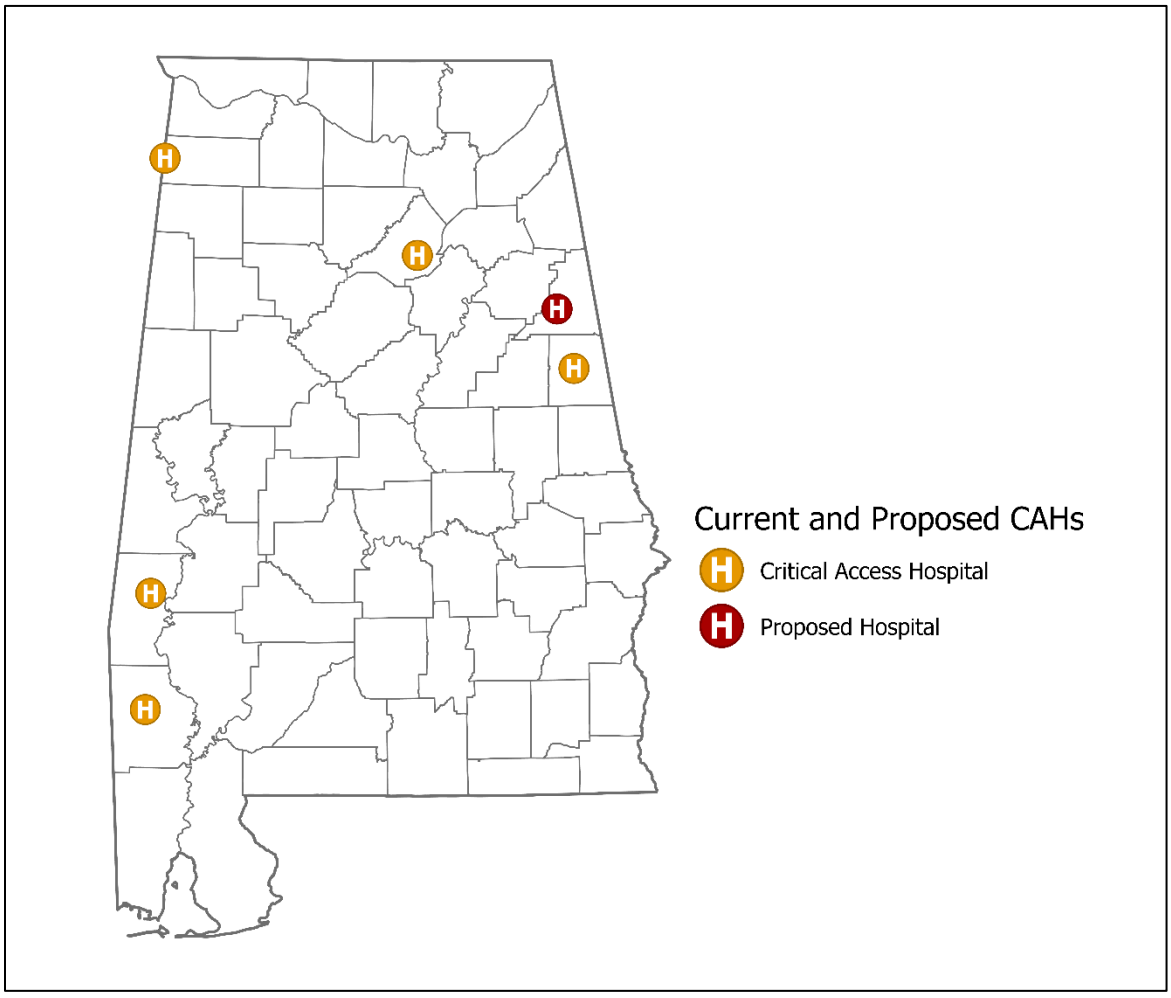


Addition of a Critical Access Hospital in Alabama

When analyzing the placement of CAHs in Alabama and surrounding states, we concluded it would be beneficial, based on AHA data, to increase the number of critical access hospitals in Alabama by at least one hospital. As previously displayed in **Figure 4**, there are one hundred and seven critical access beds in the state, all of which are in rural areas. The most beneficial area we see fit for a Critical Access Hospital is Cleburne County, a county on the east border of

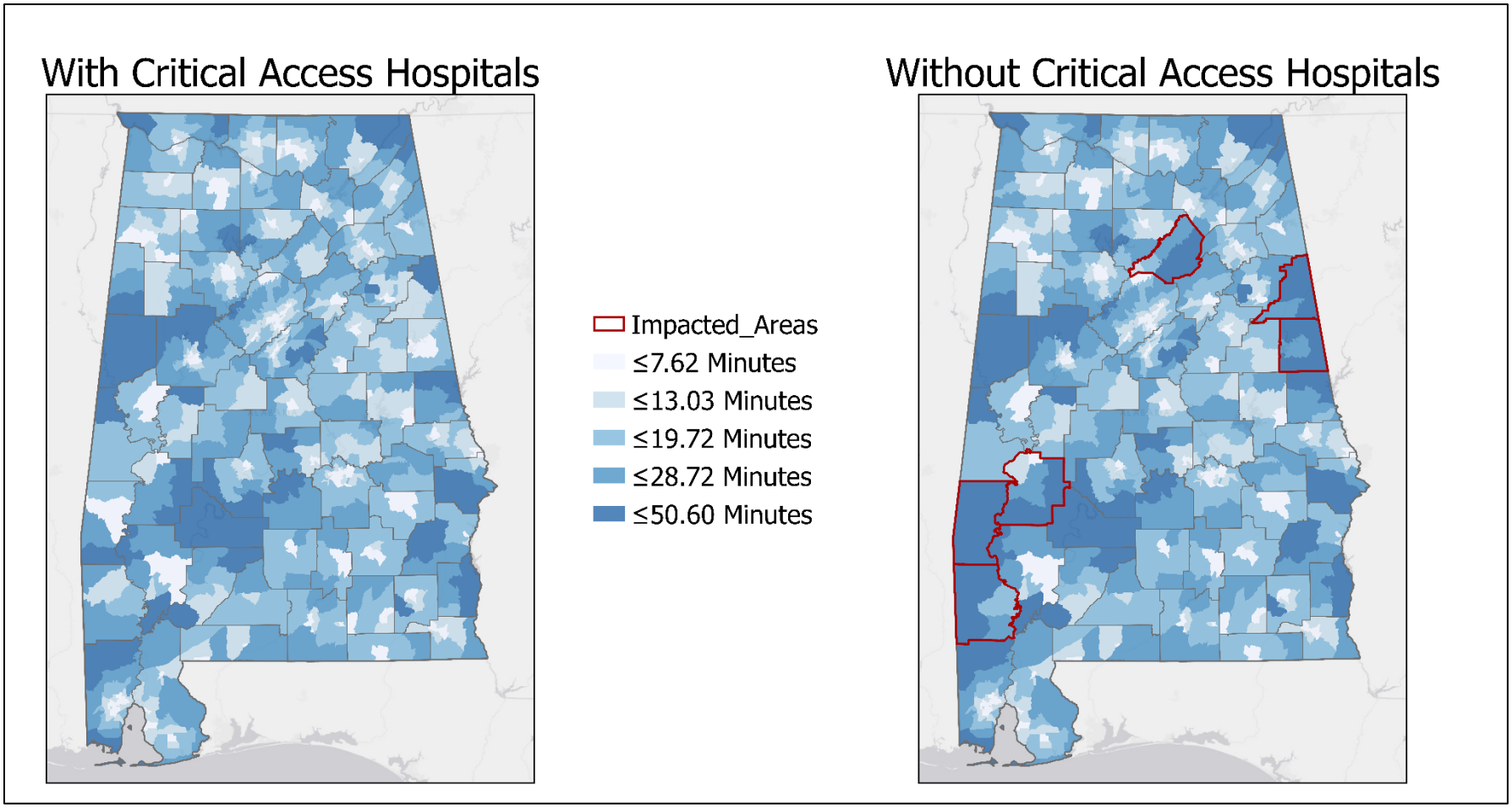
Alabama, which is home to 14,910 people (23) with immediate access to zero hospital beds. The nearest hospital beds for this population is in Wedowee, AL, which is roughly 45 minutes away from most areas of Cleburne. Adding a Critical Access Hospital to Cleburne County with twenty-five beds, the maximum for a Critical Access Hospital, would increase the state's total to one hundred and thirty-two beds. **Figure 4** displays the location of the new proposed CAH.

Figure 4. Newly proposed CAH in Cleburne County Alabama



While we see adding a CAH beneficial in related to increasing the number of beds, there are other factors to consider before placing a Critical Access Hospital. While the Critical Access Hospital Program has been beneficial in many states across the United States, the state of Alabama has had a hard time making the program a good fit. This has not only been a problem in Alabama but also in surrounding states that have large rural areas (27). The path to ideal reimbursements is strict and often not that beneficial to some areas of Alabama because some key procedures are reimbursed at a flat rate by the federal government and do not reflect current market value. Nevertheless, if policies are adjusted, CAHs do appear to promote physical access to hospital services in Alabama. **Figure 5** highlight differences in travel time when we included and removed CAHs in analyses.

Figure 5. Comparison of Travel Time With and Without CAHs



How has COVID-19 Affected Hospitals Differently in Rural Vs. Urban Areas?

COVID-19 has had a large impact on all hospitals throughout the US. During the pandemic, while hospitals around the US prepared for the pandemic that has now killed over five hundred and eighty thousand people, rural hospitals in Alabama faced serious challenges as they were already working with limited resources, which were further constrained at moments due to some restrictions to non-essential procedures. So, razor thin profit margins were likely more reduced in some areas. These contemporary challenges questions whether the state should reconsider policies associated with Medicaid expansion under the Affordable Care Act. The current pandemic does little to ease fears of hospital closure. With the lack of resources and beds for many of the population of east Alabama counties which hug the Georgia border, many patients with COVID-19 symptoms are being tested and treated across state lines (28).

Conclusion

We believe that findings from our analysis of the AHA data revealed a disparity in access to hospital beds between urban and rural counties. Every urban county, except Henry county, has at least one hospital. Whereas, there are nine rural counties with no hospitals at all. If Critical Access Hospitals were taken out of the equation, there would be 13 rural counties without any hospital beds. Critical Access Hospitals play a vital role in the population health of rural counties in Alabama. Currently, they provide the critical care needed by the 141,260 residents of the five counties they serve (23). Adding a Critical Access Hospital to Cleburne county would increase the total number of people served to 156,170. Also, since Cleburne county borders Georgia along I-20 towards Atlanta, a hospital in this county could prevent patients from Alabama seeking care across state lines.

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