

# Access to Obstetric Care Hospitals Based on Geographic Location and Socioeconomic Status in the United States, Alabama, California, and New York: 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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This report summarizes the empirical relationship between socioeconomic status and access for obstetric services in the United States. More specifically, the study's objective was to examine physical access to obstetric care at hospitals in the US among women aged 15 to 54 years.

Obstetrics is the medical field of study that specializes in the treatment of women during pregnancy and childbirth.(1) We worked as a team to generate code, analyze results, and make the most appropriate conclusions given the context and quality of the data for these services in the states of Alabama (AL), California (CA), and New York (NY) to show contrasts between various geographical regions. Our team chose to research these specific states as each vary greatly in the neighborhood distributions of population counts, household income levels, and degree of rurality. We produced comparative results by looking at AL, CA, and NY in relation to the United States as a whole.

Existing evidence suggests that there is a positive correlation between socioeconomic status and both prenatal and postnatal outcomes.(2, 3) Moreover, women who live further away from their obstetrician are more likely to skip prenatal visits,(4) which can have negative implications on maternal and birthing outcomes.(5) We used the Area Deprivation Index (ADI) to operationalize socioeconomic status. The ADI is the rankings of neighborhoods by socioeconomic disadvantage at the state and national level.(6) The factors included to generate the composite ADI measure includes each respective region's: income, education, employment, and housing quality.

Therefore, we focused on the country and state's ADI to gain insight on the relationship between a region's ADI and physical access to obstetric services at hospitals. To align with existing network adequacy standards for state Medicaid agencies across the nation with respect to primary care,(7) we determined that a travel distance within 30-minutes or less is considered suitable access to obstetric care. We successfully created tables which display the median travel

time to hospitals with obstetric services, as well as the median number of obstetric hospitals within 30-minutes in relation to the socioeconomic status of rural vs urban locations.

## **Methodology**

In addition to the ADI, this analysis includes data from the US American Community Survey at the census tract level,(8) American Hospital Association Database,(9) and travel time generated using GIS software.(10) Population-based census tract sociodemographic and population count of women aged 15-54 years come from the US American Community Survey. The median ADI of each census tract was categorized into three groups, which go as follows: 0-15=low class, 15-85=middle class, 85+=high class. Attributes from hospitals providing obstetric services come from the American Hospital Association Database. Through the assistance of a faculty mentor, travel time between census tract centroids and the latitude and longitude of each hospital in the analysis was generated to estimate how long it would take the population to travel to each hospital using a personal automobile.

To execute the analyses, we merged each of the previously described data sources and calculated estimates, which were either rendered on a map or summarized in a table. Maps generated in Tableau by our team were regenerated by our faculty mentor using ArcGIS Pro ©. Two final tables were created to represent the median travel time to obstetric facilities and the number of obstetric facilities within 30-minutes. Conclusions were made from the two tables and maps highlighting the prevalence of hospital access in geographical areas. Base analyses were completed using SQL Server Management Studio © and Azure Data Studio © using T-SQL programming to generate findings.

## Findings

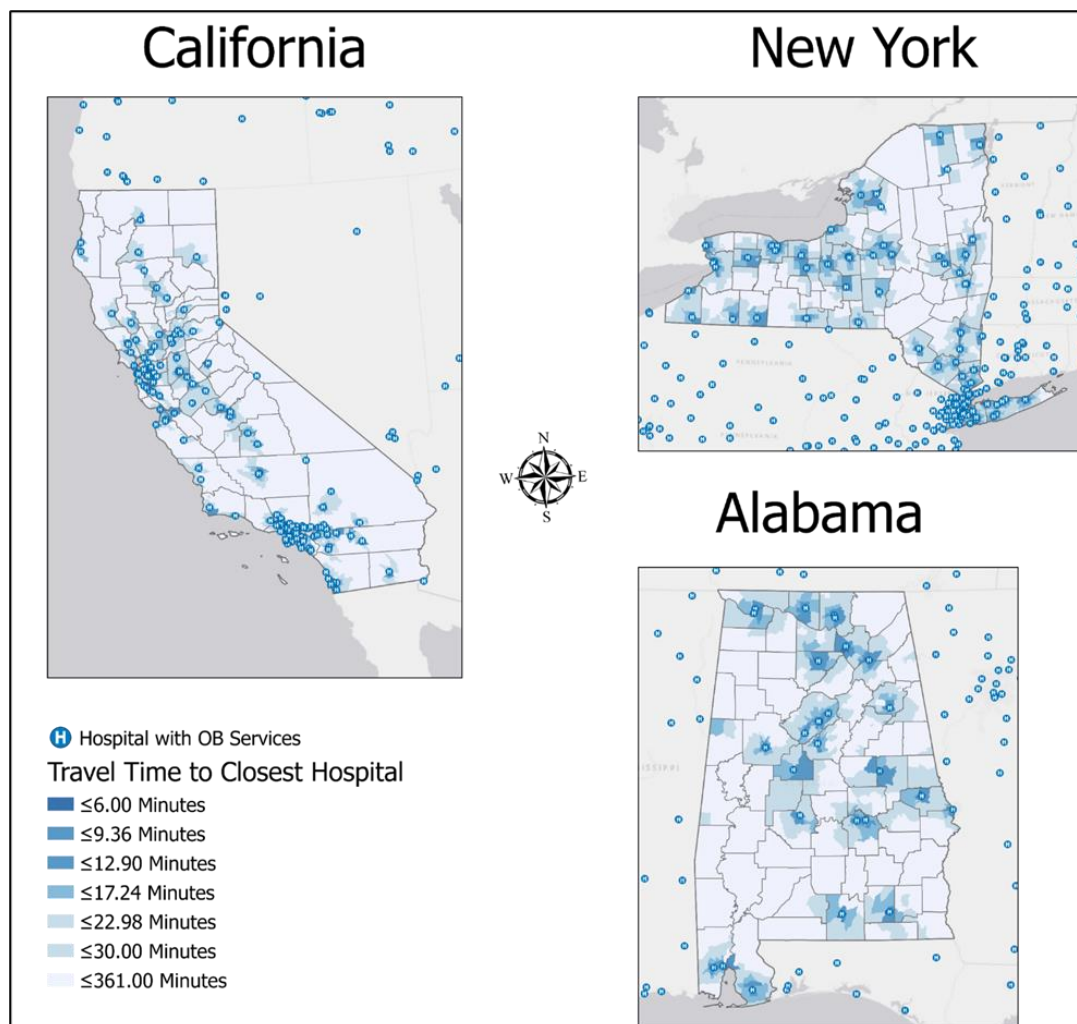
After running numerous queries in SQL Server, we developed two tables to help build conclusions. Based on the final tables, the United States has a higher median number of hospital access in urban compared to rural areas. In addition, the amount of hospital access in high class areas is doubled compared to middle and lower class. Whereas there's no major difference in middle and low class for the median number of hospitals within 30 minutes. We created a table to determine patients median travel time, in minutes, to an obstetric facility. In the United States, the overall average travel time to an obstetric facility is 13 minutes nationwide, 12 minutes for urban areas, and 26 minutes for rural areas. In comparison, each of the states have relatively the same average travel time for urban areas which range from 10 to 15 minutes. However, rural populations in the state of Alabama and California have an average median travel time of about 6 hours to the nearest facility. These evidences imply that there is very limited physical access for receiving care within a reasonable distance in these states. Based on households ADI, each state with areas labeled as high class recorded to have a median travel time ranging between 10 to 12 minutes. Whereas, regions labeled as middle class experienced a slightly higher travel distance to obstetric facilities than higher class households.

Uncharacteristically, lower class households in New York and California are more likely to have less travel time to access obstetric facilities.

Median Travel Time to Obstetric Facility (minutes)						
Based on Geographic Location & Socioeconomic Status						
Location	Statewide	Urban	Rural	High Class	Middle Class	Low Class
United States	12.83	11.66	26.41	11.34	13.45	10.35
Alabama	18.74	14.79	361.00	12.05	18.24	13.25
California	10.64	10.27	361.00	10.56	10.72	8.62
New York	10.93	10.41	24.86	10.28	13.27	7.07

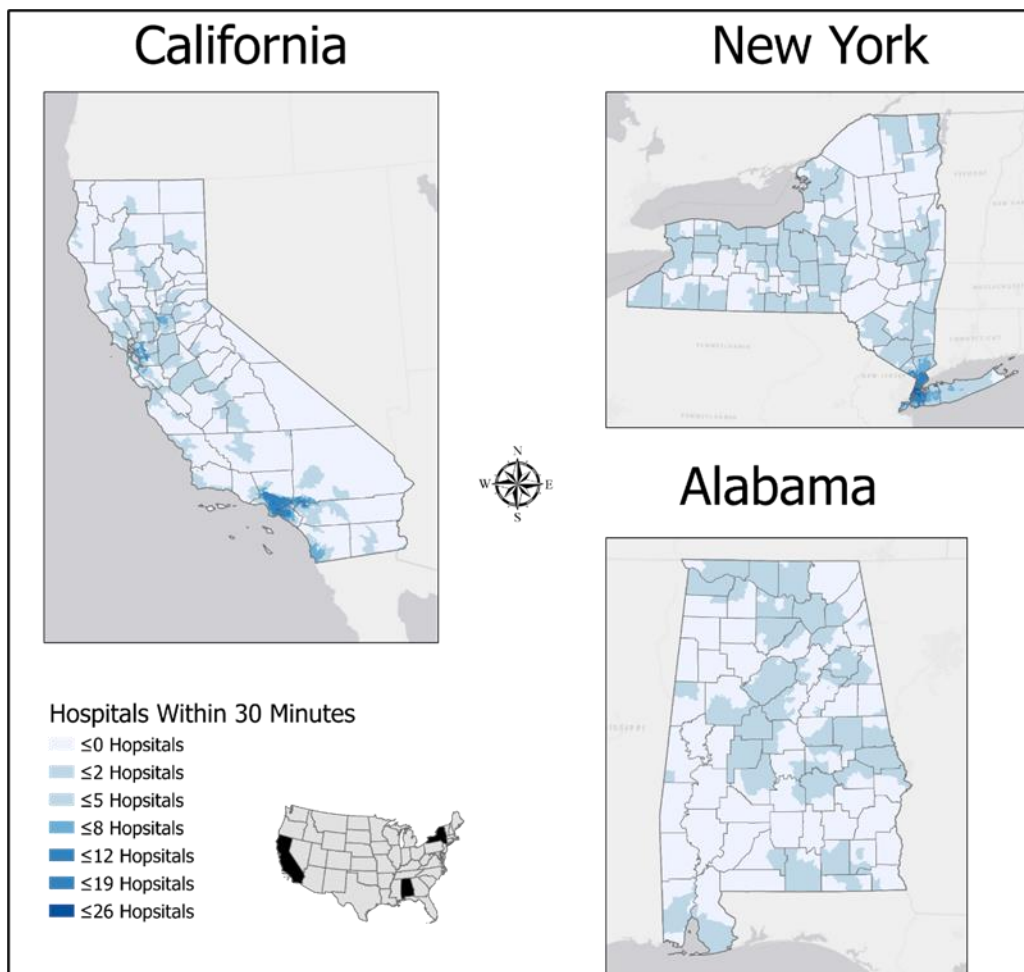
Median # of Accessible Facilities (within 30 min)						
Based on Geographic Location & Socioeconomic Status						
Location	Statewide	Urban	Rural	High Class	Middle Class	Low Class
United States	3	4	1	6	3	3
Alabama	1	2	0	3	1	1
California	6	6	0	6	6	7
New York	6	7	1	9	3	11

Figure 1. Location of hospitals that provide obstetric care and estimated travel time to nearest hospital



Displayed maps show 1) the travel time to the closest obstetric care hospital for each census tract, and 2) the sum of obstetric care hospitals within 30 minutes which is defined as adequate physical access in this analysis. The darker areas in both maps are considered to have “better” access relative to lighter shaded areas.

Figure 2. Frequency of hospitals providing obstetric care that is within 30 minute travel time threshold



## **Conclusion**

Evidence suggests that access to health care impacts one's overall physical, social, and mental health status and quality of life.(11) A high percentage of obstetric services must occur timely and effectively during women's pregnancy, labor, and birth. For instance, an individual in labor should be able to quickly get to an obstetric hospital to promote the odds of a successful and safe delivery. Therefore, accessing obstetric facilities within a feasible threshold such as 30-minutes or less is crucial as well-timed hospital care is required for most obstetrical services. As such, living in a region with fewer accessible facilities could result in multiple issues and complications which can increase the odds of negative health outcomes for the mother and child. Patients seeking medical attention for various obstetrical emergencies without immediate access can be life-threatening for women.(12) The longer amount of time it takes to receive care can increase the risk of labor and birth complications.

In addition, we determined that there was a correlation between accessibility and socioeconomic status. After examining the Area Deprivation Index (ADI) for the country and each state, regions with lower socioeconomic status scores have less travel time to obstetric facilities relative to other class statuses. Reason being is there are more facilities in low income areas than there are in high income areas for both New York and California. New York provides an exception as the state has more facilities present in lower class areas. According to our final table, the median number of facilities in New York is eleven within the low-class region with a travel time of approximately seven minutes.

The median number of facilities within the New York middle class area is three with a median travel time of approximately thirteen minutes. The high class of New York has a median number of nine facilities, which is less than the number of facilities in lower class areas. Furthermore,

California has more facilities in their lower income areas within less travel time. As for Alabama, the median number of accessible facilities is merely one in lower- and middle-income areas. However, the travel time to those facilities are seemingly different. Furthermore, in Alabama it takes about thirteen minutes to get to the facility in a lower income area and eighteen minutes to get to the facility in middle income areas. The median number of facilities and travel time are dependent on rural versus urban locations in each state. According to our research, Alabama residents live in about 41% rural and 59% urban areas.(13) Additionally, New York recorded having 12% rural and 88% urban regions. Lastly, the state of California has 5% rural and 95% urban areas. It is well-documented in the literature that individuals living in rural areas are more likely to have health complications due to limited access to health care. The majority of California is urban, and their median household income is \$75,235. This could be the reason why they have a higher number of obstetric facilities within 30 minutes. New York is mostly urban and has a median household income of \$63,998. In relation, New York shares the same number of facilities as California.

That said, Alabama has significantly less obstetric facilities compared to California and New York. Additionally, the median household income for the state of Alabama is \$50,536. This could be a reason as to why Alabama only has a median of one obstetric facility accessible within 30 minutes. Access to obstetric facilities depends on several factors such as socioeconomic status, ADI, and average income which help determine a patient's access for obstetric services within the United States.



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