

DRIVING INEQUITIES IN LOUISIANA

A Spatial Analysis of Obstetrics Services and Race

Introduction

Louisiana ranks 41st out of 45 reportable states for maternal mortality, with a rate of 37.3 deaths per 100,000 live births. However, the risk for black mothers is substantially higher at a rate of 61.7 deaths per 100,000 live births (Maternal and Child Health Bureau, 2024). Care coordination is important to ensure that women are treated at facilities appropriate to their level of risk. Otherwise, preventable deaths can occur if women experience complications but are far from a high-level obstetrics hospital (DeGruy et al., 2020). Therefore, mapping spatial distribution of obstetrics (OB) hospitals in Louisiana can highlight areas where risk assessment must be emphasized. I investigate driving times to level I (or higher) obstetrics hospitals and level 3 (or higher) obstetrics centers. The American College of Obstetrics defines level 3 centers as having subspecialty care and all the services of lower-level perinatal centers. These are crucial for higher-risk pregnancies or delivery complications. Level I centers provide care for uncomplicated pregnancies and more common conditions. Obstetrics Levels of Care is a relatively new measure that should be implemented to reduce maternal mortality.

Methods

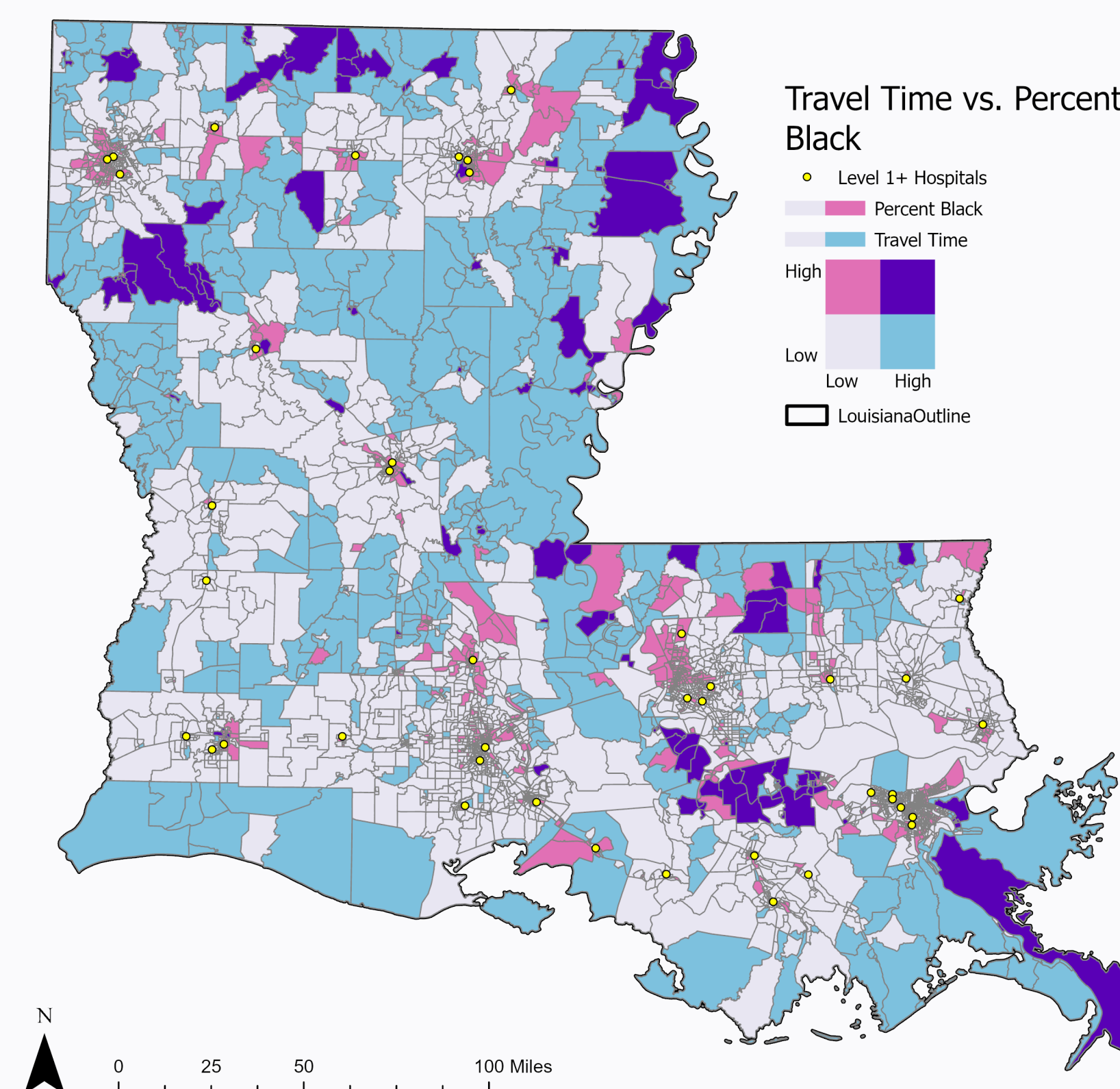
I **merged** the 64 TIGER/Line address range-feature shapefiles for every parish in the state. I then created an address locator and mapped hospitals using address data from the Louisiana department of public health. Two hospitals failed to match so I obtained latitude and longitude from Data Axle for those and geocoded them with **Table to XY Point**. I then created layers for level I or higher OB hospitals and level 3 or higher OB hospitals. I created an outline of Louisiana by selecting it from a national map and exporting it as an individual layer. To create census block groups with demographic information I downloaded the shapefiles from the census and race data. I cleaned that data then **attribute joined** it with the shapefiles. I **clipped** the census block groups to the outline of Louisiana to remove water areas and fix the coastline. I then recalculated the area of all census block groups. To calculate travel time, I first created centroids for each block group using **Feature to Point**. I then used Network Analyst in ArcGIS to calculate the **Closest Facility** (hospitals as facilities, centroids as incidents). Next, I **joined** the results of drive time from centroids to closest level I or higher facility to the census block groups. I repeated these steps for level 3+ hospitals. This approach was modified from Brown et al. (2014).

Spatial Questions

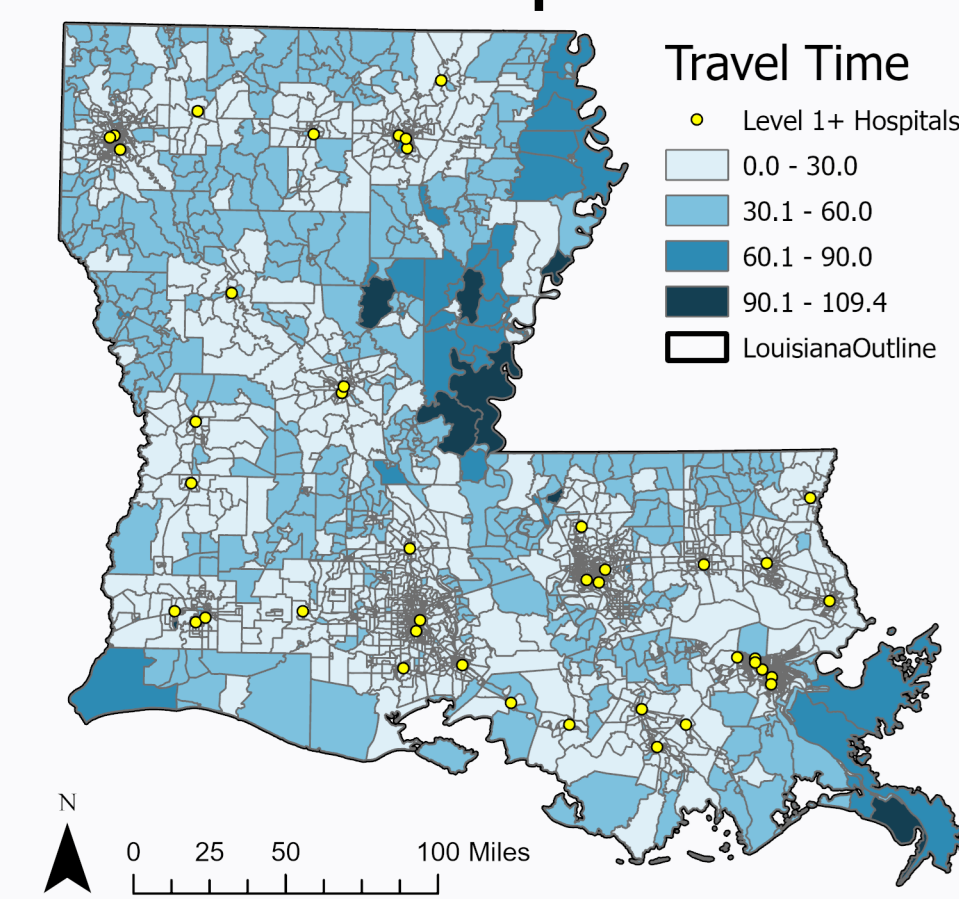
1. Where are the level I (or higher) and level 3 (or higher) obstetrics hospitals in the state of Louisiana?
2. How long does it take to drive to the closest level (I+ or 3+) obstetrics hospital from the centroid of every census block group?
3. What is the spatial distribution of Black residents of the census block groups of Louisiana?
4. Is there an overlap between predominantly Black census block groups and far distance from hospitals?

Discussion and Results

Travel Time LI vs. Percent Black

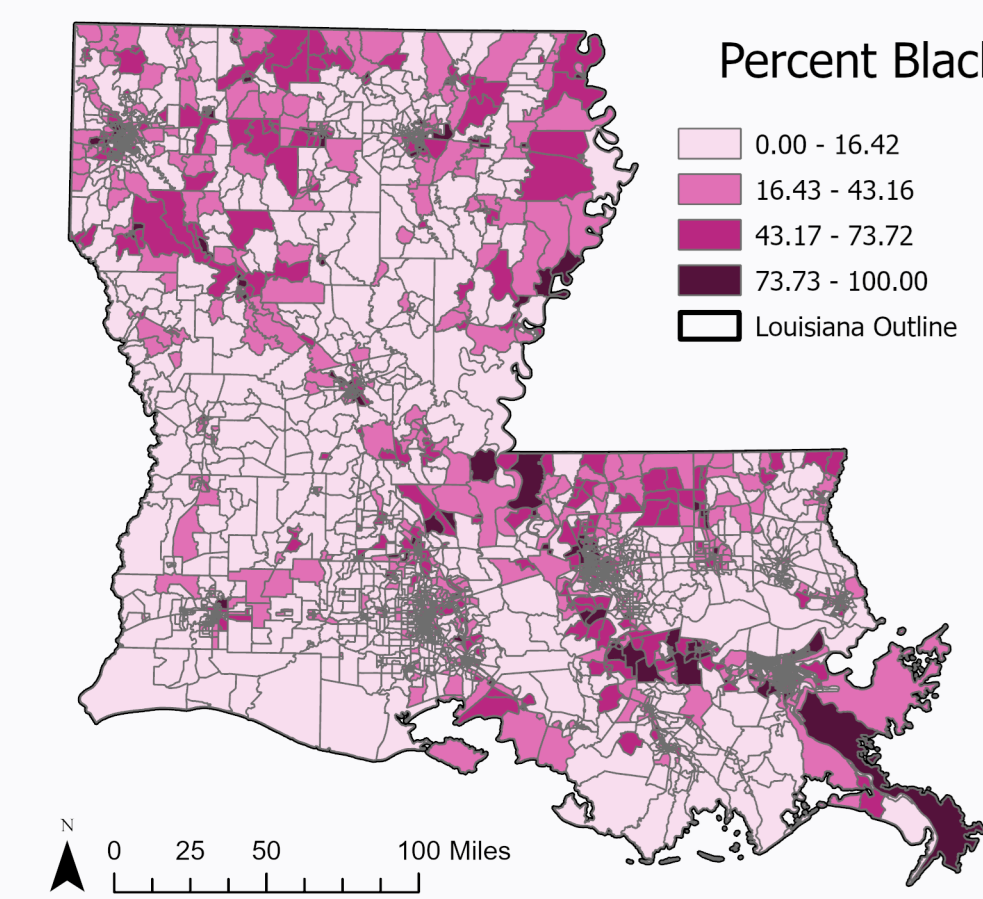


Travel Time to Level I Hospitals



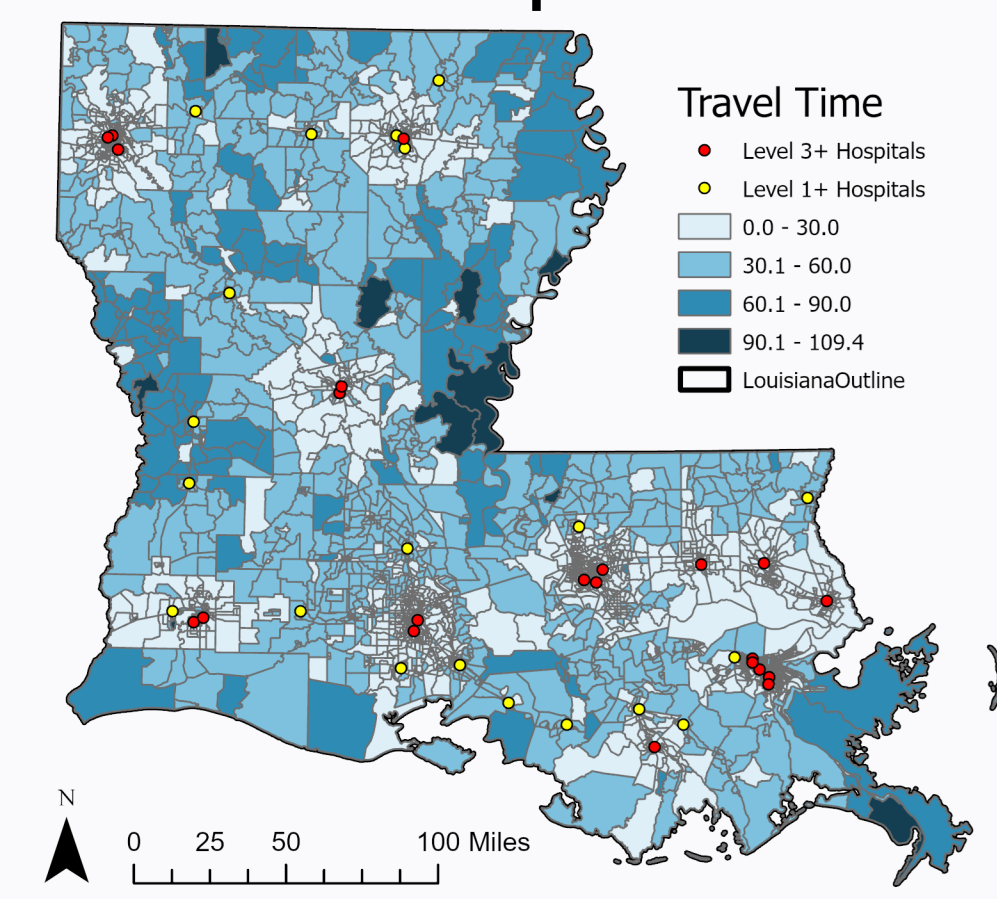
This map shows driving time to hospitals with level I+ OB services from census block group centroids. Darker colors indicate higher travel time (further from OB hospitals)

Percent Black



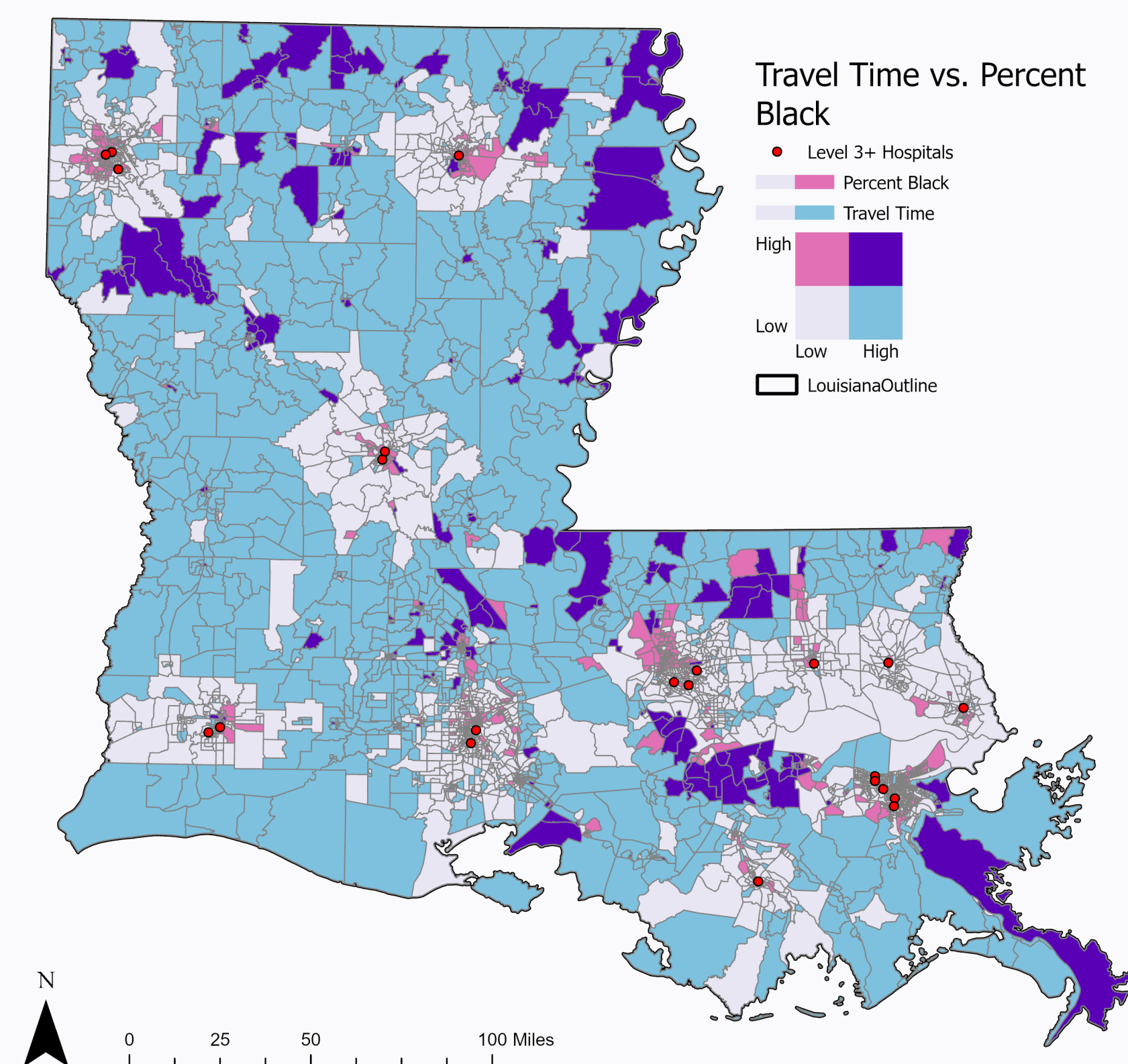
This map shows the spatial distribution of Black residents in Louisiana census block groups. Darker colors indicate a higher percentage of Black residents in that block group.

Travel Time to Level 3 Hospitals



This map shows driving time to hospitals with level 3+ OB services from census block group centroids. Darker colors indicate higher travel time (further from OB hospitals)

Travel Time L3 vs. Percent Black



The results of the analysis demonstrate travel time to level I+ or 3+ OB hospital VS percent Black by census block groups (BGs) (above and to the right, respectively). The purple color is the area of interest, as this indicates high travel time (30+ minutes) and majority Black populations (>50%). In the north half of the state, these appear to be mostly rural BGs. In the southeastern portion of the state, most of the purple sections are in Louisiana's "Cancer Alley" a historically inequitable area when it comes to Black populations and health. While these maps do not demonstrate an overwhelming racial inequity in travel time to OB services, they do show that the majority of the state is far from level 3+ services and a good portion from level I+.

Given Louisiana's high maternal mortality rate and the results of these maps, further investigation into travel time or transfers as risk factors should be considered. Since it is not feasible to have level 3 or higher services accessible within 30 minutes for every BG, risk assessment must be emphasized. This can ensure pregnant women who need higher level services plan for them and reduce maternal mortality

A limitation of this analysis is that only hospitals in Louisiana were considered. Services in bordering states were not analyzed, so access for BGs near interstate borders may be underestimated.

Conclusion

The purpose of this mapping project was to evaluate whether travel time contributes to the racial disparity in maternal mortality rates in Louisiana. Predominantly Black census block groups exist in the north of the state and along a southeastern corridor—"Cancer Alley". While there is some evidence of predominantly Black census block groups being further from obstetrics services, predominantly in "Cancer Alley", the issue seems to affect all races. As seen in the main analysis maps, most census block groups are over 30 minutes away from level 3+ OB hospitals. This means that if high-risk pregnancies go into labor early, or complications arise, they could be too far from adequate care. It is important to recognize that constructing hospitals within 30 minutes of every census block groups is likely not feasible. Therefore, risk assessment must be emphasized and the Obstetrics Levels of Care system should be implemented to prevent excess maternal deaths.

Map Details

Aubrey Rahaim | GIS 101: Intro to GIS | Dec. 17, 2024

Projection: NAD 1983 StatePlane Louisiana South FIPS 1702 (US Feet)

Data Sources: US Census, Louisiana Department of Health, DataAxle
Brown, S.A., Richards, M.E., Elwell, E.C., & Rayburn, W.F. (2013). Geographical Information Systems for Mapping Maternal Ground Transport to Level III Care Neonatal Centers. *American Journal of Perinatology*, 31, 287–292. <https://doi.org/10.1055/s-0033-1348029>

DeGruy, A., Teixeira, C., Evans, I., & Gillispie-Bell, V. (2020). Louisiana Pregnancy Associated Mortality Review Report: Maternal Mortality in Louisiana. Louisiana Department of Health. https://ldh.la.gov/assets/oph/CenterPHCH/FamilyHealth/2020_PAMR_Report_April2024.pdf

Maternal and Child Health Bureau. (2024). America's Health Rankings analysis of Federally Available Data. America's Health Rankings. https://www.americashealthrankings.org/explore/measures/maternal_mortality_cmmr_black_c/LA