Mapping Obesity Rates and Grocery Store Access In Alabama

Cartographer: Sabine Sussman **Class:** PH 262: GIS for Public Health **Date/Term:** May 4, Spring 2020

Background

Obesity and low supermarket access are serious problems in Alabama. The state has the sixth highest rate of obesity in the country (*Obesity Trends (Data)*, 2020). It also has more than 1.8 million people with inadequate access to supermarkets (Lang et al., 2015). Research on the impact of grocery store access on obesity is varied. A systematic review found inconclusive results on whether there are better obesity outcomes in areas with more grocery stores (Li et al., 2019). Another found that new grocery stores in a neighborhood didn't change food intake or BMI, but did raise awareness of food access (Cummins et al., 2014). Still, other studies have shown an impact of grocery store access on obesity as it relates to car access (Christian, 2010). What may also be a big determinant of obesity is the alternative food resources in a region. The presence of a "food swamp" with convenience stores is associated with high obesity rates (Cooksey-Stowers et al., 2017). There is a gap in the knowledge of how grocery stores impact obesity. My goal in this project is to use spatial analysis to assess the impact of grocery store access on obesity through maps of obesity rates and grocery store rates, and possible mitigating car access rates. I selected the state of Alabama, using the most up to date data I could find. My themes of interest include: how grocery store rates vary in different Alabama counties, what other food sources exist in different counties, and how accessible grocery stores are in each county.

Methodology

Data Sources:

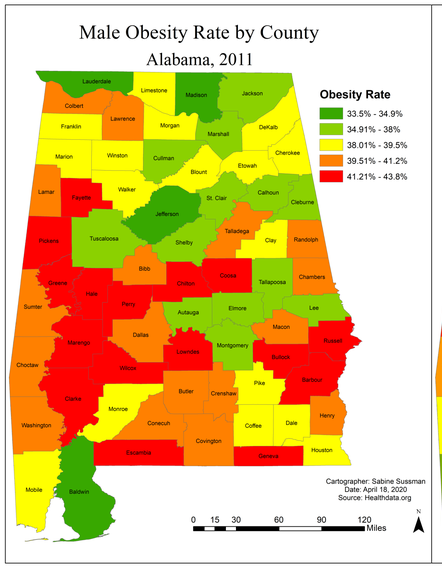
1) Tabular data from the Institute for Health Metrics and Evaluation (2011). This was good quality data although it would have been improved with more recent dates.
2) Tabular data from the USDA Food Environment Atlas (2014, updated 2019). This is high quality data as it comes directly from the USDA.
3) Tabular data from the USDA Food Access Research Atlas (2015, updated 2019). This is high quality data as it comes directly from the USDA.
4) Tabular data from the Alabama Department of Public Health's Food Establishment Scores. This was good quality data although their criteria for food establishment type was hard to understand at times.
5) Street centerline TIGER/Line Shapefiles from the U.S. Census Bureau (2015). This is high quality data as it includes every street centerline in each county.
6) Tabular data from Google Maps (2020).
7) Primary and Secondary Road TIGER/Line Shapefiles from ARCGIS (2017). This was high quality data

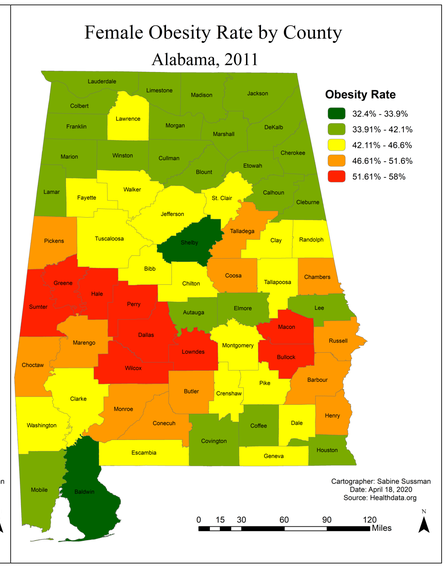
GIS Procedure:

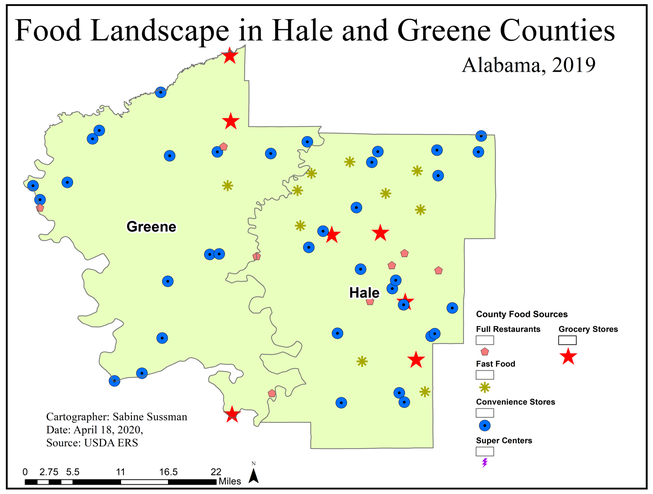
The Institute for Health Metrics and Evaluation tabular data was joined to GIS Alabama county shapefiles to conduct risk mapping. Two choropleth maps of Alabama's obesity rates by county for men and women were created. These were used to select four counties with different obesity rates. The USDA Food Access Research Atlas tabular data was joined to GIS Alabama county shapefiles to conduct descriptive mapping. Two choropleth maps of the food access and car access in each county were created. The USDA Food Environment Atlas Data was joined to GIS Alabama county shapefiles to conduct descriptive mapping. Three dot density maps of each county's food landscape were created. The Alabama Department of Public Health tabular data was combined with Google Maps tabular data to create a comprehensive list of full grocery stores. This tabular data was geocoded using the TIGER/Line shapefiles from the U.S. Census Bureau to create address locators. 1 mile proximity buffers for each grocery store were created. Primary and secondary road shapefiles were included in preparation for a network analysis. However due to the isolated nature of Alabama's roads, this was deemed unnecessary. Four dot density maps with the full grocery stores in each county were created.

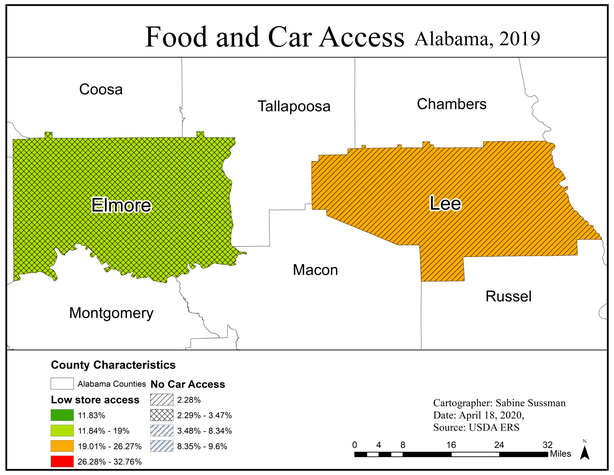
Findings

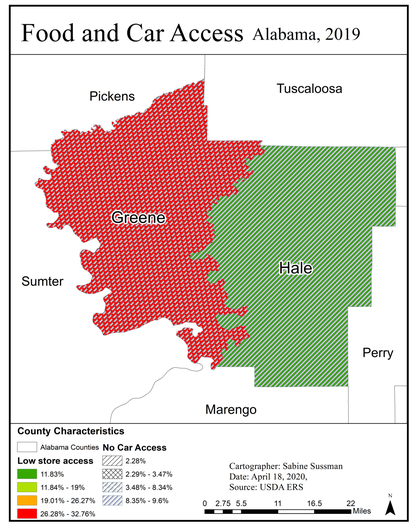
Obesity rates and low store access rates are not correlated in our maps. While Greene county had a high rate of low store access, Hale had a much lower low store access rate. In fact, Lee county, which has a lower rate of obesity than Hale, has a higher rate of low store access. Elmore also has a higher rate than Hale. On the other hand, no car access is correlated to obesity rates. Hale and Greene both have higher rates of no car access than Lee and Elmore. Maps of all four counties' food landscapes show that Hale and Green have less grocery stores, super centers, fast food restaurants, convenience stores, and full restaurants than the other two counties. In particular, Hale and Green have far less grocery stores than the other two counties. 1 mile buffers show that there is very little access off of the primary and secondary roads mapped out. A proximity analysis of roads was not helpful because there is so little road diversity. These maps illustrate a definite diversity issue when it comes to food sources. The counties with lower obesity have more of everything- and more of the food sources that offer healthier options. I am curious to further analyze how convenience store access in Alabama counties shapes obesity.

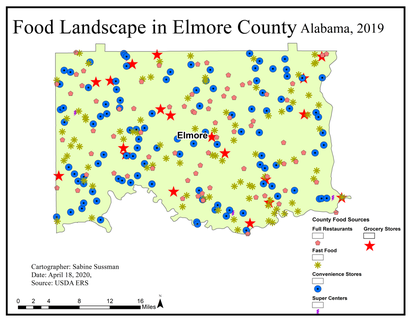


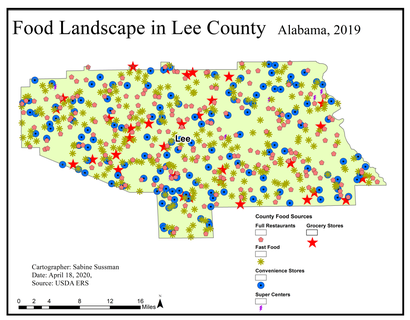


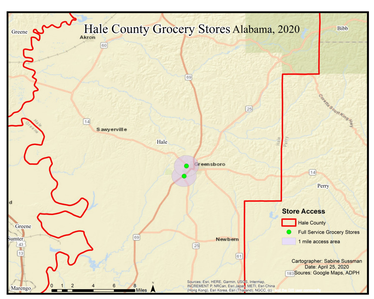


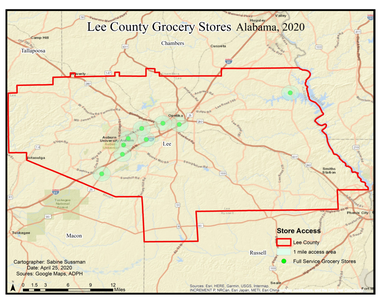


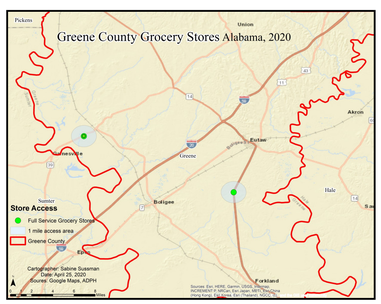


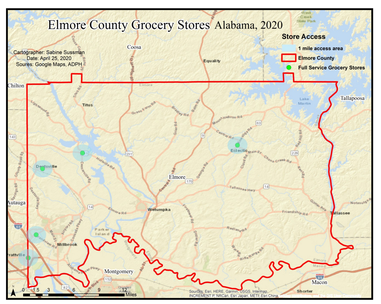












Discussion

Our findings suggest that more is at play in causing obesity than grocery store access. Although our findings do show that grocery store access is dismal in counties with high obesity rates, they also show that the high proportion of convenience stores may play a part as well. This relates back to our literature review, and adds merit to this theory. Our maps were limited in the diversity and accuracy of data available. Data relating to Alabama food access was difficult to find, and grocery store counts were estimated through best judgement rather than downloaded as an already existing tabular file. Still, the maps paint a clear picture of disparities in food landscapes and access in each county. Policymakers should further explore the impact of grocery store and convenience store access to understand why obesity rates are so higher in certain areas.

GIS Data Source: Google Maps, Alabama Department of Public Health, USDA ERS, Healthdata.org, ArcGIS

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