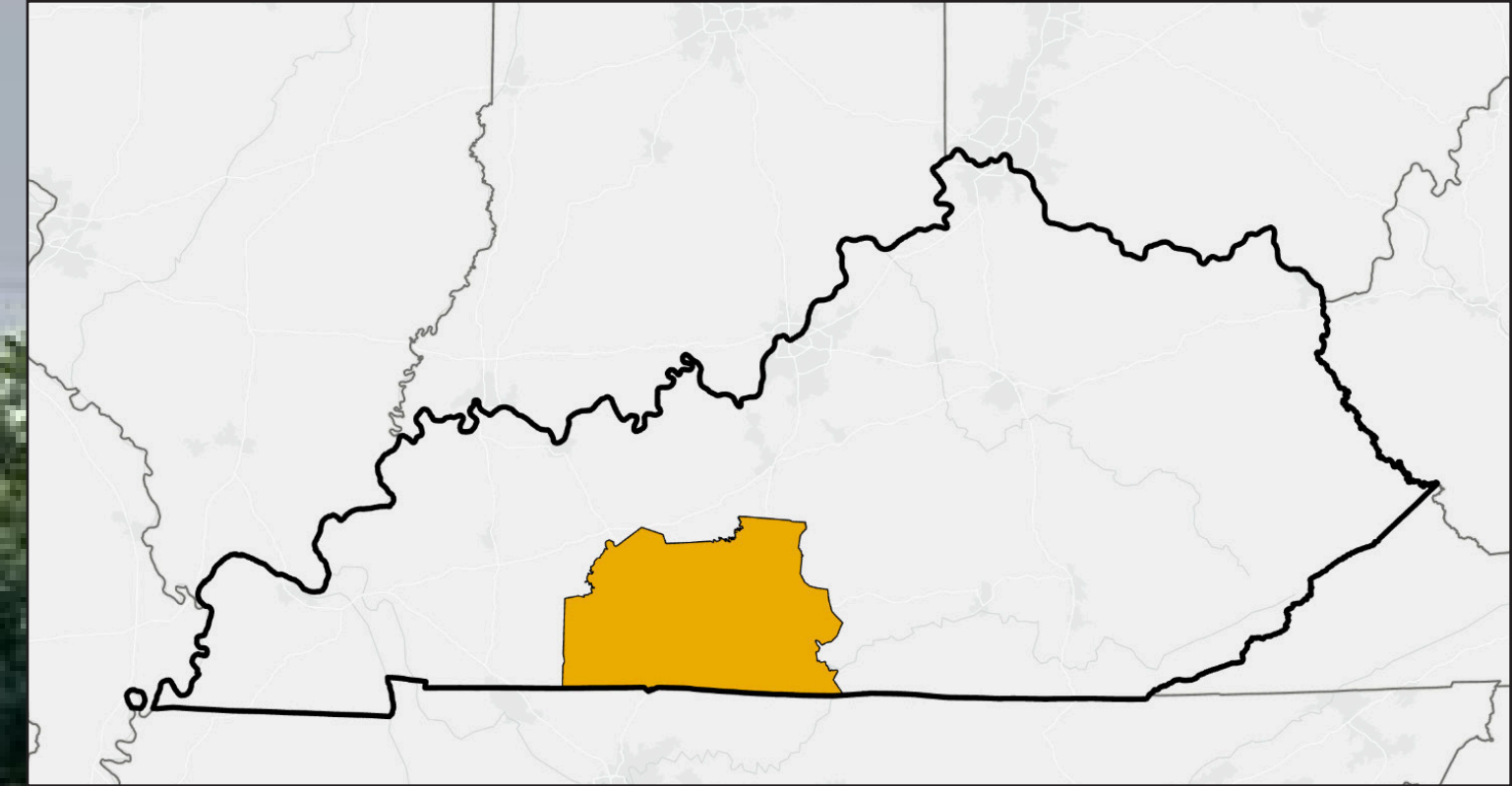# FOOD APARTHEID IN THE BARREN RIVER AREA DEVELOPMENT DISTRICT

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Introduction

Throughout the 19th and 20th centuries, agriculture was the main source of income for most families in the United States. However, the capitalist expansion of food enterprises in the United States has caused a decrease in the availability of healthy, local foods. While the industrialization of agriculture has generated numerous benefits, such as year-round produce availability, this has also led to a diminished localized food system in regions that grow crops for agribusinesses.

Food insecurity in rural areas is getting worse (USDA 2023). Many rural areas are considered food deserts: areas with limited supplies of fresh, affordable foods (RHIHub 2024). Food deserts, however, are limited in scope because they only consider access to supermarkets. The term ignores the environmental and social injustices that establish the context behind food insecurity (Powell et al., 2007). For example, studies have shown that as poverty rates increase, supermarket accessibility decreases while fast-food accessibility increases. Census tracts that are predominantly black have fewer supermarkets than white supermarkets (Gripper et al., 2022).

The term "food apartheid" is a better phrase because it emphasizes these inequities and highlights how historical and systemic factors, such as racism, classism, and disinvestment in certain communities, contribute to unequal access to healthy, affordable food (Bower et al., 2013).

Barren River Area Development District is a collection of ten counties (Allen, Barren, Butler, Edmonson, Hart, Logan, Metcalfe, Monroe, Simpson, Warren) in southcentral Kentucky. The members of the Development District are responsible for providing economic development and hazard mitigation plans for the region. I am currently collaborating with BRADD to develop ten climate resilience recommendations for each of the ten counties in addition to ten recommendations for the entire region.

My goal for this project is to provide an assessment of current food system practices in the Barren River Area Development District in Kentucky. I would like to identify food apartheid regions in the region by conducting a vulnerability assessment for access to healthy foods, physical health status, and socioeconomic status. The findings of this project would give decisionmakers insight of which communities have disproportionally fewer opportunities to consume healthy foods affordably.
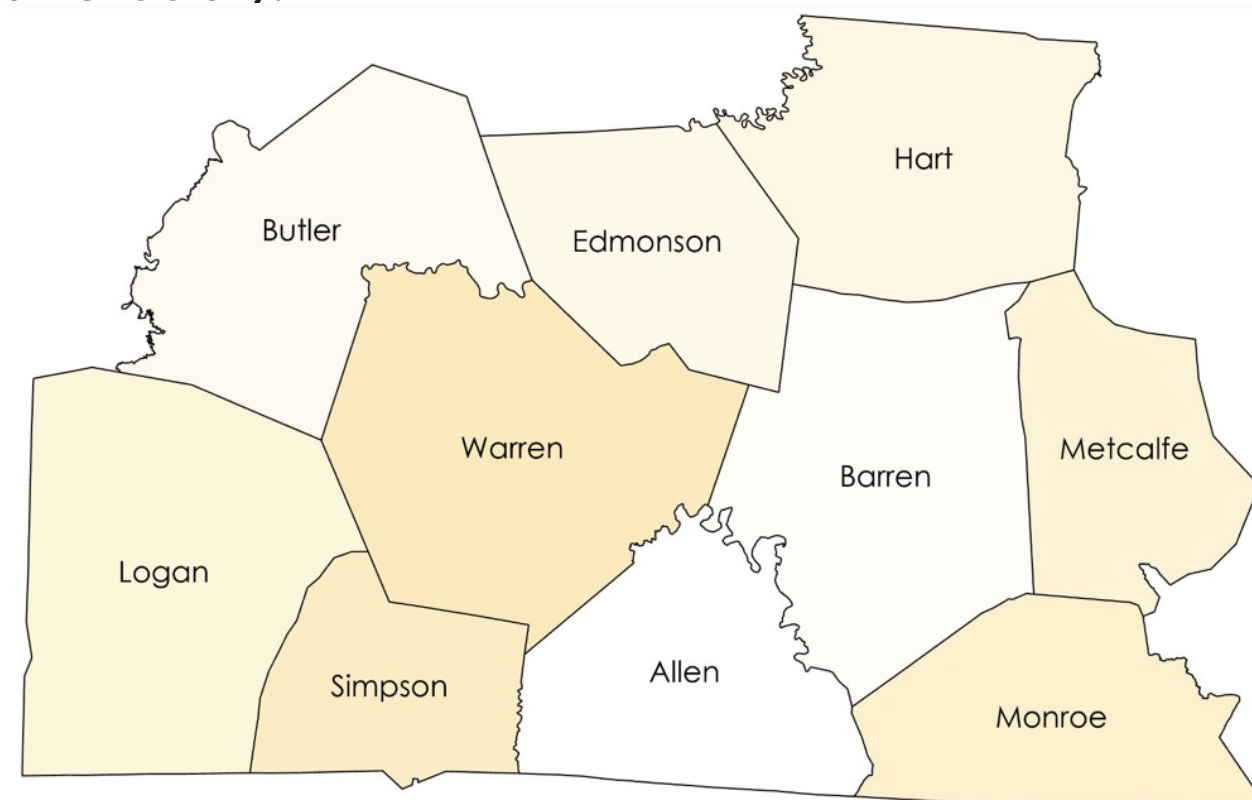
Methods

The first step of my analysis was to convert all vector shapefiles into rasters using Feature to Raster. Next, I used the Distance Accumulation tool to calculate distances from each store that accepts SNAP benefits. Then, I used Reclassify to categorize the measured data into a subjective score system of one to five, with five indicating the highest vulnerability. After I delegated scores for each variable, I summed up the scores using Raster Calculator and then used Zonal Statistics as Table to combine every spatial unit within the block group boundaries.

This created my final unweighted score for food apartheid and the maximum vulnerability score was 30. To create my weighted score system, I categorized every attribute as either "Access to Food", "Public Health Concerns", or "Socioeconomic Factors".
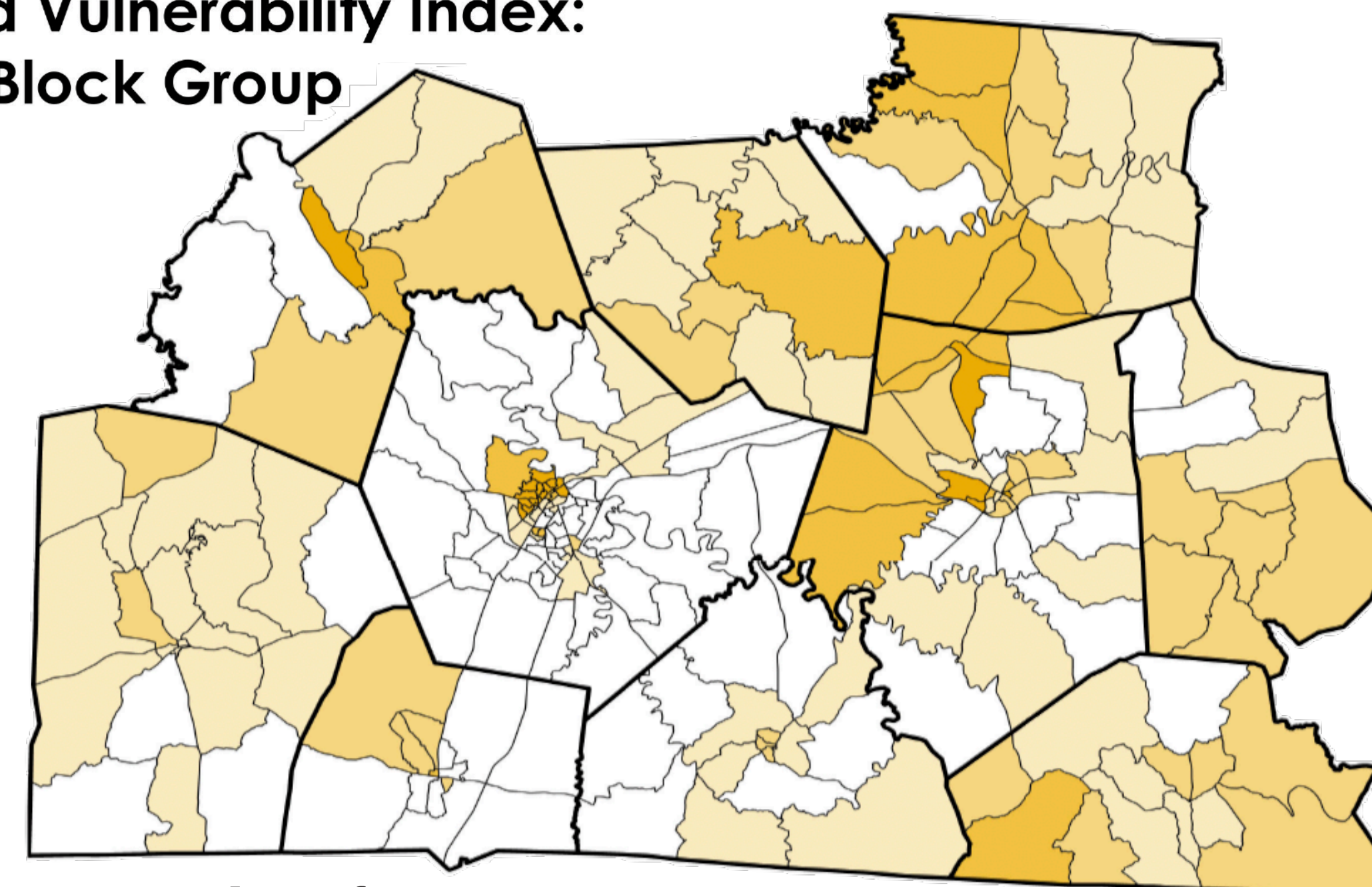
The weighted score was calculated similar to the unweighted score except that the attributes labeled "Access to Food" had a weight of 20%, "Physical Health Concerns" had a weight of 50%, and "Socioeconomic Factors" had a weight of 30%. The contribution of these variables varies based on location. For the BRADD, I chose "Access to Food" to have the lowest weight because this is the easiest challenge to overcome; an increase of public transportation or stores can quickly improve food security. Using this weight classification, the maximum vulnerability score was 10.

Finally, to identify the most vulnerable block groups and counties, I simply changed the symbology to have five quantile breaks as categories; the highest quintile had the most vulnerable communities.

Category	Weight	Parameter	Lowest Vulnerability (1)	Low Vulnerability (2)	Average Vulnerability (3)	High Vulnerability (4)	Highest Vulnerability (5)
Access to Food	0.2	Population without Reliable Transportation	< 5 %	5 - 10%	10 - 15%	15 - 25%	25 - 32%
Access to Food	0.2	Distance to Stores that Accept SNAP Benefits (miles)	< 1 mile	1 - 2.5 miles	2.5 - 5 miles	5 - 10 miles	10 - 15 miles
Socioeconomic Factors	0.3	Percentage of Population Experiencing Poverty	< 7.5%	7.5 - 15%	15 - 22.5%	22.5 - 30%	30 - 90%
Socioeconomic Factors	0.3	Population Density (people per square mile)	< 25	25 - 50	50 - 100	100 - 1,000	1,000 - 20,000
Physical Health Concerns	0.5	Percentage of Population with Fair or Poor Health	< 15%	15 - 20%	20 - 25%	25 - 30%	30 - 42%
Physical Health Concerns	0.5	Percentage of Population with Little Physical Activity	< 25%	25 - 30%	30 - 35%	35 - 40%	40 - 45%

Results

Both the weighted and unweighted analyses concluded that **Hart County** is the most vulnerable county to food apartheid in the Barren River Area Development District with a weighted score of 6.4/10 and an unweighted score of 18.2/30. In contrast, **Warren County** is the least vulnerable county to food apartheid with a weighted score of 4.0/10 and an unweighted score of 12.2/30. This information could be insightful for municipal leaders in future development for additional supermarkets and public transportation corridors.

Weighted Vulnerability Index: County

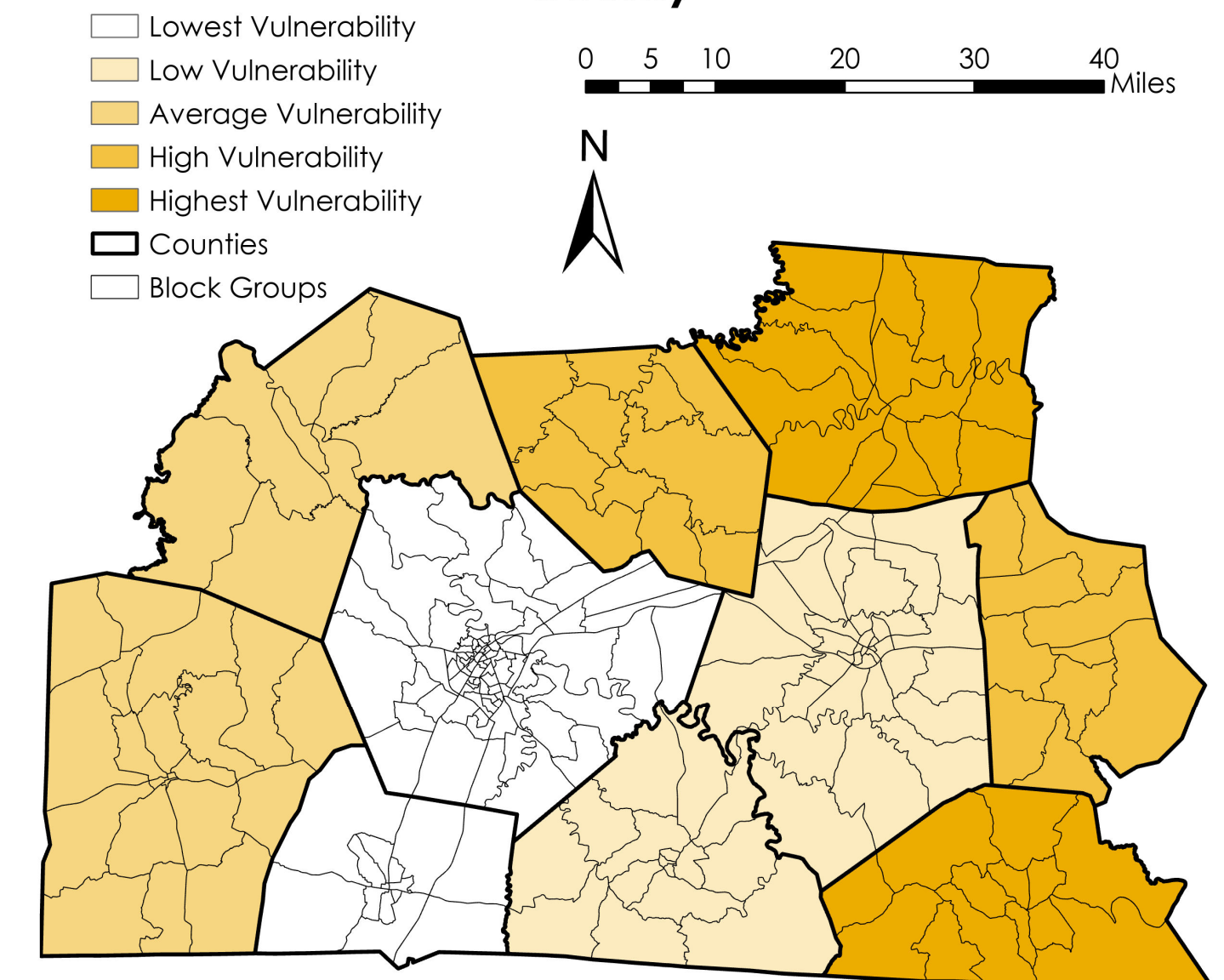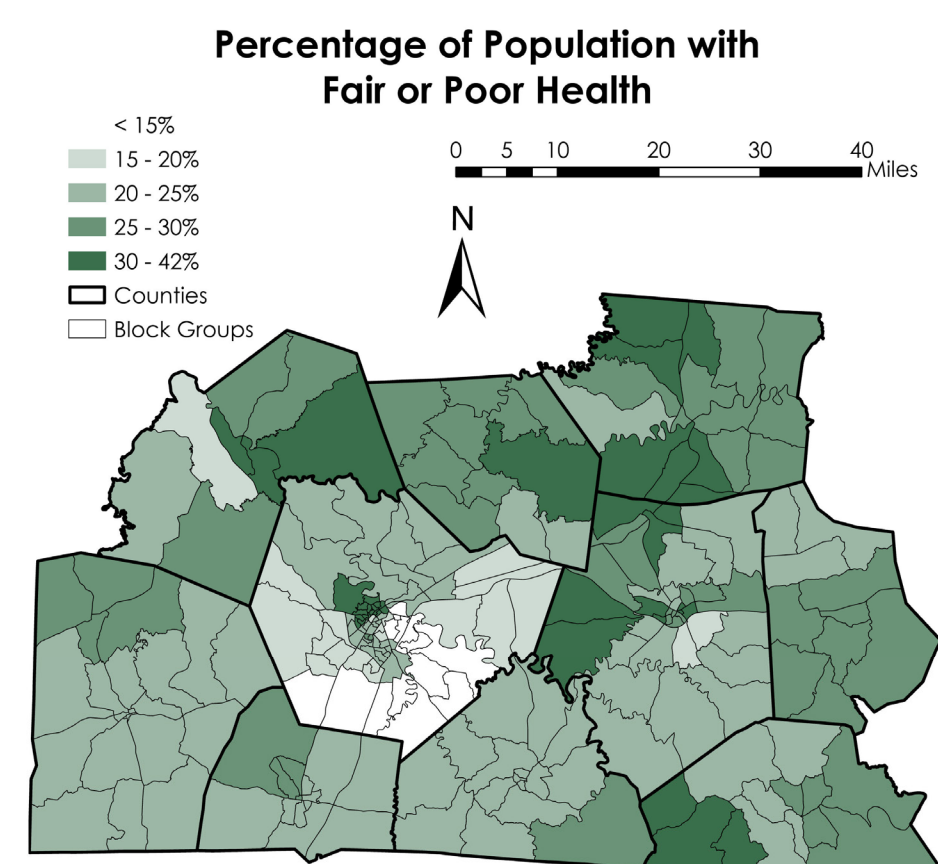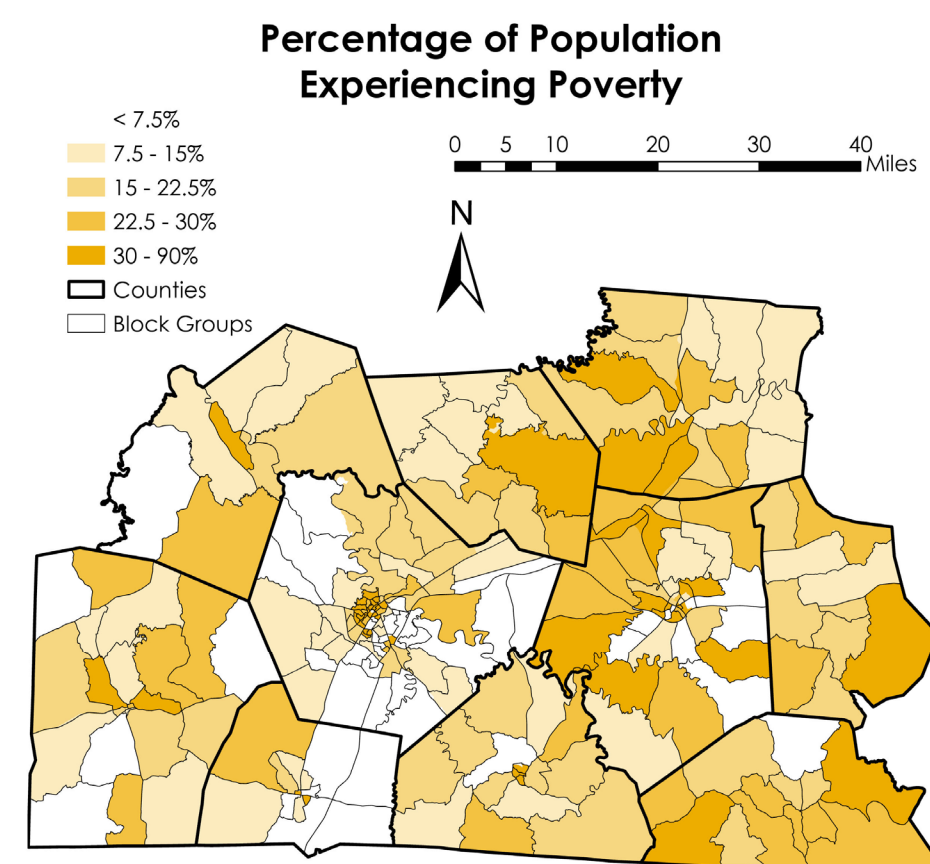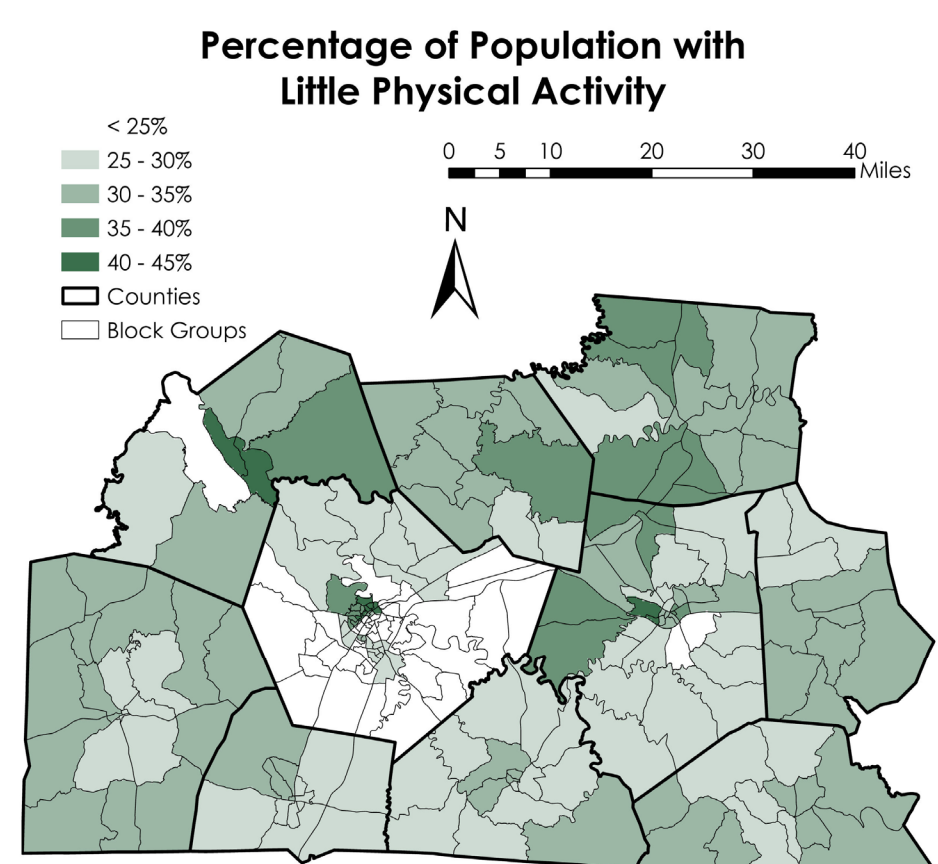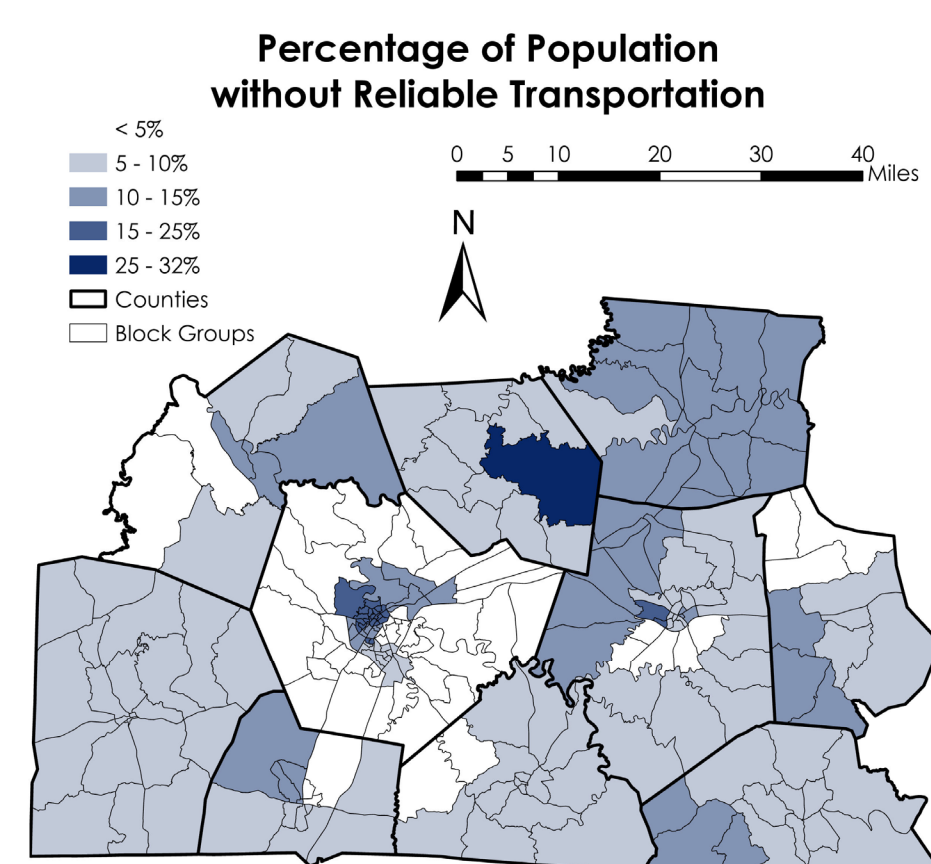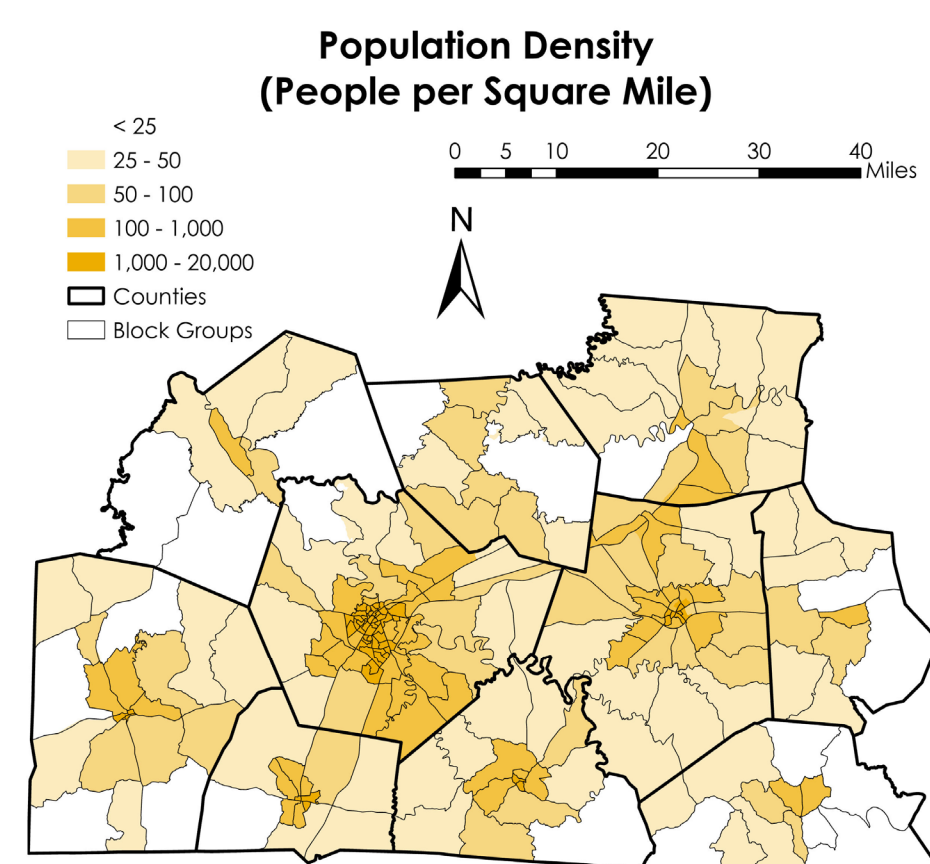Legend: Lowest Vulnerability, Low Vulnerability, Average Vulnerability, High Vulnerability, Highest Vulnerability, Counties, Block Groups

County	Overall Vulnerability Rank	Average Weighted Score	Average Unweighted Score
Hart	1	6.4	18.2
Edmonson	2	6.2	17.6
Monroe	3	5.9	17.3
Metcalfe	4	5.8	16.8
Barren	5	5.7	16.7
Butler	6	5.6	15.9
Logan	7	5.4	15.6
Allen	8	5.2	15.4
Simpson	9	5.1	14.9
Warren	10	4.0	12.2

Weighted Vulnerability Index: Block Group

Legend: Lowest Vulnerability, Low Vulnerability, Average Vulnerability, High Vulnerability, Highest Vulnerability, Counties, Block Groups

PHYSICAL HEALTH CONCERNS

Percentage of Population with Fair or Poor Health

Percentage of Population with Little Physical Activity

SOCIOECONOMIC FACTORS

Percentage of Population Experiencing Poverty

Population Density (People per Square Mile)

ACCESS TO FOOD

Percentage of Population without Reliable Transportation

Distance to Grocery Store that Accepts SNAP Benefits

Data Sources and References

Boundary Shapefiles: The polygon vector files for the counties and block groups were obtained from the United States Census Bureau. https://www.census.gov/cgi-bin/geo/shapefiles/index.php

Stores that Accept SNAP Benefits: This point vector file comes directly from the BRADD and uses a 2022 dataset. https://gis-bradd-ky.opendata.arcgis.com/

Food Atlas Data: I obtained shapefiles with health factors from the 2019 USDA Economic Research Service Food Access Research Atlas. https://www.ers.usda.gov/data-products/food-access-research-atlas/

Social Explorer: I obtained shapefiles with socioeconomic data (transportation, poverty, population density) from Social Explorer, which uses 2022 American Community Survey data. https://www.socialexplorer.com/

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