# Introduction and Research

Baltimore has historically been a city that exhibits major disparities in food insecurity, and access to nutritious food, driven by corruption, systemic inequities, governmental mismanagement, etc., and this has especially been an ongoing problem in marginalized communities

**The overarching question this presentation will answer is:**
"How does access to sustainable food sources vary across different neighborhoods in Baltimore, and how is it influenced by current (and even historical) socioeconomic and demographic factors?"

This question will be answered in three different segments with 3 different maps:
**Map Set 1:** Where are sustainable food sources—such as grocery stores, farmers markets, and community gardens—located in Baltimore, and how evenly are they distributed across the city?

**Map Set 2:** Which areas in Baltimore with high socioeconomic vulnerability also have low access to sustainable food sources?

**Map Set 3:** How accessible/reasonable is public transportation with healthy food sources for residents in food deserts?

# Data:

The majority of the data used came from Open Baltimore, Maryland Department of Transportation, and other local sources.

**Baltimore 2020 Census Tract Data**: UMBC GES 386 Introduction to Geographic Information Systems

- 200 tracts

**Baltimore 2021 Walk Score Data**: Open Baltimore

- Walk Score measures walkability by calculating the distance to amenities in nine categories, such as grocery stores, parks, and schools, with each category weighted by importance. This information is used to generate a base score, which is then normalized to a scale from 0 to 100.

**Baltimore 2025 Grocery Store Data:** Open Baltimore

- 46 grocery stores

**City Farm Data:** Baltimore Department of Recreation & Parks

- 11 City Farms

**20205 Public Bus Stops and Route Data:** Maryland Department of Transportation

- GTFS data

**Small Grocery and Corner Stores:** UMBC Story Map

- 645 Small grocery and convenience stores

All Map's coordinate system and data points are projected in NAD 1983 StatePlane Maryland FIPS 1900 (US Feet)

# Methods Map Scene 1:

**Map 1:**

- Downloaded grocery store and walk score data (which were already shapefiles and in correct projection), uploaded them to Arcgis pro, changed the color of the of the walk score data, with 5 classes and natural breaks (jenks)

- City Farm Data had the location of the city farms, but in the CSV format. This required geocoding all 11 of the city farms, turning it into an excel sheet, and uploading that data and converting it into XY Points, and setting the coordinate system to NAD 1983 StatePlane Maryland FIPS 1900 (US Feet)

- Spatially joined the city farms and grocery stores to the walk score

**Map 2:**

- Conducted a route analysis for a scenario of an individual around University of Maryland, Baltimore (a region of high walk score) and created the excellent walk score route to the nearest grocery store. Conducted the same route analysis but starting at a residency around Benjamin Franklin High School (a region with a low walk score) going to the nearest grocery score.

- Displayed the directions of both the excellent and poor routes

# Methods Map Scene 2:

**Map 1:**

- Added Census tract data (which were already shapefiles and in correct projection), uploaded it to ArcGIS pro, changed the symbology to display 5 classes of each having natural breaks (jenks) showing overall median household income.

- Retrieved the grocery store and city farm data from the previous scene 1, uploaded overlaid it to this map and redid the spatial join to the census tracts instead.

**Map 2:**

- Copied the same steps from map 1

- Calculated the Bottom 50% of median household income and exported that data to a new map. Changed the symbology of the map to 5 classes with natural breaks (jenks), along with adding the grocery store and city farm data

# Methods Map Scene 3:

**Map 1:**

- Copied the grocery store data and Bottom 50% of median household income map from the 2nd scene and pasted it to a new layout

- Extracted small grocery and corner store data points from the UMBC Story Map about food insecurity, and added it to the map. Spatially joined the grocery store and the small corner grocery store points with the bottom 50% of median household income.

**Map 2:**

- Copied everything from map 1 and pasted it to this map

- Downloaded Maryland Department of Transportation (MDOT) GTFS bus data about Baltimore City. Used the “shapes” data in it and conducted a GTFS Shapes to Features operation that showed the routes of each bus (the data also color coded the maps, but didn’t label them, so I changed them all to purple in symbology)

- Clipped the bus routes to the baltimore boundary to only know routes in the city

# Methods Map Scene 3 (cont.):

**Map 3:**

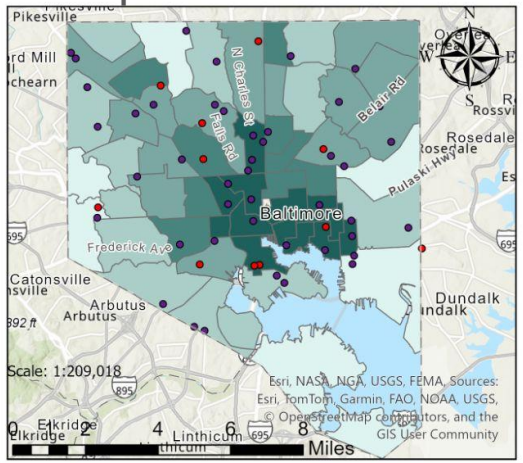
- Copied everything from map 2 and pasted onto this map
- Used the “stops” data in it and conducted a GTFS Stops to Features operation that showed the bus stops of each bus. Spatially joined bus routes with bus stops.
- Conducted a route analysis with the same location in the Benjamin Franklin High School region. Incorporated point barriers (stoplights) to best simulate an actual bus ride

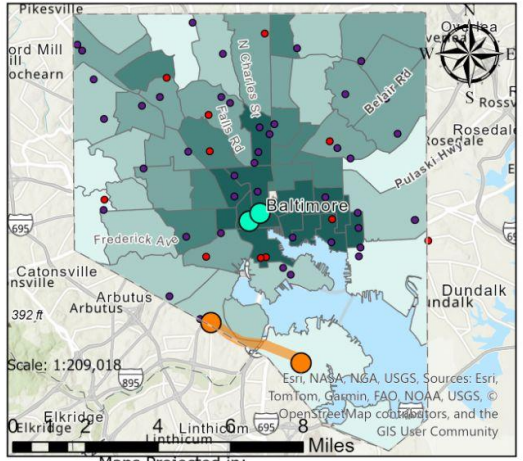
# Where's the Food?
# Mapping Walkable Food Accessibility in Baltimore

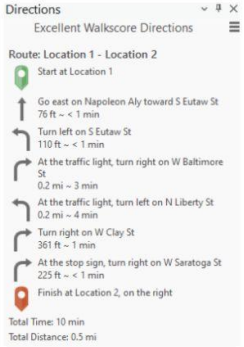
## Key Takeaways:

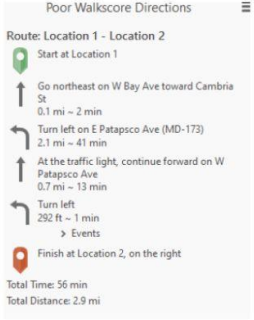
- Central, midtown, and fells point have substantially highwalk scores and better access to stores
- Areas like Curtis Bay in the south face major gaps in walkable food accessibility
- Depending on where you're located, walking to a grocery store or city farm in a poor score will be substantially longer compared to an excellent score

## Map Scene 1

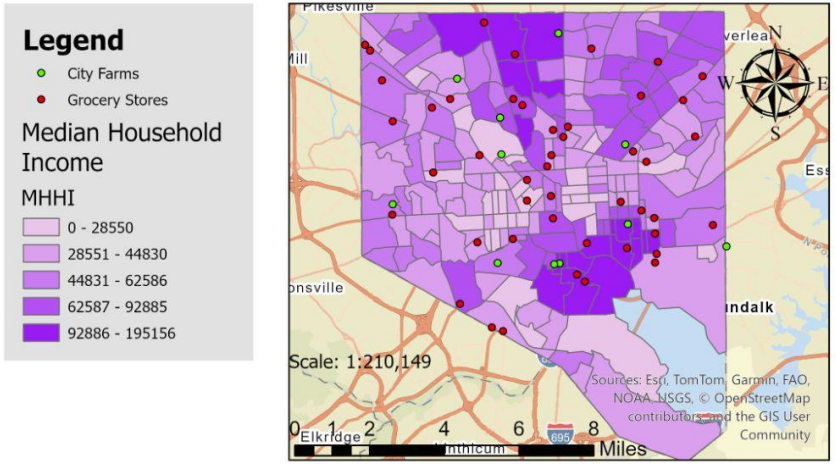

Maps Projected in:
NAD 1983 StatePlane Maryland FIPS 1900 (US Feet)

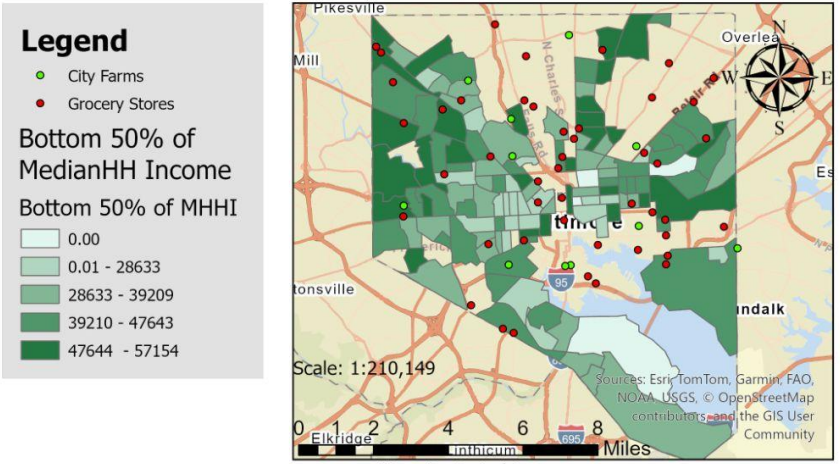
# Median Household Income vs Access to Sustainable Food Sources

## Key Takeaways:

- Out of the 200 tracts, only 41 have grocery stores, and 10 have city farms
- In the bottom 50% median income tracts, only 22 have grocery stores and just 5 city farms
- Curtis Bay, West, and Southwest Baltimore are highly underserved communities, and areas where grocery stores or farmers markets are not in their tract or even in close proximity

Map Scene 2



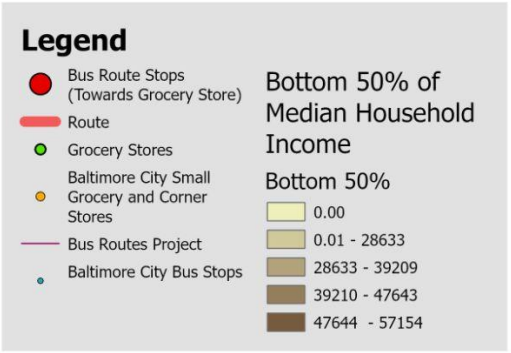

Maps Projected in:
NAD 1983 StatePlane Maryland FIPS 1900 (US Feet)

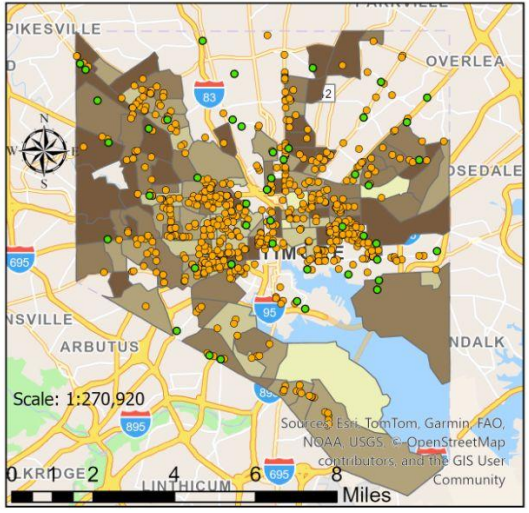
# Is Public Transportation The Solution to Ease Nutritional Disparities?

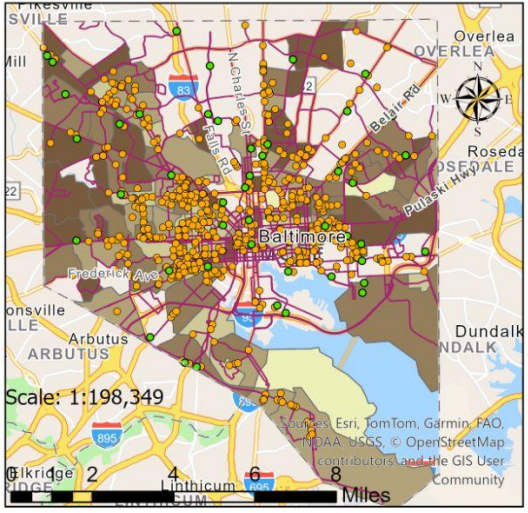
## Map Scene 3

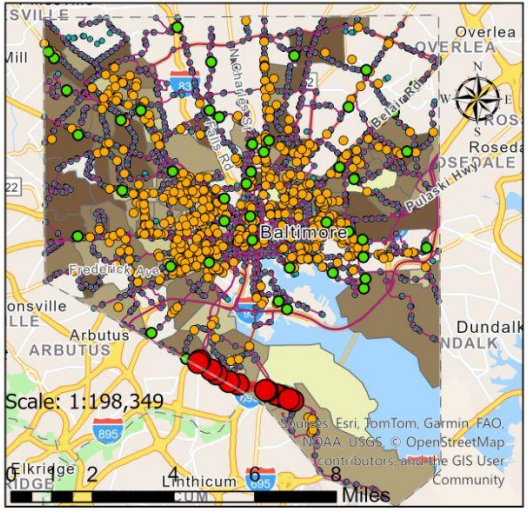
## Key Takeaways:

- Baltimore has 645 corner stores, vastly outnumbering grocery stores (46)
- The distance from the Benjamin Franklin High School to the nearest grocery store scenario had a significant time decrease of only taking 15 minutes (if things go well)
- Bus system can help shrink distance to food access - but don't fix the nutrition issue
- While Corner stores often lack fresh produce and healthy options, they have a huge advantage in costs and being in close proximity to especially residential areas.
- On a tight budget, and eating for satiation, an individual is more inclined to purchase more affordable, and accessible food, rather than having to plan a trip to the grocery store



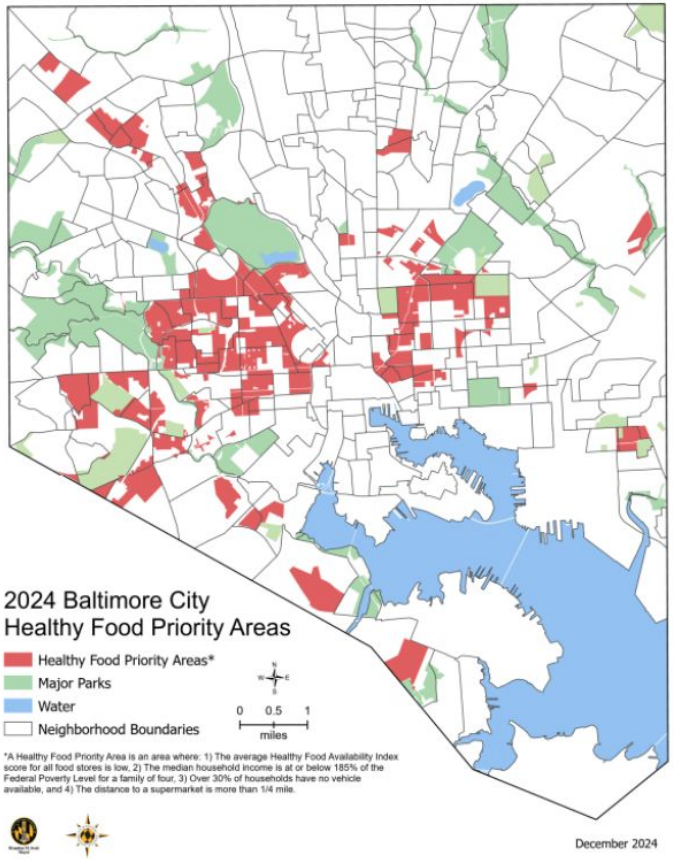



# Additional Information

Baltimore City's Department of Planning released an initiative with Food Policy Planning (FPP) to address equity in the food system

This map displays "Healthy Food Priority Areas", which are determined on four criterias: low income, vehicle availability, distance to supermarkets, and availability of healthy food options.

The terminology "Food Desert" is refrained from being used here as it could imply that there's no food in the region. This assumption isn't correct, as the main problem is that there's no **nutritional** food within specific areas



# Results and Conclusions

This project's main goal is showing the uneven distribution of healthy food access, the trends in socioeconomic status (especially marginalized communities), and highlighting disparities between the two

Using geospatial analysis, and creating a realistic route simulation of the walking in the two neighborhoods, we can see that being in an area with limited walkability can significantly decrease the accessibility of healthy food options these communities will have.

Even though public transit can aid in the total distance and time it would take for these underserved groups to get to grocery stores, it doesn't necessarily help in the socioeconomic aspect in marginalized communities. These groups could have immediate access to grocery stores, but may still not be able to afford what they want and instead resort to cheaper, more unhealthy alternatives.

While Baltimore is still trying to solve this issue, further research should be conducted to find ways of which how to provide areas that are oppressed, underrepresented, and excluded communities with accessibility to healthy **affordable** food, along with understanding the roots of how complex the problem of food insecurity really is in Baltimore City. As it currently stands, the "2024 Baltimore City Healthy Food Priority" areas map looks strikingly similar to the results of my map that I generated