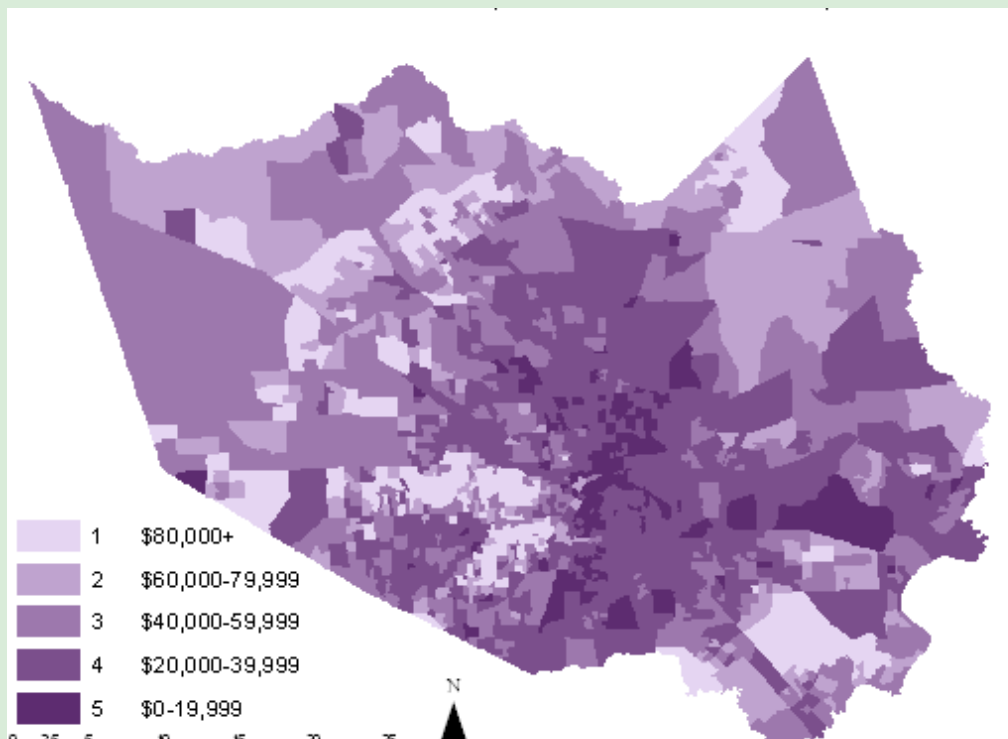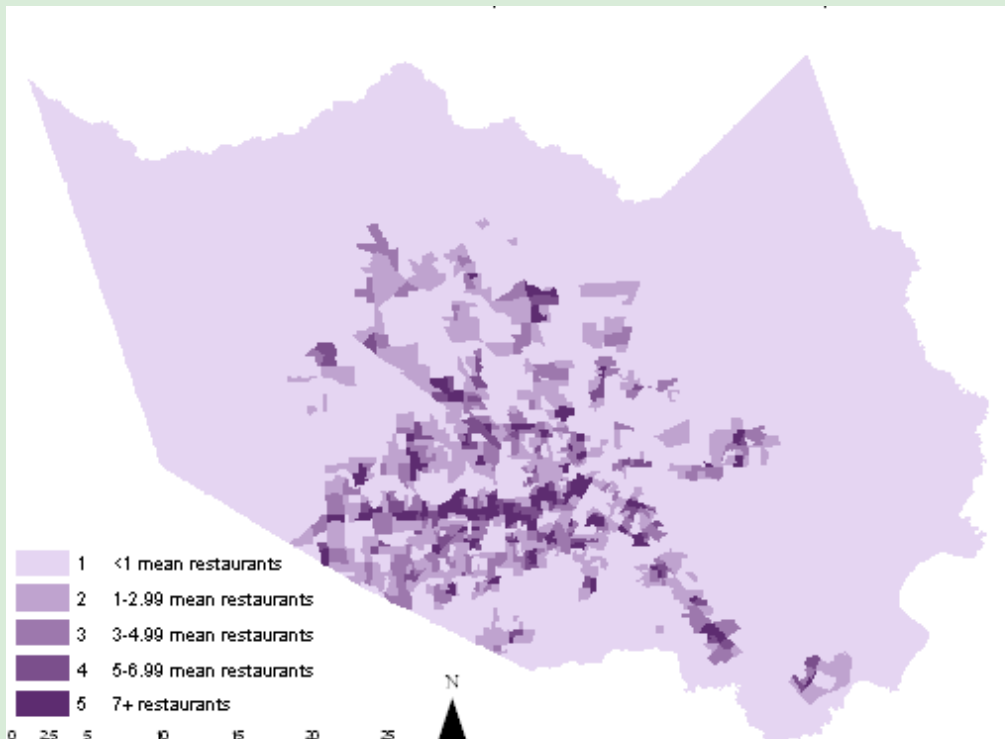# Assessing Houston's Vulnerability for Childhood Obesity

Houston, Texas has been labeled the fattest city in the United States four years within the past decade. If they're not number one, they're in the top ten. But what about Houston makes it vulnerable to the obesity epidemic? And what areas are most vulnerable? This poster and project are devoted to exhibit how GIS can be used to explore this issue with a focus on childhood obesity, as this is when eating habits are forming and preventative measures could be most effective.

Overall Map of Childhood Obesity Vulnerability Score by Block Group

- Very Low Vulnerability
- Low Vulnerability
- Medium Vulnerability
- High Vulnerability
- Very High Vulnerability

0   1.25 2.5   5   7.5   10   12.5 Miles

Average Household Median Income by Block Group

1 $80,000+
2 $60,000-79,999
3 $40,000-59,999
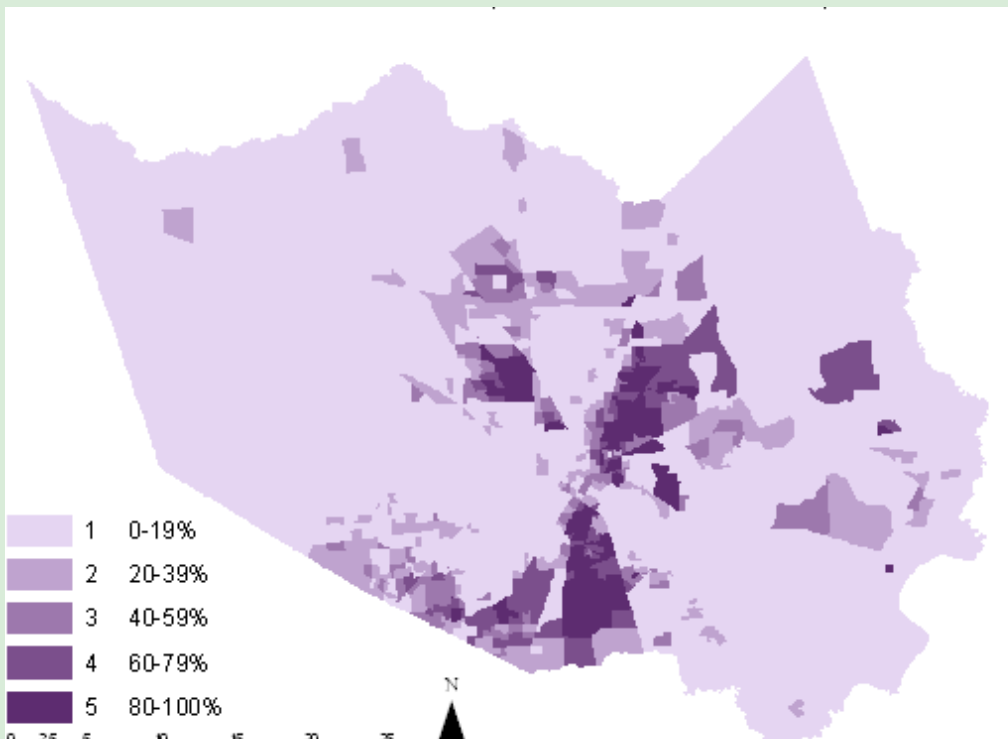4 $20,000-39,999
5 $0-19,999

This variable was weighted 20% in respect to the other variables for the final map, and it has a negative relationship with rates of childhood obesity, particularly among white children. However, according to the Department of Health and Human Services, the effect isn't as proven among minority children, which is why race, ethnicity, and income are separate variables.

Mean Number of Fast Food Restaurants within 1/4 Mile of Block Group

1 <1 mean restaurants
2 1-2.99 mean restaurants
3 3-4.99 mean restaurants
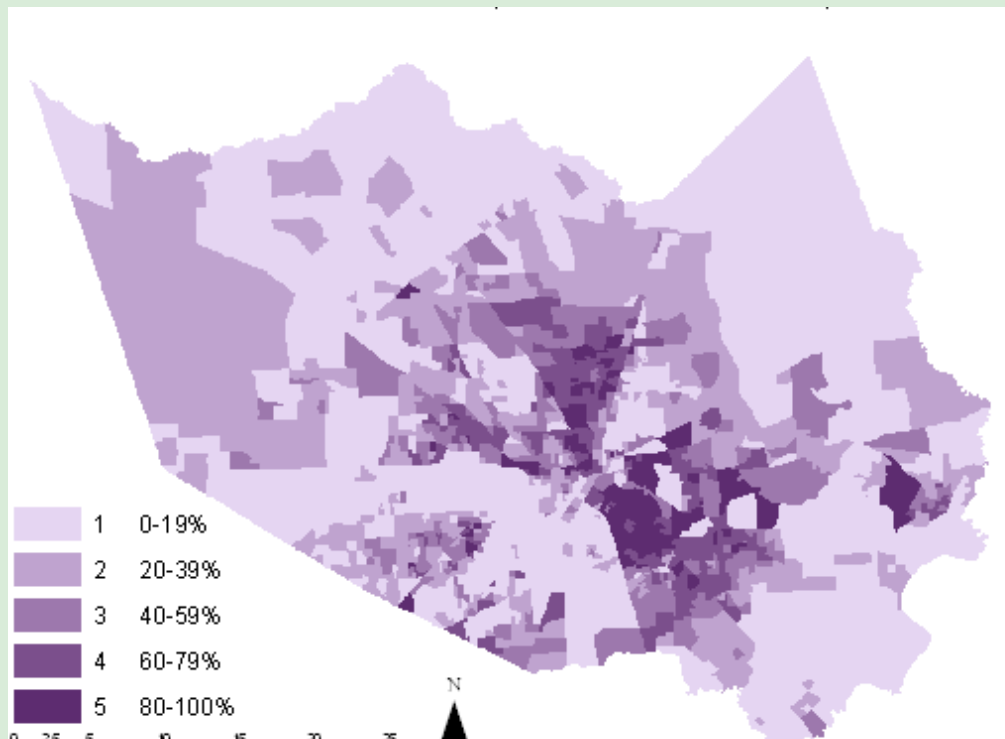4 5-6.99 mean restaurants
5 7+ restaurants

This variable was weighted 10% in respect to the other variables for the final map, and it has a positive relationship with rates of childhood obesity. Having fast food within 1/10 mile of a school increased the school's obesity rate by 5.2%, according to the University of California at Berkeley and Columbia.

Black Population as a Percentage of Block Group's Total Population

1 0-19%
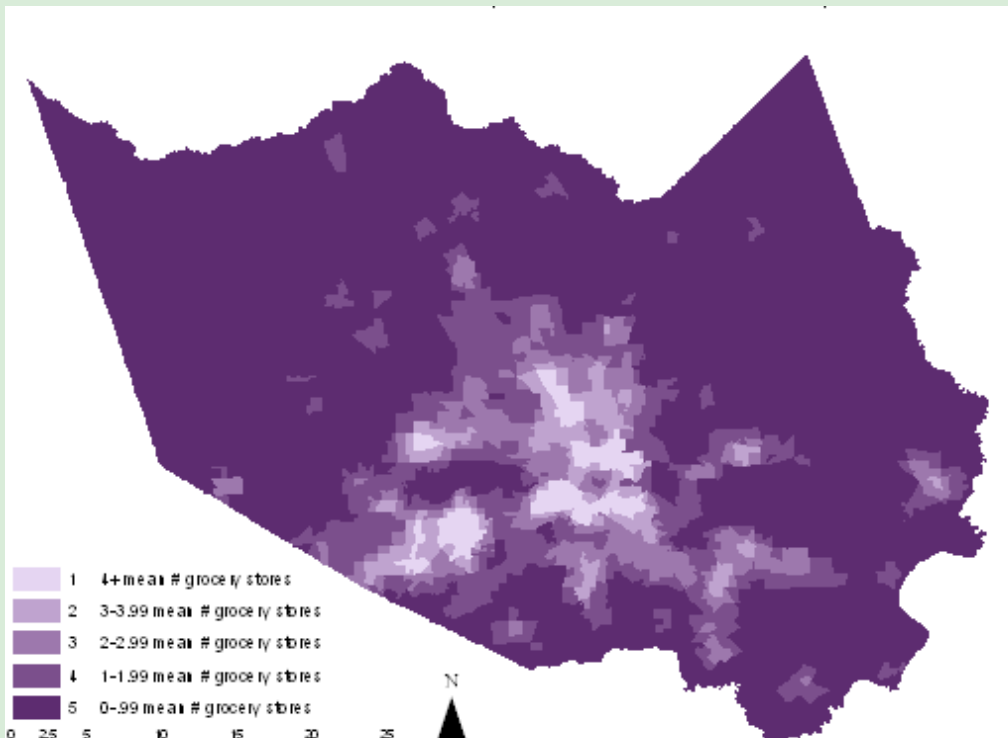2 20-39%
3 40-59%
4 60-79%
5 80-100%

This variable was weighted 20% in respect to the other variables for the final map, and it has a positive relationship with childhood obesity. This variable was chosen because, according to the Department of Health and Human Services, childhood obesity among African Americans increased 120%, as compared to a 50 % increase among non-Hispanic Whites between 1986 and 1998.

Hispanic Population as a Percentage of Block Group's Total Population
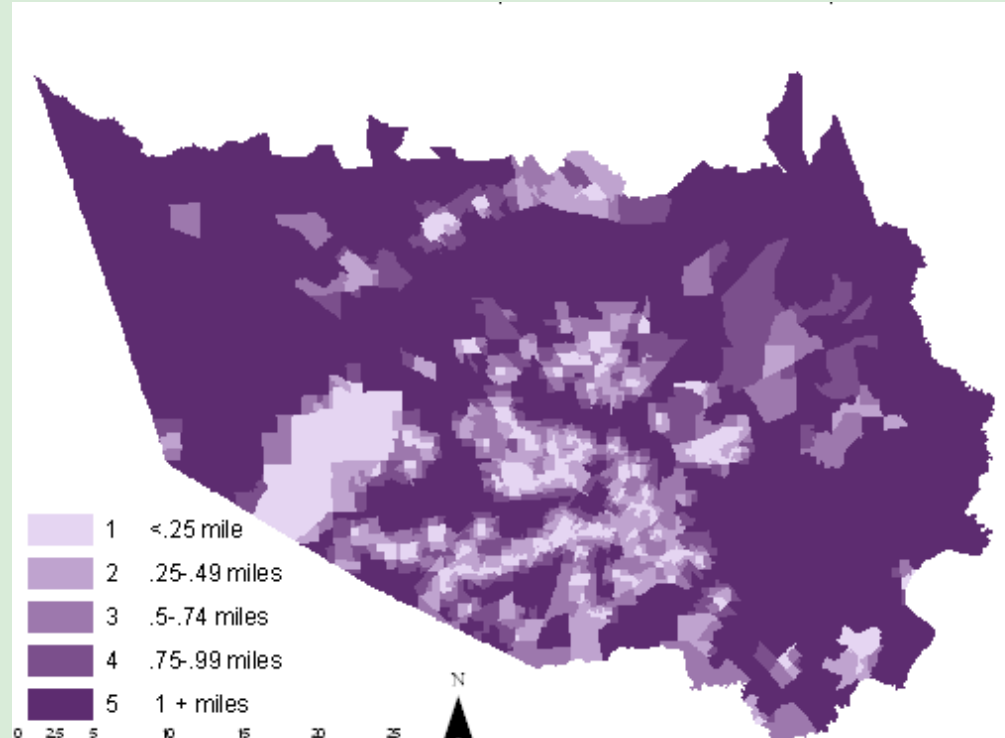
1 0-19%
2 20-39%
3 40-59%
4 60-79%
5 80-100%

This variable was weighted 20% in respect to the other variables for the final map, and it has a positive relationship with childhood obesity. This variable was chosen because, according to the Department of Health and Human Services, childhood obesity among Hispanics increased 120%, as compared to a 50% increase among non-Hispanic Whites between 1986 and 1998.

Mean Number of Grocery Stores within 1 1/2 Miles of Block Group

1 Area mean # grocery stores
2 3-3.99 mean # grocery stores
3 2-2.99 mean # grocery stores
4 1-1.99 mean # grocery stores
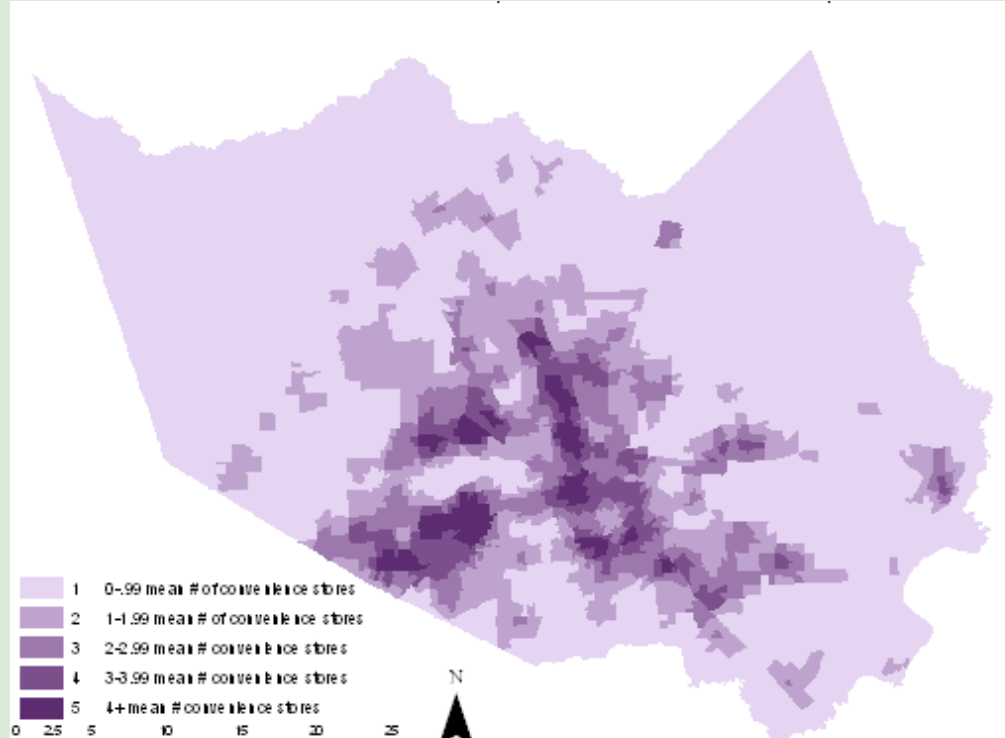5 0-.99 mean # grocery stores

This variable was weighted 10% in respect to the other variables for the final map, and it has a negative relationship with rates of childhood obesity. According to a University of Toronto study, having grocery stores near residences is shown to have a strong correlation with increased fresh fruit and vegetable consumption.

Mean Distance to Parks from Block Group

1 <.25 mile
2 .25-.49 miles
3 .5-.74 miles
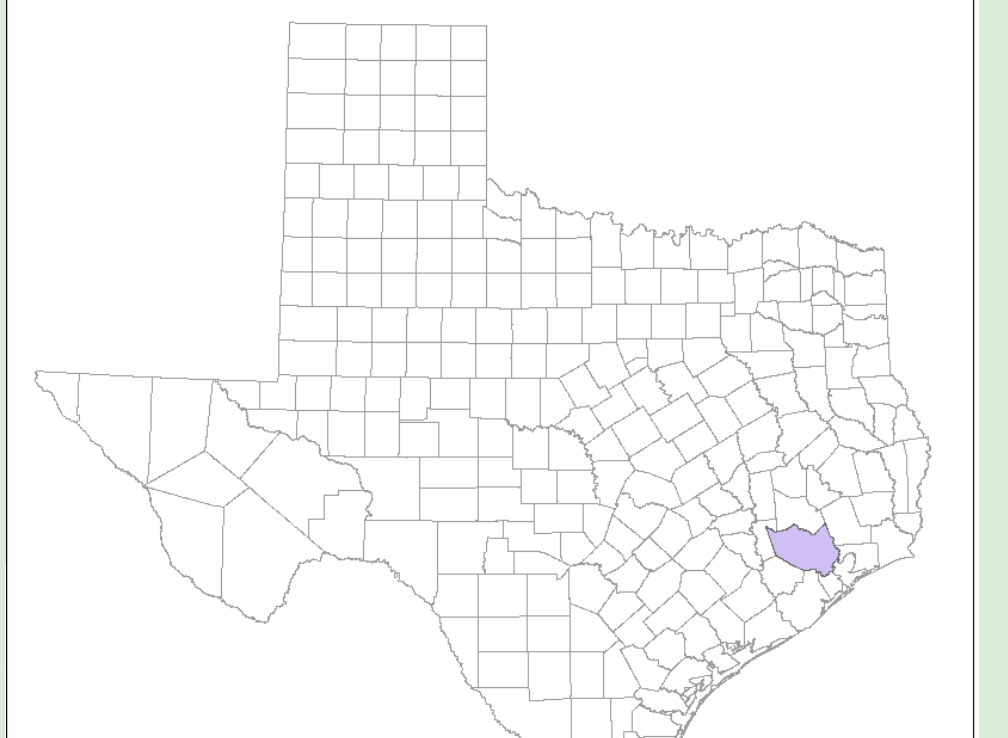4 .75-.99 miles
5 1 + miles

This variable was weighted 10% in respect to the other variables for the final map, and it has a positive relationship with childhood obesity. According to a study at the University of Southern California, parks within 500 meters of the child's residence are associated with their BMI.
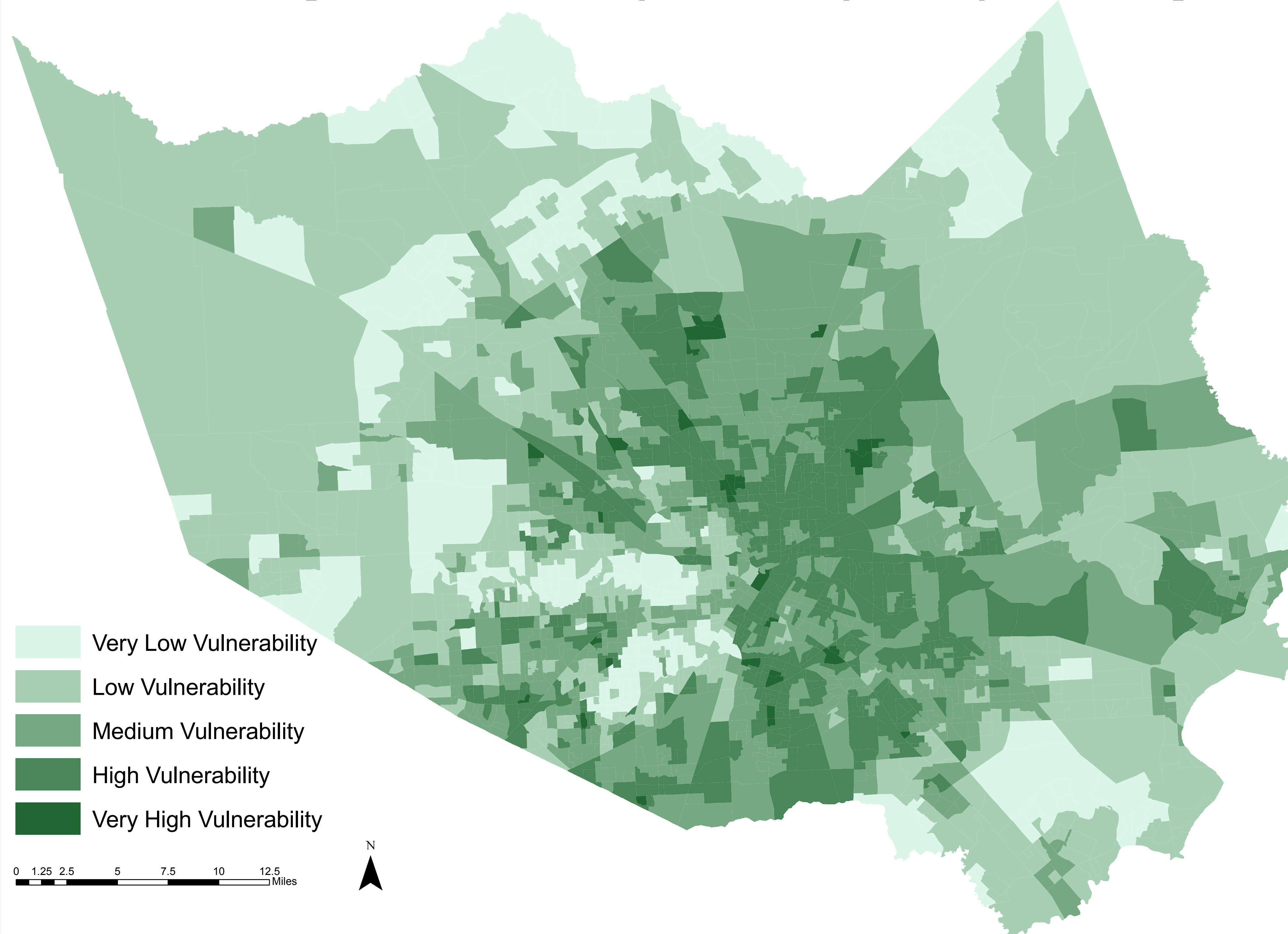
Mean Number of Convenience Stores within 1 1/2 Miles of Block Group

1 0-.99 mean # of convenience stores
2 1-1.99 mean # of convenience stores
3 2-2.99 mean # of convenience stores
4 3-3.99 mean # of convenience stores
5 4+ mean # of convenience stores

The variable was weighted 10% in respect to the other variables for the final map, and it has a positive relationship with childhood obesity. According to the University of Montreal, access to convenience stores may play a stronger role in childhood obesity than fast food restaurants.

Meyerland/Westbury

The Meyerland/ Westbury area scored very high on the childhood obesity vulnerability scale. The region has recently experienced a demographic shift with more minorities moving to the area in the past two decades. The median income is $39,792, in comparison to the Houston median of $36,616. Located close to transit corridors, there is an abundance of convenience stores and fast food restaurants with little access to grocery stores.

University of Houston/ Greater Third Ward Area
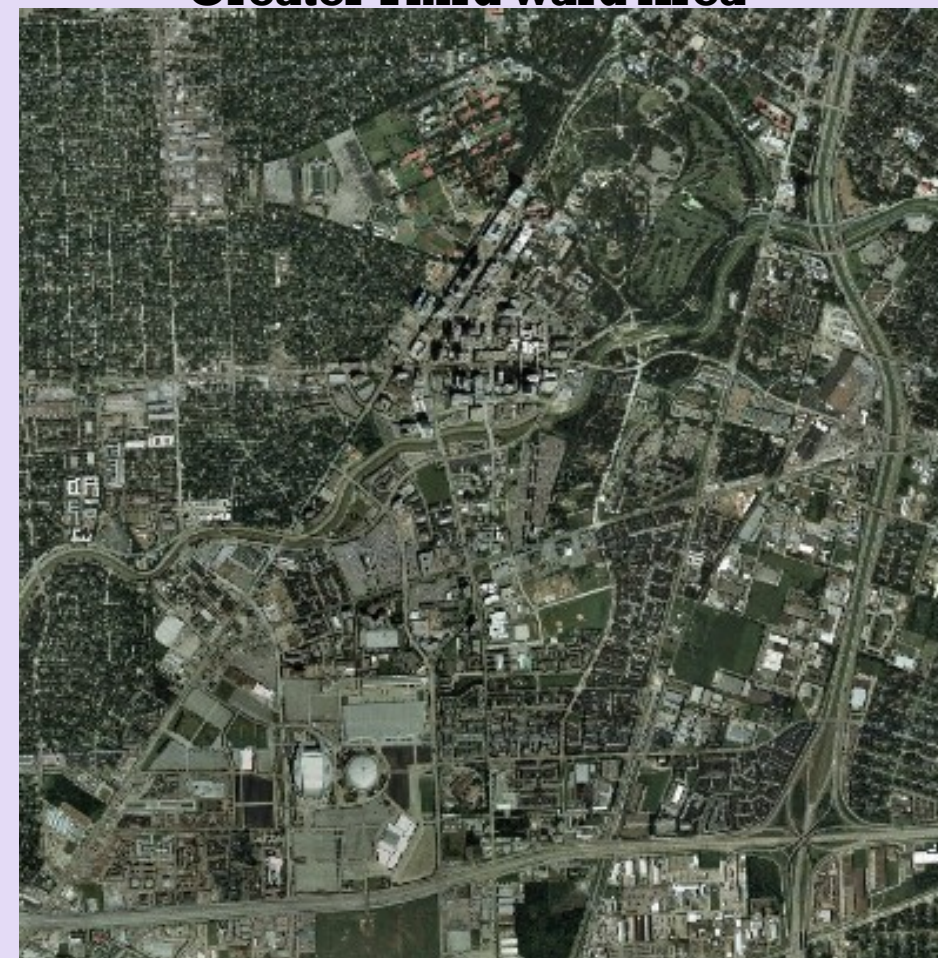
The University of Houston/ Greater Third Ward area scored very high on the childhood obesity vulnerability scale. It's located south of Houston's downtown. The median household income is $14,493. The area is not home to many students, but rather is known as the center for African American culture in Houston. The area is constrained by surrounding highways and thoroughfares, making the area more suitable for cars and fast food.

Sunnyside/ South Park
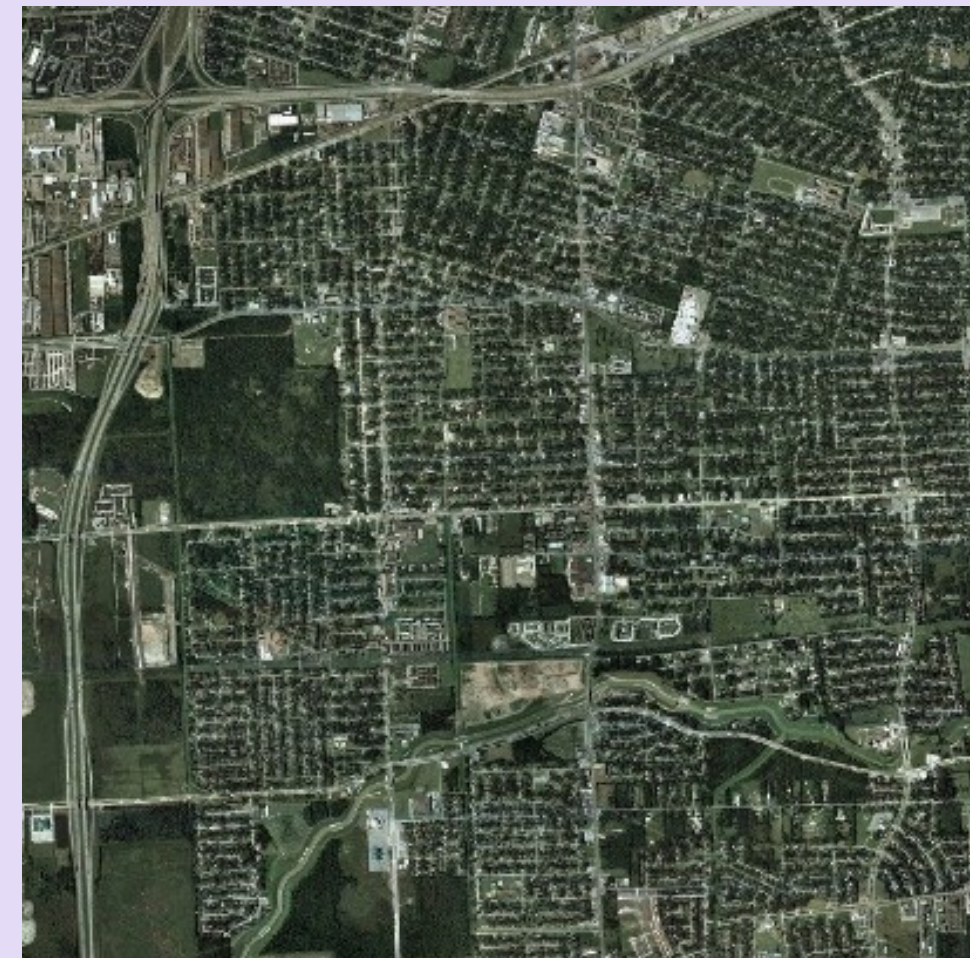
The Sunnyside/South Park neighborhood score very high on the childhood obesity vulnerability scale. This is the oldest African American neighborhood in Houston and maintains that with more than 90% of the population being African American. Although recently the area has seen a rise in the number of Hispanics. The median household income is $20,383. Being located between two transit corridors, there are many fast food restaurants nearby.

Kingwood
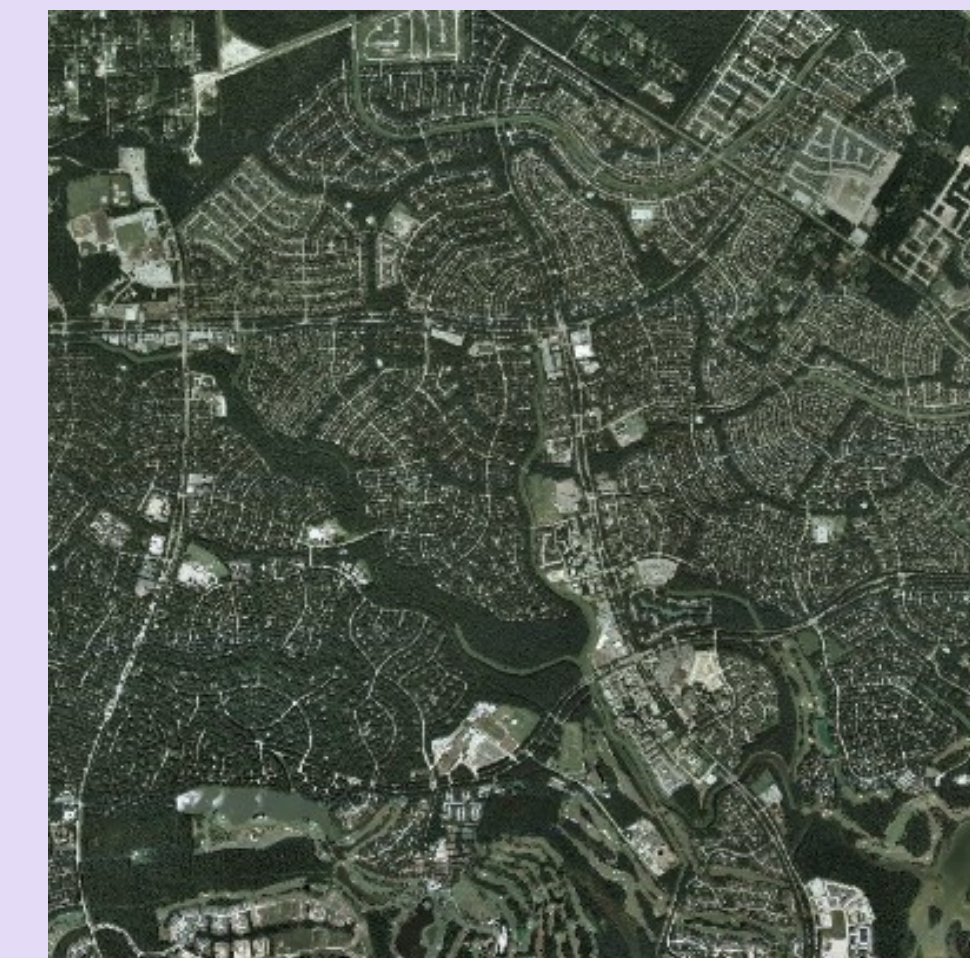
Kingwood had the lowest risk for childhood obesity. Their block groups scored the lowest among all of Harris County. The Houston suburb is also known as 'the Livable Forest.' It's located near Lake Houston with many nature trails running through the area. It's more than 90% white with a median income of $78,976 for the area. It should also be noted that Kingwood is the most planned community in Harris county.

Project Description

Although there are many, often controversial, variables included in the childhood obesity model, this method will focus on the demographic, socioeconomic, built environment, and access to food variables. The demographic variables include African American and Hispanic populations, while the socioeconomic variable will focus on low-income populations. The aforementioned three variables are identified as primary risk factors in childhood obesity. The built environment variable is measured with distance to green spaces. Access to food variables include limited access to grocery stores with excessive access to fast food restaurants and convenience stores. Built environment and access to food variables will have less weight than the demographic and socioeconomic variables, as they aren't as definitive and researched as the latter. The variables can be seen in the purple maps to the left with their weights, relationship, and reasoning discussed in the boxes below. In the legend, the amount of points per category is listed. The higher the number of points, the more likely that block group has a higher rate of childhood obesity. The points are then combined and weighted to produce the green map to the left to identify vulnerable areas in Houston. Areas with high scores will be discussed in the aerial maps below, as well as an affluent area with low scores to provide contrast.

Methodology

Using Spatial Analyst, the density of fast food restaurants, grocery stores, and convenience stores was calculated. The mean distance for green spaces was found for each block group using the Distance function in Spatial Analyst. The radius used for all four variables is not consistent because GIS wasn't able to change the search radius for two of the four variables.
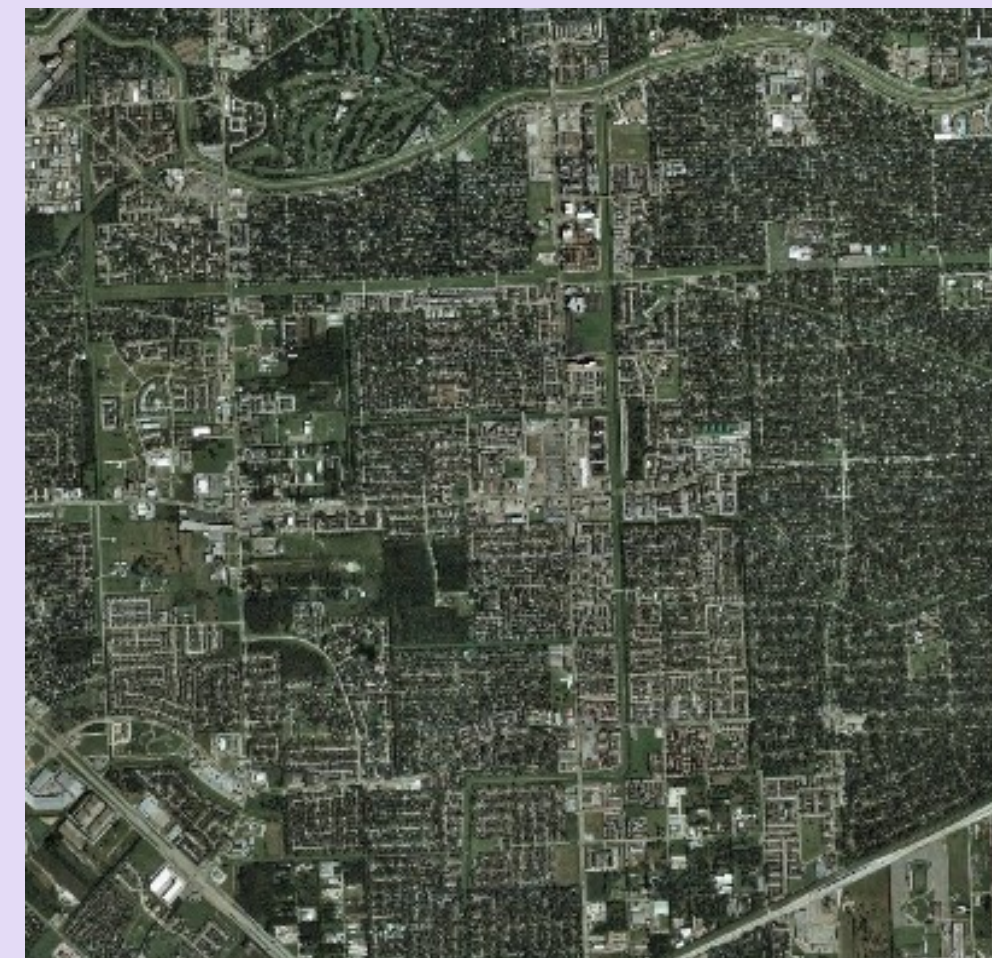
Limitations

This project is to show what can be done when mapping health issues and the built environment. It should not be considered a research project. The weighting isn't representative of an actual equation, but an assessment of how much each variable has been researched and established as having a relationship with childhood obesity. The more researched, the stronger the weighting. It should also be noted that these variables have a strong collinear relationship with one another, especially between the demographic and socioeconomic variables, and should not be considered independent of one another.

Future Research

A more accurate project would analyze level of fitness looking at schools or aggregated health data. The children could be geo-referenced by school or residence, and the areas with higher rates could be examined and compared to those with lower rates to see if the built environment had an effect.

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