DISPARITIES IN FOOD ACCESS:

AN EMPIRICAL ANALYSIS OF NEIGHBORHOODS IN THE ATLANTA METROPOLITAN STATISTICAL AREA

by

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DEDICATION

I dedicate this document to my wife, Caren Morganstern, for her support, encouragement, and most importantly, understanding through the process of completing my Master's Thesis. I also dedicate this document to my parents, Alan and Carol Grodin, for their support and teaching me the value of a well-earned education.

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LIST OF ABBREVIATIONS

ACS	American Community Survey
CBG	Census Block Group
GIS	Geographic Information Systems
KDE	Kernel Density Estimation
MSA	Metropolitan Statistical Area
USDA	United States Department of Agriculture

ABSTRACT

Disparities in food access to different types of food stores are a key factor in assessing the health of food environments. The spatial accessibility of food (hereinafter "food access") refers to the physical distance between food stores and the neighborhoods they service (Sharkey and Horel 2008; Larson et al. 2009). Nationwide studies of metropolitan and urban areas have shown that low socioeconomic areas have fewer supermarkets and more convenience stores than high socioeconomic areas (Morris et al. 1990; Cotterill and Franklin 1995). However, some more recent studies of localized areas have found no evidence of a relationship between food access and socioeconomic conditions (Alviola et al. 2013). Still others have found that deprived minority neighborhoods exhibit better food access than wealthier areas (Sharkey and Horel 2008). Gaps exist in the literature for food access analyses at the local scale. The Atlanta-Sandy Springs-Roswell, GA MSA is one such region lacking an empirical analysis of food access at the neighborhood scale. To investigate the relationship between food access and neighborhood characteristics, this study measures road network distance of neighborhoods, defined as the population weighted centroid of Census Block Groups, to different types of food stores (chain supermarkets, small grocery stores, convenient stores, and fast food restaurants) throughout the 2010 Atlanta MSA. The primary conclusion of this study is that food access to all food store types in the Atlanta MSA is highest among high minority and low income neighborhoods. This may speak more broadly to the differences in food access between urban and rural areas as the majority of all types of food businesses are located in the densely populated areas surrounding the city center of Atlanta. Future research should investigate how urban, rural, and suburban neighborhood types shape food access in the Atlanta MSA.

CHAPTER 1: INTRODUCTION

Food access is a broadly used term to describe a key component of the food environment. Food access refers to the distance one must travel to patron food stores offering affordable and healthy food options (Sharkey and Horel 2008; Larson et al. 2009). Empirical evidence suggests a relationship between people's health and their food environment (Moreland et al 2002a; Sparks et al 2009). A growing body of evidence indicates that residential segregation by income, race, and ethnicity contributes to health disparities in the U.S. (Larson et al. 2009). This has inspired researchers to investigate how disparities in food access contribute to this trend throughout the U.S. Many empirical gaps exist with food access research. The Atlanta MSA is an example of a heavily populated region without such a study.

1.1 Why Food Access Matters

There are many factors affecting a population's diet and therefore health, including food access (Yamashita and Kunkel 2010). Some studies have concluded that people with higher access to supermarkets and limited access to convenient stores have healthier diets and lower levels of obesity (Moreland et al. 2006; Larson et al. 2009). Longitudinal studies further demonstrate this relationship by showing an increase in general health conditions when a supermarket is introduced to a neighborhood where one had not previously existed (Moreland et al. 2002a).

Food access can have a large impact on the shopping habits of individuals, particularly in economically deprived neighborhoods. Households in these neighborhoods often have lower access to private transportation and must rely on public transportation or walking to purchase food (Moreland et al. 2002a, 2002b; Shaw 2006). This is even more concerning for rural areas where daily public transportation is not available. When people use public transportation or

walk to access food stores they are limited to purchase what they can carry. This limits them to only the most essential products, including non-food items.

Disparities in food access throughout the U.S. are of great concern because of its potential effect on a population's overall health and risk of chronic disease (Larson et al. 2009). Given the well documented racial disparities in the rates of chronic diseases in the U.S., with African Americans exhibiting the highest rates (Zenk et al. 2005), it is easy to understand how food access is considered an important social justice issue (Pearce et al. 2005; Apparicio et al. 2007). While studies in the U.S. have not reached a consensus on the characteristics of areas with poor food access, these areas often lack access to other services as well, such as banks, health care, transportation infrastructure, and public parks (Dutko et al. 2012).

1.2 Existing Research Gaps

Empirical gaps exist in research focusing on food environments at the local neighborhood scale that control for socioeconomic conditions and different types of food stores (Sharkey and Horel 2008). Investigating neighborhood disparities in food access to both healthy and unhealthy food stores throughout an entire geographic landscape is essential for developing public health policies and strategies aimed at reducing health inequalities (Larson et al. 2009). The Atlanta MSA is an example of a region lacking this type of research.

The Atlanta MSA is one of the largest and fastest growing regions in the U.S., exhibiting a 72% population increase from 1990 to 2010 and ranked 9th in total population in the 2010 census (U.S. Census 2012). A comprehensive literature review of food environment research found only one study covering the Atlanta MSA. The study completed by Helling and Sawicki in 2003, analyzed access to a range of services, not just food stores, while controlling for race (whites and blacks) and income. One conclusion they reached was that black neighborhoods do

not have worse access to fast food restaurants and grocery stores than white neighborhoods (Helling and Sawicki 2003). There are several factors that explain why their research does not satisfy the need for empirical research on food access in the Atlanta MSA. The first is the geographic extent of the study which only covered a 10 county area of the Atlanta MSA. Their justification was that 85% of the region's jobs and 87% of its population were found in their 10 county study area. Figure 1 shows the boundaries of my study which are consistent with the 2010 Atlanta MSA boundaries, comprised of 28 counties. The very nature of empirical research is that it does not focus on select neighborhoods within a community, but rather the totality of the area.

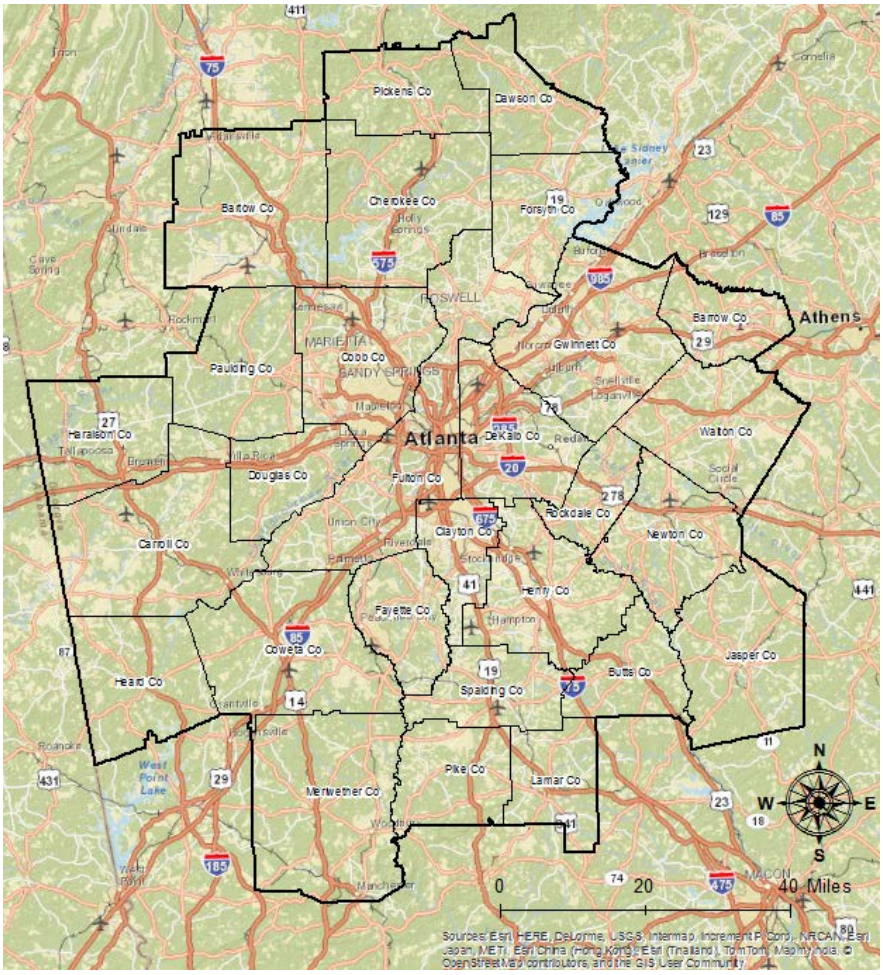


Figure 1 2010 Atlanta MSA Boundaries

The second factor explaining why the 2003 study does not satisfy the need for empirical research on disparities in food access throughout the Atlanta MSA is the geographic scale in which it was carried out. The Helling and Sawicki (2003) study used census tracts to represent neighborhoods and carry out subsequent spatial analyses. It is important to examine disparities in food access at as fine a geographic scale as feasible (Raja et al. 2008). Conducting similar analyses at a finer scale, such as the census block group, should provide more meaningful results than a more aggregated unit such as census tracts. The analysis completed in my thesis is unique in that it covers the entire 2010 Atlanta MSA, over double the size of a previous study, and defines neighborhoods at the most precise geographic scale available, the census block group.

1.3 Objective

My study is in support of the greater body of research on inequalities in food access throughout the United States. It does so through empirical analysis of disparities in food access at the neighborhood scale and exploring any correlations of food access with socioeconomic and demographic characteristics in the Atlanta MSA, one of the largest and fastest growing metropolitan areas in the U.S. The research questions addressed in this thesis for the 2010 Atlanta MSA are (1) how does food access differ in predominately white neighborhoods as compared to neighborhoods of minority composition, specifically blacks, Asians, and Hispanics and (2) How does food access differ in high income neighborhoods as compared to low income neighborhoods?

The remainder of this thesis is divided into four chapters. In Chapter Two, I discuss the early research on food environments, the social and physical attributes shaping food environments, defining food environments in the context of modern food movements, and different quantitative methods of assessing food environments using a GIS. In Chapter Three, I

describe the framework of my research, data sources, the metrics that are calculated and mapped, and the expected outcomes. In Chapter Four, I document and interpret the study outcomes. In Chapter Five, I discuss key observations and their contribution to existing research on food environments in the U.S. I conclude this thesis by identifying future research directions in analyzing food environments.

CHAPTER 2: BACKGROUND AND LITERATURE REVIEW

It is important to understand the significance of disparities in food access among the greater body of literature on food environments. This chapter examines the origins of food environment research and different approaches to studying it, including food access.

2.1 Early Research on Food Environments

Much of the initial research on food environments began in the UK with studies focusing on the relationship between poverty and food. Cole-Hamilton and Lang (1986) were the first to note the potential risk that consumers, particularly those who live in poor areas, may face higher food prices as a result of the realities of food business industry (Cummins and Macintyre 2002). They confirmed that small food stores, typically found in impoverished neighborhoods throughout London, charged over 20% more than large, corporate owned supermarkets (Cole-Hamilton and Lang 1986). What followed were a series of studies focusing on a range of conclusions related to the cost and availability of healthy foods throughout Britain. It was found that healthy foods were more expensive and less available than unhealthy foods, particularly in deprived neighborhoods (Mooney 1990). Several researchers had similar conclusions for cities throughout Britain. This led to scattered investigations of food environments throughout North America.

2.2 Ways of Thinking about the Food Environment

There are multiple ways of thinking about the food environment, each emphasizing different factors shaping healthy food consumption. It is important to understand these approaches as they are strongly influenced by area of interest, geographic scale, and location.

2.2.1 Key Factors Shaping the Food Environment

There are three key factors to consider when assessing the food environment: availability, cost, and attitude (Shaw 2006). These factors have the greatest influence over people's consumption of healthy foods. The cost of food is a significant factor because the same basket of food can cost significantly more or less depending the type of food store it is purchased (Cummins and Macintyre 2002). Food availability refers to the distance one must travel to obtain affordable, healthy food. Travel distance can also be impacted by other geographic and social factors such as physical barriers from major highways and high crime rates, respectively. Attitude refers to any state of mind preventing that individual from consuming a healthy diet where availability and cost are non-factors. The most important characteristics to consider when assessing the food environment are cost and availability (Moreland et al. 2006).

Food access is of particular concern in economically deprived areas. Households in these neighborhoods often have lower access to private transportation and must rely on public transportation or walking to purchase food (Moreland et al. 2002a, 2002b; Shaw 2006). This is even more concerning for rural areas where daily public transportation is not available. When people use public transportation or walk to access food stores they are limited to purchasing what they can carry. This limits them to only the most essential products, including non-food items. As such, travel distance has a large impact on the shopping habits of individuals.

The cost of food plays an important role in food shopping and dietary habits as well. People often cite cost as the limiting factor for their lack of healthy food consumption (Nord and Andrews 2002). This association is further solidified by studies showing a positive relationship between adhering to dietary recommendations and household income (Jetter and Cassady 2006). Given that low income households spend a greater percentage of their overall budget on food it is

not surprising that healthy dietary habits suffer due to budget constraints (Moreland et al. 2002a). Similarly, decreases in food insecurity nationwide were consistent with rising incomes between 1995 and 2001 (Nord and Andrews 2002). These studies solidify the relationship between food costs and food consumption habits.

2.2.2 Schools of Thought: Defining Food Accessibility

There are several key terms used in scientific literature, public policy, and movements to describe the food environment: food sovereignty, foodscape, food justice, food insecurity, food swamps, and food deserts. The suitability of each term in addressing challenges of the food environment is dependent on scope, geographic scale, and location.

Food sovereignty is related to the right to have rights over food production and consumption in one's own lands, territory, or country. It approaches the food environment from a global scale and focuses on the rights of corporations versus the rights of people, international banking systems, and neoliberal trade agreements. The aim is to restore control over food access and production from large corporations and international financial institutions back to native populations who ultimately produce the food and those who eat it (Schiavoni 2009). The term originates from Via Campesina: International Peasant Movement, an organization composed of local farming groups from around the globe.

Many of the issues of food sovereignty are the result of neoliberal policies driving global markets. Trade agreements on agricultural commodities favor corporations and industrialized nations (Alkon and Mares 2012). One way this occurs is less developed nations, or peasant nations, are forced to remove trade tariffs which help subsidize food production. At the same time, the industrialized nation can afford to subsidize food operations and is not barred from doing so. It is not an oversimplification to say that the corporate food industry disenfranchises

food producers and consumers in peasant nations (Alkon and Mares 2012). There are challenges to achieving food sovereignty within industrialized nations; however, they seem more aligned with the foodscapes and the food justice movement.

The challenges to achieving food sovereignty in the U.S. are grossly different than those faced by peasant nations. In many ways, the foodscapes and food justice movements are the embodiment of food sovereignty in developed nations. Foodscapes is most similar to food sovereignty. It views the food environment from a holistic approach by considering all the social and environmental factors affecting food production, retailing, and consumption at a range of scales (Miewald and McCann 2014). The movement is more focused on the existing power structures affecting social and business conditions shaping poor food environments. The food justice movement has a narrower scope.

The food justice movement is one of the more discussed food environment approaches in the U.S. Food justice places the need for food security and food access in the contexts of institutional racism, racial formation, and racialized geographies (Alkon and Norgaard 2009). The movement is set up as a means for active participation in lobbying for changes in local food environments. The approach is still somewhat broad and includes many aspects of the food environment, including local food production and consumption. Beyond race, food justice encompasses class and gender, and considers how they impact who can produce and consume what kinds of food (Alkon 2014). This carries some overlap with the food insecurity concept.

The term food insecurity specifically refers to households that do not have consistent access to quantities of food required to support an active and healthy lifestyle (Nord and Andrews 2002). Households experiencing the following conditions are considered food insecure: worried whether food will run out before they have the money to purchase more, food

purchased did not last and they did not have money to buy more, and they could not afford to eat healthy, balanced meals. In 1996, the U.S. government formally addressed food insecurity by adopting the Rome Declaration at the World Food Summit. The declaration sets the goal of reducing food insecurity in half by 2010 (Nord and Andrews 2002). Food insecurity has the narrowest focus of the approaches discussed to this point by focusing primarily on a population's ability to purchase affordable and healthy food. There are more variables to consider including social demographics and food store types.

The term food swamp refers to areas where high caloric, energy dense food stores inundate healthy food options (Rose et al. 2009). Food swamps can carry greater risks to public health than food deserts (Economic Research Service 2009). Several researchers have found positively correlated associations between the density of convenient stores and fast food restaurants in an area with the population's body mass index (Moreland et al. 2006 and Rose et al. 2009). Furthermore, research shows that introducing a supermarket to areas over saturated with unhealthy food options only incrementally improves the overall health of the respective population (Economic Research Service 2009). This suggests that an inadequate food environment (defined as poor access to affordable and healthy food) is less detrimental than an overabundance of unhealthy food options in a food swamp.

In the early 1990's, the term food desert was first used by an urban resident in Scotland to describe his experience living in an economically deprived area where food was relatively unavailable (Cummins and Macintyre 2002). Food desert is a vague term used to describe areas with poor access to healthy food. The U.S. government defines food deserts, per the 2008 Farm Bill, as low income areas with limited access to affordable and nutritious food. Food deserts are census tracts which fall outside the distance threshold to supermarkets and are considered low

income. The distance threshold is 1 mile for urban designated areas and 10 miles for rural designated areas. The economic thresholds are based on household incomes relative to the surrounding area. Low income areas are defined as census tracts with a median family income that is 80 percent or less of the metropolitan area's median family income or the statewide median family income (Dutko et al. 2012).

A food desert is likely the most commonly known word in the vocabulary of food environments. It has captured the attention of the public, government, and academia (Cummins and Macintyre 2002). Despite the precise definition of food deserts in U.S. legislation, the term is used more like a metaphor. Some studies view food deserts as areas devoid of supermarkets and large grocery stores (Hoesen et al. 2013) while other studies only consider areas devoid of supermarkets (Sparks et al. 2009). Both methods are reasonable for studying food environments however they are not comparable.

Raja et al. (2008) argues that the "shifting" definition of food deserts is due to the lack of empirical research on nature, extent, and location of food stores and disparities in access to them. The problem with focusing too much on food desert analyses (as defined in the 2008 Farm Bill) is they are akin to a site suitability analysis. They ignore data in areas which fall outside the set of strict economic conditions leaving data only explored in the most impoverished neighborhoods of a study area. The USDA created a website called the searchable online interactive map called the "Food Desert Locator". The website contained an interactive map that identified census tracts classified as food deserts. However the website was taken down in 2014 and replaced with the "Food Environment Atlas" website (USDA 2014). The Atlas has two objectives: (1) stimulate research on the determinants of food choices and diet quality and (2) to provide a spatial overview of community's ability to access healthy food. This shift in the

USDA's outward facing data gateway for food environment research is in line with a broader and arguably greater understanding of the food environment.

It is fair to say that although the investigation completed in this thesis report specifically focuses on food access it still falls in the food desert approach. Food desert studies are largely based on quantitative techniques and GIS (McKinnon et al. 2009). They involve a static investigation of food access controlling for neighborhood conditions (usually economic status). Unlike the other approaches discussed in this section, food deserts studies do not consider the broader factors dictating food environments (political influences, laws governing corporations, and large scale food production).

2.3 Geographic Information Systems and Food Access

Geographic information systems (GIS) play an important role in analyzing local food environments. There are two primary methods of assessing the local food environment using a GIS. One measures the density of food stores in an area and the other measures their proximity to other locations, such as neighborhoods (Charreire et al. 2010). Both of these approaches, density and proximity, align with the broader analytical methods of identifying food deserts.

Charreire et al. (2010) completed a comprehensive review of food environment studies with methodologies utilizing a GIS from 1999 to 2008. They found that the density approach utilizes the buffer, kernel density estimation, or spatial clustering tools with the primary tool being the buffer method. Of these studies the most common location source for buffers (in order from greatest to least) are homes, schools, food stores, and neighborhood centroids. The researchers looked to identify the density of various types of food stores around these locations. In 2008, Zenk and Powell conducted a nationwide study looking at the concentration of fast food and convenient stores around schools, while controlling for socioeconomic demographic data at

the census tract level. They utilized a half-mile buffer and found that schools in low income census tracts had more fast food and convenient stores concentrated around them than schools in wealthier census tracts (Zenk and Powell 2008).

A potentially significant problem with the buffer approach is that it ignores data which falls outside the buffer zone. While this is an inherent consequence of the buffer tool it can mislead researchers when target locations fall within a statistically insignificant distance beyond the buffer. For example, several studies utilize a one mile buffer as an acceptable walking distance to a supermarket (Charreire et al. 2010; Dutko et al. 2012). If a supermarket is 1.01 miles from the source location the density value will not consider the store even though the extra 1% in distance would not likely preclude a customer who would otherwise walk one mile to the store. Results for the kernel density estimation (KDE) and spatial clustering tools are not based on hard geographic boundaries. Based on the methodological review completed by Charreire et al. (2010), few studies utilize KDE and spatial clustering tools to assess the food environment.

The proximity method is advantageous because it is a data inclusive approach, unrestricted by administrative boundaries, such as ones created by the buffer tool or areal units. Proximity studies assess the distance to food stores by utilizing different types of distance measurements. There are three mthods of measuring distance using a GIS: Euclidean, Manhattan, and network; they are explained in Chapter 3. A nationwide study of New Zealand utilizes a similar analysis to the one proposed in my study. They utilize the network distance approach from different food stores to neighborhood centroids derived from New Zealand's census areal units. They found that access to fast food stores is greater in poorer neighborhoods than wealthier neighborhoods (Pearce et al. 2007).

Building on the approach by Sharkey and Horel (2008), I employ a proximity approach to investigate food access at the neighborhood scale in the Atlanta MSA while controlling for different types of food stores, race, and income. These methods are discussed in greater detail in Chapter 3.

CHAPTER 3: METHODOLOGY

A case study is undertaken to analyze disparities in food access to different types of food stores at the neighborhood scale and explore any correlations of food access with socioeconomic and demographic characteristics. The methodology for my study is adapted from one developed by Sharkey and Horel (2008), who conducted a food environment study investigating any relationship of neighborhood socioeconomic condition and minority composition with the spatial availability of food store types.

My investigation utilizes a GIS to calculate the network distance of different food store types to the population weighted centroid of each census block group in the Atlanta MSA. The results of the respective network proximity analyses are then explored against their respective neighborhood minority composition and socioeconomic condition. Neighborhoods are grouped by racial and economic status and compared against their average distance to each food store type. Figure 2 provides a summary workflow of my study.

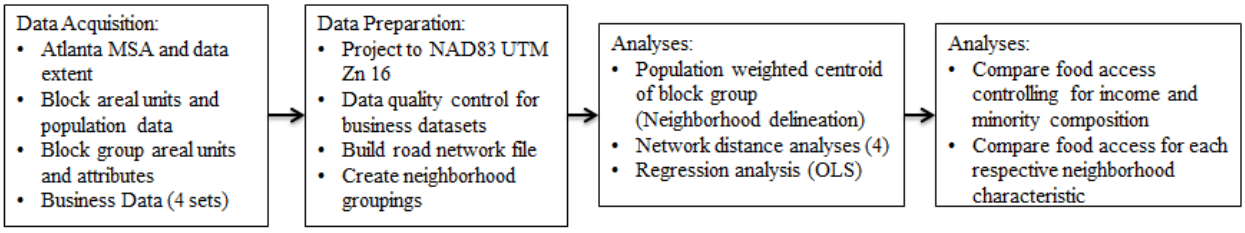


Figure 2 Summary of Workflow

My study is in support of the greater body of research on inequalities in the food environment throughout the United States. While it does not address all aspects and methods of defining and analyzing the food environment, it does assess any spatial relationship between socioeconomic and demographic patterns with the availability, defined as road network distance, of food store types in the Atlanta MSA.

3.1 Geographic Data Sources

The primary datasets for this study contain information on the population, food businesses, and road network of the Atlanta MSA. Data for this study is primarily collected through two sources, (1) Esri's Business Analyst data suite and (2) the U.S. Census Bureau which house demographic data and census areal unit shapefiles. In an effort to reduce any potential error along the boundary extent of the study area, food business and road network data were collected for the adjacent counties surrounding the Atlanta MSA. These areas are delineated in Figure 3.

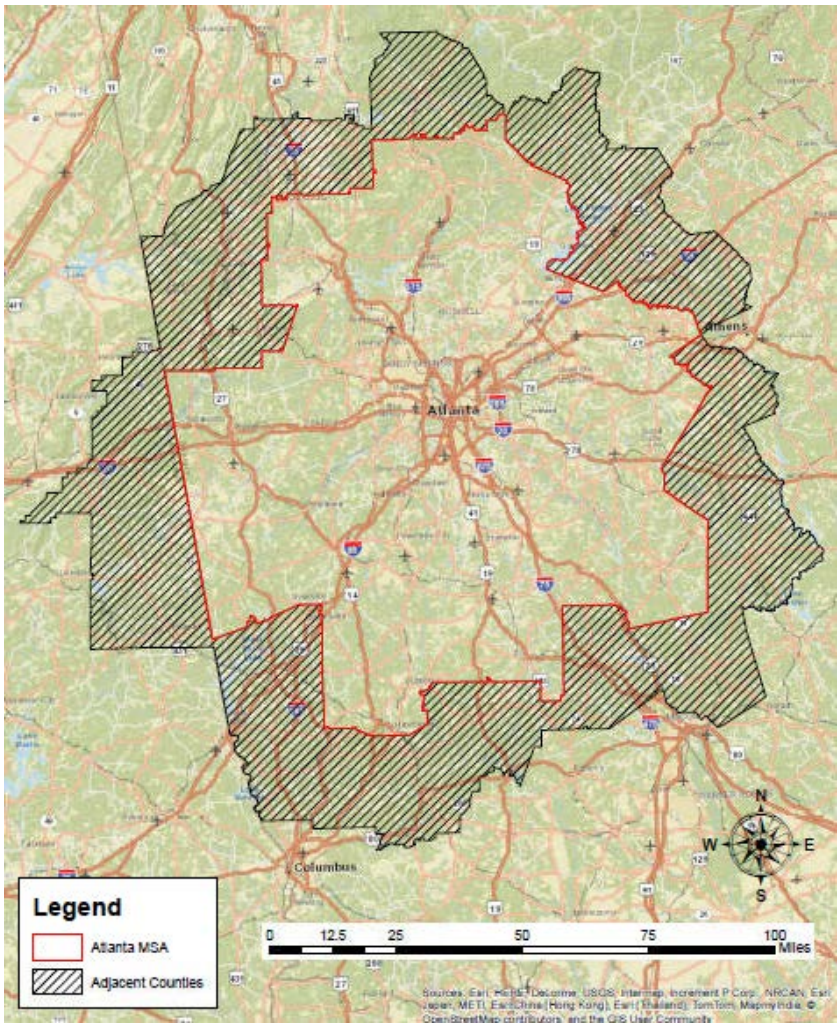


Figure 3 Data Collection Area

3.2 Description of Spatial Datasets

This study extracts food business data from Esri's Business Location database, which utilizes Dun & Bradstreet's (hereinafter "D&B") proprietary business database supplemented by the following publicly available sources: business registries, internet/web mining, news and media reports, telephone directories, court and legal filings, company financials, banking information, directory assistance, industry trade data, and telephone interviews (Esri 2013). Several studies involving the geographic analysis of the food environment utilize the D&B dataset (Alviola et al. 2013). It classifies the businesses by the six-digit North American Industry Classification System (NAICS). NAICS was developed by the U.S. Census Bureau, Bureau of Labor Statistics, Bureau of Economic Analysis, and Office of Management and Budget to standardize a classification system for collecting, analyzing, and publishing statistical data related to the U.S. business economy (U.S. Census Bureau 2014a). Table 1 contains a list of the NAICS codes of food businesses used for this study. The business datasets extracted from Esri's Business Location Data required.

Table 1: Summary of Business Dataset

Dataset	NAICS Code	NAICS Description	Initial / Final Counts
Supermarket	44511001	Supermarkets & Other Grocery Stores	525 / 496
Small Grocery	44511001	Supermarkets & Other Grocery Stores	673 / 640
Convenient Store	44512001 & 44719005	Convenience Stores & Other Gasoline Stations	3,130 / 3,005
Fast Food Restaurant	72211019	Full-Service Restaurant	8,175 / 2,158

The supermarket dataset is composed of supermarkets and large grocery stores, above 2,500 square feet. The dataset extracted from Esri's database includes grocery stores of all sizes. In an effort to remove smaller groceries, which typically sell low nutritional value foods at higher prices (McEntee and Agyeman 2009), locations less than 2,500 square feet were placed in the small grocery dataset. This reduced the supermarket dataset from 1,198 to 525 businesses. Publix As shown in Table 2, supermarkets and Kroger have the highest number of locations in the Atlanta MSA.

Table 2: Supermarkets with most locations

Company Name	Count
Publix Super Market	144
Kroger	126
Ingles Market	53
Piggly Wiggly	25
Food Lion	21

The dataset was then reviewed to ensure each feature class is accurately categorized as a supermarket. Any data point without a recognized company name was reviewed using Google Street Maps. The final supermarket count is 493. Due to the size of the study area and the number of supermarkets it was not possible to confirm whether each business is in operation.

The small grocery store dataset is composed of a subset of the Supermarket & Other Grocery Stores dataset. It consists of locations which fall below 2,500 square feet. Small grocery stores typically sell low nutritional value foods at higher prices (McEntee and Agyeman 2009). Table 3 highlights the small grocery stores with the greatest number of locations in the

Atlanta MSA. The dataset was reviewed for duplicate addresses. The final small grocery store count is 640.

Table 3: Small Grocery with most locations

Company Name	Count
ALDI	23
Food Depot	4
Wayfield Foods	3

The convenience store dataset is composed of Convenience Stores & Other Gasoline Stations extracted from Esri's database. It consists of 3,130 locations throughout the study area. The study area is too large to verity each feature; however, some data quality analysis was possible. Duplicate addresses were removed from the dataset. The final convenience store count is 2,986. Table 4 contains a list of the convenience stores with the most locations in the study area.

Table 4: Convenience stores with most locations

Company Name	Count
Shell Food Mark	117
Quik Trip	109
Chevron Food Mart	103
BP	67
CITGO Food Mart	56

The fast food restaurant dataset is composed of a subset of the Full-Service Restaurant category of NAICS (see Table 1). This dataset contains all of the restaurants in the study area (n

= 8,975). Since this dataset should only consist of fast food restaurants, any business not considered a chain fast food restaurant was removed from the dataset. The final count of the fast food restaurant dataset is 2,153. Of the locations removed from the dataset, several businesses could be argued as a type of fast food restaurant. Given the size of the study area it is impossible to review each business' menu and restaurant format. Therefore the focus of the fast food restaurant dataset is on national fast food chain restaurants. Table 5 contains a list of the businesses with the highest number of locations within the study area.

Table 5: Fast food restaurants with most locations

Company Name	Count
Subway	426
Mc Donald's	264
Wendy's	168
Chick-fil-A	131
Burger King	125
Zaxby's	104
Taco Bell	98
KFC	88
Arby's	82
Dairy Queen	81

All four business datasets are below in Figures 4-7. The black boundary represents the data collection extent while the red boundary represents the Atlanta MSA (study area).

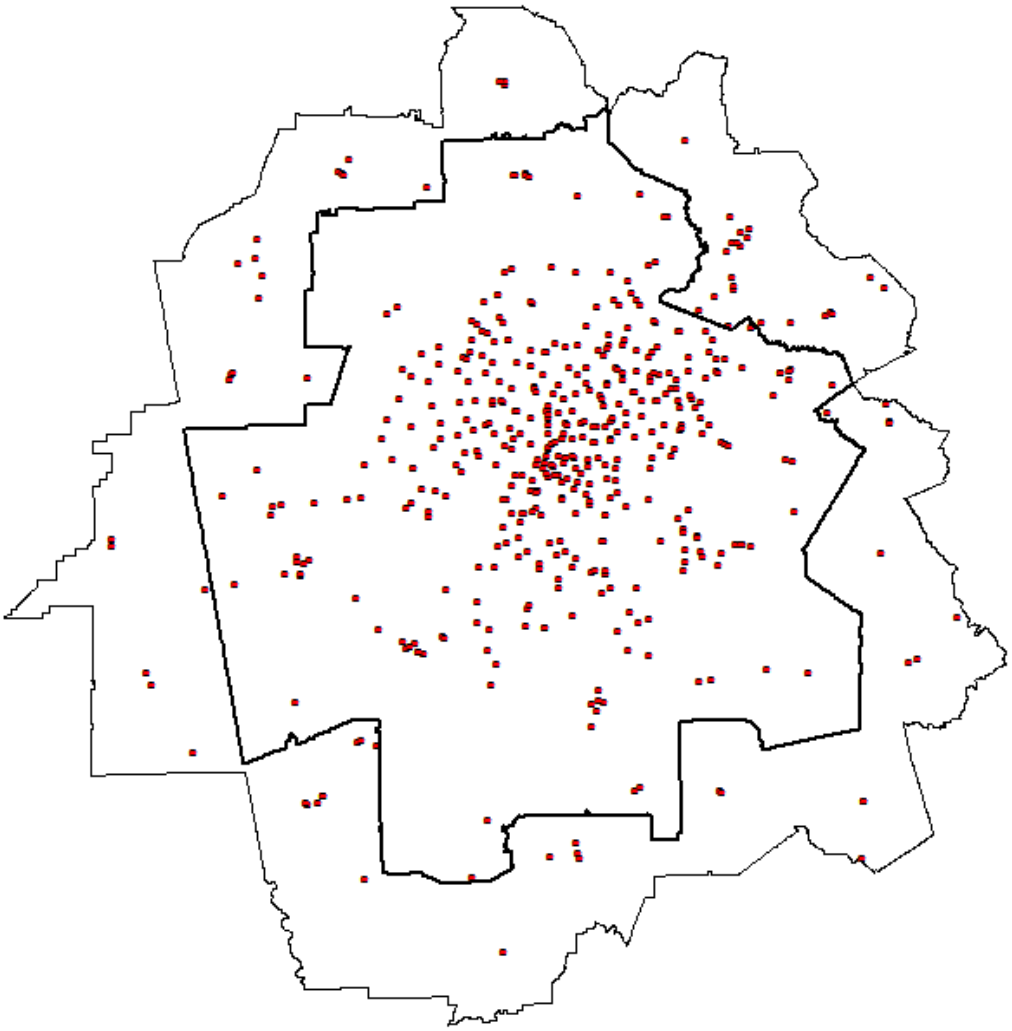


Figure 4 Supermarket dataset (n = 493)

The supermarket dataset shows a cluster of locations in the center of the MSA, the location of the City of Atlanta. From there, the majority of locations are dispersed throughout the suburban region which circles the city. Most locations are in the northern suburbs. The rural areas have few locations. Some clusters exist in rural city centers primarily to the southern and western areas of the MSA.

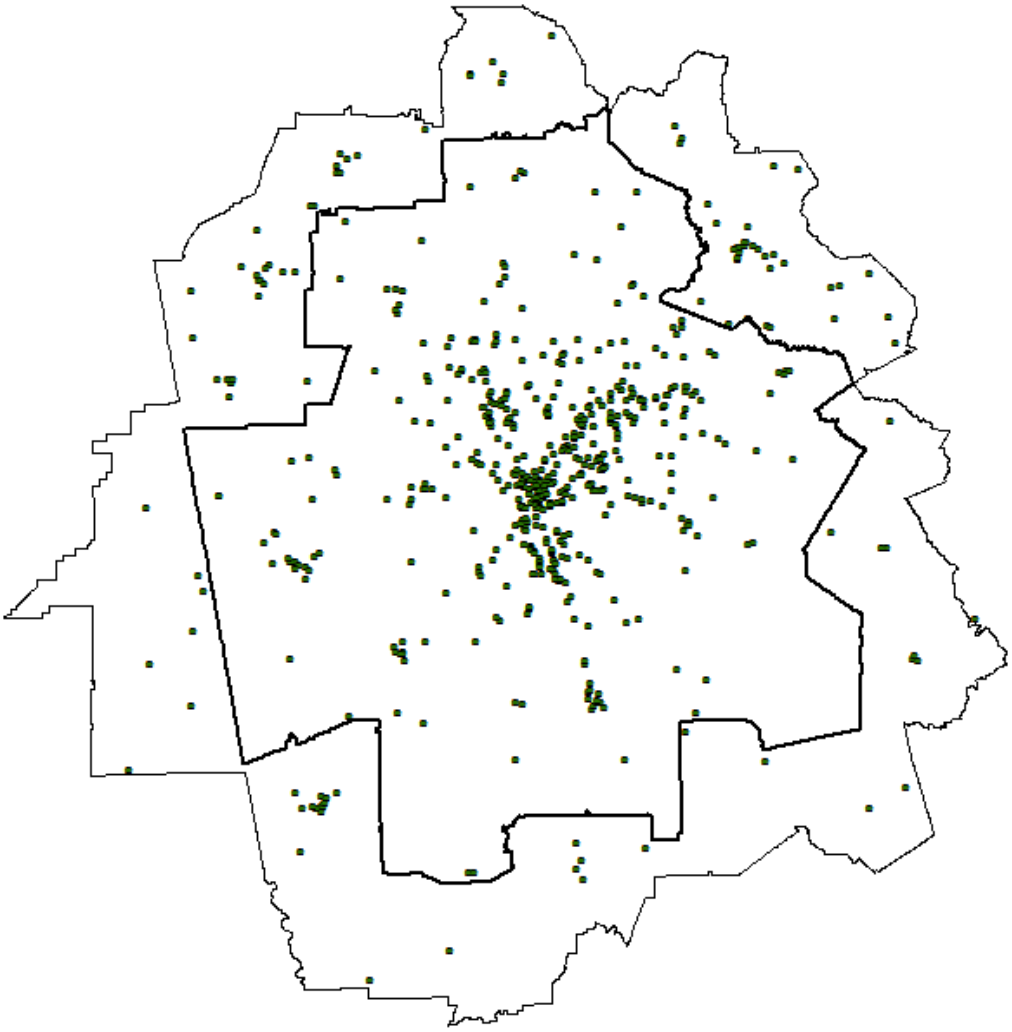


Figure 5 Small grocery store dataset (n = 640)

The small grocery store dataset exhibits a more clustered distribution than the supermarket dataset. Locations are highly concentrated in the downtown areas and are less dispersed throughout the suburban region. There is little representation of this type of food store in rural areas, particularly to the southeast. However there are a greater number of small grocery stores than supermarkets along the northern boundary of the MSA.

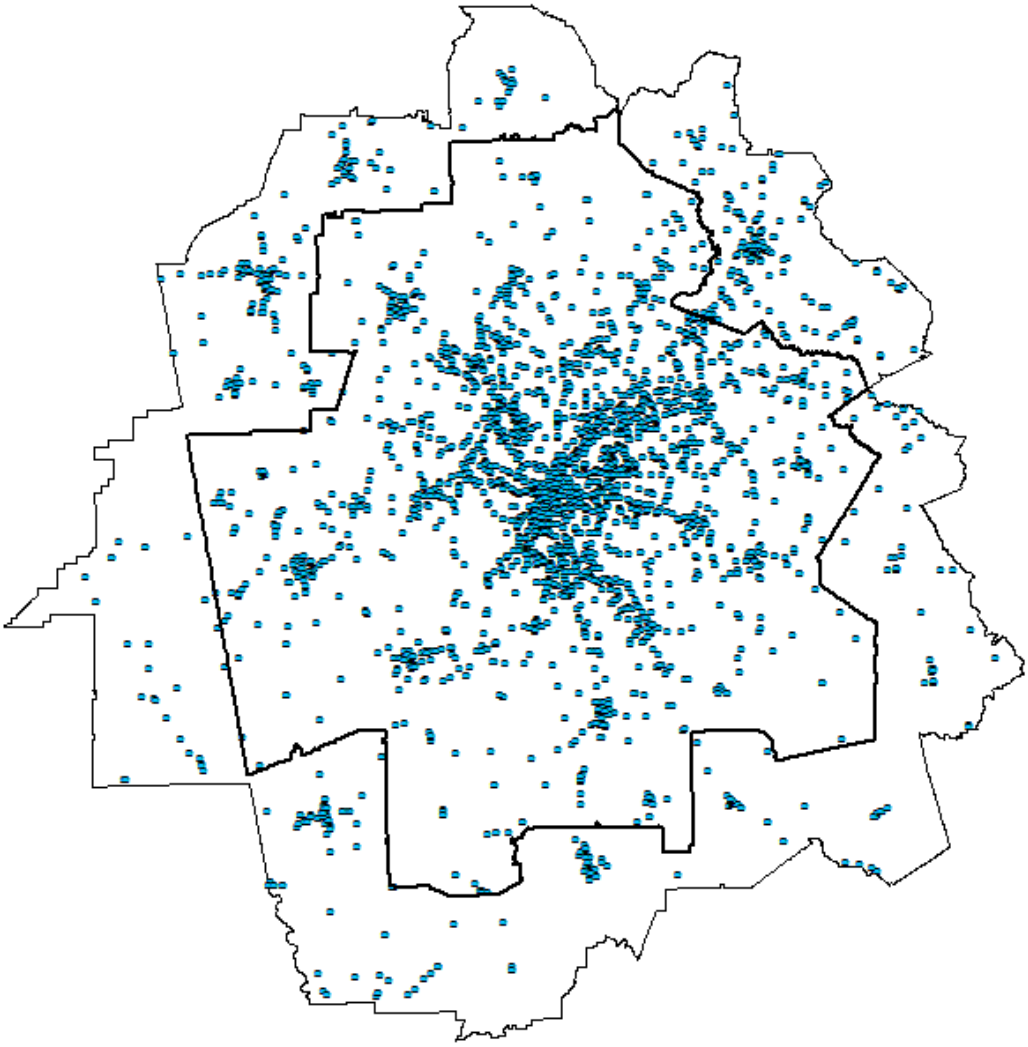


Figure 6 Convenience store dataset (n = 3,986)

The convenience store dataset contains the most locations of all the food store types included in this study. The majority of locations are in the urban and rural regions, with several clusters located in rural city centers. Convenience stores are less dispersed than supermarkets and small grocery stores but still have representation scattered throughout rural areas

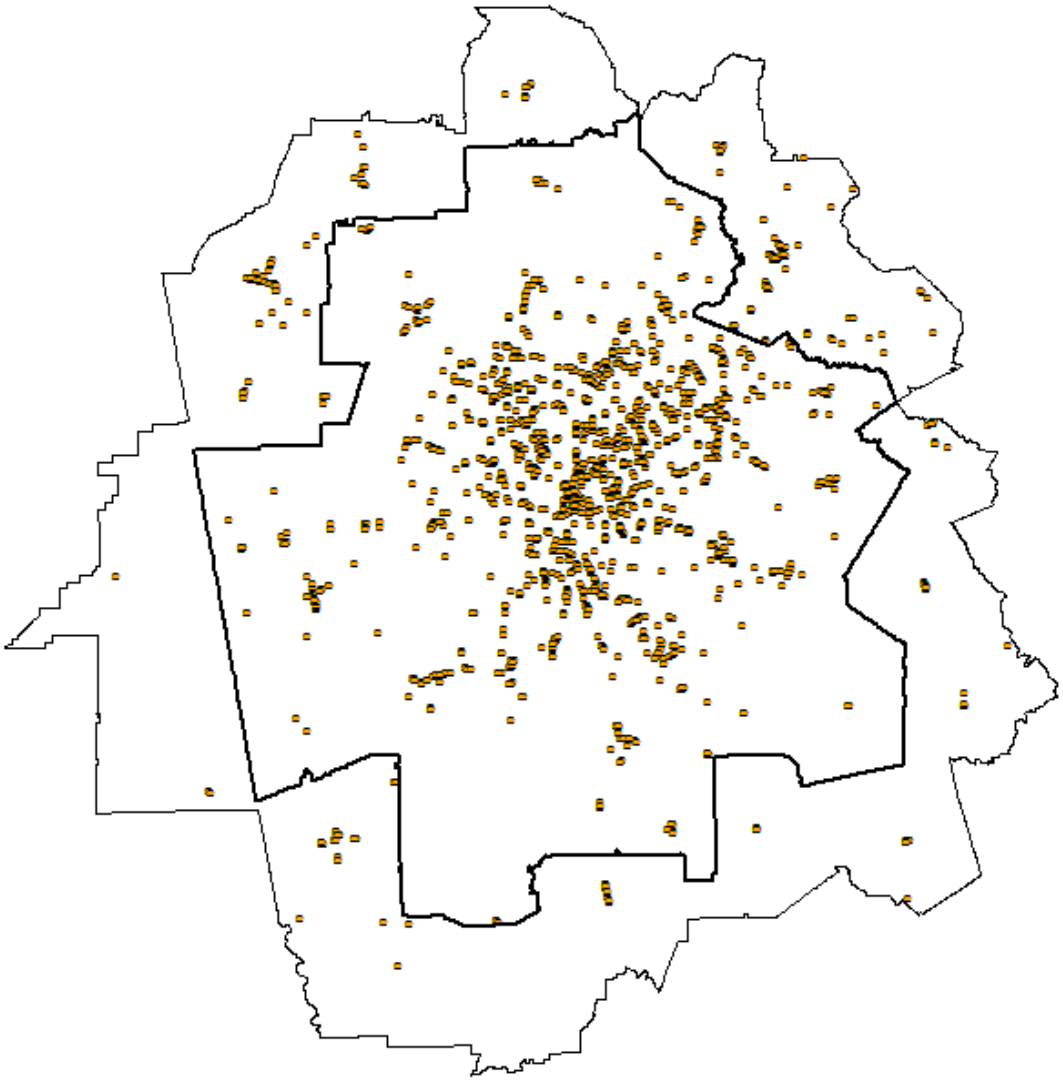


Figure 7 Fast food restaurant dataset (n = 2,153)

The fast food restaurant dataset contains the second most food store locations for this study. The locations are primarily located in the urban and suburban regions with clusters in rural city centers. Similar to the small grocery store dataset, fast food restaurants are not heavily located throughout the rural regions of the Atlanta MSA.

Demographic data is primarily available from Esri's Business Analyst data suite and the U.S. Census Bureau's online data gateway website, American FactFinder (http://www.factfinder2.census.gov/) and American Community Survey (hereinafter "ACS";

http://www.census.gov/acs). Data is collected at two scales (areal units): block level and block group level. The block areal unit data is only available through Esri's Business Analyst data repository. It is used to identify the neighborhood locations by means of a population weighted centroid analysis for each block group in the study area. The demographic data collected at the block group areal unit is used to investigate the spatial relationship between the food environment and socioeconomic conditions at the neighborhood scale.

Block group attribute data is only available through the ACS and not the primary census data gateway website, American Fact Finder. The U.S. Census Bureau collects and distributes a vast amount of individual's personal information. To protect the privacy of individuals throughout the population, the data is aggregated to different scales. Since block group sizes are small, ranging from 600-3,000 people or 240-1,200 housing units, information collected from the decennial census is withheld from the general public. As such, detailed information on the population and the block group areal unit are only available through estimates delineated from community surveys, or the ACS. The attributes used in this study are discussed in Section 3.4 and highlighted in Table 7.

The ACS data was retrieved using the Summary File Data Retrieval Tool, a zipped excel file that enables the user to load block group level census data at the state level. The 5-year data table estimates (2006-2010) were used due to the availability of block level data which is not accessible at the 1- and 3-year estimates.

Road network shapefiles are available from the U.S. Census Bureau at the county level. In 2010, the Atlanta MSA covered twenty-eight counties. Since the data is only available at the county level and there are over thirty counties (including counties adjacent to the study area), this study utilizes a detailed road network shapefile available through Esri. The road network

shapefile is current through 2005. The shapefile was converted to a road network using Esri's New Network Dataset tool in ArcCatalog so it may be used as a network file in Esri's Network Analyst extension. The default settings were used with length units measured in meters (consistent with NAD83 UTM Zone units).

Table 6: Summary of spatial datasets

Dataset	File Type	Data Type	Details	Quality	Source
Food Business Data	Shapefile	Vector (point)	Supermarkets, convenient stores, fast-food restaurants	High (proprietary dataset)	Esri, Inc.
Road Network	Shapefile	Vector (polyline)	All streets and highways	High (proprietary dataset)	Esri, Inc.
Census Areal Unit (block & block group)	Shapefile	Vector (polygon)	Units within Atlanta MSA	High (acquired from original source)	U.S. Census Bureau & Esri, Inc.
Atlanta MSA	Shapefile	Vector (polygon)	Study area	High (acquired from original source)	U.S. Census Bureau

3.3 Geographic Calculations

This project conducts two geographic calculations using Esri's ArcGIS Spatial Analyst and Network Analyst extensions. The Spatial Analyst extension is used for the neighborhood calculation while the Network Analyst extension is used for the respective distance calculations.

3.3.1 Neighborhood Delineation

There are multiple approaches to delineating neighborhoods in a GIS. Most food environment studies utilize predefined U.S. Census Bureau areal units because of how they collect and aggregate demographic data. U.S. Census data is aggregated to the following units (starting with the smallest) block, block group, census tract, county, and state. Most food environment studies conducted in the United States define neighborhood scale at the census tract level (Economic

Research Service 2009; Charreire et al. 2010). Utilizing smaller areal units, such as the block group, should increase the precision and accuracy of the analysis, and decrease the potential for the modifiable areal unit problem (MAUP) by avoiding unnecessary data smoothing. The MAUP is a type of statistical bias which occurs when analyzing spatially aggregated data such as U.S. Census Bureau data. It refers to the unavoidable phenomena where identical analyses of the same data produce varying results based on the scheme and level of data aggregation (Dark and Bram 2007). The smaller areal units will also increase the precision of the network distance measurements by increasing the volume of data points for a given area.

This study utilizes the population weighted centroid as opposed to the geographic centroid of each CBG. Since the study area contains rural neighborhoods, which are typically larger than urban CBG, the geographic center may not accurately represent the population center of each neighborhood (Sharkey and Horel 2008).

The population weighted centroid of each census block group is calculated using the Mean Center tool in the Spatial Statistic Toolbox of ArcGIS 10.2.2. The input feature class consists of a block areal unit shapefile covering the Atlanta MSA. The attributes required to complete the analysis are the 2010 population and the corresponding census block group ID. The 2010 population field is assigned to the Weight_Field option and the census block group ID field is assigned to the Case_Field option. The output is a point shapefile of population weighted centroids for each CBG. The output feature class represents the neighborhoods used for the network distance analysis. Figure 5 delineates the neighborhood centroids.

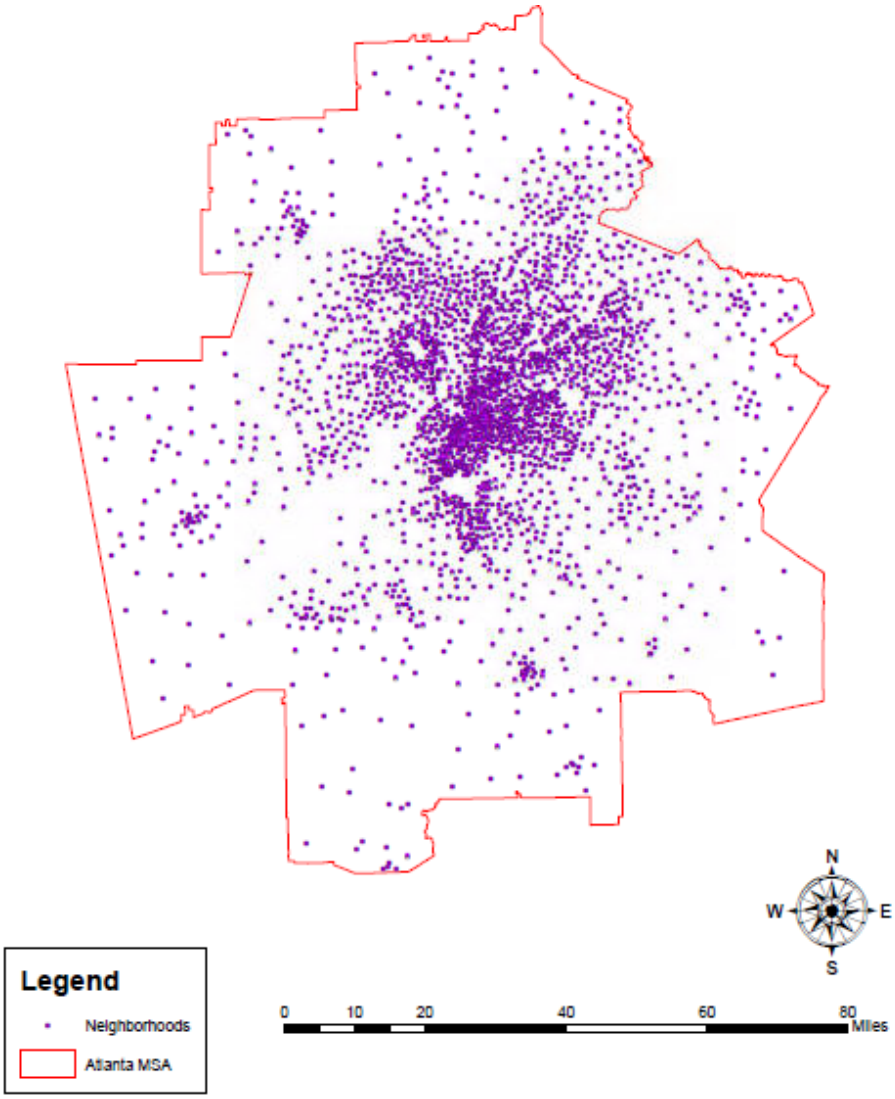


Figure 8 Neighborhoods (Population Weighted Block Group Centroids)

The neighborhood centroids, shown in Figure 8, show that the center of the MSA, which coincides with downtown Atlanta exhibits the highest population densities, and therefore highest concentration or cluster of neighborhoods. The suburban areas are primarily located north of downtown. The majority of the MSA contains rural neighborhoods which appear dispersed throughout the exterior half of the study area. There are some clusters throughout these areas which indicate rural town and city centers.

3.3.2 Distance Measurements

Three types of distances may be measured in a GIS: Euclidean, Manhattan, and network. Euclidean distance refers to the shortest distance between two points. This measure is most appropriate when interested in the geographic distance ("as the crow flies") between points. Manhattan distance refers to the shortest distance between two points when restricted to a grid pattern. The name Manhattan is appropriate as the best way to think about how this distance works. If walking the streets of New York City you would be restricted to travelling along a grid of 90 degree angles (or city blocks). As such, the measurement is most appropriate for city centers and dense urban environments. Finally, the network distance refers to the shortest distance between two points along a defined network, usually roads or trails. This measurement is most appropriate when looking at transportation and travel times outside of a major, densely populated city center. Residents in the Atlanta MSA have a high automobile dependency as evidenced by the automobile share of home-based work trips being over 90% (Jeon et al. 2010). The network distance measurement is therefore most appropriate for this study.

The network distance of neighborhood (CBG population weighted) centroids to the nearest respective food store type is measured using the New Closest Facility tool in the Network Analyst toolbox. The tool calculates the distances of each neighborhood centroid to the nearest food store type, respectively. The tool was used three times, one for each food store type. In each trial, the respective food store type shapefiles are designated as the Facilities input. The neighborhood shapefile is designated as the Incidents input. The tool calculates the shortest route along the road network from each incident (neighborhood) to each facility (food store type). The output contains a vector shapefile of all the calculated routes with an FID field corresponding to each neighborhood and a distance field in meters. The three network distances

attributes for each neighborhood are added to the neighborhood centroid shapefile. These network distance measurements are used in the OLS linear regression analysis and for comparison against different types of neighborhoods. A subset of the network distance analysis results for neighborhoods in Jasper County, GA are highlighted in Figure 9.

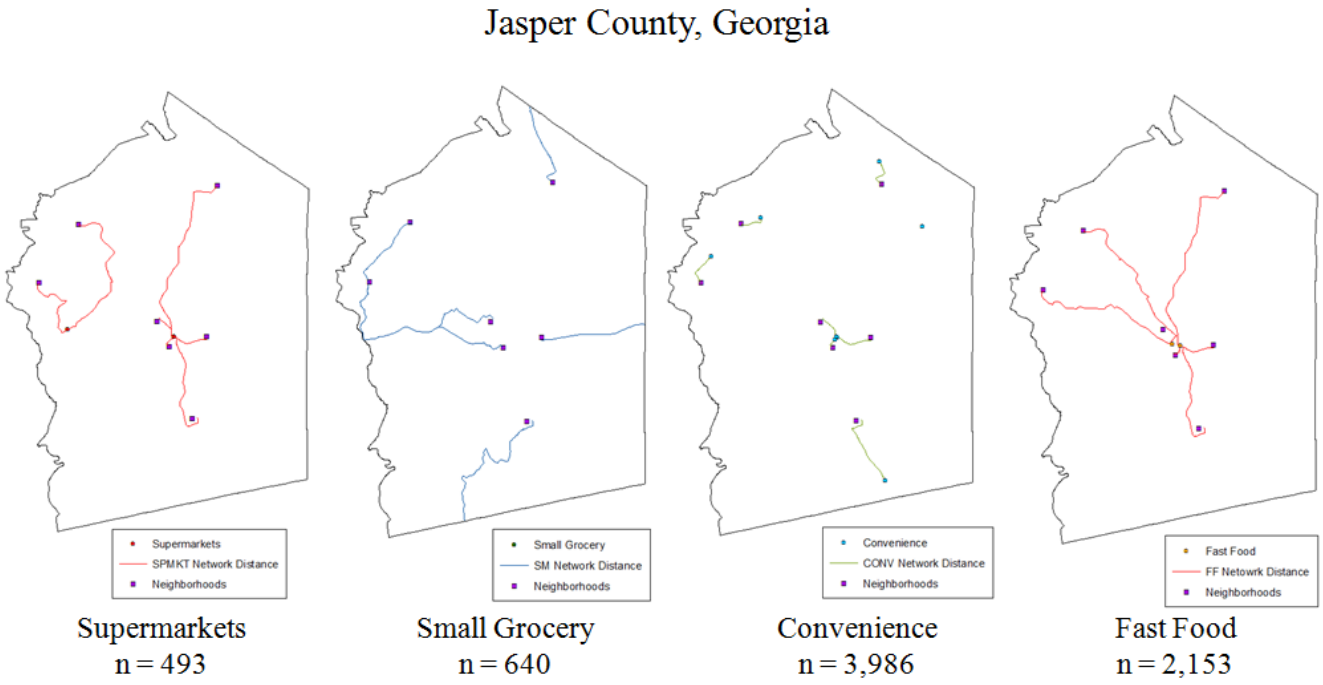


Figure 9 Network Distance Analysis Sample Result (Jasper County, GA)

3.4 Statistical Analysis

There are two types of statistical analyses used in this study. The first investigates access to each respective food store while simultaneously controlling for both neighborhood income and minority composition. The second analysis looks at each neighborhood characteristic and investigates how food access varies as the degree or severity of each variable changes.

This study set also set out to create a regression model to explore causality of neighborhood food access. The Exploratory Regression tool is part of the Spatial Statistics toolbox in ArcGIS. It performs a linear regression analysis to predict the relationship between a dependent variable and a set of independent variables. The model is run four times, once for each network distance measurement to each respective food store type. The count (N) for each model is equal to the number of neighborhoods in the MSA which is 2,583. The dependent variable is the network distance measurements. The independent variables, shown in Table 7, consist of neighborhood socioeconomic and demographic attributes. These were collected and from the U.S. Census Bureau (ACS 5-year estimates) and Esri's Business Analyst data suite. The hypothesis of the regression analyses is that the dependent variable will increase as evidence of neighborhood deprivation increase. Similarly, the dependent variable will decrease as evidence of neighborhood deprivation decrease.

During the investigation it became apparent that this approach could be problematic due to the number of independent variables non-normally distributed throughout the Atlanta MSA. Appendix A contains histograms for each explanatory variable. Of them, only the educational attainment and median household income variables are normally distributed.

Table 7: Summary of Neighborhood Characteristic Variables

Variable Name	Source	Description
White, non-Hispanic (%)	Esri, Inc.	Percentage of white, non-Hispanic residents
Black (%)	Esri, Inc.	Percentage of blacks
Asian (%)	Esri, Inc.	Percentage of Asians
Hispanic (%)	Esri, Inc.	Percentage of Hispanics
Educational Attainment	ACS (B99151)	Educational attainment for population above 15yr +
Median Household Income	Esri, Inc.	Median household income
Household Poverty Status	ACS (B17017)	Percentage of households with income below poverty level in the past 12 months
Population Density	Esri, Inc.	Population density of CBG per square mile

The first four variables (listed in Table 7) provide information on the racial composition of each neighborhood; the remaining variables contain information of socioeconomic conditions and population density. Each variable is investigated individually as neighborhoods are grouped by standard deviation. The breakdown of groupings for all neighborhood characteristics are as follows: High = greater than +0.5 STD, Medium = -0.5 to +0.5 STD, and Low = less than -0.5 STD. The average food access measurement to each food store type will be calculated for the neighborhood groupings for comparison within each respective neighborhood characteristic.

3.5 Expected Outcome

There is some ambiguity in the literature regarding whether any correlation exists between disparities in food access and socioeconomic status and minority composition of neighborhoods (Sharkey and Horel 2008; Alviola et al. 2013). Neighborhoods with lower socioeconomic conditions and higher minority composition were expected to have less access to supermarkets and higher access to convenient stores and fast food restaurants. It also expected to find that the inverse relationship is true: neighborhoods with higher socioeconomic conditions and of majority composition have greater access to supermarkets than convenient stores and fast food restaurants.

CHAPTER 4: RESULTS

This chapter documents disparities in food access to different types of food stores (supermarket, small grocery, convenience, and fast-food) throughout neighborhoods in the Atlanta MSA. Correlations with neighborhood minority composition and income are explored. The food access measurement results for each neighborhood characteristic are also reported.

The chapter begins with Section 4.1 which details the neighborhood groupings throughout the Atlanta MSA. These groupings were used for investigating correlations of spatial access to food stores with neighborhood characteristics. Each grouping (minority and income) are presented with one map per group in Sections 4.1.1 and 4.1.2, respectively. The maps bring spatial context to Section 4.2 which details the food access measurement to each food store type while controlling for neighborhood income and minority composition. There are four graphs which support this section: supermarkets (Section 4.2.1), small grocery stores (Section 4.2.2), convenience stores (Section 4.2.3), and fast-food restaurants (Section 4.2.4). The average, minimums, and maximum food access measurements for each neighborhood grouping and food store type is outlined in Table 8. Section 4.3 details the descriptive statistics results which group each neighborhood characteristic into three groups: high, medium, and low. Each neighborhood characteristic is reported in its own subsection and contains a map, providing spatial context to the respective groups throughout the Atlanta MSA, and a graph reporting the average food access measurement to each group for each of the four food store types.

4.1 Summaries of Neighborhood Groupings for Minority and Income

Each neighborhood in the study area was grouped by income and minority composition. These groupings were used as controls for comparing food access measurements to the respective food store types. The groupings are mapped in Figures 10 and 11 and the food access measurements,

controlling for neighborhood income and minority composition are presented in Figures 12 through 15.

4.1.1 Neighborhood Minority Groupings

The neighborhood minority groupings for the Atlanta MSA are shown below in Figure 10. The majority of the MSA is covered by neighborhoods of low minority composition, especially in the suburban and rural areas. Neighborhoods of high minority composition are mostly concentrated in the urban areas, within and south of the downtown Atlanta. The region appears to be segregated along racial lines with few areas of intermixed neighborhood types. Medium minority neighborhoods mostly buffer the area between the high minority city center and the low minority suburban and rural areas. There is a fair concentration of medium minority neighborhoods in the rural areas along the southern boundary of the Atlanta MSA.

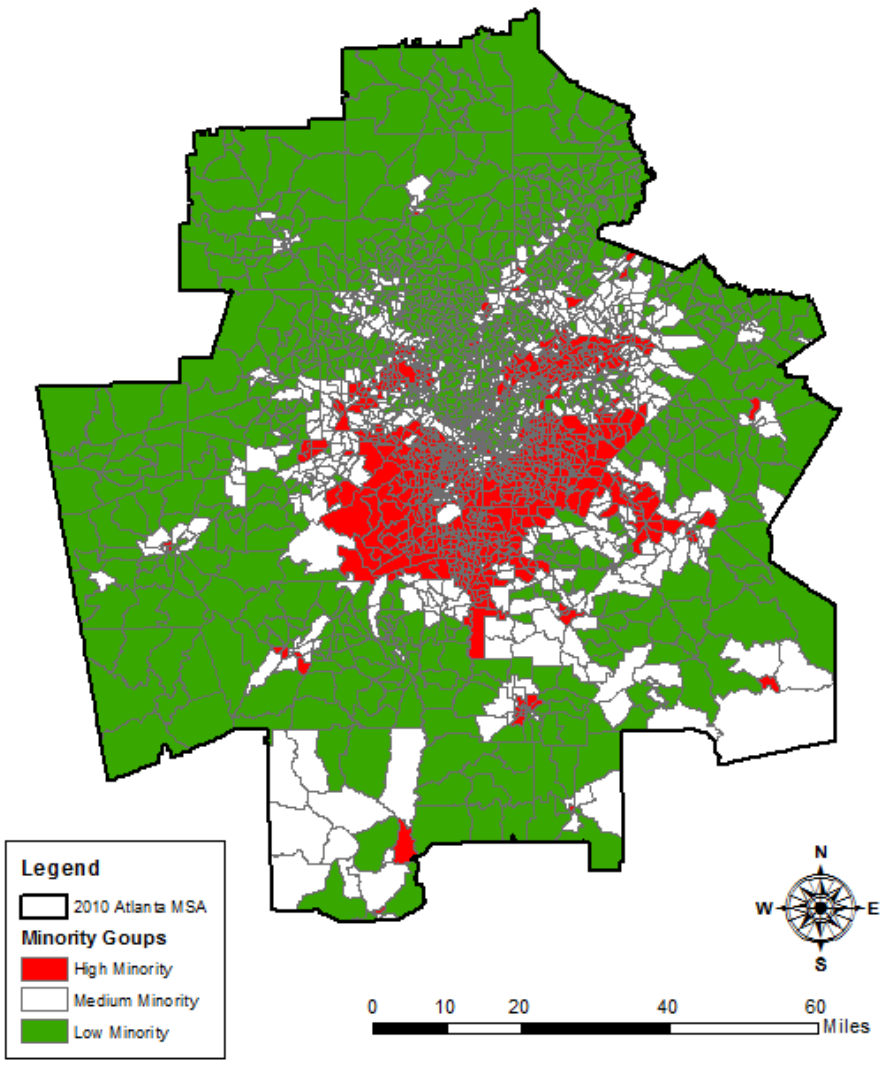


Figure 10 Neighborhood Minority Groupings

4.1.2 Neighborhood Income Groupings

The neighborhood income groupings for the Atlanta MSA are shown below in Figure 11. The low income neighborhoods mostly fall along the boundaries of the Atlanta MSA, however there are several neighborhoods dispersed throughout the region. There is a high concentration of low income neighborhoods overlapping the area of high minority composition, within and south of downtown Atlanta. High income neighborhoods mostly fall in the suburban areas north and

south of the Atlanta city center. Medium income neighborhoods are dispersed throughout the region however they are mostly located in suburban areas circling the Atlanta city center and rural areas to the north, east, and south.

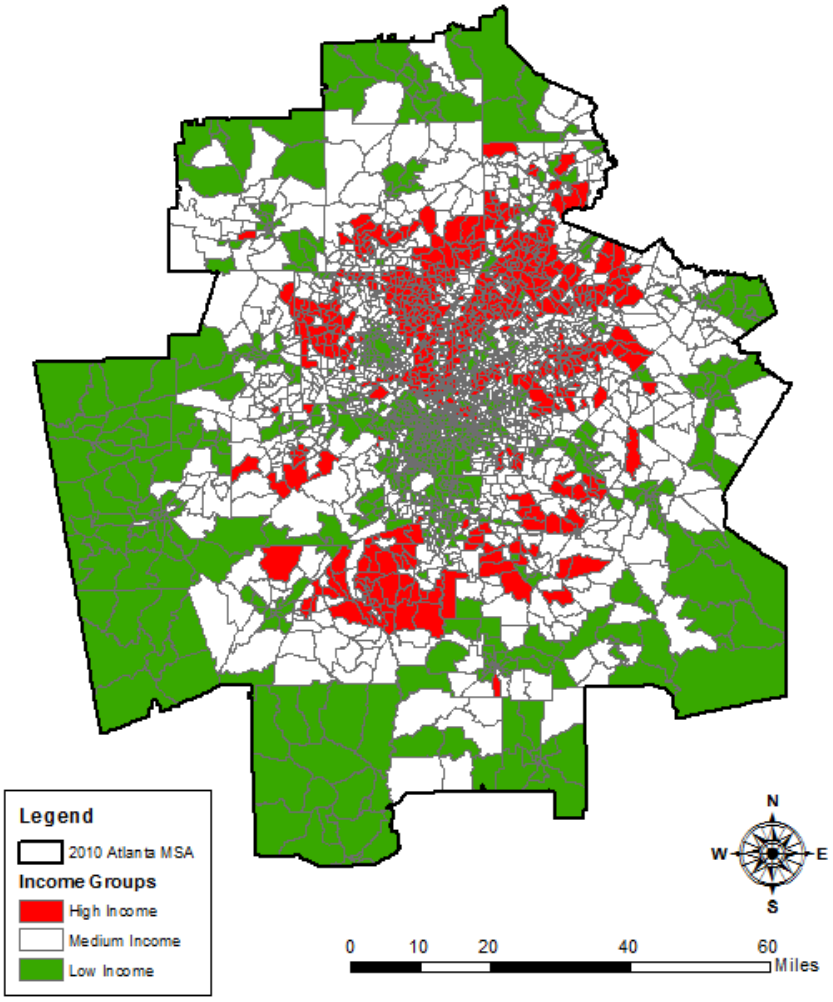


Figure 11 Neighborhood Income Groupings

4.2 Food Store Access Controlling for Minority and Income

A summary of the averages, minimums, and maximum food access measurements, when controlling for neighborhood income and minority composition for each food store type, is presented in Table 8. Figures 12-15 highlight these results for each food store type.

Table 8: Summary of food access controlling for income and minority

	Low Minority			Medium Minority			High Minority		
	Avg.	Min	Max	Avg.	Min	Max	Avg.	Min	Max
Supermarket									
Low Income	4.2	0.1	13.9	1.7	< 0.0	13.5	1.5	0.1	3.9
Medium Income	3.1	< 0.0	15.2	1.8	0.2	7.1	1.9	0.3	7.3
High Income	2.0	0.4	8.1	1.9	0.1	4.3	2.3	0.6	5.4
Small Grocery									
Low Income	4.3	0.2	17.3	2.2	0.1	17.8	1.2	< 0.0	17.4
Medium Income	3.6	0.1	13.7	2.2	0.2	8.6	1.9	0.1	6.1
High Income	2.9	0.1	11.5	2.6	0.2	6.8	2.5	0.6	5.2
Convenience Store									
Low Income	1.9	0.1	8.3	0.8	0.1	6.1	0.6	< 0.0	2.1
Medium Income	1.6	0.1	6.5	1.1	< 0.0	5.2	1.0	0.1	4.3
High Income	1.6	0.2	4.5	1.6	0.4	4.5	1.4	0.2	3.7
Fast Food									
Low Income	3.7	0.1	14.3	1.4	< 0.0	14.4	1.1	< 0.0	10.8
Medium Income	2.5	< 0.0	12.8	1.5	< 0.0	5.3	1.4	< 0.0	5.1
High Income	1.8	0.2	7.1	1.7	0.5	3.9	2.1	0.6	5.0

Low = < -0.5 Std dev Medium = -0.5 - +0.5 High = > +0.5

4.2.1 Food Store Access: Supermarkets

Neighborhood food access measurements to supermarkets, shown in Figure 12 had varying results when controlling for neighborhood income and minority composition. Food access to supermarkets in low minority neighborhoods increased as neighborhood income increased (Low Income = 4.2 miles; Medium Income = 3.1 miles; High Income = 2.0 miles). Neighborhoods of medium and high minority composition had an inverse relationship where food access decreased as income increased. Food access to supermarkets in neighborhoods of medium minority composition was as follows: Low Income = 1.7 miles; Medium Income = 1.8 miles; High Income = 1.9 miles. Food access to supermarkets in neighborhoods of high minority composition was as follows: Low Income = 1.5 miles; Medium Income = 1.9 miles; High Income = 2.3 miles. Neighborhoods of medium and high minority composition had similar food

access values when controlling for income. Food access to supermarkets in high income neighborhoods, regardless of minority composition, was tightly grouped with values ranging from 1.9 to 2.0 miles.

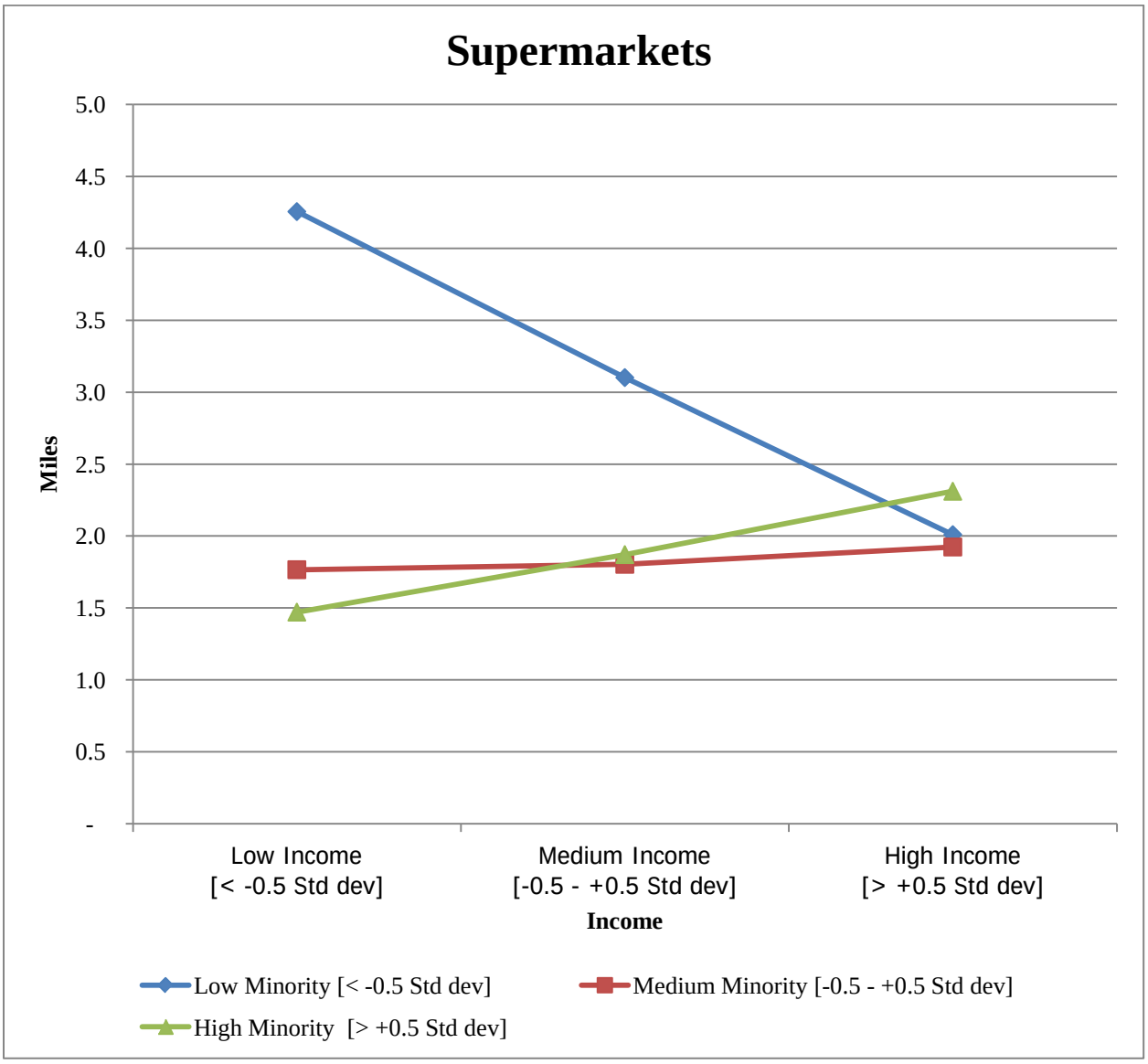


Figure 12 Neighborhood food access to supermarkets

4.2.2 Food Store Access: Small Grocery Stores

Neighborhood food access measurements to small grocery stores, as shown in Figure 13 had varying results when controlling for neighborhood income and minority composition. Food access to small grocery stores in low minority neighborhoods increased as neighborhood income increased (Low Income = 4.3 miles; Medium Income = 3.6 miles; High Income = 2.9 miles). Medium and high minority composition neighborhoods had a negative relationship where food access decreased as income levels increased. Food access to small grocery stores in neighborhoods of medium minority composition are as follows: Low Income = 2.2 miles; Medium Income = 2.2 miles; High Income = 2.6 miles. Food access to small grocery stores in neighborhoods of high minority composition are as follows: Low Income = 1.2 miles; Medium Income = 1.9 miles; High Income = 2.5 miles. These trends are similar to those of food access to grocery stores. In both cases, low minority neighborhoods showed significant increases in food access as income increased. Medium and high minority neighborhoods had decreases in food access as income levels increased, and high income neighborhoods for all minority composition levels had a small range of food access (2.5 to 2.9 miles).

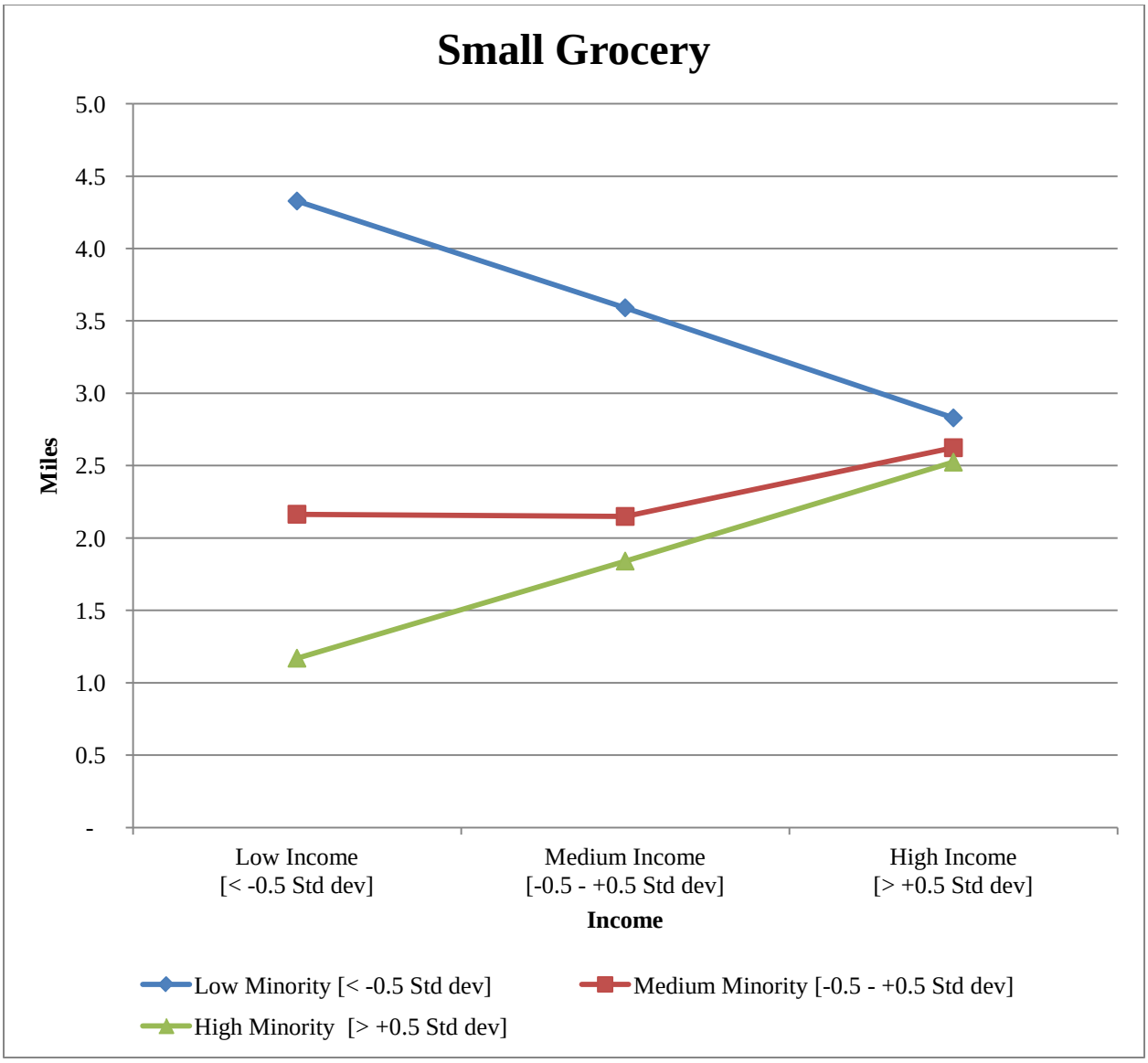


Figure 13 Neighborhood food access to small grocery stores

4.2.3 Food Store Access: Convenience Stores

Neighborhood food access measurements to convenience stores, shown in Figure 14 had varying results when controlling for neighborhood income and minority composition. Food access to convenience stores in low minority neighborhoods increased slightly between low income and high income neighborhoods (Low Income = 1.9 miles; Medium Income = 1.6 miles; High

Income = 1.6 miles). Medium minority and high minority neighborhoods showed very similar food access levels: Low Income = 0.8 miles; Medium Income = 1.1 miles; High Income = 1.6 miles and Low Income = 0.6 miles; Medium Income = 1.0 miles; High Income = 1.4 miles, respectively. High income neighborhoods for all minority composition levels had a small range of food access (1.4 to 1.6 miles).

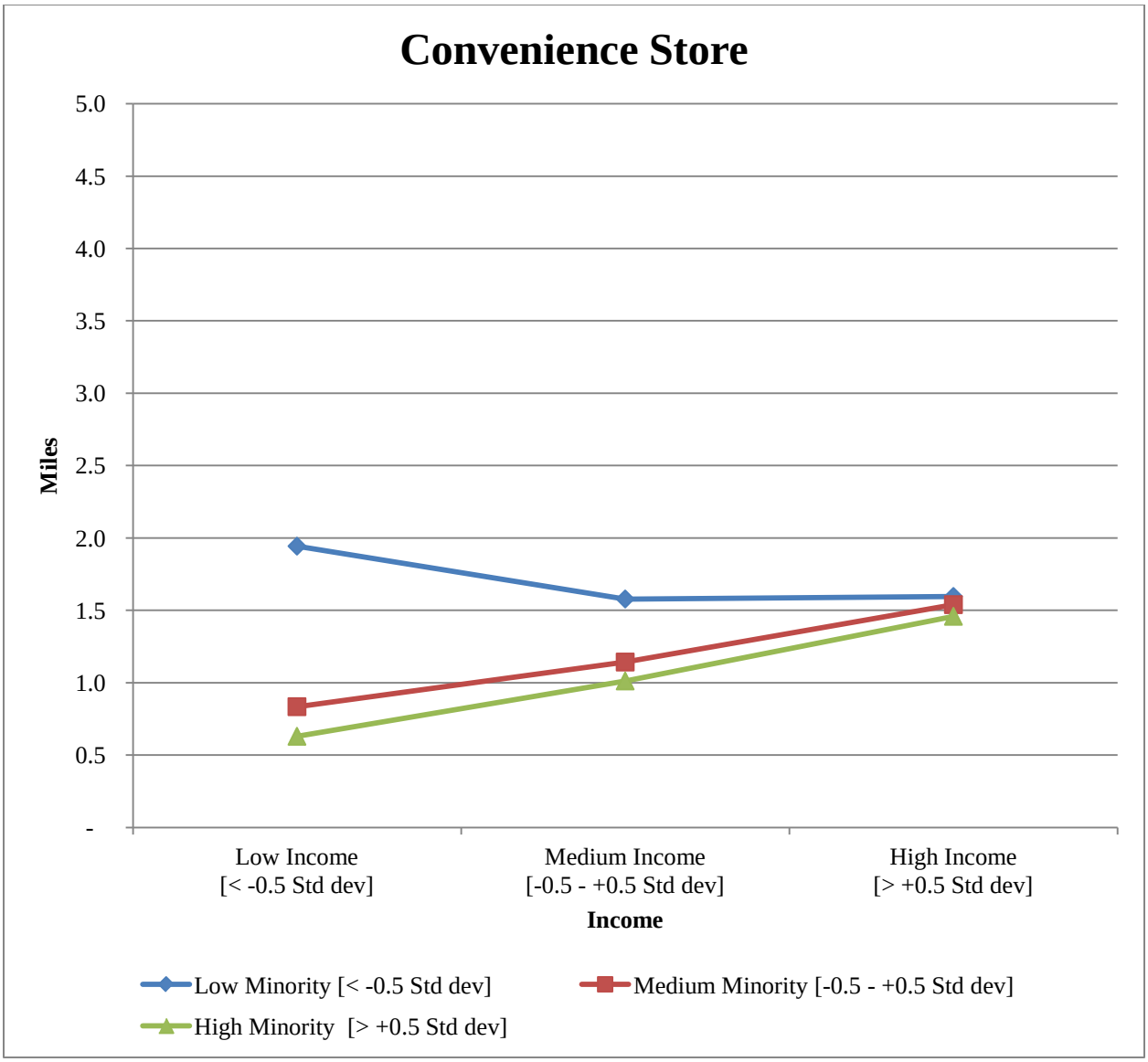


Figure 14 Neighborhood food access to convenience stores

4.2.4 Food Store Access: Fast-Food Restaurants

Neighborhood food access measurements to fast food restaurants, shown in Figure 15 had varying results when controlling for neighborhood income and minority composition. Food access to fast food restaurants in low minority neighborhoods increased neighborhood income increased (Low Income = 3.7 miles; Medium Income = 2.5 miles; High Income = 1.8 miles). Medium minority and high minority neighborhoods showed very similar food access levels: Low Income = 1.4 miles; Medium Income = 1.5 miles; High Income = 1.7 miles and Low Income = 1.1 miles; Medium Income = 1.4 miles; High Income = 2.1 miles, respectively. High income neighborhoods for all minority composition levels had a small range of food access (1.7 to 2.1 miles).

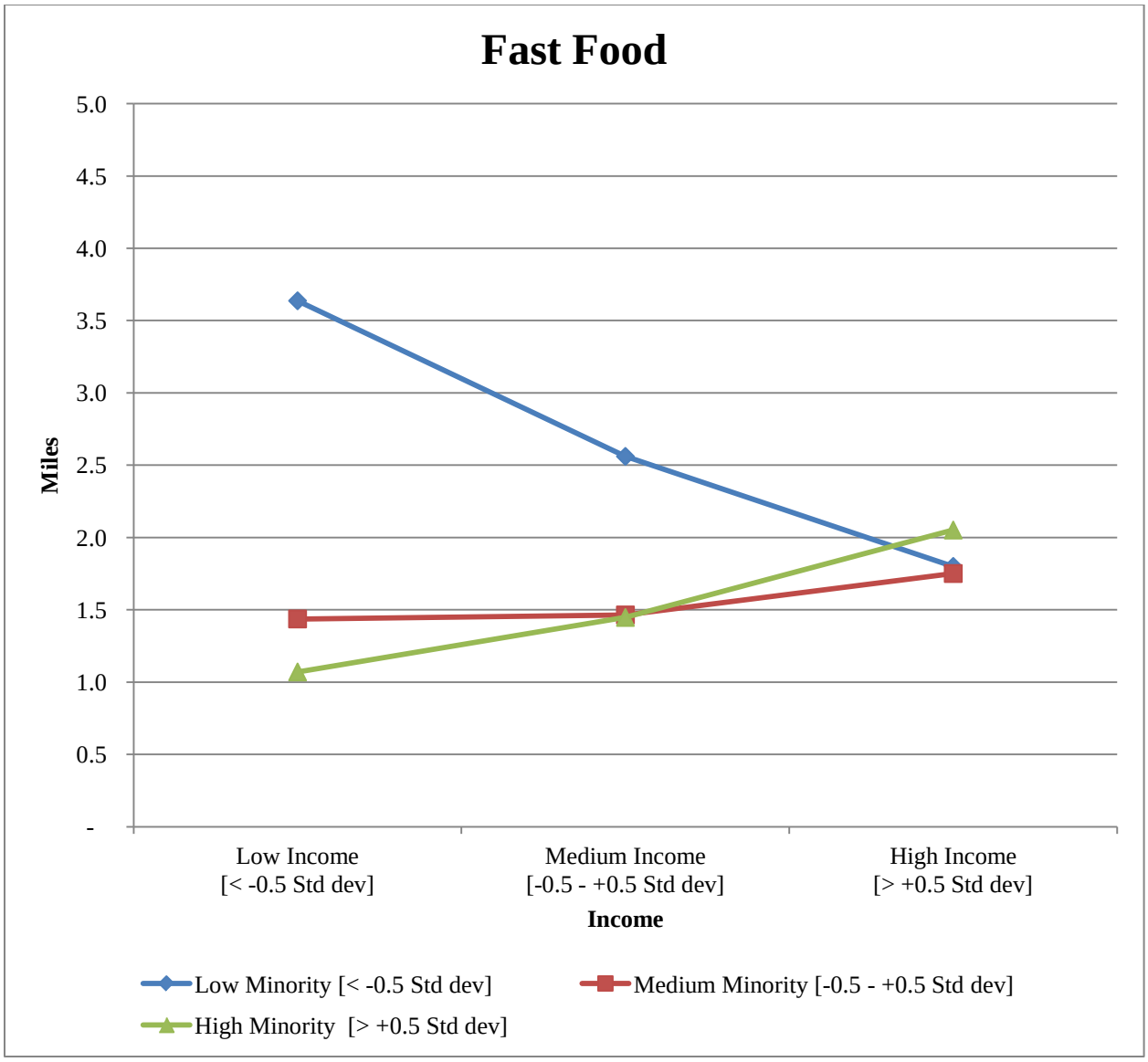


Figure 15 Neighborhood food access to fast food restaurants

4.3 Regression Models

The results of the four regression models using the Exploratory Regression tool in ArcMap provided unreliable results. The tool was used for each food store type to investigate causality of food access measurements to neighborhood characteristics. The results report for the regression model investigating food access to supermarkets is shown in Figures 16 and 17. This section

discusses these results in detail and explains why their results are unreliable. The remaining three regression analysis results, not discussed in this section, suffer from the same issues. Their explanation is consistent with that described in this section for supermarkets. Appendix B contains the results (both reports and tables) for all four analyses.

```
********************************************************************************
Choose 1 of 7 Summary
     Highest Adjusted R-Squared Results
AdjR2     AICc   JB K(BP)  VIF   SA   Model
 0.12 10093.69 0.00  0.03 1.00 0.00  -POPDEN***
 0.09 10167.91 0.00  0.00 1.00 0.00  +WHITEPCT***
 0.04 10324.43 0.00  0.00 1.00 0.00  -ASIANPCT***
       Passing Models
AdjR2 AICc JB K(BP) VIF SA   Model
********************************************************************************
Choose 2 of 7 Summary
          Highest Adjusted R-Squared Results
AdjR2     AICc   JB K(BP)  VIF   SA   Model
 0.16  9966.02 0.00  0.00 1.12 0.00  +WHITEPCT***  -POPDEN***
 0.14 10030.07 0.00  0.00 1.02 0.00  -ASIANPCT***  -POPDEN***
 0.14 10045.81 0.00  0.00 1.03 0.00  -BLACKPCT***  -POPDEN***
       Passing Models
AdjR2 AICc JB K(BP) VIF SA   Model
********************************************************************************
Choose 3 of 7 Summary
               Highest Adjusted R-Squared Results
AdjR2    AICc   JB K(BP)  VIF   SA   Model
 0.20 9854.64 0.00  0.00 1.40 0.00  -MEDHINC_CY***  +WHITEPCT***  -POPDEN***
 0.19 9894.59 0.00  0.00 1.14 0.00  +WHITEPCT***  -ASIANPCT***  -POPDEN***
 0.17 9930.57 0.00  0.00 4.87 0.00  +WHITEPCT***  +BLACKPCT***  -POPDEN***
       Passing Models
AdjR2 AICc JB K(BP) VIF SA   Model
********************************************************************************
Choose 4 of 7 Summary
                    Highest Adjusted R-Squared Results
AdjR2    AICc   JB K(BP)  VIF   SA   Model
 0.21 9818.50 0.00  0.00 1.49 0.00  -MEDHINC_CY***  +WHITEPCT***  -POPDEN***  -SCH***
 0.21 9826.33 0.00  0.00 1.43 0.00  -MEDHINC_CY***  +WHITEPCT***  -ASIANPCT***  -POPDEN***
 0.21 9830.14 0.00  0.00 4.98 0.00  -MEDHINC_CY***  +WHITEPCT***  +BLACKPCT***  -POPDEN***
       Passing Models
AdjR2 AICc JB K(BP) VIF SA   Model
********************************************************************************
Choose 5 of 7 Summary
                         Highest Adjusted R-Squared Results
AdjR2    AICc   JB K(BP)  VIF   SA   Model
 0.22 9787.13 0.00  0.00 5.21 0.00  -MEDHINC_CY***  +WHITEPCT***  +BLACKPCT***  -POPDEN***  -SCH***
 0.22 9790.85 0.00  0.00 1.52 0.00  -MEDHINC_CY***  +WHITEPCT***  -ASIANPCT***  -POPDEN***  -SCH***
 0.21 9807.98 0.00  0.00 1.53 0.00  -MEDHINC_CY***  +WHITEPCT***  -HISPPCT***  -POPDEN***  -SCH***
       Passing Models
AdjR2 AICc JB K(BP) VIF SA   Model
********************************************************************************
************ Exploratory Regression Global Summary (SPMKDISTMI) *************

             Percentage of Search Criteria Passed
                  Search Criterion Cutoff Trials # Passed % Passed
           Min Adjusted R-Squared > 0.50    115        0     0.00
          Max Coefficient p-value < 0.05    115      107    93.04
                    Max VIF Value < 7.50    115      108    93.91
          Min Jarque-Bera p-value > 0.10    115        0     0.00
Min Spatial Autocorrelation p-value > 0.10     17        0     0.00

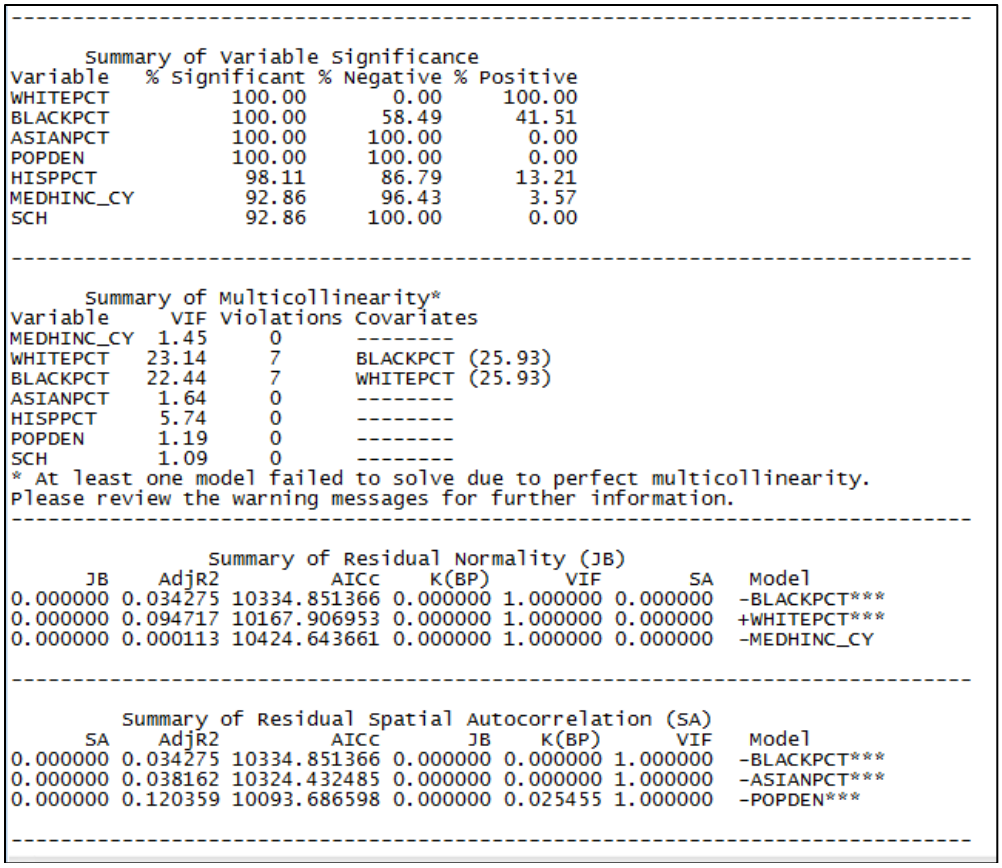
--------------------------------------------------------------------------------
```

Figure 16 Regression Results Report for Food Access to Supermarkets

Figure 16 shows the output report from the Exploratory Regression tool in ArcGIS. It shows 5 of 7 summary outputs. The "AdjR2" column (far left) represents the degree of correlation between the dependent and independent variables. The value ranges from 0 to 1. The "Model"

column (far right) shows which independent variables were used to determine the adjusted R^2 value. The highest adjusted R^2 value is 0.22. Two iterations came up with this value, shown in the "Choose 5 of 7 Summary" section of Figure 16. Both iterations use five independent variables. The first uses median household income, percent white, percent black, population density, and educational attainment. The second iteration switches out percent black for percent Asian. Ultimately, these R^2 values are relatively small which means that variables not included in the model are significantly affecting the dependent variable (food access measurements to supermarkets).

The next section of the model output report, shown in Figure 17, shows that none of the models were shown to be "passing models". This means they did not meet the criteria of a statistically significant or unbiased model. None of the models passed the Minimum Jarque-Bera p-value (JB) or the Minimum Spatial Autocorrelation p-value (SA). These tests indicate the level of biasness affecting model results. The JB values were all below 0.00000 meaning that model residuals are non-normally distributed. This indicates that the results are bias and therefore, not trustworthy. The same can be said for the SA measurement. None of the results measured above 0.000000 meaning that there is significant spatial autocorrelation impacting model results. Figure 17 shows the second half of the regression results report for food access to supermarkets.



Summary of Variable Significance

Variable	% Significant	% Negative	% Positive
WHITEPCT	100.00	0.00	100.00
BLACKPCT	100.00	58.49	41.51
ASIANPCT	100.00	100.00	0.00
POPDEN	100.00	100.00	0.00
HISPPCT	98.11	86.79	13.21
MEDHINC_CY	92.86	96.43	3.57
SCH	92.86	100.00	0.00

Summary of Multicollinearity*

Variable	VIF	Violations	Covariates
MEDHINC_CY	1.45	0	--------
WHITEPCT	23.14	7	BLACKPCT (25.93)
BLACKPCT	22.44	7	WHITEPCT (25.93)
ASIANPCT	1.64	0	--------
HISPPCT	5.74	0	--------
POPDEN	1.19	0	--------
SCH	1.09	0	--------

* At least one model failed to solve due to perfect multicollinearity.
Please review the warning messages for further information.

Summary of Residual Normality (JB)

JB	AdjR2	AICc	K(BP)	VIF	SA	Model
0.000000	0.034275	10334.851366	0.000000	1.000000	0.000000	-BLACKPCT***
0.000000	0.094717	10167.906953	0.000000	1.000000	0.000000	+WHITEPCT***
0.000000	0.000113	10424.643661	0.000000	1.000000	0.000000	-MEDHINC_CY

Summary of Residual Spatial Autocorrelation (SA)

SA	AdjR2	AICc	JB	K(BP)	VIF	Model
0.000000	0.034275	10334.851366	0.000000	0.000000	1.000000	-BLACKPCT***
0.000000	0.038162	10324.432485	0.000000	0.000000	1.000000	-ASIANPCT***
0.000000	0.120359	10093.686598	0.000000	0.025455	1.000000	-POPDEN***

Figure 17 Regression Results Report for Food Access to Supermarkets - Continued

The report continues to demonstrate problems with result criteria. JB and SA values continue to be shown well below acceptable levels. The summary of multicollinearity section shows that the percent white and percent black variables provide very similar information for the model. This means that these values follow a similar pattern in that as one value increases the other exhibits a similar degree of decrease, and vice versa. This indicates that the majority of the population in neighborhoods throughout the Atlanta MSA are either white or black. If the models were closer to meeting the passing criteria, removing the percent black variable might increase model performance.

4.4 Descriptive Statistics for Neighborhood Characteristics

Descriptive statistics were used as an alternative to a regression model as their results proved to be unreliable. These analyses reveal how food access varies to each type of food store based on the severity of each variable.

4.4.1 Food Store Access: Percent White Population

The neighborhood groupings for the percentage of white residents are the same as Figure 18 and are therefore not shown in this subsection. Food access measurements to each type of food store, shown in Figures 16, varied when controlling for the percent white population of neighborhoods. There is a negative relationship between the food access measurements and the percentage of white residents. In all four food store types, food access increases with decreasing percentage of white residents in neighborhoods. All four food stores are more accessible in neighborhoods of low white composition. This relationship is likely due to the location of high and low white neighborhoods. The majority of low white neighborhoods, shown in Figure 10, are at the outskirts of the MSA which are predominantly rural, low population density neighborhoods where transportation is primarily attributable to privately owned vehicles. Neighborhoods have the greatest access to convenience stores, followed by fast food restaurants, supermarkets, and small grocery stores. In low white neighborhoods however small grocery stores are slightly more accessible than supermarkets. Neighborhoods in the high white group must travel farther to access food stores than neighborhoods in the low white group.

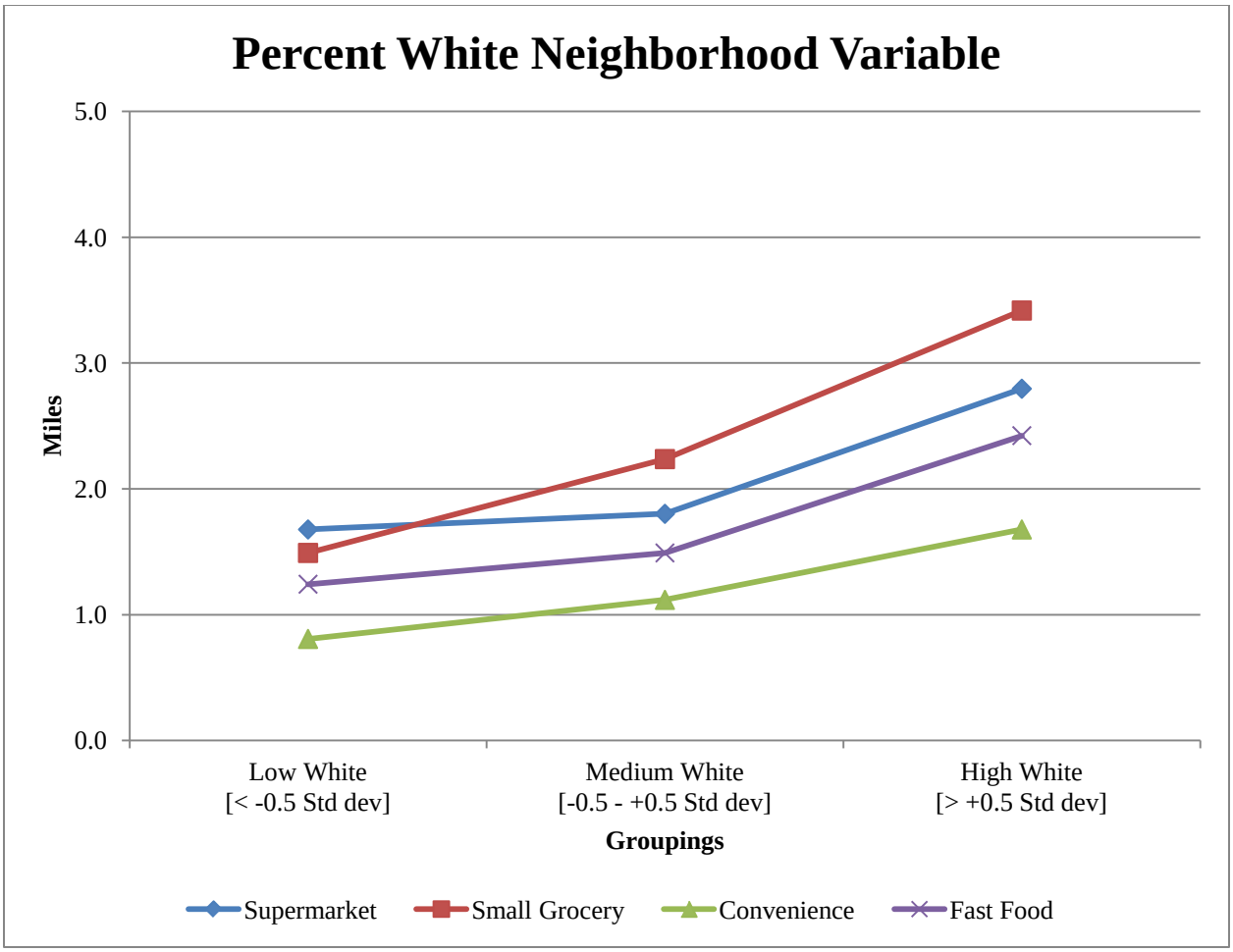


Figure 18 Percent white neighborhood food access

4.4.2 Food Store Access: Percent Black Population

The majority of neighborhoods in the Atlanta MSA, shown in Figure 19, fall in the low black grouping. These neighborhoods fall outside of the downtown Atlanta area in the suburban and rural regions of the MSA. Neighborhoods containing a high percentage of black residents fall within the downtown Atlanta area and expand to the west, south, and easterly directions. There are also some high black groupings to the south of the MSA and in rural town centers. Medium

black neighborhoods are scattered throughout the southern half of the MSA and generally form a ring around the downtown area forming a buffer between high and low black groups.

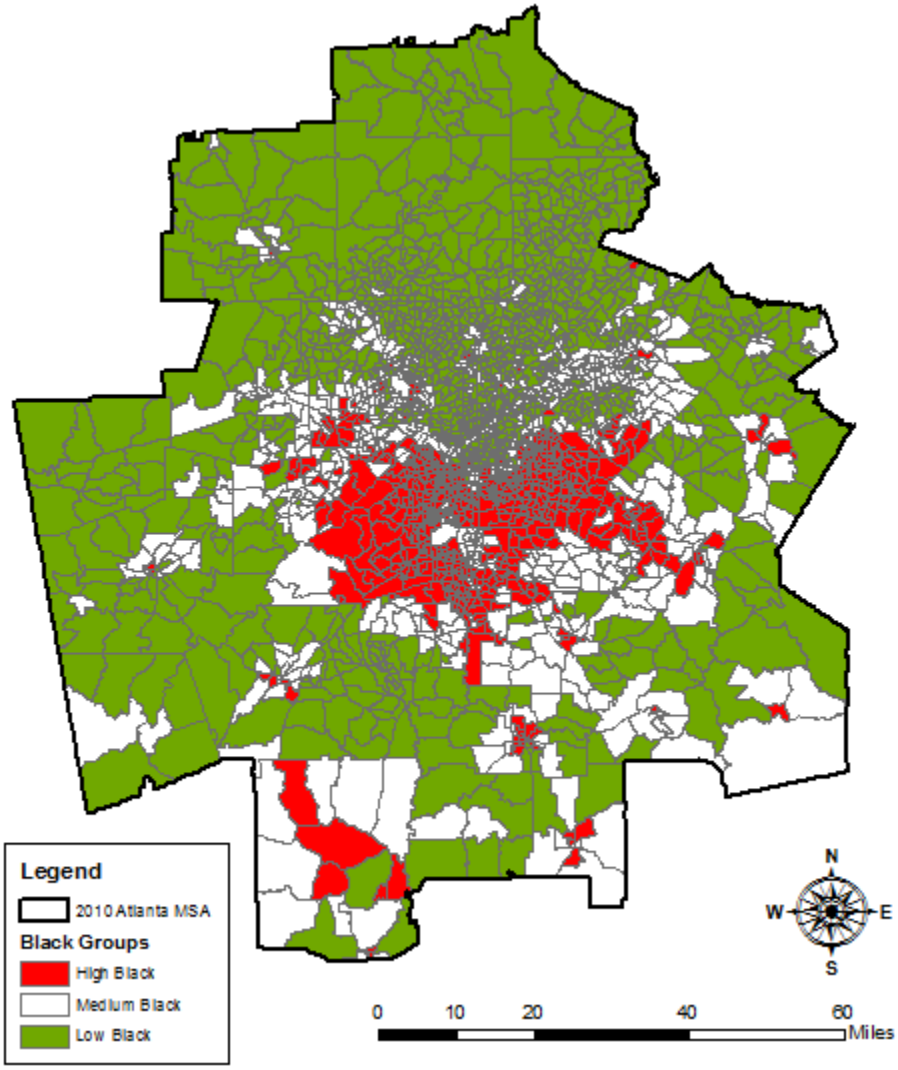


Figure 19 Percent black neighborhood groupings

Food access measurements to each type of food store, shown in Figure 20, varied when controlling for the percent black population of neighborhoods. There is a positive relationship between neighborhood food access measurements and percentage of black residents. Food access for all four food store types increase as the proportion of black residents per neighborhood

increases. Neighborhoods in the low black group must travel farther to access food stores than neighborhoods in the high black group.

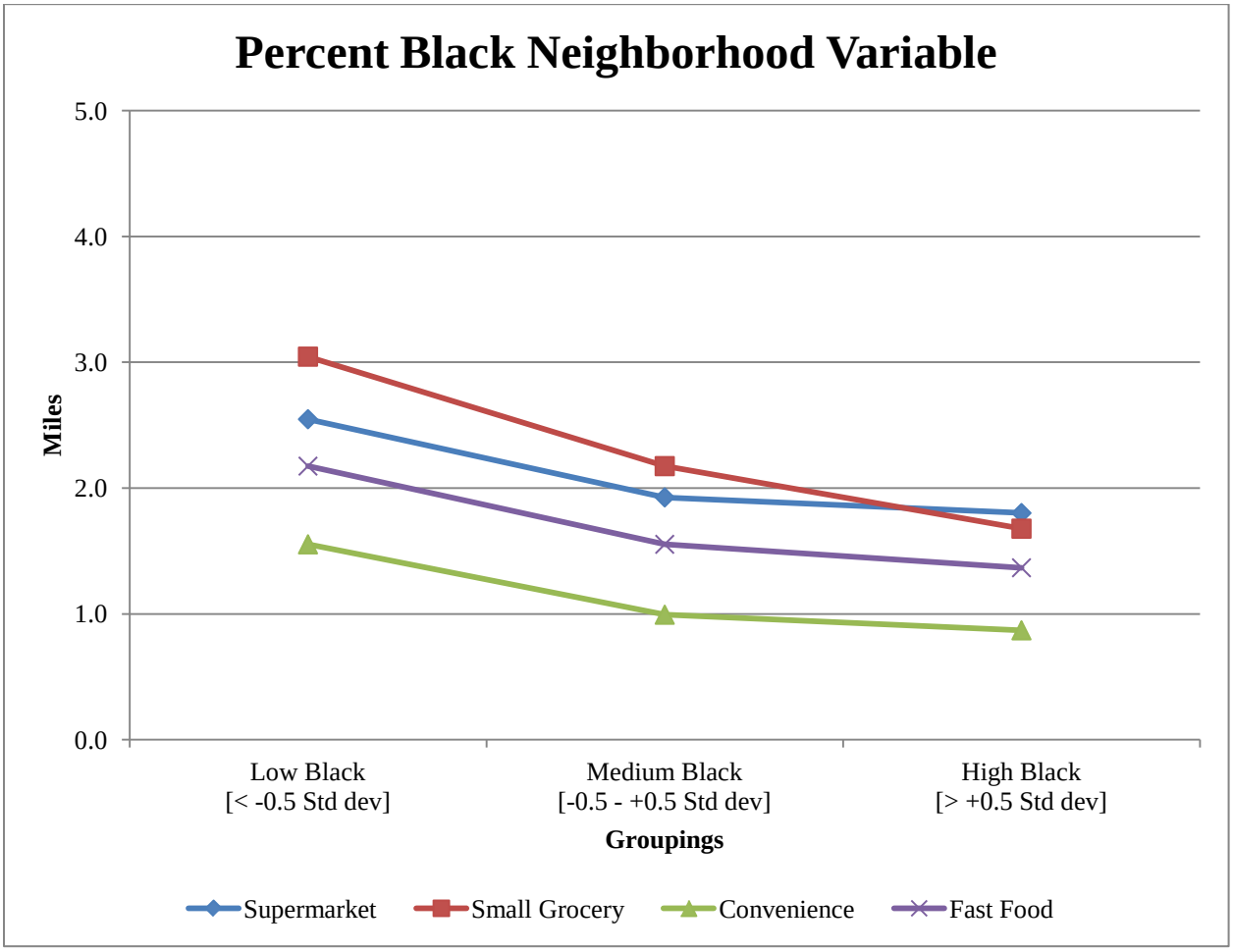


Figure 20 Percent black neighborhood food access

4.4.3 Food Store Access: Percent Asian Population

The majority of neighborhoods in the Atlanta MSA, shown in Figure 21, fall in the low Asian group. These neighborhoods are located in the rural areas surrounding the city to the north, west, south, and southwest. The majority of high Asian neighborhoods are clustered in the

northeastern region of the MSA. The largely suburban neighborhoods north and south of the City of Atlanta fall into the middle Asian group.

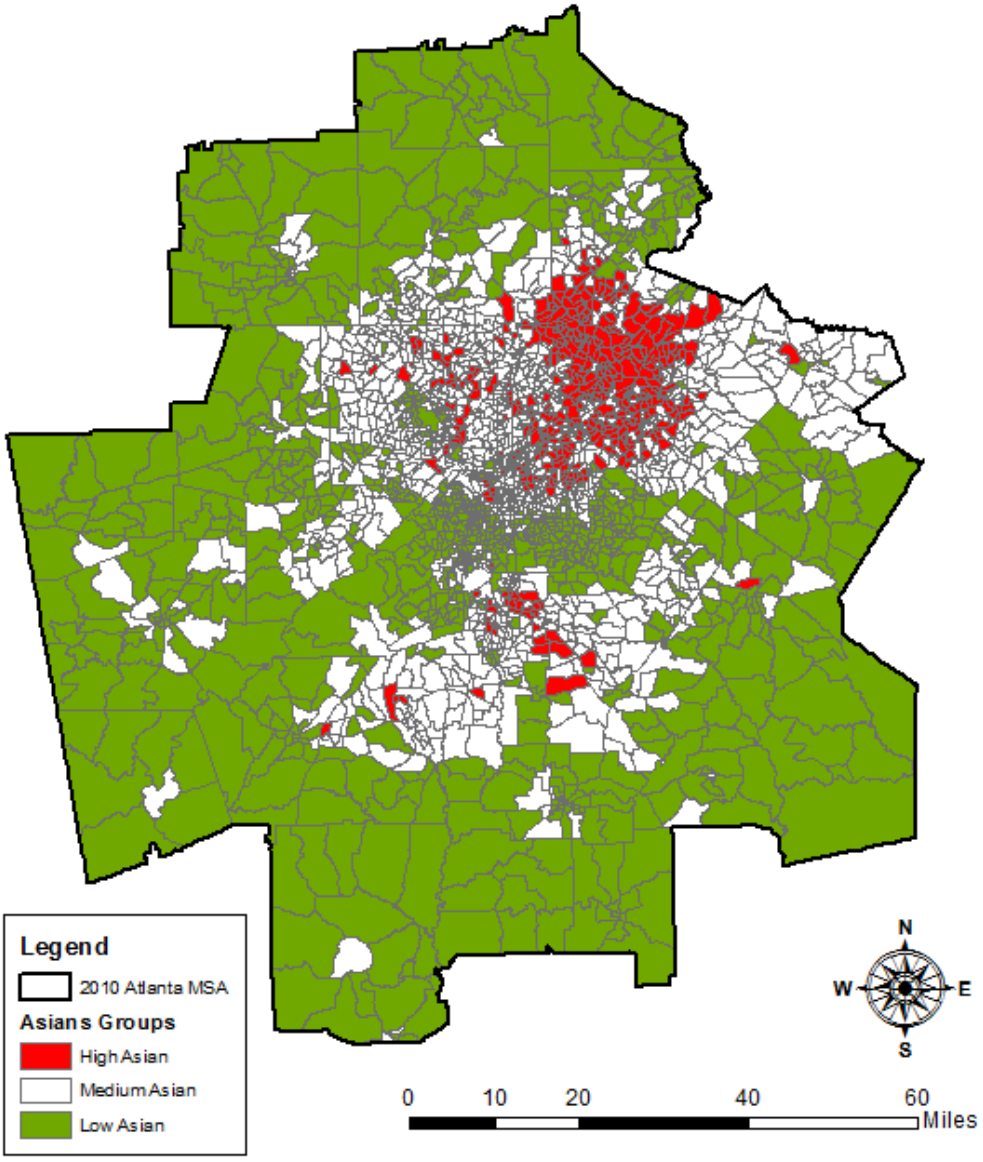


Figure 21 Percent Asian neighborhood groupings

Food access measurements to each type of food store, shown in Figure 20, varied when controlling for the percent Asian population of neighborhoods. The variation between the low and high Asian neighborhood groups was not as severe as the white and black neighborhood

groupings. There appears to be a positive relationship between food access and the proportion of Asian residents per neighborhood. All three groupings have the greatest access to convenience stores, followed by fast food restaurants, supermarkets, and small grocery stores. Neighborhoods in the low Asian group must travel farther to access food stores than neighborhoods in the high Asian group.

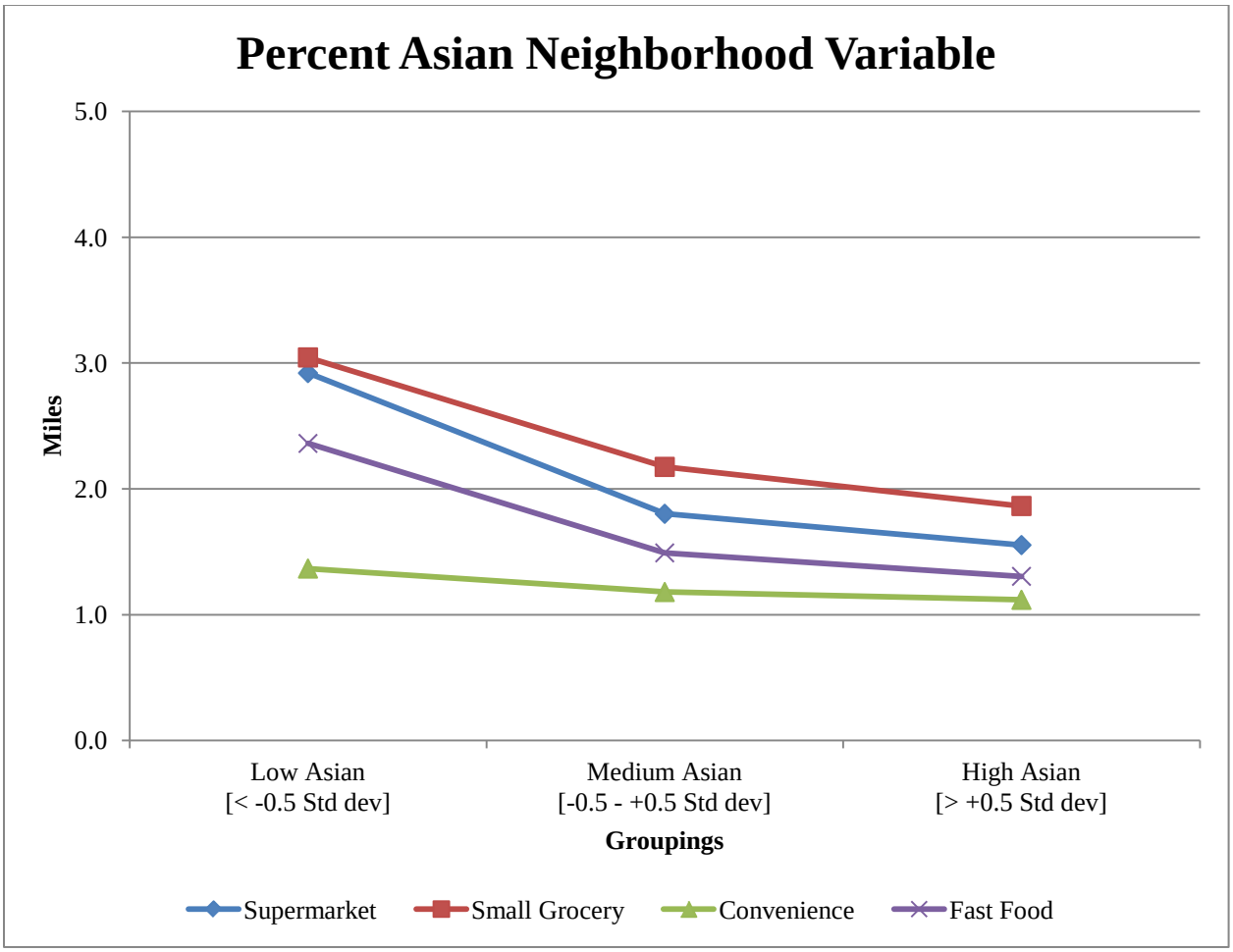


Figure 22 Percent Asian neighborhood food access

4.4.4 Food Store Access: Percent Hispanic Population

The majority of neighborhoods in the Atlanta MSA, shown in Figure 23, fall in medium Hispanic group. These neighborhoods are located in the suburban areas surrounding the city and the rural areas in the northern half of the Atlanta MSA. The majority of high Hispanic neighborhoods are clustered throughout the suburban areas to the northeast, northwest, and south of downtown Atlanta.

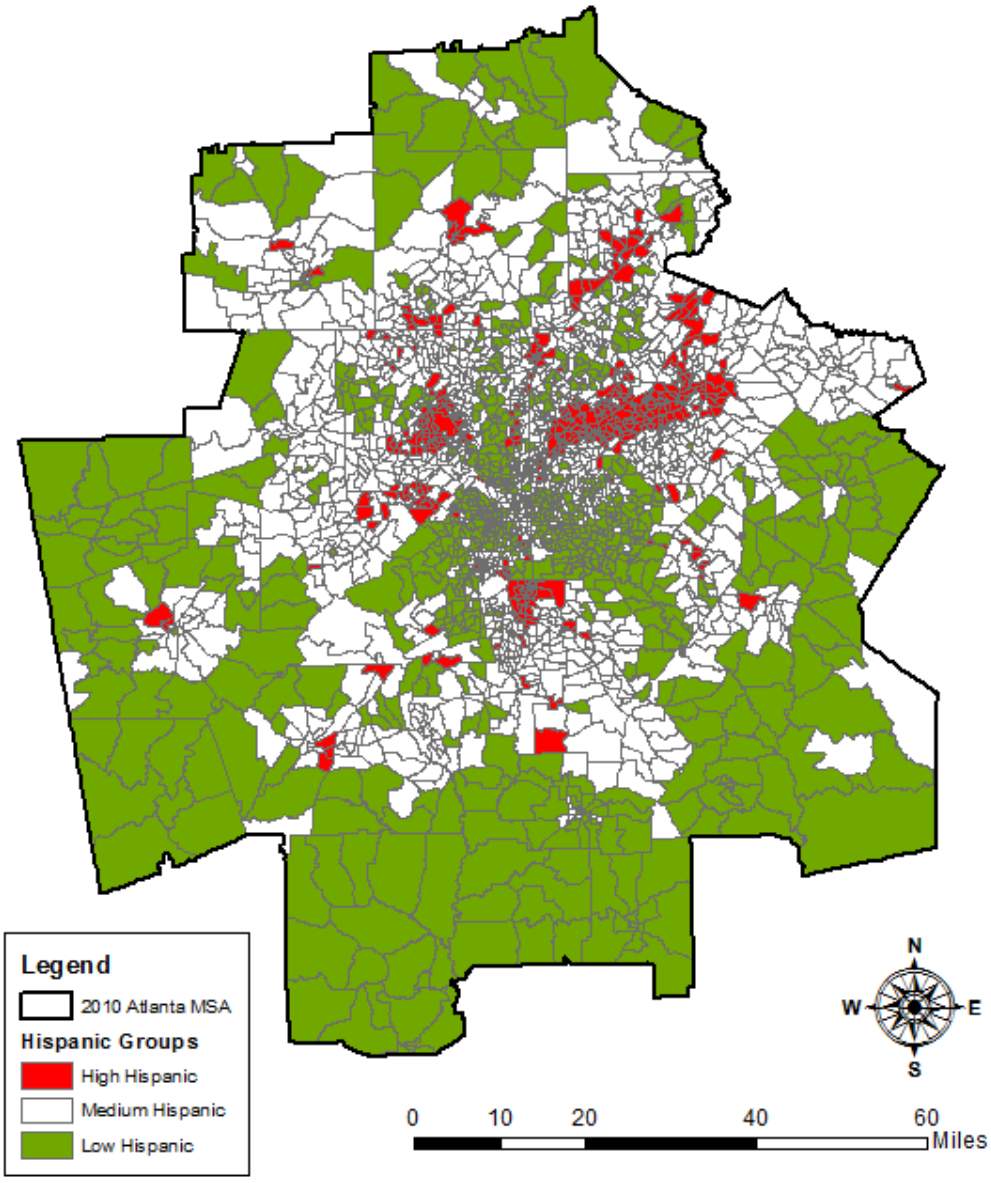


Figure 23 Percent Hispanic neighborhood groupings

Food access measurements to each type of food store, shown in Figure 24, varied when controlling for the percent Hispanic population of neighborhoods. There is a positive relationship between food access and the proportion of Hispanic residents per neighborhood. For all four types of food stores, food access increases with increasing proportion of Hispanic residents. All three groupings have the greatest access to convenience stores, followed by fast food restaurants, supermarkets, and small grocery stores. High Hispanic neighborhoods are the only exception where food access is greater for small grocery stores than supermarkets. Neighborhoods in the low Hispanic group must travel farther to access food stores than neighborhoods in the high Hispanic group.

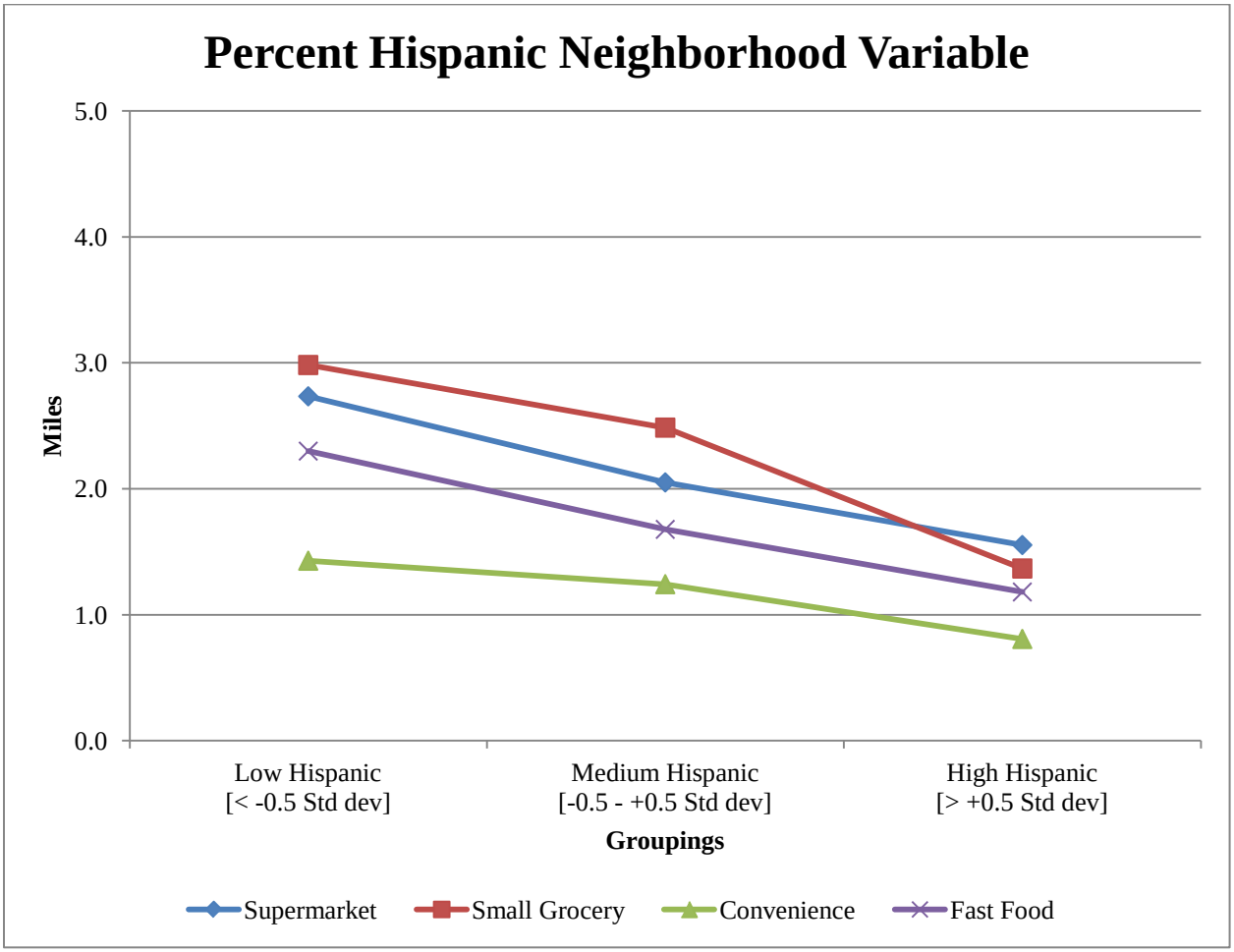


Figure 24 Percent Hispanic neighborhood food access

4.4.5 Food Store Access: Education Levels

The education groupings of Atlanta MSA neighborhoods, shown in Figure 25, exhibit a more dispersed distribution than the variables analyzed thus far in this Chapter. There are several clusters of high and low neighborhood groups throughout the urban, suburban, and rural areas of the MSA. The majority of neighborhoods falls in the medium group and are scattered primarily throughout the suburban and rural areas.

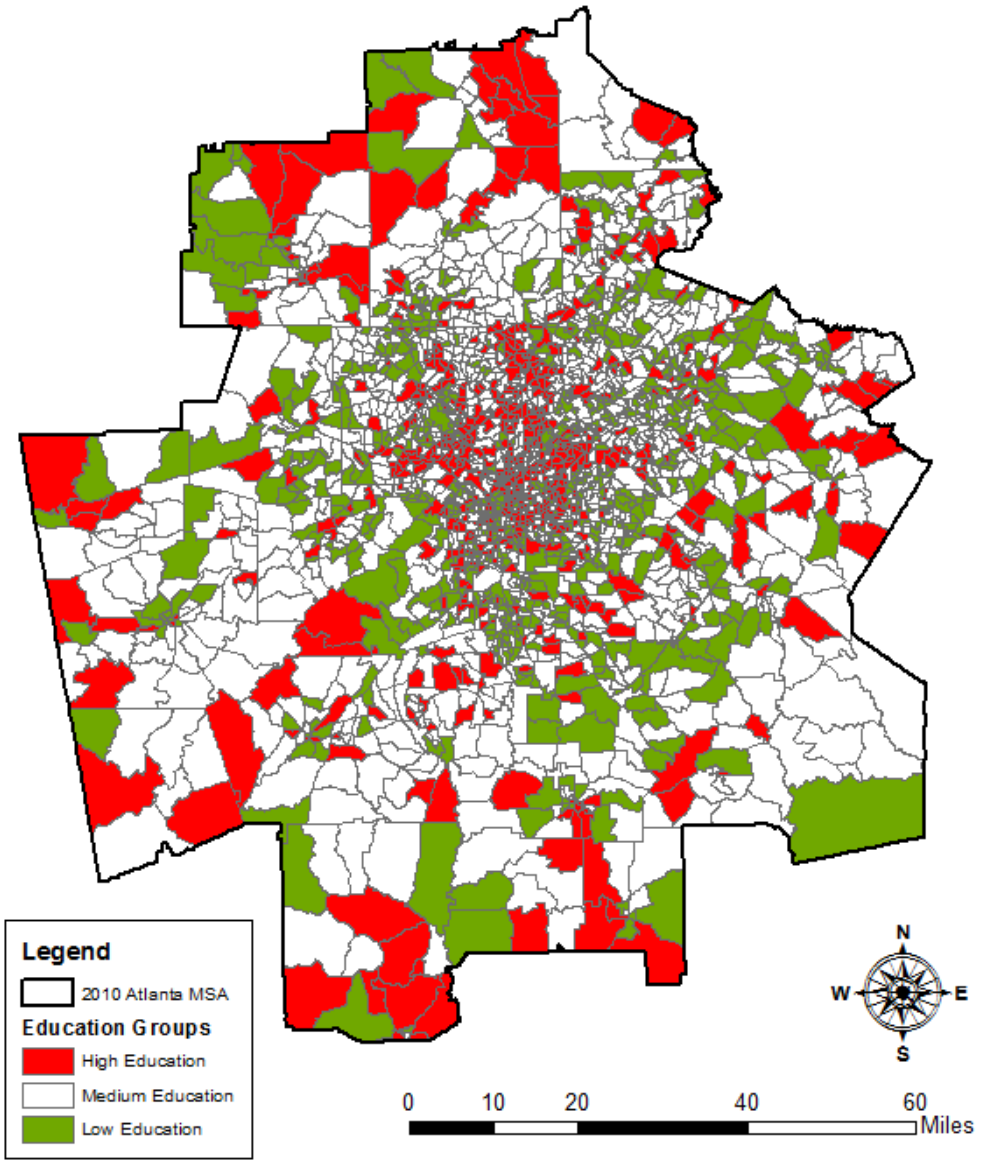


Figure 25 Education level groupings

Food access measurements to each type of food store, shown in Figure 26, varied when controlling for neighborhood percentage of educational attainment through the twelfth grade. Neighborhoods in the low and high education groups had better food access than the medium group. For all four food store types, low and high measurements of food access were very similar to one another, respectively. The most accessible food store type for all three groups is convenience stores, followed by fast food restaurants, supermarkets, and small grocery stores. Thus far this is the first variable that did not have a positive or negative relationship with food access measurements. The medium education group has to travel farther to shop at all the food store types.

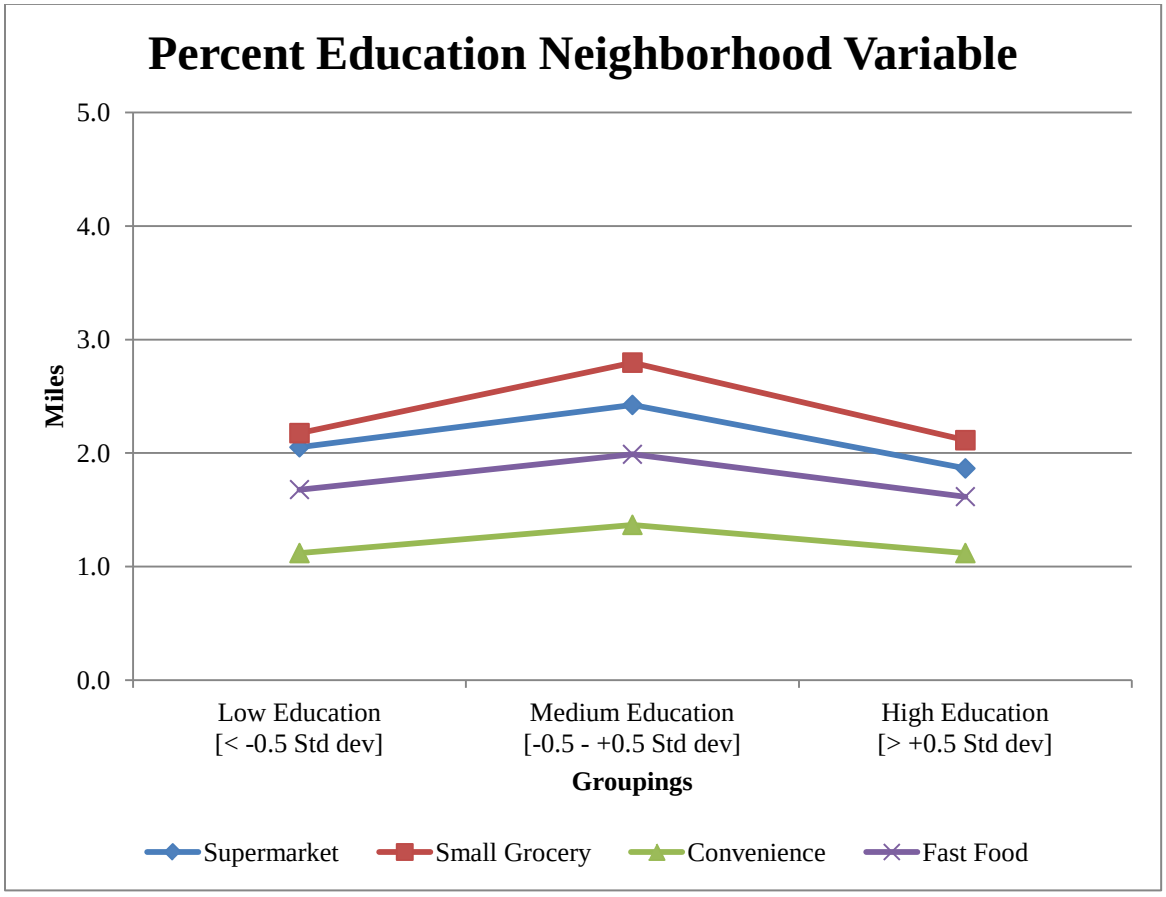


Figure 26 Education level food access

4.4.6 Food Store Access: Income Levels

The neighborhood groupings for the percentage of white residents are the same as Figure 11 and are therefore not shown in this subsection. Food access measurements to each type of food store, shown in Figure 27, varied when controlling for neighborhood household income levels. Small grocery stores, fast food restaurants, and convenience stores exhibit a negative correlation with food access. As neighborhood income levels increase, food access decreases causing resident to have to travel farther to patron food stores. Supermarkets are the only food store that does not exhibit this trend when controlling for income. Residents in the high income group have the greatest food access to supermarkets followed by low, then medium groups. With the exception of supermarkets, neighborhoods in the high income group must travel farther to access food stores than neighborhoods in the low income group.

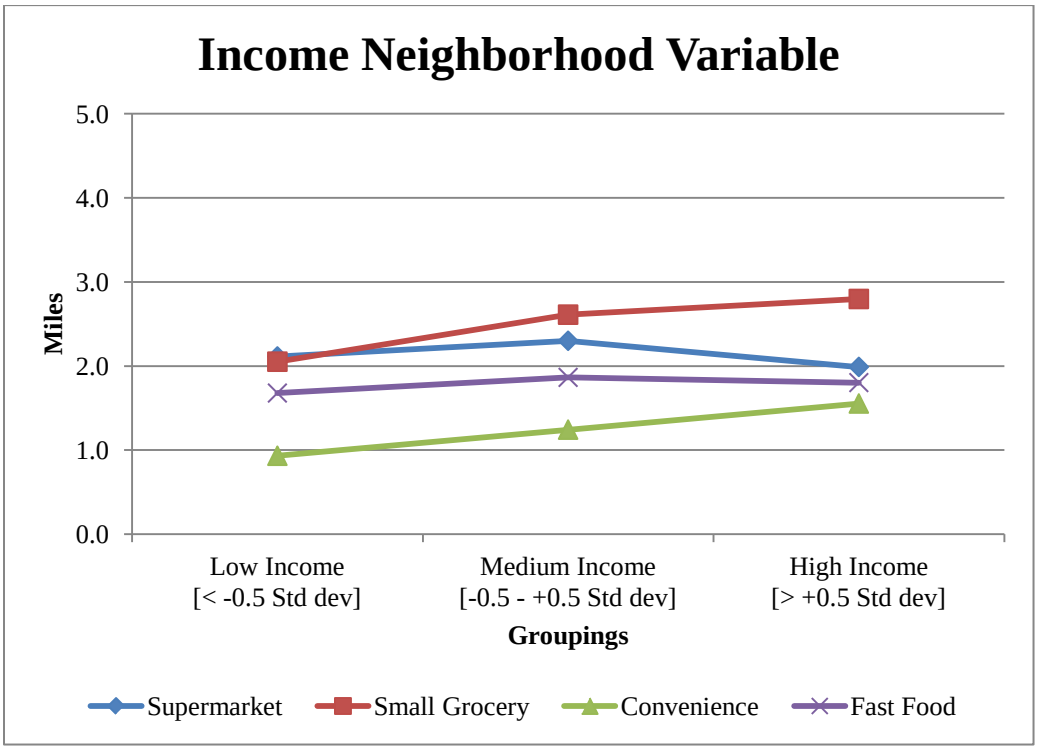


Figure 27 Income level food access

4.4.7 Food Store Access: Household Poverty Levels

The majority of neighborhoods in the Atlanta MSA, shown in Figure 28, fall in low poverty group, followed by medium and high neighborhood groups. The majority of neighborhoods in the low poverty group fall in the suburban region of the Atlanta MSA with some scattered throughout the rural areas along the boundary of the MSA. Neighborhoods in the high poverty group are clustered throughout the downtown Atlanta area and some rural areas. Neighborhoods in the medium group cover a large portion of the rural areas north, west, and south of Atlanta and are also scattered throughout the suburban regions of the city.

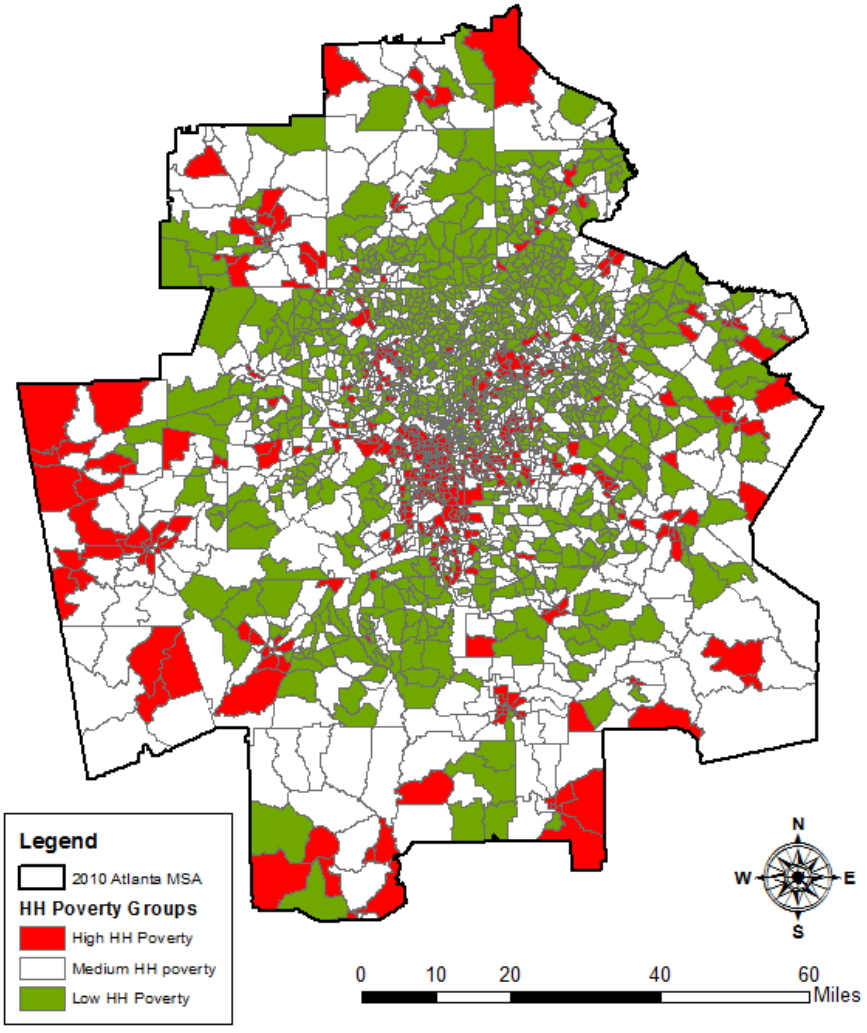


Figure 28 Poverty level groupings

Food access measurements to each type of food store, shown in Figure 29, varied when controlling for the percentage of households in poverty per neighborhood. There is a positive relationship between food access and the percentage of household poverty where as the proportion of respective neighborhood poverty increases, resident have better food access to all four food store types. Regardless of which group neighborhoods fall in, residents generally have the greatest food access to convenience stores, followed by fast food restaurants, supermarkets, and small grocery stores. Neighborhoods in the high poverty group have slightly better access to small grocery stores than supermarkets. Supermarkets also show a slight decrease in food access between low and medium poverty groups whereby both the low and high groups have greater access to supermarkets. Neighborhoods in the low group must travel farther to access food stores than neighborhoods in the high poverty group.

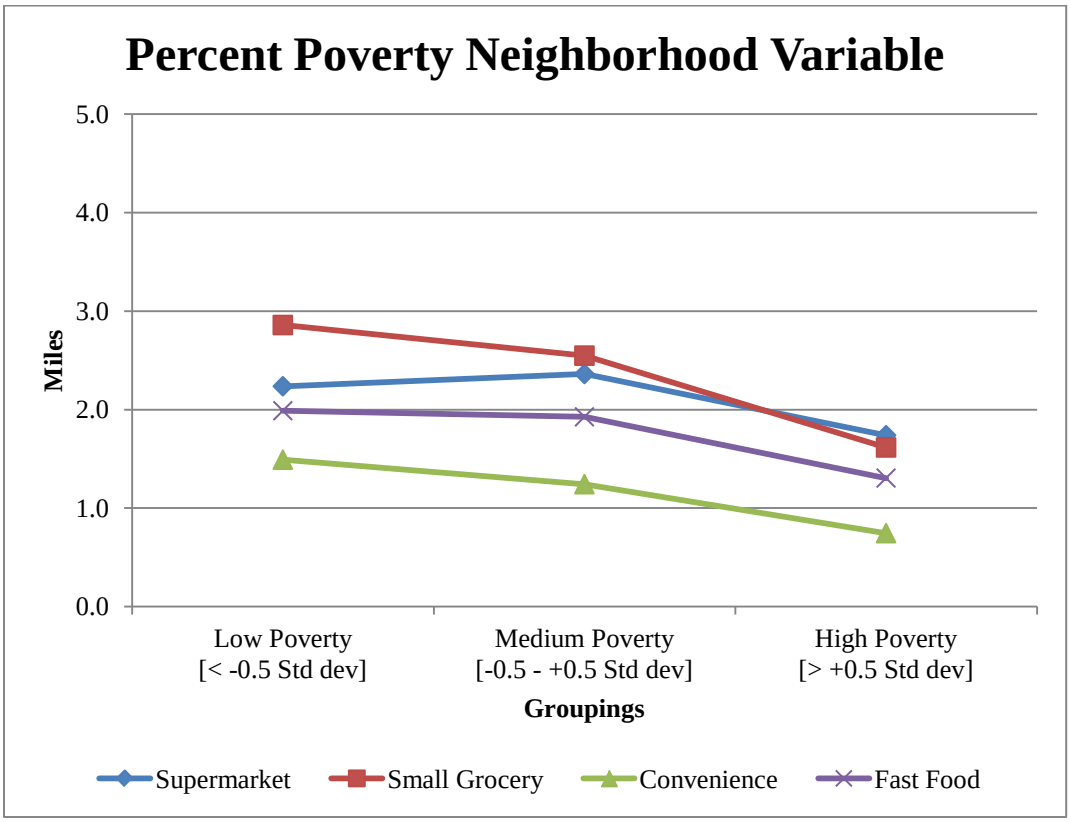


Figure 29 Household poverty level food access

4.4.8 Food Store Access: Population Density Levels

The majority of neighborhoods in the Atlanta MSA, shown in Figure 30, fall in the low population density group. These neighborhoods cover almost all of the rural areas of the MSA. The vast majority of the suburban regions are in the medium group with high density neighborhoods scattered throughout them. There is also a cluster of high population density neighborhoods clustered in the downtown Atlanta area.

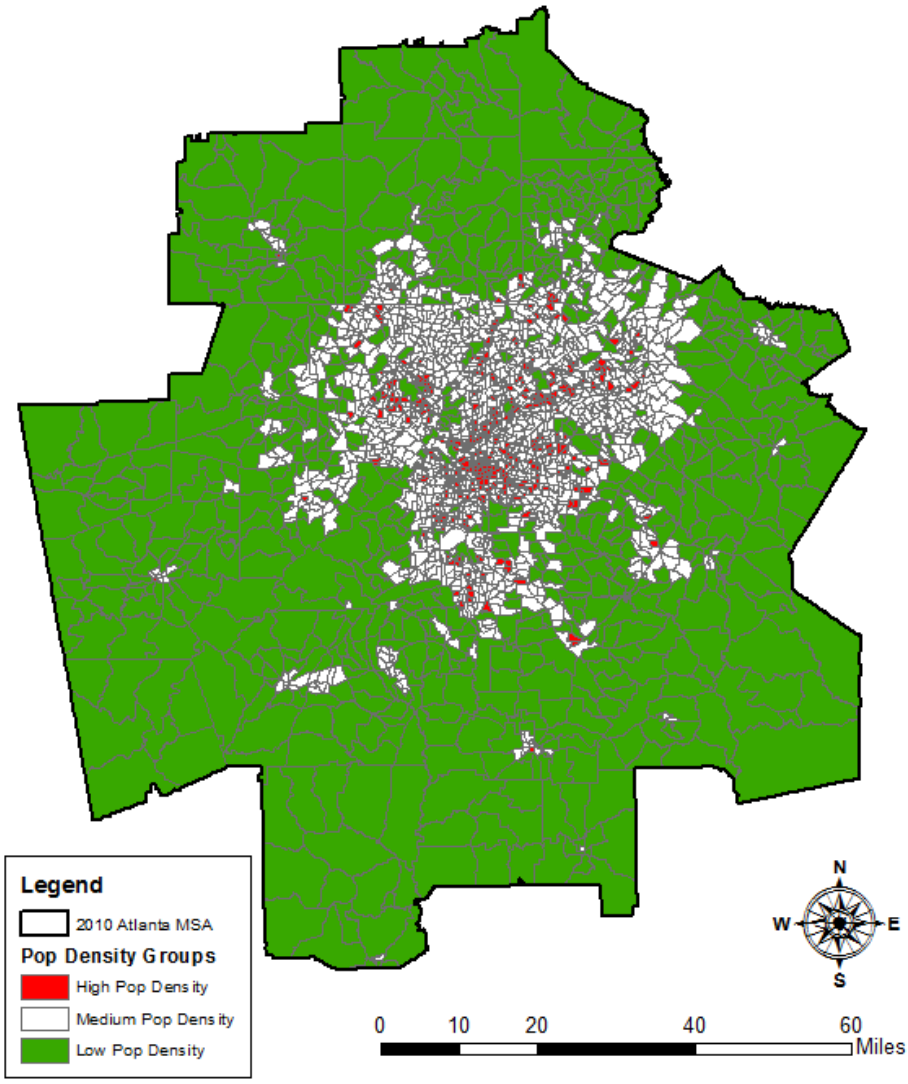


Figure 30 Population density groupings

Food access measurements to each type of food store, shown in Figure 31, varied when controlling for neighborhood population density. There is a positive relationship between neighborhood population density and food access. As population density increases, food access also increases. With one exception, all three groups have the greatest food access to convenience stores, fast food restaurants, supermarkets, and small grocery stores. The high population density group has slightly better access to small grocery stores than supermarkets. Residents living in low population density neighborhood groups have to travel farther to access food stores than residents in high population density neighborhood groups.

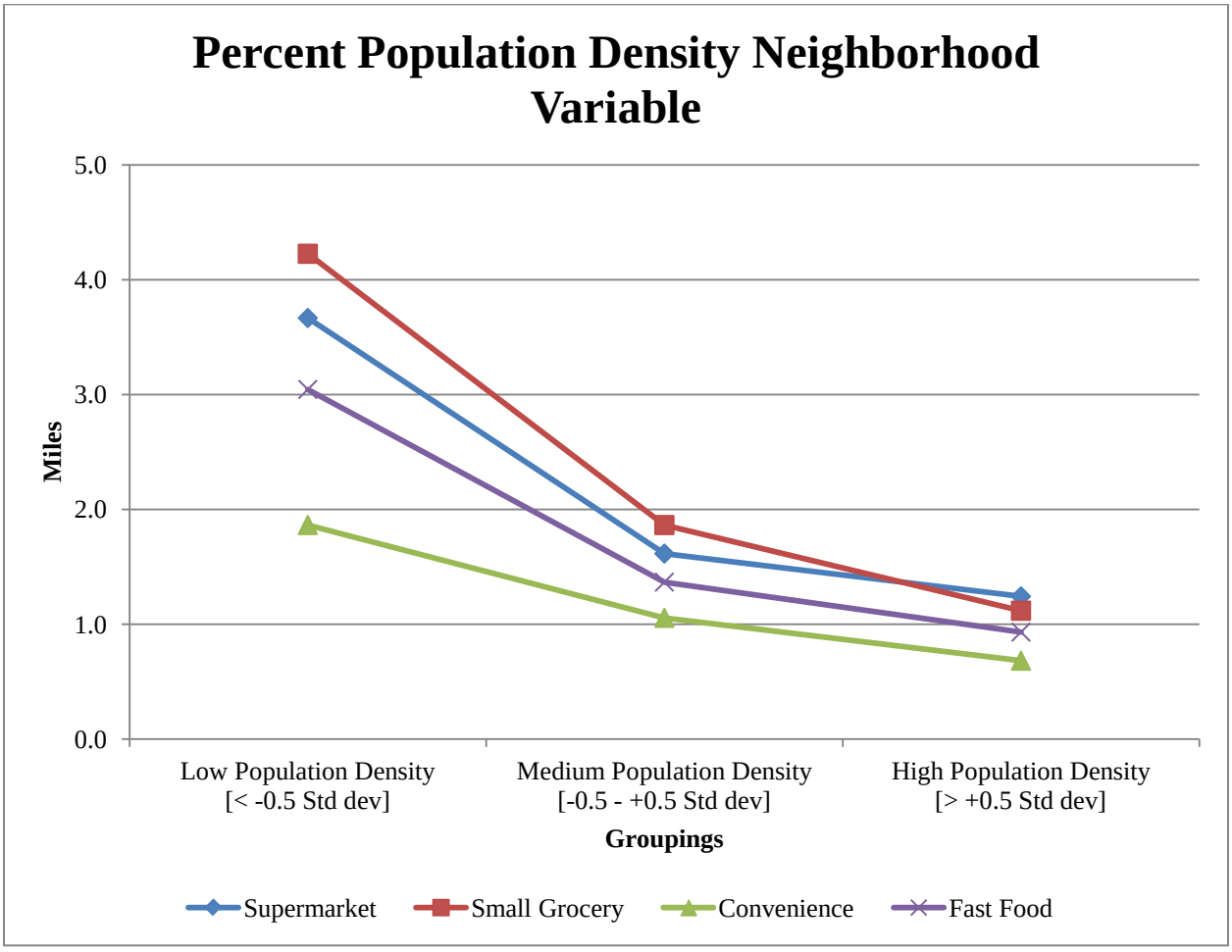


Figure 31 Population density level food access

CHAPTER 5: DISCUSSION AND CONCLUSION

This chapter discusses the key observations this study and their contribution to existing research on food access in the United States. The chapter concludes with a discussion of recommended future research on food access in the Atlanta MSA.

5.1 Summary of Results

The primary analysis of this study, modeled after Sharkey and Horel (2008), measured food access to different types of food stores while controlling for neighborhood socioeconomic and demographic conditions. The secondary analysis measured food access but only controlled for a single neighborhood characteristic per iteration.

There are several conclusions to draw from the primary analysis. Neighborhoods with the overall best food access are low income, high minority neighborhoods. These neighborhoods have to travel the least distance to reach food stores. Neighborhoods with high income levels and low minority composition have worse access to each respective food store than low income, high minority neighborhoods. The most accessible food stores for all neighborhoods, regardless of minority composition and income levels, are convenience stores, followed by fast food, small grocery, and then supermarkets.

High minority neighborhoods with low income exhibited the best food access to all types of food stores. These neighborhoods are located in and around the downtown Atlanta area. Figures 4-7 show that the highest concentrations of food stores are located in these areas. As such, they exhibit better food access than the low minority neighborhoods located primarily throughout the suburban and rural areas of the MSA. As income levels increase, the target neighborhoods move out of the urban areas and into more suburban and rural regions; therefore, as income increases, food access decreases.

Neighborhoods of predominately white residents and low income levels exhibit the worst food access to all types of food stores. Food access improves in white neighborhoods as income rises. This trend is likely caused by the shift from rural to suburban neighborhoods. Neighborhoods of low income and low minority composition are heavily located in the rural area along the MSA boundary. Low minority neighborhoods primarily make up the majority of wealthy suburbs north of downtown Atlanta. As income levels improve for low minority neighborhoods, the subject neighborhoods shift from rural to suburban areas where there is a significantly higher concentration of all four food store types.

The results of neighborhood food access, when controlling for respective race (white, black, Hispanic, and Asian) showed consistent results. As the percentage of blacks, Hispanics, and Asians increased in neighborhoods, food access to all types of food stores was improved. Higher minority neighborhoods had to travel significantly less distance than neighborhoods of lower percent minority. Similarly, neighborhoods with a low percentage of white residents had better food access than high percent white neighborhoods. With the exception of percent white, the variance in food access between each respective race for low, medium, and high percentages was relatively low. Minority neighborhoods, regardless of minority type, all exhibited similar food access to each food store type. This demonstrates that when analyzing food access in the Atlanta MSA, there is a significant difference between white neighborhoods and minority neighborhoods.

The results of neighborhood food access analyses for the other variables (population density, household poverty, income, and education) were less correlated with each other. The greatest relative change for these variables was exhibited in the population density analysis. Residents in neighborhoods of higher population density have to travel less distance to access all

food store types than lower population density neighborhoods. Given the distribution of all the food store types, shown in Figures 4-7, this is not an entirely unexpected conclusion. The majority of each type of food store is located in either the urban or suburban neighborhoods, both of which exhibit higher population densities than rural neighborhoods.

Neighborhood income and education levels did not show a large variance in food access from low to high groupings. The percentage of households living in poverty showed greater variance. Neighborhoods with a higher percentage of households in poverty have better food access than low poverty neighborhoods. Similar to the population density analysis, high poverty neighborhoods are located primarily in the urban region of the MSA where the concentration of food businesses is greatest.

5.2 Significance of Findings

A primary conclusion of this study is that food access in the Atlanta MSA is highest among high minority and low income neighborhoods. The results are in line with a primary conclusion of Sharkey and Horel 2008, that the neighborhoods with high socioeconomic deprivation have the best food access to all types of food stores. This may speak more broadly to the differences in food access between urban and rural areas. Figures 28 and 29, focusing on food access and population density, describe significant variations in food access based on the urban and rural divide. Urban neighborhoods exhibit greater food access to all types of food stores than rural neighborhoods in the Atlanta MSA. This is consistent with several nationwide food access studies conducted in the US (Morris et al. 1990; Powell et al. 2007).

A regression model was designed to investigate if measurements of neighborhood food access are correlated with neighborhood characteristics. However, the models did not meet the criteria to be considered a valid result. This is not surprising given that the majority of the

explanatory variables, particularly those dealing with race, were non-normally distributed throughout the study area. The non-normally distributed neighborhood racial data points to a high level of segregation in the Atlanta MSA. Neighborhoods either have a high or low concentration of a particular race. Few neighborhoods contain a reasonable mix of multiple races (see Appendix A). It is possible that increasing the size of neighborhoods from CBG to census tracts could smooth the data to an appropriate level. Another approach would be to adjust the geographic extent covered in each regression model. Decreasing the extent might increase the uniformity of each area and thus increase the normality of the demographic variables.

While the secondary analysis does provide a greater understanding of the food access patterns facing Atlanta MSA residents, the lack of a regression analysis inhibits the ability of this study to draw more intricate conclusions about the variables impacting the food access measurements. For example, the secondary analysis of neighborhood income levels, shown in Figure 22, shows little variance from low to high groupings. However, when income and minority are controlled in the same analysis, shown in Figure 12 for supermarkets, the results are significantly more insightful. This points to the limitation of using food access to define the food environment.

5.3 Future Research

The results of this study highlight some limitations of investigating the food environment through food access only. The primary result of the study (food access is best in highly deprived, minority neighborhoods) does not necessarily portray the realities of the food environment in the 28-county Atlanta MSA. Neighborhood type (urban, rural, or suburban) has a significant impact on the food access measurements. Grouping both urban and rural neighborhoods contributed to descriptive statistics that mask disparities in food access. For

example, the results show that low income neighborhoods have excellent food access measurements. However, disparities in food access between rural, urban, and suburban neighborhoods are significant and not reflected in the results. Future studies should control for urban, rural, and suburban neighborhood types to investigate how they shape food accessibility in the Atlanta MSA.

The results of this study also highlight the limitations of using food access measurements to describe the local food environment. Deprived neighborhoods in the Atlanta MSA, primarily in the urban Atlanta city center, showed favorable food access measurements despite the troubling signs of neighborhood deprivation. Other approaches that consider more social, business, and environmental conditions that shape food consumption habits, such as foodscapes, may be more appropriate for investigating and defining an urban food environment.

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APPENDIX A: NEIGHBORHOOD DATA HISTOGRAMS

Figure 33: Percent white histogram

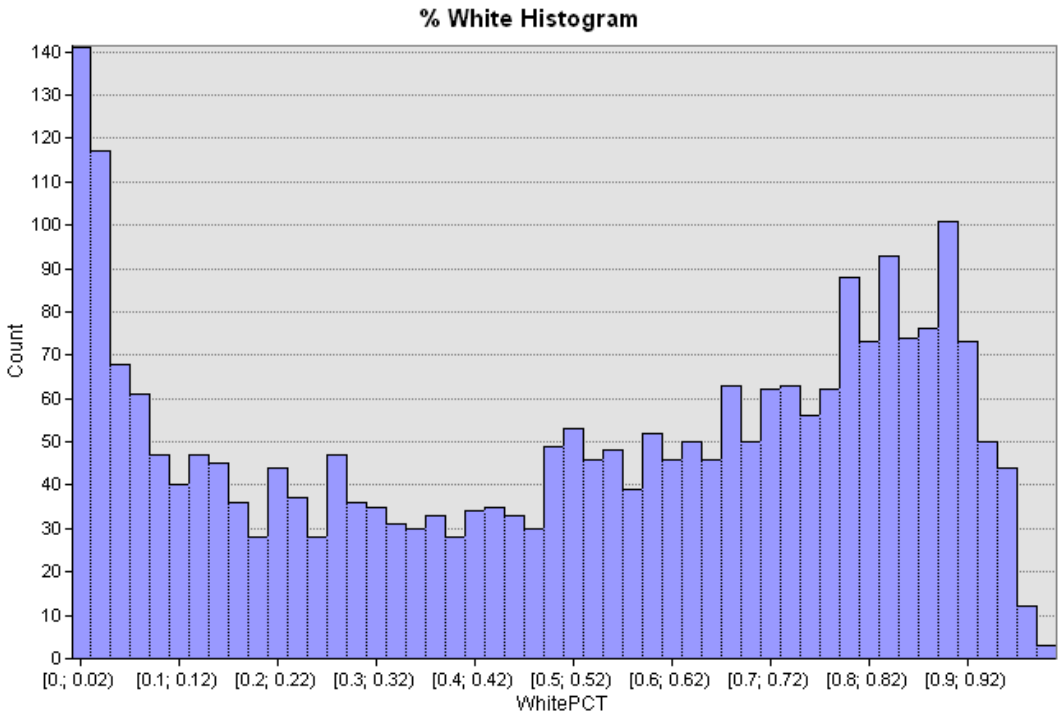


Figure 34: Percent black histogram

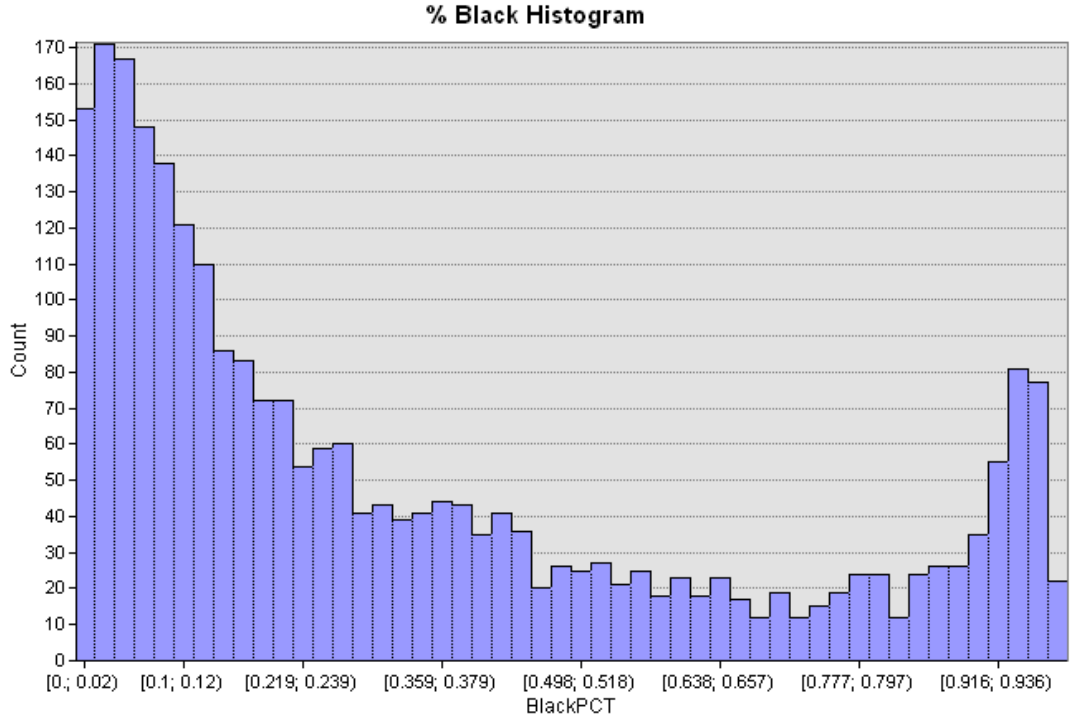


Figure 35: Percent Asian histogram

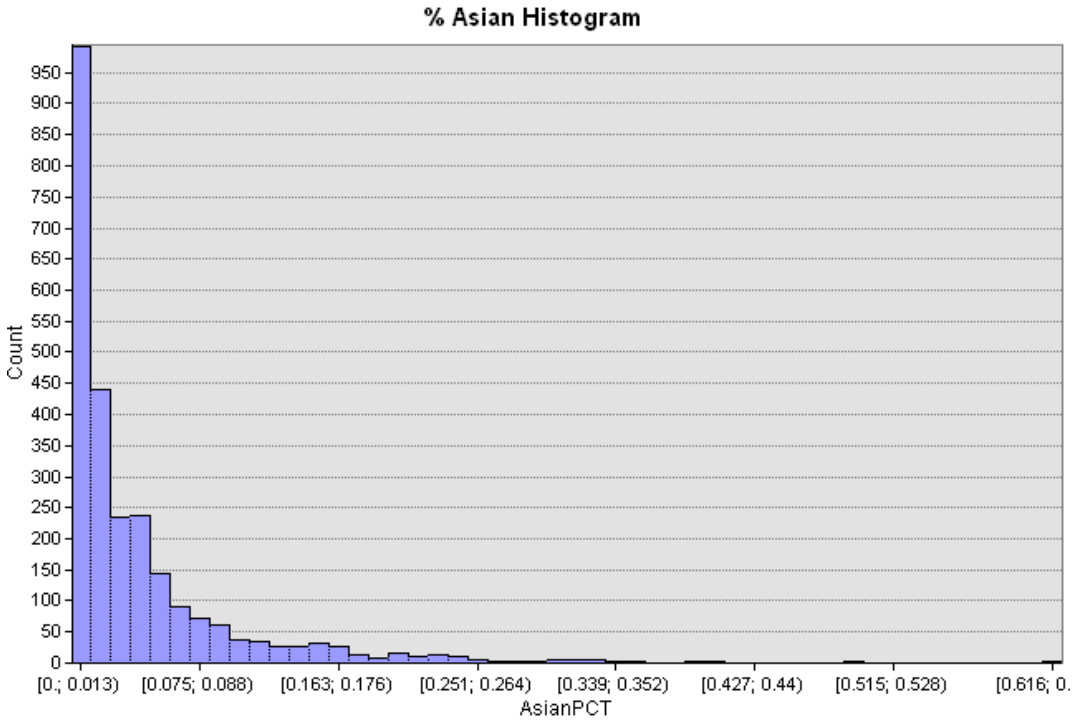


Figure 36: Percent Hispanic histogram

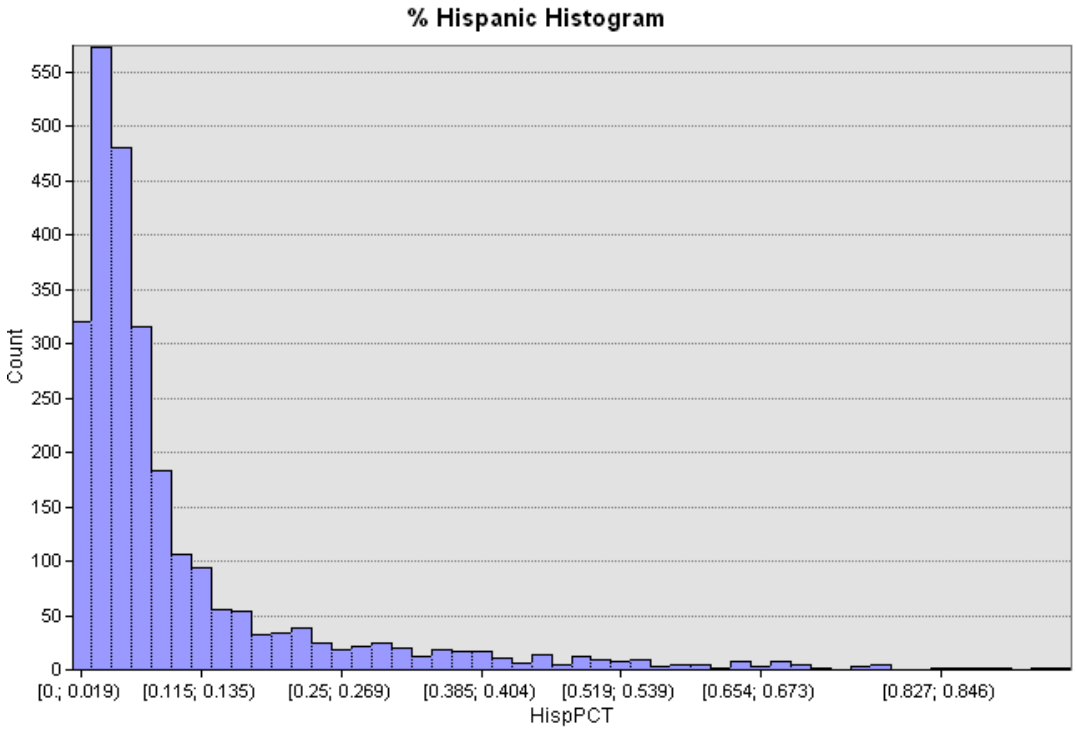


Figure 37: Education attainment histogram

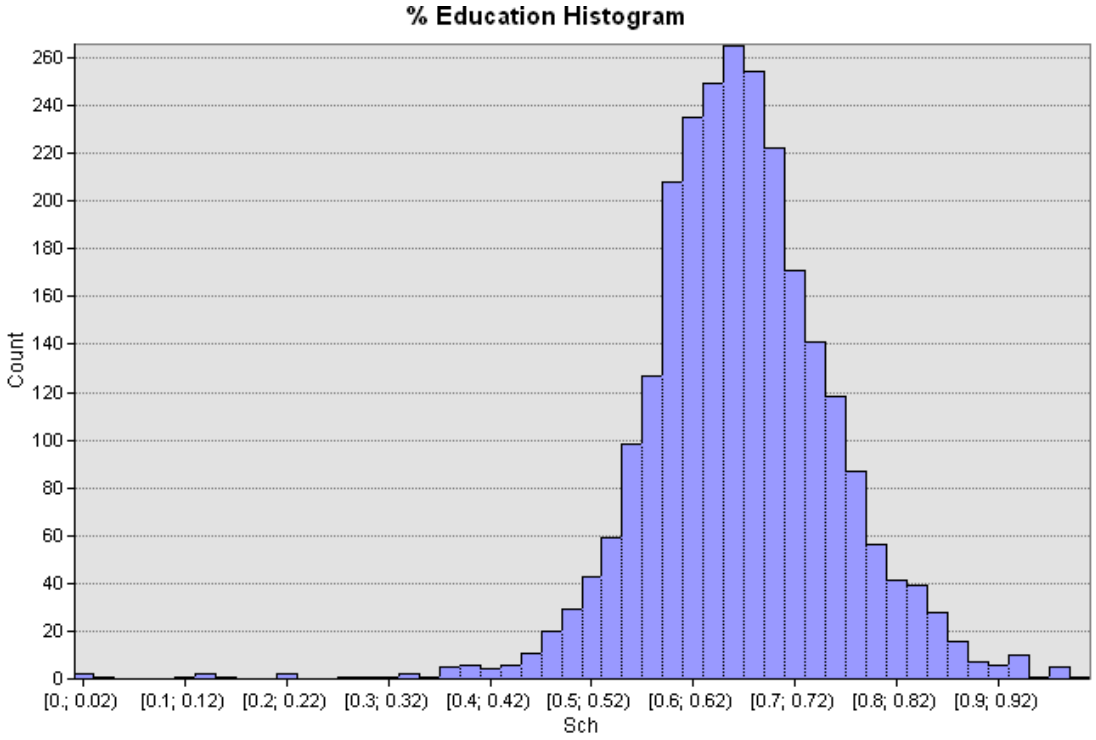


Figure 38: Median household income histogram

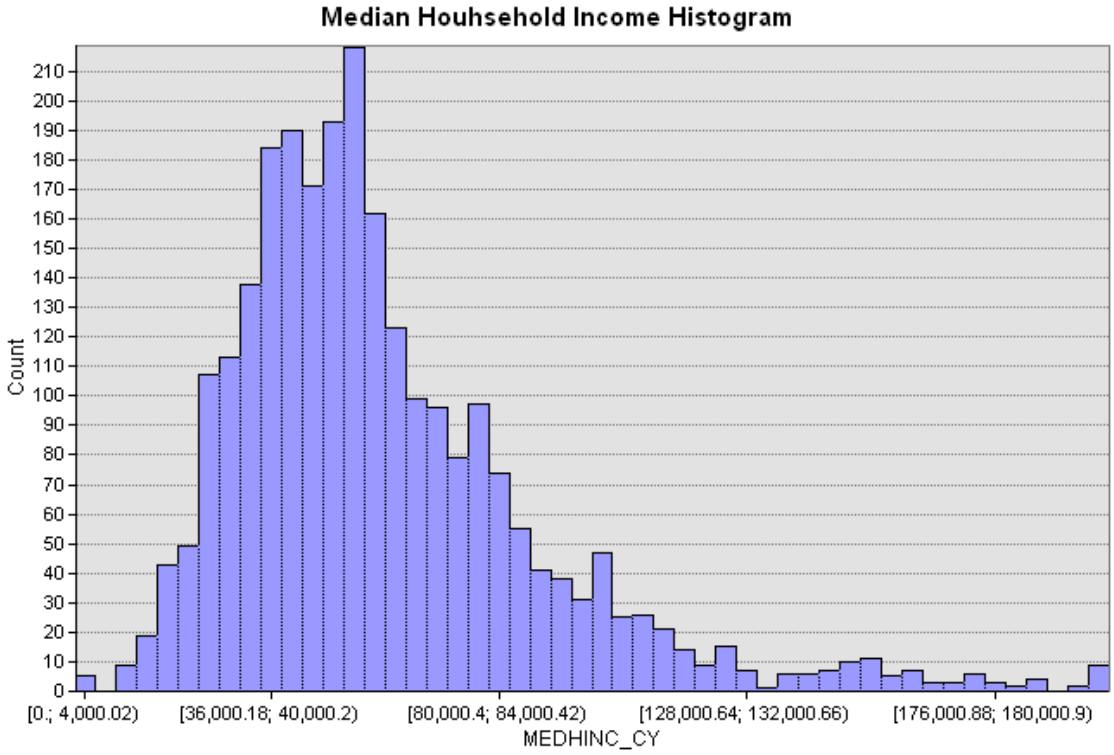


Figure 39: % household below poverty histogram

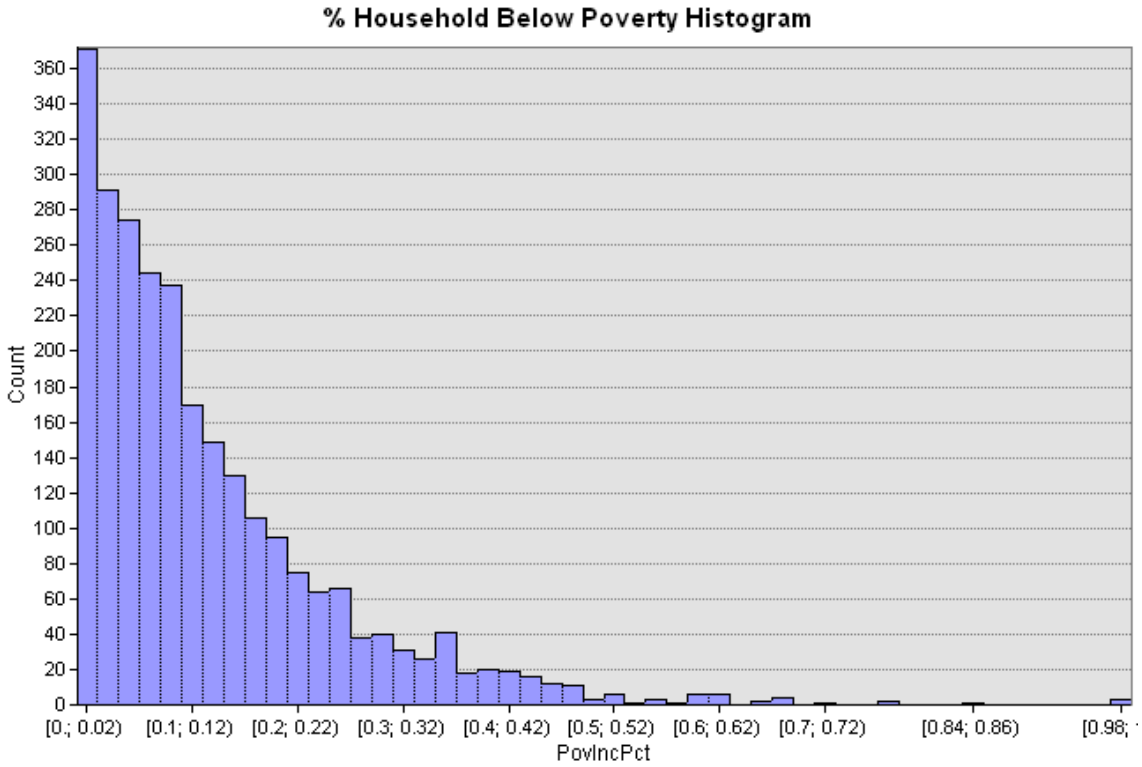
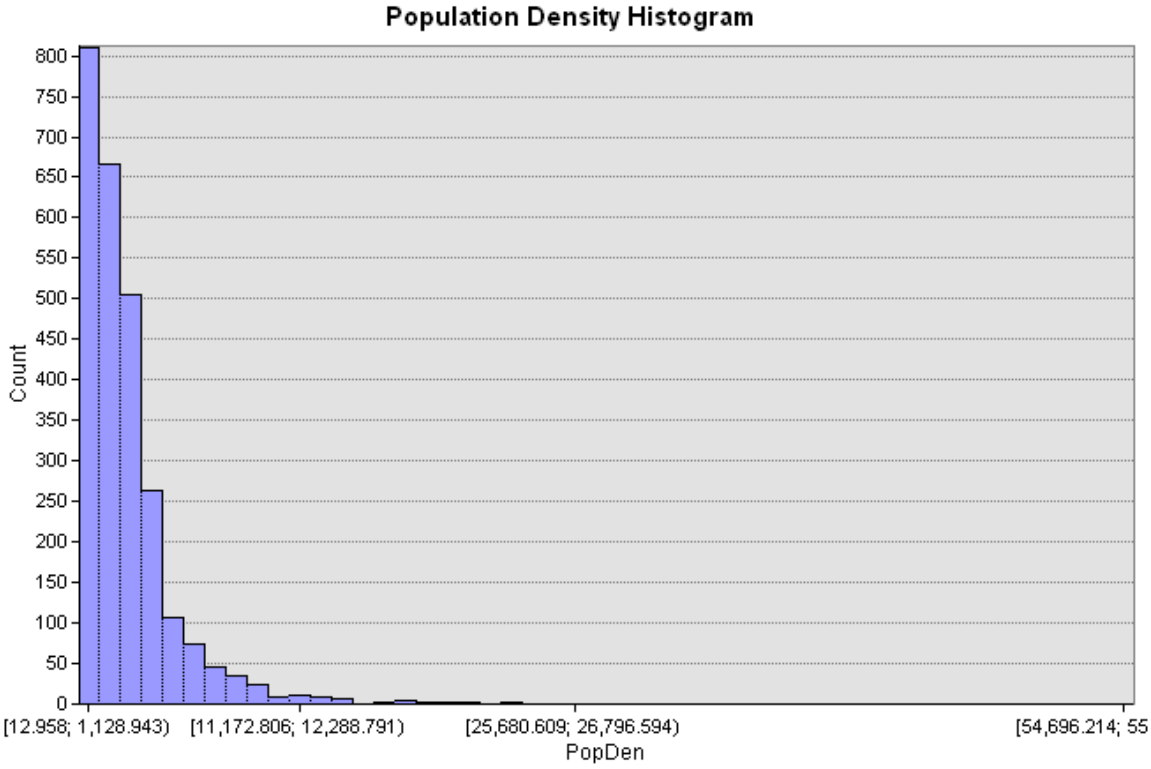


Figure 40: Population density histogram



APPENDIX B: EXPLORATORY REGRESSION REPORT AND TABLE RESULTS

Figure 41: OLS Report Result for Supermarkets

```
********************************************************************************
Choose 1 of 7 Summary
     Highest Adjusted R-Squared Results
AdjR2     AICc   JB K(BP)  VIF   SA   Model
 0.12 10093.69 0.00  0.03 1.00 0.00  -POPDEN***
 0.09 10167.91 0.00  0.00 1.00 0.00  +WHITEPCT***
 0.04 10324.43 0.00  0.00 1.00 0.00  -ASIANPCT***
       Passing Models
AdjR2 AICc JB K(BP) VIF SA   Model
********************************************************************************
Choose 2 of 7 Summary
          Highest Adjusted R-Squared Results
AdjR2     AICc   JB K(BP)  VIF   SA   Model
 0.16  9966.02 0.00  0.00 1.12 0.00  +WHITEPCT***  -POPDEN***
 0.14 10030.07 0.00  0.00 1.02 0.00  -ASIANPCT***  -POPDEN***
 0.14 10045.81 0.00  0.00 1.03 0.00  -BLACKPCT***  -POPDEN***
       Passing Models
AdjR2 AICc JB K(BP) VIF SA   Model
********************************************************************************
Choose 3 of 7 Summary
               Highest Adjusted R-Squared Results
AdjR2    AICc   JB K(BP)  VIF   SA   Model
 0.20 9854.64 0.00  0.00 1.40 0.00  -MEDHINC_CY***  +WHITEPCT***  -POPDEN***
 0.19 9894.59 0.00  0.00 1.14 0.00  +WHITEPCT***  -ASIANPCT***  -POPDEN***
 0.17 9930.57 0.00  0.00 4.87 0.00  +WHITEPCT***  +BLACKPCT***  -POPDEN***
       Passing Models
AdjR2 AICc JB K(BP) VIF SA   Model
********************************************************************************
Choose 4 of 7 Summary
                     Highest Adjusted R-Squared Results
AdjR2    AICc   JB K(BP)  VIF   SA   Model
 0.21 9818.50 0.00  0.00 1.49 0.00  -MEDHINC_CY***  +WHITEPCT***  -POPDEN***  -SCH***
 0.21 9826.33 0.00  0.00 1.43 0.00  -MEDHINC_CY***  +WHITEPCT***  -ASIANPCT***  -POPDEN***
 0.21 9830.14 0.00  0.00 4.98 0.00  -MEDHINC_CY***  +WHITEPCT***  +BLACKPCT***  -POPDEN***
       Passing Models
AdjR2 AICc JB K(BP) VIF SA   Model
********************************************************************************
Choose 5 of 7 Summary
                          Highest Adjusted R-Squared Results
AdjR2    AICc   JB K(BP)  VIF   SA   Model
 0.22 9787.13 0.00  0.00 5.21 0.00  -MEDHINC_CY***  +WHITEPCT***  +BLACKPCT***  -POPDEN***  -SCH***
 0.22 9790.85 0.00  0.00 1.52 0.00  -MEDHINC_CY***  +WHITEPCT***  -ASIANPCT***  -POPDEN***  -SCH***
 0.21 9807.98 0.00  0.00 1.53 0.00  -MEDHINC_CY***  +WHITEPCT***  -HISPPCT***  -POPDEN***  -SCH***
       Passing Models
AdjR2 AICc JB K(BP) VIF SA   Model
********************************************************************************
************* Exploratory Regression Global Summary (SPMKDISTMI) *************

              Percentage of Search Criteria Passed
                   Search Criterion Cutoff Trials # Passed % Passed
            Min Adjusted R-Squared > 0.50    115        0      0.00
           Max Coefficient p-value < 0.05    115      107     93.04
                    Max VIF Value < 7.50    115      108     93.91
           Min Jarque-Bera p-value > 0.10    115        0      0.00
Min Spatial Autocorrelation p-value > 0.10     17        0      0.00

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      Summary of Variable Significance
Variable   % Significant % Negative % Positive
WHITEPCT          100.00       0.00     100.00
BLACKPCT          100.00      58.49      41.51
ASIANPCT          100.00     100.00       0.00
POPDEN            100.00     100.00       0.00
HISPPCT            98.11      86.79      13.21
MEDHINC_CY         92.86      96.43       3.57
SCH                92.86     100.00       0.00

--------------------------------------------------------------------------------

      Summary of Multicollinearity*
Variable     VIF Violations Covariates
MEDHINC_CY  1.45      0       --------
WHITEPCT   23.14      7       BLACKPCT (25.93)
BLACKPCT   22.44      7       WHITEPCT (25.93)
ASIANPCT    1.64      0       --------
HISPPCT     5.74      0       --------
POPDEN      1.19      0       --------
SCH         1.09      0       --------
* At least one model failed to solve due to perfect multicollinearity.
Please review the warning messages for further information.
--------------------------------------------------------------------------------

                Summary of Residual Normality (JB)
      JB    AdjR2         AICc     K(BP)      VIF       SA   Model
0.000000 0.034275 10334.851366 0.000000 1.000000 0.000000  -BLACKPCT***
0.000000 0.094717 10167.906953 0.000000 1.000000 0.000000  +WHITEPCT***
0.000000 0.000113 10424.643661 0.000000 1.000000 0.000000  -MEDHINC_CY

--------------------------------------------------------------------------------

         Summary of Residual Spatial Autocorrelation (SA)
      SA    AdjR2         AICc       JB    K(BP)      VIF   Model
0.000000 0.034275 10334.851366 0.000000 0.000000 1.000000  -BLACKPCT***
0.000000 0.038162 10324.432485 0.000000 0.000000 1.000000  -ASIANPCT***
0.000000 0.120359 10093.686598 0.000000 0.025455 1.000000  -POPDEN***

--------------------------------------------------------------------------------
```

Table 9: OLS Table Result for Supermarkets

AdjR2	AICc	JB	K_BP	MVIF	SA	X1	X2	X3	X4	X5
0.220	9787	0.0000	0.0000	5.2	0.0000	MEDHINC_CY	WHITEPCT	BLACKPCT	POPDEN	SCH
0.219	9791	0.0000	0.0000	1.5	0.0000	MEDHINC_CY	WHITEPCT	ASIANPCT	POPDEN	SCH
0.214	9808	0.0000	0.0000	1.5	0.0000	MEDHINC_CY	WHITEPCT	HISPPCT	POPDEN	SCH
0.210	9819	0.0000	0.0000	1.5	0.0000	MEDHINC_CY	WHITEPCT	POPDEN	SCH	
0.209	9822	0.0000	0.0000	7.0		MEDHINC_CY	WHITEPCT	BLACKPCT	ASIANPCT	POPDEN
0.209	9824	0.0000	0.0000	1.5		MEDHINC_CY	WHITEPCT	ASIANPCT	HISPPCT	POPDEN
0.208	9826	0.0000	0.0000	1.4	0.0000	MEDHINC_CY	WHITEPCT	ASIANPCT	POPDEN	
0.207	9829	0.0000	0.0000	1.4		MEDHINC_CY	BLACKPCT	ASIANPCT	HISPPCT	POPDEN
0.207	9830	0.0000	0.0000	5.0	0.0000	MEDHINC_CY	WHITEPCT	BLACKPCT	POPDEN	
0.201	9849	0.0000	0.0000	1.4		MEDHINC_CY	WHITEPCT	HISPPCT	POPDEN	
0.199	9855	0.0000	0.0000	1.4	0.0000	MEDHINC_CY	WHITEPCT	POPDEN		
0.197	9861	0.0000	0.0000	6.7		WHITEPCT	BLACKPCT	ASIANPCT	POPDEN	SCH
0.197	9863	0.0000	0.0000	1.2		WHITEPCT	ASIANPCT	HISPPCT	POPDEN	SCH
0.196	9865	0.0000	0.0000	1.2		WHITEPCT	ASIANPCT	POPDEN	SCH	
0.196	9866	0.0000	0.0000	1.2		BLACKPCT	ASIANPCT	HISPPCT	POPDEN	SCH
0.196	9867	0.0000	0.0000	1.5		MEDHINC_CY	BLACKPCT	HISPPCT	POPDEN	SCH
0.191	9881	0.0000	0.0000	1.4		MEDHINC_CY	BLACKPCT	ASIANPCT	POPDEN	SCH
0.187	9894	0.0000	0.0000	6.4		WHITEPCT	BLACKPCT	ASIANPCT	POPDEN	
0.187	9894	0.0000	0.0000	5.1		WHITEPCT	BLACKPCT	POPDEN	SCH	
0.186	9895	0.0000	0.0000	1.1	0.0000	WHITEPCT	ASIANPCT	POPDEN		
0.186	9897	0.0000	0.0000	1.3		MEDHINC_CY	BLACKPCT	ASIANPCT	POPDEN	
0.186	9898	0.0000	0.0000	1.2		BLACKPCT	ASIANPCT	HISPPCT	POPDEN	
0.184	9901	0.0000	0.0000	1.4		MEDHINC_CY	BLACKPCT	HISPPCT	POPDEN	
0.179	9918	0.0000	0.0000	1.2		BLACKPCT	ASIANPCT	POPDEN	SCH	
0.175	9931	0.0000	0.0000	1.2		WHITEPCT	HISPPCT	POPDEN	SCH	
0.175	9931	0.0000	0.0000	4.9	0.0000	WHITEPCT	BLACKPCT	POPDEN		
0.174	9934	0.0000	0.0000	1.1		BLACKPCT	ASIANPCT	POPDEN		
0.173	9937	0.0000	0.0000	1.2		WHITEPCT	POPDEN	SCH		
0.171	9943	0.0000	0.0000	6.7		MEDHINC_CY	WHITEPCT	BLACKPCT	ASIANPCT	SCH
0.170	9949	0.0000	0.0000	1.5		MEDHINC_CY	WHITEPCT	ASIANPCT	HISPPCT	SCH
0.169	9949	0.0000	0.0000	4.5		MEDHINC_CY	WHITEPCT	BLACKPCT	SCH	
0.167	9957	0.0000	0.0000	1.4		MEDHINC_CY	BLACKPCT	ASIANPCT	HISPPCT	SCH
0.164	9963	0.0000	0.0000	1.2		WHITEPCT	HISPPCT	POPDEN		
0.163	9966	0.0000	0.0000	1.1	0.0000	WHITEPCT	POPDEN			
0.163	9969	0.0000	0.0000	1.3		MEDHINC_CY	BLACKPCT	POPDEN	SCH	
0.160	9976	0.0000	0.0000	1.4		MEDHINC_CY	WHITEPCT	ASIANPCT	SCH	
0.158	9981	0.0000	0.0000	1.3		MEDHINC_CY	BLACKPCT	POPDEN		
0.158	9982	0.0000	0.0000	1.2		BLACKPCT	HISPPCT	POPDEN	SCH	
0.156	9989	0.0000	0.0000	1.4		MEDHINC_CY	WHITEPCT	HISPPCT	SCH	

0.156	9989	0.0000	0.0000	6.4		MEDHINC_CY	WHITEPCT	BLACKPCT	ASIANPCT	
0.155	9993	0.0000	0.0000	1.4		MEDHINC_CY	WHITEPCT	ASIANPCT	HISPPCT	
0.153	9998	0.0000	0.0000	4.3		MEDHINC_CY	WHITEPCT	BLACKPCT		
0.153	10001	0.0000	0.0000	1.4		MEDHINC_CY	BLACKPCT	ASIANPCT	HISPPCT	
0.152	10004	0.0000	0.0000	1.2		MEDHINC_CY	ASIANPCT	HISPPCT	POPDEN	SCH
0.150	10007	0.0000	0.0000	1.1		BLACKPCT	HISPPCT	POPDEN		
0.150	10008	0.0000	0.0000	1.1		ASIANPCT	HISPPCT	POPDEN	SCH	
0.149	10011	0.0000	0.0000	1.2		MEDHINC_CY	ASIANPCT	HISPPCT	POPDEN	
0.149	10012	0.0000	0.0000	6.2		WHITEPCT	BLACKPCT	ASIANPCT	SCH	
0.148	10013	0.0000	0.0000	1.4		MEDHINC_CY	WHITEPCT	ASIANPCT		
0.147	10016	0.0000	0.0000	1.2		WHITEPCT	ASIANPCT	HISPPCT	SCH	
0.147	10015	0.0000	0.0000	1.1		ASIANPCT	HISPPCT	POPDEN		
0.146	10021	0.0000	0.0000	1.1		BLACKPCT	ASIANPCT	HISPPCT	SCH	
0.144	10026	0.0000	0.0000	1.1		MEDHINC_CY	ASIANPCT	POPDEN	SCH	
0.143	10027	0.0000	0.0000	1.0		ASIANPCT	POPDEN	SCH		
0.143	10028	0.0000	0.0000	1.4		MEDHINC_CY	WHITEPCT	SCH		
0.143	10029	0.0000	0.0000	1.1		MEDHINC_CY	ASIANPCT	POPDEN		
0.142	10030	0.0000	0.0000	1.0	0.0000	ASIANPCT	POPDEN			
0.141	10034	0.0000	0.0000	1.1		BLACKPCT	POPDEN	SCH		
0.141	10035	0.0000	0.0000	1.1		WHITEPCT	ASIANPCT	SCH		
0.141	10036	0.0000	0.0000	1.4		MEDHINC_CY	WHITEPCT	HISPPCT		
0.138	10043	0.0000	0.0000	4.4		WHITEPCT	BLACKPCT	SCH		
0.138	10045	0.0000	0.0000	1.1		MEDHINC_CY	HISPPCT	POPDEN	SCH	
0.137	10046	0.0000	0.0000	1.0	0.0000	BLACKPCT	POPDEN			
0.136	10050	0.0000	0.0000	6.1		WHITEPCT	BLACKPCT	ASIANPCT		
0.135	10051	0.0000	0.0000	1.1		MEDHINC_CY	HISPPCT	POPDEN		
0.135	10053	0.0000	0.0000	1.1		WHITEPCT	ASIANPCT	HISPPCT		
0.133	10057	0.0000	0.0000	1.1		BLACKPCT	ASIANPCT	HISPPCT		
0.131	10066	0.0000	0.0000	1.1		HISPPCT	POPDEN	SCH		
0.130	10066	0.0000	0.0000	1.3		MEDHINC_CY	WHITEPCT			
0.130	10066	0.0000	0.0000	1.0		WHITEPCT	ASIANPCT			
0.128	10075	0.0000	0.0000	1.4		MEDHINC_CY	BLACKPCT	HISPPCT	SCH	
0.128	10073	0.0000	0.0000	1.1		HISPPCT	POPDEN			
0.127	10077	0.0000	0.0000	1.0		MEDHINC_CY	POPDEN	SCH		
0.126	10079	0.0000	0.0000	1.0		MEDHINC_CY	POPDEN			
0.124	10085	0.0000	0.0000	4.2		WHITEPCT	BLACKPCT			
0.122	10090	0.0000	0.0378	1.0		POPDEN	SCH			
0.120	10094	0.0000	0.0255	1.0	0.0000	POPDEN				
0.117	10107	0.0000	0.0000	1.2		WHITEPCT	HISPPCT	SCH		
0.114	10114	0.0000	0.0000	1.4		MEDHINC_CY	BLACKPCT	HISPPCT		
0.107	10136	0.0000	0.0000	1.3		MEDHINC_CY	BLACKPCT	ASIANPCT	SCH	
0.106	10137	0.0000	0.0000	1.1		WHITEPCT	SCH			

0.103	10144	0.0000	0.0000	1.1		WHITEPCT	HISPPCT			
0.102	10149	0.0000	0.0000	1.3		MEDHINC_CY	BLACKPCT	ASIANPCT		
0.102	10150	0.0000	0.0000	1.1		BLACKPCT	ASIANPCT	SCH		
0.097	10163	0.0000	0.0000	1.1		BLACKPCT	ASIANPCT			
0.095	10168	0.0000	0.0000	1.0	0.0000	WHITEPCT				
0.090	10183	0.0000	0.0000	1.1		BLACKPCT	HISPPCT	SCH		
0.079	10212	0.0000	0.0000	1.0		BLACKPCT	HISPPCT			
0.066	10251	0.0000	0.0000	1.0		ASIANPCT	HISPPCT	SCH		
0.064	10256	0.0000	0.0000	1.0		ASIANPCT	HISPPCT			
0.051	10291	0.0000	0.0000	1.3		MEDHINC_CY	BLACKPCT	SCH		
0.048	10298	0.0000	0.0000	1.3		MEDHINC_CY	BLACKPCT			
0.039	10324	0.0000	0.0000	1.1		MEDHINC_CY	ASIANPCT			
0.038	10326	0.0000	0.0000	1.1		MEDHINC_CY	HISPPCT	SCH		
0.038	10324	0.0000	0.0000	1.0	0.0000	ASIANPCT				
0.037	10328	0.0000	0.0000	1.0		BLACKPCT	SCH			
0.036	10331	0.0000	0.0000	1.0		MEDHINC_CY	HISPPCT			
0.036	10331	0.0000	0.0000	1.0		HISPPCT	SCH			
0.034	10335	0.0000	0.0000	1.0	0.0000	BLACKPCT				
0.033	10337	0.0000	0.0000	1.0		HISPPCT				

Figure 42: OLS Report Result for Small Grocery

```
Choose 1 of 8 Summary
     Highest Adjusted R-Squared Results
AdjR2     AICc   JB K(BP)  VIF   SA   Model
 0.17 10730.35 0.00  0.00 1.00 0.00  +WHITEPCT***
 0.15 10791.71 0.00  0.88 1.00 0.00  -POPDEN***
 0.07 11013.00 0.00  0.00 1.00 0.00  -BLACKPCT***
       Passing Models
AdjR2 AICc JB K(BP) VIF SA   Model
********************************************************************************
Choose 2 of 8 Summary
           Highest Adjusted R-Squared Results
AdjR2     AICc   JB K(BP)  VIF   SA   Model
 0.24 10498.90 0.00  0.00 1.12 0.00  +WHITEPCT***  -POPDEN***
 0.20 10626.20 0.00  0.00 4.22 0.00  +WHITEPCT***  +BLACKPCT***
 0.19 10658.53 0.00  0.00 1.03 0.00  -BLACKPCT***  -POPDEN***
       Passing Models
AdjR2 AICc JB K(BP) VIF SA   Model
********************************************************************************
Choose 3 of 8 Summary
                Highest Adjusted R-Squared Results
AdjR2     AICc   JB K(BP)  VIF   SA   Model
 0.25 10450.93 0.00  0.00 4.87 0.00  +WHITEPCT***  +BLACKPCT***  -POPDEN***
 0.25 10467.62 0.00  0.00 1.14 0.00  +WHITEPCT***  -ASIANPCT***  -POPDEN***
 0.25 10470.16 0.00  0.00 1.19 0.00  +WHITEPCT***  -POPDEN***  -SCH***
       Passing Models
AdjR2 AICc JB K(BP) VIF SA   Model
********************************************************************************
Choose 4 of 8 Summary
                  Highest Adjusted R-Squared Results
AdjR2     AICc   JB K(BP)  VIF   SA   Model
 0.27 10413.13 0.00  0.00 5.09 0.00  +WHITEPCT***  +BLACKPCT***  -POPDEN***  -SCH***
 0.26 10438.47 0.00  0.00 1.20 0.00  +WHITEPCT***  -ASIANPCT***  -POPDEN***  -SCH***
 0.26 10440.67 0.00  0.00 1.24 0.00  +WHITEPCT***  -HISPPCT***  -POPDEN***  -SCH***
       Passing Models
AdjR2 AICc JB K(BP) VIF SA   Model
********************************************************************************
Choose 5 of 8 Summary
                        Highest Adjusted R-Squared Results
AdjR2     AICc   JB K(BP)   VIF   SA   Model
 0.27 10395.74 0.00  0.00  5.18 0.00  -POVINCPCT***  +WHITEPCT***  +BLACKPCT***  -POPDEN***  -SCH***
 0.27 10402.17 0.00  0.00  5.21 0.00  -MEDHINC_CY***  +WHITEPCT***  +BLACKPCT***  -POPDEN***  -SCH***
 0.27 10409.24 0.00  0.00 22.26 0.00  +WHITEPCT***  +BLACKPCT***  +HISPPCT***  -POPDEN***  -SCH***
       Passing Models
AdjR2 AICc JB K(BP) VIF SA   Model
********************************************************************************
************** Exploratory Regression Global Summary (SMDISTMI) **************

             Percentage of Search Criteria Passed
                  Search Criterion Cutoff Trials # Passed % Passed
           Min Adjusted R-Squared > 0.50    213        0      0.00
          Max Coefficient p-value < 0.05    213      178     83.57
                Max VIF Value < 7.50        213      202     94.84
          Min Jarque-Bera p-value > 0.10    213        0      0.00
Min Spatial Autocorrelation p-value > 0.10   17        0      0.00
```

```
      Summary of Variable Significance
Variable   % Significant % Negative % Positive
POVINCPCT         100.00     100.00       0.00
WHITEPCT          100.00       0.00     100.00
BLACKPCT          100.00      60.64      39.36
HISPPCT           100.00      88.30      11.70
POPDEN            100.00     100.00       0.00
ASIANPCT           96.81     100.00       0.00
SCH                90.82      97.96       2.04
MEDHINC_CY         76.53      72.45      27.55

--------------------------------------------------------------------------------

      Summary of Multicollinearity*
Variable     VIF Violations Covariates
POVINCPCT   1.74      0      --------
MEDHINC_CY  1.75      0      --------
WHITEPCT   23.14     11      BLACKPCT (25.58)
BLACKPCT   22.44     11      WHITEPCT (25.58)
ASIANPCT    1.64      0      --------
HISPPCT     5.74      0      --------
POPDEN      1.20      0      --------
SCH         1.19      0      --------
* At least one model failed to solve due to perfect multicollinearity.
Please review the warning messages for further information.
--------------------------------------------------------------------------------

                Summary of Residual Normality (JB)
      JB    AdjR2          AICc    K(BP)      VIF       SA   Model
0.000000 0.168742 10730.347327 0.000000 1.000000 0.000000  +WHITEPCT***
0.000000 0.017180 11162.963148 0.000002 1.000000 0.000000  +MEDHINC_CY***
0.000000 0.059737 11048.623817 0.732558 1.000000 0.000000  -POVINCPCT***

--------------------------------------------------------------------------------

        Summary of Residual Spatial Autocorrelation (SA)
      SA    AdjR2          AICc        JB    K(BP)      VIF   Model
0.000000 0.168742 10730.347327 0.000000 0.000000 1.000000  +WHITEPCT***
0.000000 0.072614 11013.004732 0.000000 0.000007 1.000000  -BLACKPCT***
0.000000 0.148759 10791.705595 0.000000 0.876968 1.000000  -POPDEN***
```

Table 10: OLS Table Result for Small Grocery

AdjR2	AICc	JB	K_BP	MVIF	SA	X1	X2	X3	X4	X5
0.2709	10396	0.0000	0.0000	5.2	0.0000	POVINCPCT	WHITEPCT	BLACKPCT	POPDEN	SCH
0.2691	10402	0.0000	0.0000	5.2	0.0000	MEDHINC_CY	WHITEPCT	BLACKPCT	POPDEN	SCH
0.2664	10411	0.0000	0.0000	6.7		WHITEPCT	BLACKPCT	ASIANPCT	POPDEN	SCH
0.2657	10413	0.0000	0.0000	5.1	0.0000	WHITEPCT	BLACKPCT	POPDEN	SCH	
0.2656	10414	0.0000	0.0000	1.2		WHITEPCT	ASIANPCT	HISPPCT	POPDEN	SCH
0.2655	10415	0.0000	0.0000	1.7		POVINCPCT	MEDHINC_CY	WHITEPCT	POPDEN	SCH
0.2650	10416	0.0000	0.0000	1.4		POVINCPCT	WHITEPCT	ASIANPCT	POPDEN	SCH
0.2643	10419	0.0000	0.0000	1.2		BLACKPCT	ASIANPCT	HISPPCT	POPDEN	SCH
0.2637	10421	0.0000	0.0000	1.5		MEDHINC_CY	WHITEPCT	HISPPCT	POPDEN	SCH
0.2629	10424	0.0000	0.0000	5.1		POVINCPCT	MEDHINC_CY	WHITEPCT	BLACKPCT	POPDEN
0.2614	10429	0.0000	0.0000	1.5		POVINCPCT	WHITEPCT	HISPPCT	POPDEN	SCH
0.2600	10434	0.0000	0.0000	1.5		MEDHINC_CY	WHITEPCT	ASIANPCT	POPDEN	SCH
0.2584	10438	0.0000	0.0000	1.2	0.0000	WHITEPCT	ASIANPCT	POPDEN	SCH	
0.2582	10440	0.0000	0.0000	6.8		POVINCPCT	WHITEPCT	BLACKPCT	ASIANPCT	POPDEN
0.2578	10441	0.0000	0.0000	1.2	0.0000	WHITEPCT	HISPPCT	POPDEN	SCH	
0.2576	10442	0.0000	0.0000	1.4		POVINCPCT	WHITEPCT	ASIANPCT	HISPPCT	POPDEN
0.2575	10442	0.0000	0.0000	5.0		MEDHINC_CY	WHITEPCT	BLACKPCT	POPDEN	
0.2571	10444	0.0000	0.0000	1.6		POVINCPCT	MEDHINC_CY	WHITEPCT	HISPPCT	POPDEN
0.2569	10445	0.0000	0.0000	1.5		MEDHINC_CY	WHITEPCT	ASIANPCT	HISPPCT	POPDEN
0.2567	10445	0.0000	0.0000	1.7		POVINCPCT	MEDHINC_CY	WHITEPCT	ASIANPCT	POPDEN
0.2565	10446	0.0000	0.0000	1.4		POVINCPCT	BLACKPCT	ASIANPCT	HISPPCT	POPDEN
0.2562	10446	0.0000	0.0000	5.0		POVINCPCT	WHITEPCT	BLACKPCT	POPDEN	
0.2558	10448	0.0000	0.0000	6.4		WHITEPCT	BLACKPCT	ASIANPCT	POPDEN	
0.2555	10450	0.0000	0.0000	1.4		MEDHINC_CY	BLACKPCT	ASIANPCT	HISPPCT	POPDEN
0.2551	10450	0.0000	0.0000	1.2		WHITEPCT	ASIANPCT	HISPPCT	POPDEN	
0.2546	10451	0.0000	0.0000	4.9	0.0000	WHITEPCT	BLACKPCT	POPDEN		
0.2541	10454	0.0000	0.0000	1.5		MEDHINC_CY	WHITEPCT	POPDEN	SCH	
0.2539	10454	0.0000	0.0000	1.2		BLACKPCT	ASIANPCT	HISPPCT	POPDEN	
0.2527	10459	0.0000	0.0000	1.4		POVINCPCT	WHITEPCT	POPDEN	SCH	
0.2526	10459	0.0000	0.0000	1.4		POVINCPCT	WHITEPCT	ASIANPCT	POPDEN	
0.2521	10460	0.0000	0.0000	1.4		MEDHINC_CY	WHITEPCT	HISPPCT	POPDEN	
0.2509	10464	0.0000	0.0000	1.4		MEDHINC_CY	WHITEPCT	ASIANPCT	POPDEN	
0.2499	10468	0.0000	0.0000	1.6		POVINCPCT	MEDHINC_CY	WHITEPCT	POPDEN	
0.2497	10468	0.0000	0.0000	1.1	0.0000	WHITEPCT	ASIANPCT	POPDEN		
0.2490	10470	0.0000	0.0000	1.2	0.0000	WHITEPCT	POPDEN	SCH		
0.2480	10475	0.0000	0.0000	1.4		POVINCPCT	WHITEPCT	HISPPCT	POPDEN	
0.2471	10477	0.0000	0.0000	1.2		WHITEPCT	HISPPCT	POPDEN		
0.2469	10479	0.0000	0.0000	1.5		MEDHINC_CY	BLACKPCT	HISPPCT	POPDEN	SCH
0.2447	10487	0.0000	0.0000	1.4		POVINCPCT	BLACKPCT	HISPPCT	POPDEN	SCH

0.2447	10485	0.0000	0.0000	1.4		MEDHINC_CY	WHITEPCT	POPDEN		
0.2427	10494	0.0000	0.0000	1.6		POVINCPCT	MEDHINC_CY	BLACKPCT	HISPPCT	POPDEN
0.2414	10496	0.0000	0.0000	1.4		POVINCPCT	WHITEPCT	POPDEN		
0.2405	10500	0.0000	0.0000	1.2		BLACKPCT	HISPPCT	POPDEN	SCH	
0.2403	10499	0.0000	0.0000	1.1	0.0000	WHITEPCT	POPDEN			
0.2368	10513	0.0000	0.0000	1.4		MEDHINC_CY	BLACKPCT	HISPPCT	POPDEN	
0.2363	10515	0.0000	0.0000	4.6		POVINCPCT	MEDHINC_CY	WHITEPCT	BLACKPCT	SCH
0.2341	10523	0.0000	0.0000	1.4		POVINCPCT	BLACKPCT	ASIANPCT	POPDEN	SCH
0.2329	10526	0.0000	0.0000	1.3		POVINCPCT	BLACKPCT	HISPPCT	POPDEN	
0.2314	10530	0.0000	0.0000	1.1		BLACKPCT	HISPPCT	POPDEN		
0.2267	10548	0.0000	0.0000	6.4		POVINCPCT	WHITEPCT	BLACKPCT	ASIANPCT	SCH
0.2265	10548	0.0000	0.0000	1.6		POVINCPCT	MEDHINC_CY	BLACKPCT	ASIANPCT	POPDEN
0.2258	10550	0.0000	0.0000	1.3		POVINCPCT	BLACKPCT	ASIANPCT	POPDEN	
0.2252	10553	0.0000	0.0000	1.4		POVINCPCT	WHITEPCT	ASIANPCT	HISPPCT	SCH
0.2247	10554	0.0000	0.0000	1.7		POVINCPCT	MEDHINC_CY	WHITEPCT	HISPPCT	SCH
0.2246	10554	0.0000	0.0000	4.5		POVINCPCT	WHITEPCT	BLACKPCT	SCH	
0.2235	10558	0.0000	0.0000	1.4		POVINCPCT	BLACKPCT	ASIANPCT	HISPPCT	SCH
0.2195	10571	0.0000	0.0000	1.2		BLACKPCT	ASIANPCT	POPDEN	SCH	
0.2183	10575	0.0000	0.0000	4.5		MEDHINC_CY	WHITEPCT	BLACKPCT	SCH	
0.2165	10582	0.0000	0.0000	1.5		MEDHINC_CY	WHITEPCT	ASIANPCT	HISPPCT	SCH
0.2163	10581	0.0000	0.0000	6.2		WHITEPCT	BLACKPCT	ASIANPCT	SCH	
0.2162	10581	0.0000	0.0000	1.1		BLACKPCT	ASIANPCT	POPDEN		
0.2157	10584	0.0000	0.0000	1.8		POVINCPCT	MEDHINC_CY	WHITEPCT	ASIANPCT	SCH
0.2156	10583	0.0000	0.0000	4.4		WHITEPCT	BLACKPCT	SCH		
0.2148	10586	0.0000	0.0000	1.2		WHITEPCT	ASIANPCT	HISPPCT	SCH	
0.2142	10589	0.0000	0.0000	1.4		MEDHINC_CY	BLACKPCT	ASIANPCT	HISPPCT	SCH
0.2133	10592	0.0000	0.0000	1.2		POVINCPCT	ASIANPCT	HISPPCT	POPDEN	SCH
0.2132	10592	0.0000	0.0000	6.6		POVINCPCT	MEDHINC_CY	WHITEPCT	BLACKPCT	ASIANPCT
0.2127	10593	0.0000	0.0000	1.1		BLACKPCT	ASIANPCT	HISPPCT	SCH	
0.2126	10593	0.0000	0.0000	4.5		POVINCPCT	MEDHINC_CY	WHITEPCT	BLACKPCT	
0.2116	10598	0.0000	0.0000	1.7		POVINCPCT	MEDHINC_CY	WHITEPCT	ASIANPCT	HISPPCT
0.2114	10598	0.0000	0.0000	1.7		POVINCPCT	MEDHINC_CY	BLACKPCT	POPDEN	SCH
0.2097	10604	0.0000	0.0000	1.7		POVINCPCT	MEDHINC_CY	BLACKPCT	ASIANPCT	HISPPCT
0.2086	10607	0.0000	0.0000	1.4		POVINCPCT	WHITEPCT	ASIANPCT	SCH	
0.2081	10608	0.0000	0.0000	6.3		POVINCPCT	WHITEPCT	BLACKPCT	ASIANPCT	
0.2075	10610	0.0000	0.0000	1.4		MEDHINC_CY	WHITEPCT	HISPPCT	SCH	
0.2075	10610	0.0000	0.0000	1.4		POVINCPCT	WHITEPCT	HISPPCT	SCH	
0.2067	10612	0.0000	0.0000	1.4		POVINCPCT	WHITEPCT	ASIANPCT	HISPPCT	
0.2057	10616	0.0000	0.0003	1.4		POVINCPCT	BLACKPCT	POPDEN	SCH	
0.2057	10615	0.0000	0.0000	4.4		POVINCPCT	WHITEPCT	BLACKPCT		
0.2051	10618	0.0000	0.0000	1.4		POVINCPCT	BLACKPCT	ASIANPCT	HISPPCT	
0.2046	10619	0.0000	0.0000	1.1		POVINCPCT	ASIANPCT	HISPPCT	POPDEN	

0.2041	10620	0.0000	0.0000	4.3		MEDHINC_CY	WHITEPCT	BLACKPCT		
0.2033	10624	0.0000	0.0000	1.6		POVINCPCT	MEDHINC_CY	BLACKPCT	POPDEN	
0.2032	10623	0.0000	0.0000	6.1		WHITEPCT	BLACKPCT	ASIANPCT		
0.2029	10625	0.0000	0.0000	1.4		MEDHINC_CY	WHITEPCT	ASIANPCT	HISPPCT	
0.2025	10627	0.0000	0.0000	1.7		POVINCPCT	MEDHINC_CY	HISPPCT	POPDEN	SCH
0.2019	10626	0.0000	0.0000	4.2	0.0000	WHITEPCT	BLACKPCT			
0.2018	10628	0.0000	0.0000	1.1		WHITEPCT	ASIANPCT	HISPPCT		
0.2012	10629	0.0000	0.0000	1.2		WHITEPCT	HISPPCT	SCH		
0.2010	10631	0.0000	0.0000	1.7		POVINCPCT	MEDHINC_CY	WHITEPCT	SCH	
0.2010	10631	0.0000	0.0000	1.6		POVINCPCT	MEDHINC_CY	WHITEPCT	HISPPCT	
0.2010	10631	0.0000	0.0003	1.2		POVINCPCT	HISPPCT	POPDEN	SCH	
0.1999	10634	0.0000	0.0000	1.1		BLACKPCT	ASIANPCT	HISPPCT		
0.1997	10636	0.0000	0.0000	1.7		POVINCPCT	MEDHINC_CY	BLACKPCT	HISPPCT	SCH
0.1994	10635	0.0000	0.0003	1.3		POVINCPCT	BLACKPCT	POPDEN		
0.1968	10645	0.0000	0.0000	1.2		POVINCPCT	ASIANPCT	POPDEN	SCH	
0.1968	10644	0.0000	0.0000	1.1		WHITEPCT	ASIANPCT	SCH		
0.1968	10645	0.0000	0.0000	1.7		POVINCPCT	MEDHINC_CY	WHITEPCT	ASIANPCT	
0.1943	10652	0.0000	0.0072	1.1		BLACKPCT	POPDEN	SCH		
0.1931	10656	0.0000	0.0002	1.1		POVINCPCT	HISPPCT	POPDEN		
0.1931	10656	0.0000	0.0000	1.4		MEDHINC_CY	WHITEPCT	HISPPCT		
0.1931	10656	0.0000	0.0000	1.3		POVINCPCT	WHITEPCT	ASIANPCT		
0.1919	10659	0.0000	0.0023	1.0	0.0000	BLACKPCT	POPDEN			
0.1909	10663	0.0000	0.0000	1.1		POVINCPCT	ASIANPCT	POPDEN		
0.1900	10665	0.0000	0.0000	1.4		POVINCPCT	WHITEPCT	HISPPCT		
0.1878	10672	0.0000	0.0000	1.1		WHITEPCT	HISPPCT			
0.1868	10675	0.0000	0.0000	1.0		WHITEPCT	ASIANPCT			
0.1857	10679	0.0000	0.0000	1.4		POVINCPCT	WHITEPCT	SCH		
0.1854	10682	0.0000	0.0000	1.2		MEDHINC_CY	ASIANPCT	HISPPCT	POPDEN	SCH
0.1840	10686	0.0000	0.0000	1.2		MEDHINC_CY	ASIANPCT	HISPPCT	POPDEN	
0.1839	10685	0.0000	0.0000	1.4		MEDHINC_CY	WHITEPCT	SCH		
0.1818	10691	0.0000	0.0000	1.6		POVINCPCT	MEDHINC_CY	WHITEPCT		
0.1816	10693	0.0000	0.0000	1.4		POVINCPCT	BLACKPCT	HISPPCT	SCH	
0.1810	10694	0.0000	0.0878	1.2		POVINCPCT	POPDEN	SCH		
0.1804	10697	0.0000	0.0000	1.4		MEDHINC_CY	BLACKPCT	HISPPCT	SCH	
0.1788	10700	0.0000	0.0000	1.1		WHITEPCT	SCH			
0.1786	10702	0.0000	0.0000	1.1		ASIANPCT	HISPPCT	POPDEN	SCH	
0.1778	10705	0.0000	0.0000	1.6		POVINCPCT	MEDHINC_CY	BLACKPCT	HISPPCT	
0.1775	10705	0.0000	0.0000	1.1		ASIANPCT	HISPPCT	POPDEN		
0.1761	10708	0.0000	0.1891	1.0		POVINCPCT	POPDEN			
0.1755	10712	0.0000	0.0000	1.1		MEDHINC_CY	HISPPCT	POPDEN	SCH	
0.1741	10716	0.0000	0.0000	1.1		MEDHINC_CY	HISPPCT	POPDEN		
0.1737	10717	0.0000	0.0000	1.1		BLACKPCT	HISPPCT	SCH		

0.1731	10718	0.0000	0.0000	1.3		MEDHINC_CY	WHITEPCT			
0.1728	10720	0.0000	0.0006	1.1		HISPPCT	POPDEN	SCH		
0.1717	10722	0.0000	0.0000	1.3		POVINCPCT	WHITEPCT			
0.1716	10723	0.0000	0.0002	1.1		HISPPCT	POPDEN			
0.1687	10730	0.0000	0.0000	1.0	0.0000	WHITEPCT				
0.1680	10735	0.0000	0.0000	1.1		MEDHINC_CY	ASIANPCT	POPDEN		
0.1679	10735	0.0000	0.0000	1.4		MEDHINC_CY	BLACKPCT	HISPPCT		
0.1660	10741	0.0000	0.0000	1.3		POVINCPCT	BLACKPCT	HISPPCT		
0.1624	10751	0.0000	0.0000	1.0		BLACKPCT	HISPPCT			
0.1569	10768	0.0000	0.0000	1.0		ASIANPCT	POPDEN			
0.1540	10777	0.0000	0.0000	1.0		MEDHINC_CY	POPDEN			
0.1532	10781	0.0000	0.0000	1.3		POVINCPCT	BLACKPCT	ASIANPCT	SCH	
0.1488	10792	0.0000	0.8770	1.0	0.0000	POPDEN				
0.1432	10811	0.0000	0.0000	1.3		POVINCPCT	BLACKPCT	ASIANPCT		
0.1398	10822	0.0000	0.0000	1.2		POVINCPCT	ASIANPCT	HISPPCT	SCH	
0.1282	10855	0.0000	0.0000	1.1		POVINCPCT	ASIANPCT	HISPPCT		
0.1260	10863	0.0000	0.0000	1.3		MEDHINC_CY	BLACKPCT	ASIANPCT	SCH	
0.1235	10869	0.0000	0.0000	1.1		BLACKPCT	ASIANPCT	SCH		
0.1234	10870	0.0000	0.0000	1.3		MEDHINC_CY	BLACKPCT	ASIANPCT		
0.1209	10876	0.0000	0.0000	1.1		BLACKPCT	ASIANPCT			
0.1177	10887	0.0000	0.0000	1.6		POVINCPCT	MEDHINC_CY	HISPPCT	SCH	
0.1164	10890	0.0000	0.0000	1.1		POVINCPCT	HISPPCT	SCH		
0.1060	10919	0.0000	0.0000	1.0		POVINCPCT	HISPPCT			
0.1048	10925	0.0000	0.0000	1.7		POVINCPCT	MEDHINC_CY	BLACKPCT	SCH	
0.0998	10938	0.0000	0.0000	1.3		POVINCPCT	BLACKPCT	SCH		
0.0993	10940	0.0000	0.0000	1.1		POVINCPCT	ASIANPCT	SCH		
0.0960	10950	0.0000	0.0000	1.1		MEDHINC_CY	ASIANPCT	HISPPCT	SCH	
0.0957	10950	0.0000	0.0000	1.6		POVINCPCT	MEDHINC_CY	BLACKPCT		
0.0947	10953	0.0000	0.0000	1.1		MEDHINC_CY	ASIANPCT	HISPPCT		
0.0935	10956	0.0000	0.0000	1.5		POVINCPCT	MEDHINC_CY	ASIANPCT		
0.0927	10958	0.0000	0.0000	1.2		POVINCPCT	BLACKPCT			
0.0922	10959	0.0000	0.0000	1.0		POVINCPCT	ASIANPCT			
0.0787	10997	0.0000	0.0000	1.0		ASIANPCT	HISPPCT			
0.0744	11010	0.0000	0.0000	1.1		MEDHINC_CY	HISPPCT	SCH		
0.0741	11010	0.0000	0.0001	1.0		BLACKPCT	SCH			
0.0730	11013	0.0000	0.0000	1.0		MEDHINC_CY	HISPPCT			
0.0726	11013	0.0000	0.0000	1.0	0.0000	BLACKPCT				
0.0668	11030	0.0000	0.0000	1.0		HISPPCT	SCH			
0.0658	11032	0.0000	0.0000	1.0		HISPPCT				
0.0653	11034	0.0000	0.3367	1.1		POVINCPCT	SCH			
0.0597	11049	0.0000	0.7326	1.0	0.0000	POVINCPCT				
0.0526	11069	0.0000	0.0000	1.1		MEDHINC_CY	ASIANPCT			

0.0209	11153	0.0000	0.0000	1.0		ASIANPCT				
0.0172	11163	0.0000	0.0000	1.0	0.0000	MEDHINC_CY				

Figure 43: OLS Report Result for Convenience Store

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Choose 1 of 8 Summary
    Highest Adjusted R-Squared Results
AdjR2    AICc   JB K(BP)  VIF   SA   Model
 0.18 6450.35 0.00  0.00 1.00 0.00  +WHITEPCT***
 0.12 6609.58 0.00  0.34 1.00 0.00  -POPDEN***
 0.09 6701.98 0.00  0.00 1.00 0.00  -BLACKPCT***
       Passing Models
AdjR2 AICc JB K(BP) VIF SA   Model
********************************************************************************
Choose 2 of 8 Summary
          Highest Adjusted R-Squared Results
AdjR2    AICc   JB K(BP)  VIF   SA   Model
 0.23 6282.01 0.00  0.00 1.12 0.00  +WHITEPCT***  -POPDEN***
 0.19 6398.81 0.00  0.00 4.22 0.00  +WHITEPCT***  +BLACKPCT***
 0.19 6408.80 0.00  0.00 1.10 0.00  +WHITEPCT***  -HISPPCT***
       Passing Models
AdjR2 AICc JB K(BP) VIF SA   Model
********************************************************************************
Choose 3 of 8 Summary
                Highest Adjusted R-Squared Results
AdjR2    AICc   JB K(BP)  VIF   SA   Model
 0.24 6250.37 0.00  0.00 1.38 0.00  -POVINCPCT***  +WHITEPCT***  -POPDEN***
 0.23 6263.06 0.00  0.00 1.40 0.00  +MEDHINC_CY***  +WHITEPCT***  -POPDEN***
 0.23 6263.29 0.00  0.00 1.19 0.00  +WHITEPCT***  -POPDEN***  -SCH***
       Passing Models
AdjR2 AICc JB K(BP) VIF SA   Model
********************************************************************************
Choose 4 of 8 Summary
                      Highest Adjusted R-Squared Results
AdjR2    AICc   JB K(BP)  VIF   SA   Model
 0.25 6213.43 0.00  0.00 1.41 0.00  -POVINCPCT***  +WHITEPCT***  -POPDEN***  -SCH***
 0.24 6229.63 0.00  0.00 5.04 0.00  -POVINCPCT***  +WHITEPCT***  +BLACKPCT***  -POPDEN***
 0.24 6237.11 0.00  0.00 1.44 0.00  -POVINCPCT***  +WHITEPCT***  -HISPPCT***  -POPDEN***
       Passing Models
AdjR2 AICc JB K(BP) VIF SA   Model
********************************************************************************
Choose 5 of 8 Summary
                            Highest Adjusted R-Squared Results
AdjR2    AICc   JB K(BP)  VIF   SA   Model
 0.26 6184.59 0.00  0.00 5.18 0.00  -POVINCPCT***  +WHITEPCT***  +BLACKPCT***  -POPDEN***  -SCH***
 0.26 6193.92 0.00  0.00 1.45 0.00  -POVINCPCT***  +WHITEPCT***  -HISPPCT***  -POPDEN***  -SCH***
 0.25 6206.94 0.00  0.00 1.43 0.00  -POVINCPCT***  +WHITEPCT***  -ASIANPCT***  -POPDEN***  -SCH***
       Passing Models
AdjR2 AICc JB K(BP) VIF SA   Model
********************************************************************************
************ Exploratory Regression Global Summary (CONVDISTMI) *************

             Percentage of Search Criteria Passed
                  Search Criterion Cutoff Trials # Passed % Passed
           Min Adjusted R-Squared > 0.50    213        0     0.00
          Max Coefficient p-value < 0.05    213      157    73.71
                     Max VIF Value < 7.50    213      202    94.84
          Min Jarque-Bera p-value > 0.10    213        0     0.00
Min Spatial Autocorrelation p-value > 0.10     17        0     0.00
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      Summary of Variable Significance
Variable   % Significant % Negative % Positive
POVINCPCT          100.00     100.00       0.00
WHITEPCT           100.00       0.00     100.00
POPDEN             100.00     100.00       0.00
BLACKPCT            97.87      60.64      39.36
MEDHINC_CY          89.80       0.00     100.00
HISPPCT             88.30      92.55       7.45
SCH                 81.63      93.88       6.12
ASIANPCT            79.79      94.68       5.32

--------------------------------------------------------------------------------

      Summary of Multicollinearity*
Variable     VIF Violations Covariates
POVINCPCT   1.74     0      --------
MEDHINC_CY  1.75     0      --------
WHITEPCT   23.14     11     BLACKPCT (25.58)
BLACKPCT   22.44     11     WHITEPCT (25.58)
ASIANPCT    1.64     0      --------
HISPPCT     5.74     0      --------
POPDEN      1.20     0      --------
SCH         1.19     0      --------
* At least one model failed to solve due to perfect multicollinearity.
Please review the warning messages for further information.
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                Summary of Residual Normality (JB)
      JB    AdjR2         AICc    K(BP)      VIF      SA   Model
0.000000 0.176192 6450.345752 0.000000 1.000000 0.000000  +WHITEPCT***
0.000000 0.070986 6760.785908 0.095126 1.000000 0.000000  +MEDHINC_CY***
0.000000 0.090738 6705.274588 0.011032 1.000000 0.000000  -POVINCPCT***

--------------------------------------------------------------------------------

        Summary of Residual Spatial Autocorrelation (SA)
      SA    AdjR2         AICc       JB    K(BP)      VIF   Model
0.000000 0.176192 6450.345752 0.000000 0.000000 1.000000  +WHITEPCT***
0.000000 0.091899 6701.975975 0.000000 0.000000 1.000000  -BLACKPCT***
0.000000 0.123807 6609.582123 0.000000 0.336761 1.000000  -POPDEN***
```

Table 11: OLS Table Result for Convenience Stores

AdjR2	AICc	JB	K_BP	MVIF	SA	X1	X2	X3	X4	X5
0.2579	6185	0.0000	0.0000	5.2	0.0000	POVINCPCT	WHITEPCT	BLACKPCT	POPDEN	SCH
0.2552	6194	0.0000	0.0000	1.5	0.0000	POVINCPCT	WHITEPCT	HISPPCT	POPDEN	SCH
0.2514	6207	0.0000	0.0000	1.4	0.0000	POVINCPCT	WHITEPCT	ASIANPCT	POPDEN	SCH
0.2493	6213	0.0000	0.0000	1.4	0.0000	POVINCPCT	WHITEPCT	POPDEN	SCH	
0.2478	6219	0.0000	0.0000	5.2		MEDHINC_CY	WHITEPCT	BLACKPCT	POPDEN	SCH
0.2465	6224	0.0000	0.0000	5.1		POVINCPCT	MEDHINC_CY	WHITEPCT	BLACKPCT	POPDEN
0.2454	6228	0.0000	0.0000	1.4		POVINCPCT	BLACKPCT	HISPPCT	POPDEN	SCH
0.2452	6229	0.0000	0.0000	1.5		MEDHINC_CY	WHITEPCT	HISPPCT	POPDEN	SCH
0.2445	6230	0.0000	0.0000	5.0	0.0000	POVINCPCT	WHITEPCT	BLACKPCT	POPDEN	
0.2435	6234	0.0000	0.0000	1.4		POVINCPCT	WHITEPCT	ASIANPCT	HISPPCT	POPDEN
0.2425	6237	0.0000	0.0000	1.7		POVINCPCT	MEDHINC_CY	WHITEPCT	ASIANPCT	POPDEN
0.2424	6237	0.0000	0.0000	1.4	0.0000	POVINCPCT	WHITEPCT	HISPPCT	POPDEN	
0.2422	6239	0.0000	0.0000	1.5		MEDHINC_CY	WHITEPCT	ASIANPCT	POPDEN	SCH
0.2422	6239	0.0000	0.0000	1.4		POVINCPCT	BLACKPCT	ASIANPCT	HISPPCT	POPDEN
0.2413	6241	0.0000	0.0000	5.0		MEDHINC_CY	WHITEPCT	BLACKPCT	POPDEN	
0.2411	6242	0.0000	0.0000	5.1		WHITEPCT	BLACKPCT	POPDEN	SCH	
0.2404	6245	0.0000	0.0000	1.5		MEDHINC_CY	WHITEPCT	ASIANPCT	HISPPCT	POPDEN
0.2404	6244	0.0000	0.0000	1.2		WHITEPCT	HISPPCT	POPDEN	SCH	
0.2398	6246	0.0000	0.0000	1.4		POVINCPCT	WHITEPCT	ASIANPCT	POPDEN	
0.2397	6246	0.0000	0.0000	1.5		MEDHINC_CY	WHITEPCT	POPDEN	SCH	
0.2395	6247	0.0000	0.0000	1.6		POVINCPCT	MEDHINC_CY	WHITEPCT	POPDEN	
0.2393	6249	0.0000	0.0000	1.4		MEDHINC_CY	BLACKPCT	ASIANPCT	HISPPCT	POPDEN
0.2387	6251	0.0000	0.0000	1.2		BLACKPCT	ASIANPCT	HISPPCT	POPDEN	SCH
0.2385	6250	0.0000	0.0000	1.4		MEDHINC_CY	WHITEPCT	HISPPCT	POPDEN	
0.2382	6250	0.0000	0.0000	1.4	0.0000	POVINCPCT	WHITEPCT	POPDEN		
0.2370	6255	0.0000	0.0000	1.4		MEDHINC_CY	WHITEPCT	ASIANPCT	POPDEN	
0.2346	6265	0.0000	0.0000	1.5		MEDHINC_CY	BLACKPCT	HISPPCT	POPDEN	SCH
0.2344	6263	0.0000	0.0000	1.4	0.0000	MEDHINC_CY	WHITEPCT	POPDEN		
0.2343	6263	0.0000	0.0000	1.2	0.0000	WHITEPCT	POPDEN	SCH		
0.2339	6265	0.0000	0.0000	4.9		WHITEPCT	BLACKPCT	POPDEN		
0.2337	6267	0.0000	0.0000	1.3		POVINCPCT	BLACKPCT	HISPPCT	POPDEN	
0.2331	6267	0.0000	0.0000	1.2		WHITEPCT	HISPPCT	POPDEN		
0.2316	6274	0.0000	0.0000	1.2		BLACKPCT	ASIANPCT	HISPPCT	POPDEN	
0.2309	6276	0.0000	0.0000	1.2		BLACKPCT	HISPPCT	POPDEN	SCH	
0.2288	6283	0.0000	0.0000	1.4		MEDHINC_CY	BLACKPCT	HISPPCT	POPDEN	
0.2285	6282	0.0000	0.0000	1.1	0.0000	WHITEPCT	POPDEN			
0.2245	6296	0.0000	0.0000	1.1		BLACKPCT	HISPPCT	POPDEN		
0.2240	6299	0.0000	0.0000	4.5		POVINCPCT	WHITEPCT	BLACKPCT	SCH	
0.2229	6304	0.0000	0.0000	1.4		POVINCPCT	BLACKPCT	ASIANPCT	POPDEN	SCH

0.2222	6306	0.0000	0.0000	1.4		POVINCPCT	WHITEPCT	ASIANPCT	HISPPCT	SCH
0.2220	6307	0.0000	0.0000	1.6		POVINCPCT	MEDHINC_CY	BLACKPCT	ASIANPCT	POPDEN
0.2202	6313	0.0000	0.0000	1.4		POVINCPCT	BLACKPCT	ASIANPCT	HISPPCT	SCH
0.2178	6319	0.0000	0.0000	1.4		POVINCPCT	WHITEPCT	HISPPCT	SCH	
0.2152	6328	0.0000	0.0000	1.3		POVINCPCT	BLACKPCT	ASIANPCT	POPDEN	
0.2144	6332	0.0000	0.0000	1.4		MEDHINC_CY	BLACKPCT	ASIANPCT	POPDEN	SCH
0.2139	6333	0.0000	0.0000	1.7		POVINCPCT	MEDHINC_CY	BLACKPCT	POPDEN	SCH
0.2128	6336	0.0000	0.0000	1.3		MEDHINC_CY	BLACKPCT	ASIANPCT	POPDEN	
0.2116	6340	0.0000	0.0000	1.4		POVINCPCT	BLACKPCT	POPDEN	SCH	
0.2106	6344	0.0000	0.0000	1.8		POVINCPCT	MEDHINC_CY	WHITEPCT	ASIANPCT	SCH
0.2095	6347	0.0000	0.0000	1.4		POVINCPCT	WHITEPCT	ASIANPCT	SCH	
0.2094	6347	0.0000	0.0000	4.5		MEDHINC_CY	WHITEPCT	BLACKPCT	SCH	
0.2090	6348	0.0000	0.0000	4.5		POVINCPCT	MEDHINC_CY	WHITEPCT	BLACKPCT	
0.2088	6349	0.0000	0.0000	1.6		POVINCPCT	MEDHINC_CY	BLACKPCT	POPDEN	
0.2077	6354	0.0000	0.0000	1.5		MEDHINC_CY	WHITEPCT	ASIANPCT	HISPPCT	SCH
0.2077	6354	0.0000	0.0000	1.7		POVINCPCT	MEDHINC_CY	WHITEPCT	ASIANPCT	HISPPCT
0.2072	6353	0.0000	0.0000	4.4		POVINCPCT	WHITEPCT	BLACKPCT		
0.2061	6359	0.0000	0.0000	1.7		POVINCPCT	MEDHINC_CY	BLACKPCT	ASIANPCT	HISPPCT
0.2059	6360	0.0000	0.0000	1.4		MEDHINC_CY	BLACKPCT	ASIANPCT	HISPPCT	SCH
0.2055	6360	0.0000	0.0000	1.4		POVINCPCT	WHITEPCT	ASIANPCT	HISPPCT	
0.2051	6360	0.0000	0.0000	1.3		POVINCPCT	BLACKPCT	POPDEN		
0.2046	6364	0.0000	0.0000	1.6		POVINCPCT	MEDHINC_CY	ASIANPCT	HISPPCT	POPDEN
0.2046	6364	0.0000	0.0000	1.7		POVINCPCT	MEDHINC_CY	HISPPCT	POPDEN	SCH
0.2037	6366	0.0000	0.0000	1.4		POVINCPCT	BLACKPCT	ASIANPCT	HISPPCT	
0.2033	6367	0.0000	0.0000	1.4		MEDHINC_CY	WHITEPCT	HISPPCT	SCH	
0.2028	6367	0.0000	0.0000	1.4		POVINCPCT	WHITEPCT	SCH		
0.2017	6371	0.0000	0.0000	4.4		WHITEPCT	BLACKPCT	SCH		
0.2017	6371	0.0000	0.0000	1.4		POVINCPCT	WHITEPCT	HISPPCT		
0.2015	6373	0.0000	0.0000	1.4		POVINCPCT	BLACKPCT	HISPPCT	SCH	
0.2011	6373	0.0000	0.0000	4.3		MEDHINC_CY	WHITEPCT	BLACKPCT		
0.2003	6377	0.0000	0.0000	1.2		WHITEPCT	ASIANPCT	HISPPCT	SCH	
0.2001	6377	0.0000	0.0000	1.3		MEDHINC_CY	BLACKPCT	POPDEN	SCH	
0.1997	6379	0.0000	0.0000	1.2		POVINCPCT	ASIANPCT	HISPPCT	POPDEN	SCH
0.1997	6378	0.0000	0.0000	1.4		MEDHINC_CY	WHITEPCT	ASIANPCT	HISPPCT	
0.1997	6380	0.0000	0.0000	1.7		POVINCPCT	MEDHINC_CY	ASIANPCT	POPDEN	SCH
0.1992	6380	0.0000	0.0000	1.5		POVINCPCT	MEDHINC_CY	HISPPCT	POPDEN	
0.1990	6380	0.0000	0.0000	1.3		MEDHINC_CY	BLACKPCT	POPDEN		
0.1988	6380	0.0000	0.0000	1.2		WHITEPCT	HISPPCT	SCH		
0.1983	6383	0.0000	0.0000	1.7		POVINCPCT	MEDHINC_CY	WHITEPCT	ASIANPCT	
0.1980	6384	0.0000	0.0000	1.4		MEDHINC_CY	BLACKPCT	ASIANPCT	HISPPCT	
0.1979	6384	0.0000	0.0000	1.1		BLACKPCT	ASIANPCT	HISPPCT	SCH	
0.1975	6386	0.0000	0.0000	1.2		POVINCPCT	HISPPCT	POPDEN	SCH	

0.1962	6390	0.0000	0.0000	1.5		POVINCPCT	MEDHINC_CY	ASIANPCT	POPDEN	
0.1956	6392	0.0000	0.0000	1.4		MEDHINC_CY	WHITEPCT	ASIANPCT	SCH	
0.1953	6392	0.0000	0.0000	1.3		POVINCPCT	WHITEPCT	ASIANPCT		
0.1948	6393	0.0000	0.0000	1.4		MEDHINC_CY	WHITEPCT	HISPPCT		
0.1947	6395	0.0000	0.0000	1.2		BLACKPCT	ASIANPCT	POPDEN	SCH	
0.1932	6398	0.0000	0.0000	1.1		BLACKPCT	ASIANPCT	POPDEN		
0.1928	6399	0.0000	0.0000	4.2	0.0000	WHITEPCT	BLACKPCT			
0.1918	6404	0.0000	0.0000	1.1		POVINCPCT	ASIANPCT	HISPPCT	POPDEN	
0.1918	6404	0.0000	0.0000	1.7		POVINCPCT	MEDHINC_CY	POPDEN	SCH	
0.1913	6405	0.0000	0.0000	1.1		WHITEPCT	ASIANPCT	HISPPCT		
0.1899	6409	0.0000	0.0000	1.1		POVINCPCT	HISPPCT	POPDEN		
0.1897	6409	0.0000	0.0000	1.1	0.0000	WHITEPCT	HISPPCT			
0.1896	6410	0.0000	0.0000	1.4		MEDHINC_CY	WHITEPCT	ASIANPCT		
0.1895	6409	0.0000	0.0000	1.3		POVINCPCT	WHITEPCT			
0.1890	6412	0.0000	0.0000	1.1		BLACKPCT	ASIANPCT	HISPPCT		
0.1885	6413	0.0000	0.0000	1.5		POVINCPCT	MEDHINC_CY	POPDEN		
0.1884	6414	0.0000	0.0000	1.4		MEDHINC_CY	WHITEPCT	SCH		
0.1876	6417	0.0000	0.0000	1.2		MEDHINC_CY	ASIANPCT	HISPPCT	POPDEN	
0.1868	6419	0.0000	0.0000	1.3		POVINCPCT	BLACKPCT	HISPPCT		
0.1862	6421	0.0000	0.0000	1.1		BLACKPCT	POPDEN	SCH		
0.1860	6421	0.0000	0.0000	1.1		WHITEPCT	ASIANPCT	SCH		
0.1859	6423	0.0000	0.0000	1.2		POVINCPCT	ASIANPCT	POPDEN	SCH	
0.1854	6424	0.0000	0.0000	1.4		MEDHINC_CY	BLACKPCT	HISPPCT	SCH	
0.1851	6423	0.0000	0.0000	1.0		BLACKPCT	POPDEN			
0.1831	6430	0.0000	0.0000	1.1		WHITEPCT	SCH			
0.1826	6432	0.0000	0.0000	1.1		MEDHINC_CY	HISPPCT	POPDEN		
0.1822	6433	0.0000	0.0001	1.2		POVINCPCT	POPDEN	SCH		
0.1822	6433	0.0000	0.0000	1.3		MEDHINC_CY	WHITEPCT			
0.1820	6434	0.0000	0.0000	1.1		BLACKPCT	HISPPCT	SCH		
0.1804	6439	0.0000	0.0000	1.1		POVINCPCT	ASIANPCT	POPDEN		
0.1792	6442	0.0000	0.0000	1.0		WHITEPCT	ASIANPCT			
0.1781	6446	0.0000	0.0000	1.4		MEDHINC_CY	BLACKPCT	HISPPCT		
0.1774	6448	0.0000	0.0002	1.1		MEDHINC_CY	ASIANPCT	POPDEN		
0.1772	6448	0.0000	0.0040	1.0		POVINCPCT	POPDEN			
0.1762	6450	0.0000	0.0000	1.0	0.0000	WHITEPCT				
0.1739	6458	0.0000	0.0000	1.0		BLACKPCT	HISPPCT			
0.1701	6470	0.0000	0.0129	1.0		MEDHINC_CY	POPDEN			
0.1677	6481	0.0000	0.0000	1.7		POVINCPCT	MEDHINC_CY	BLACKPCT	ASIANPCT	SCH
0.1609	6501	0.0000	0.0000	1.6		POVINCPCT	MEDHINC_CY	BLACKPCT	ASIANPCT	
0.1606	6502	0.0000	0.0000	1.3		POVINCPCT	BLACKPCT	ASIANPCT	SCH	
0.1551	6520	0.0000	0.0000	1.6		POVINCPCT	MEDHINC_CY	ASIANPCT	HISPPCT	SCH
0.1514	6529	0.0000	0.0000	1.3		POVINCPCT	BLACKPCT	ASIANPCT		

0.1480	6540	0.0000	0.0000	1.6		POVINCPCT	MEDHINC_CY	ASIANPCT	HISPPCT	
0.1455	6548	0.0000	0.0000	1.3		MEDHINC_CY	BLACKPCT	ASIANPCT	SCH	
0.1444	6550	0.0000	0.0000	1.3		MEDHINC_CY	BLACKPCT	ASIANPCT		
0.1441	6550	0.0000	0.0000	1.1		HISPPCT	POPDEN			
0.1426	6557	0.0000	0.0000	1.6		POVINCPCT	MEDHINC_CY	HISPPCT	SCH	
0.1422	6558	0.0000	0.0000	1.2		POVINCPCT	ASIANPCT	HISPPCT	SCH	
0.1375	6572	0.0000	0.0000	1.7		POVINCPCT	MEDHINC_CY	BLACKPCT	SCH	
0.1354	6577	0.0000	0.0000	1.5		POVINCPCT	MEDHINC_CY	HISPPCT		
0.1350	6578	0.0000	0.0000	1.1		POVINCPCT	HISPPCT	SCH		
0.1348	6579	0.0000	0.0000	1.3		POVINCPCT	BLACKPCT	SCH		
0.1319	6588	0.0000	0.0000	1.1		POVINCPCT	ASIANPCT	HISPPCT		
0.1318	6588	0.0000	0.0000	1.6		POVINCPCT	MEDHINC_CY	BLACKPCT		
0.1289	6597	0.0000	0.0000	1.6		POVINCPCT	MEDHINC_CY	ASIANPCT	SCH	
0.1275	6600	0.0000	0.0000	1.2		POVINCPCT	BLACKPCT			
0.1253	6606	0.0000	0.0000	1.0		POVINCPCT	HISPPCT			
0.1251	6608	0.0000	0.0000	1.5		POVINCPCT	MEDHINC_CY	ASIANPCT		
0.1238	6610	0.0000	0.3368	1.0	0.0000	POPDEN				
0.1207	6621	0.0000	0.0000	1.1		MEDHINC_CY	ASIANPCT	HISPPCT		
0.1148	6638	0.0000	0.0000	1.1		BLACKPCT	ASIANPCT	SCH		
0.1138	6640	0.0000	0.0000	1.1		BLACKPCT	ASIANPCT			
0.1127	6643	0.0000	0.0000	1.3		MEDHINC_CY	BLACKPCT			
0.1091	6655	0.0000	0.0000	1.1		POVINCPCT	ASIANPCT	SCH		
0.1083	6657	0.0000	0.0000	1.6		POVINCPCT	MEDHINC_CY	SCH		
0.1082	6656	0.0000	0.0000	1.0		MEDHINC_CY	HISPPCT			
0.1048	6666	0.0000	0.0000	1.4		POVINCPCT	MEDHINC_CY			
0.1026	6672	0.0000	0.0000	1.0		POVINCPCT	ASIANPCT			
0.0963	6691	0.0000	0.0008	1.1		POVINCPCT	SCH			
0.0921	6702	0.0000	0.0001	1.1		MEDHINC_CY	ASIANPCT			
0.0919	6702	0.0000	0.0000	1.0	0.0000	BLACKPCT				
0.0907	6705	0.0000	0.0110	1.0	0.0000	POVINCPCT				
0.0710	6761	0.0000	0.0951	1.0	0.0000	MEDHINC_CY				
0.0580	6798	0.0000	0.0000	1.0		ASIANPCT	HISPPCT			
0.0569	6800	0.0000	0.0000	1.0		HISPPCT				
0.0043	6940	0.0000	0.0000	1.0		ASIANPCT				

Figure 44: OLS Report Result for Fast Food

```
Choose 1 of 8 Summary
    Highest Adjusted R-Squared Results
AdjR2    AICc   JB K(BP)  VIF   SA   Model
 0.12 9547.44 0.00  0.01 1.00 0.00  -POPDEN***
 0.12 9562.93 0.00  0.00 1.00 0.00  +WHITEPCT***
 0.04 9762.72 0.00  0.00 1.00 0.00  -BLACKPCT***
       Passing Models
AdjR2 AICc JB K(BP) VIF SA   Model
********************************************************************************
Choose 2 of 8 Summary
          Highest Adjusted R-Squared Results
AdjR2    AICc   JB K(BP)  VIF   SA   Model
 0.18 9372.63 0.00  0.00 1.12 0.00  +WHITEPCT***  -POPDEN***
 0.15 9472.63 0.00  0.00 4.22 0.00  +WHITEPCT***  +BLACKPCT***
 0.14 9477.50 0.00  0.00 1.03 0.00  -BLACKPCT***  -POPDEN***
       Passing Models
AdjR2 AICc JB K(BP) VIF SA   Model
********************************************************************************
Choose 3 of 8 Summary
                Highest Adjusted R-Squared Results
AdjR2    AICc   JB K(BP)  VIF   SA   Model
 0.20 9310.80 0.00  0.00 1.40 0.00  -MEDHINC_CY***  +WHITEPCT***  -POPDEN***
 0.20 9320.69 0.00  0.00 1.14 0.00  +WHITEPCT***  -ASIANPCT***  -POPDEN***
 0.19 9330.63 0.00  0.00 4.87 0.00  +WHITEPCT***  +BLACKPCT***  -POPDEN***
       Passing Models
AdjR2 AICc JB K(BP) VIF SA   Model
********************************************************************************
Choose 4 of 8 Summary
                       Highest Adjusted R-Squared Results
AdjR2    AICc   JB K(BP)  VIF   SA   Model
 0.21 9278.00 0.00  0.00 4.98 0.00  -MEDHINC_CY***  +WHITEPCT***  +BLACKPCT***  -POPDEN***
 0.21 9287.14 0.00  0.00 1.43 0.00  -MEDHINC_CY***  +WHITEPCT***  -ASIANPCT***  -POPDEN***
 0.21 9287.25 0.00  0.00 1.49 0.00  -MEDHINC_CY***  +WHITEPCT***  -POPDEN***  -SCH***
       Passing Models
AdjR2 AICc JB K(BP) VIF SA   Model
********************************************************************************
Choose 5 of 8 Summary
                             Highest Adjusted R-Squared Results
AdjR2    AICc   JB K(BP)  VIF   SA   Model
 0.22 9248.03 0.00  0.00 5.21 0.00  -MEDHINC_CY***  +WHITEPCT***  +BLACKPCT***  -POPDEN***  -SCH***
 0.21 9264.16 0.00  0.00 1.52 0.00  -MEDHINC_CY***  +WHITEPCT***  -ASIANPCT***  -POPDEN***  -SCH***
 0.21 9267.40 0.00  0.00 1.74 0.00  -POVINCPCT***  -MEDHINC_CY***  +WHITEPCT***  -POPDEN***  -SCH***
       Passing Models
AdjR2 AICc JB K(BP) VIF SA   Model
********************************************************************************
************** Exploratory Regression Global Summary (FFDISTMI) **************

              Percentage of Search Criteria Passed
                   Search Criterion Cutoff Trials # Passed % Passed
             Min Adjusted R-Squared > 0.50    213        0     0.00
            Max Coefficient p-value < 0.05    213      165    77.46
                      Max VIF Value < 7.50    213      202    94.84
            Min Jarque-Bera p-value > 0.10    213        0     0.00
Min Spatial Autocorrelation p-value > 0.10     17        0     0.00
```

```
      Summary of Variable Significance
Variable   % Significant % Negative % Positive
WHITEPCT          100.00       0.00     100.00
BLACKPCT          100.00      60.64      39.36
ASIANPCT          100.00     100.00       0.00
HISPPCT           100.00      88.30      11.70
POPDEN            100.00     100.00       0.00
MEDHINC_CY         87.76      89.80      10.20
SCH                82.65      96.94       3.06
POVINCPCT          76.53      94.90       5.10

--------------------------------------------------------------------------------

      Summary of Multicollinearity*
Variable     VIF Violations Covariates
POVINCPCT   1.74          0 --------
MEDHINC_CY  1.75          0 --------
WHITEPCT   23.14         11 BLACKPCT (25.58)
BLACKPCT   22.44         11 WHITEPCT (25.58)
ASIANPCT    1.64          0 --------
HISPPCT     5.74          0 --------
POPDEN      1.20          0 --------
SCH         1.19          0 --------
* At least one model failed to solve due to perfect multicollinearity.
Please review the warning messages for further information.
--------------------------------------------------------------------------------

               Summary of Residual Normality (JB)
      JB    AdjR2        AICc    K(BP)      VIF       SA   Model
0.000000 0.115524 9562.928708 0.000000 1.000000 0.000000  +WHITEPCT***
0.000000 0.000840 9877.847480 0.000000 1.000000 0.000000  +MEDHINC_CY**
0.000000 0.027053 9809.176662 0.116035 1.000000 0.000000  -POVINCPCT***

--------------------------------------------------------------------------------

        Summary of Residual Spatial Autocorrelation (SA)
      SA    AdjR2        AICc       JB    K(BP)      VIF   Model
0.000000 0.115524 9562.928708 0.000000 0.000000 1.000000  +WHITEPCT***
0.000000 0.044397 9762.716383 0.000000 0.000000 1.000000  -BLACKPCT***
0.000000 0.120812 9547.438919 0.000000 0.008814 1.000000  -POPDEN***
```

Table 12: OLS Table Result for Fast Food

AdjR2	AICc	JB	K_BP	MVIF	SA	X1	X2	X3	X4	X5
0.2183	9248	0.0000	0.0000	5.2	0.0000	MEDHINC_CY	WHITEPCT	BLACKPCT	POPDEN	SCH
0.2134	9264	0.0000	0.0000	1.5	0.0000	MEDHINC_CY	WHITEPCT	ASIANPCT	POPDEN	SCH
0.2124	9267	0.0000	0.0000	1.7	0.0000	POVINCPCT	MEDHINC_CY	WHITEPCT	POPDEN	SCH
0.2118	9269	0.0000	0.0000	1.5		MEDHINC_CY	WHITEPCT	HISPPCT	POPDEN	SCH
0.2113	9271	0.0000	0.0000	5.1		POVINCPCT	MEDHINC_CY	WHITEPCT	BLACKPCT	POPDEN
0.2100	9275	0.0000	0.0000	7.0		MEDHINC_CY	WHITEPCT	BLACKPCT	ASIANPCT	POPDEN
0.2090	9278	0.0000	0.0000	1.5		MEDHINC_CY	WHITEPCT	ASIANPCT	HISPPCT	POPDEN
0.2089	9279	0.0000	0.0000	1.7		POVINCPCT	MEDHINC_CY	WHITEPCT	ASIANPCT	POPDEN
0.2088	9278	0.0000	0.0000	5.0	0.0000	MEDHINC_CY	WHITEPCT	BLACKPCT	POPDEN	
0.2070	9285	0.0000	0.0000	1.4		MEDHINC_CY	BLACKPCT	ASIANPCT	HISPPCT	POPDEN
0.2060	9287	0.0000	0.0000	1.4	0.0000	MEDHINC_CY	WHITEPCT	ASIANPCT	POPDEN	
0.2060	9287	0.0000	0.0000	1.5	0.0000	MEDHINC_CY	WHITEPCT	POPDEN	SCH	
0.2057	9289	0.0000	0.0000	6.7		WHITEPCT	BLACKPCT	ASIANPCT	POPDEN	SCH
0.2049	9292	0.0000	0.0000	1.6		POVINCPCT	MEDHINC_CY	WHITEPCT	HISPPCT	POPDEN
0.2048	9292	0.0000	0.0000	1.2		WHITEPCT	ASIANPCT	HISPPCT	POPDEN	SCH
0.2032	9297	0.0000	0.0000	1.2		BLACKPCT	ASIANPCT	HISPPCT	POPDEN	SCH
0.2026	9298	0.0000	0.0000	1.4		MEDHINC_CY	WHITEPCT	HISPPCT	POPDEN	
0.2017	9301	0.0000	0.0000	1.2		WHITEPCT	ASIANPCT	POPDEN	SCH	
0.2008	9304	0.0000	0.0000	1.6		POVINCPCT	MEDHINC_CY	WHITEPCT	POPDEN	
0.2007	9304	0.0000	0.0000	5.1		WHITEPCT	BLACKPCT	POPDEN	SCH	
0.1984	9311	0.0000	0.0000	1.4	0.0000	MEDHINC_CY	WHITEPCT	POPDEN		
0.1981	9313	0.0000	0.0000	6.4		WHITEPCT	BLACKPCT	ASIANPCT	POPDEN	
0.1974	9315	0.0000	0.0000	1.2		WHITEPCT	ASIANPCT	HISPPCT	POPDEN	
0.1959	9320	0.0000	0.0000	1.2		BLACKPCT	ASIANPCT	HISPPCT	POPDEN	
0.1953	9321	0.0000	0.0000	1.1	0.0000	WHITEPCT	ASIANPCT	POPDEN		
0.1944	9326	0.0000	0.0000	1.5		MEDHINC_CY	BLACKPCT	HISPPCT	POPDEN	SCH
0.1922	9331	0.0000	0.0000	4.9	0.0000	WHITEPCT	BLACKPCT	POPDEN		
0.1897	9341	0.0000	0.0000	1.6		POVINCPCT	MEDHINC_CY	BLACKPCT	HISPPCT	POPDEN
0.1897	9340	0.0000	0.0000	1.2		WHITEPCT	HISPPCT	POPDEN	SCH	
0.1867	9349	0.0000	0.0000	1.4		MEDHINC_CY	BLACKPCT	HISPPCT	POPDEN	
0.1851	9353	0.0000	0.0000	1.2		WHITEPCT	POPDEN	SCH		
0.1846	9357	0.0000	0.0000	1.6		POVINCPCT	MEDHINC_CY	BLACKPCT	ASIANPCT	POPDEN
0.1842	9358	0.0000	0.0000	4.6		POVINCPCT	MEDHINC_CY	WHITEPCT	BLACKPCT	SCH
0.1820	9363	0.0000	0.0000	1.2		WHITEPCT	HISPPCT	POPDEN		
0.1815	9367	0.0000	0.0000	1.4		POVINCPCT	BLACKPCT	ASIANPCT	POPDEN	SCH
0.1813	9367	0.0000	0.0000	1.4		MEDHINC_CY	BLACKPCT	ASIANPCT	POPDEN	SCH
0.1787	9373	0.0000	0.0000	1.1	0.0000	WHITEPCT	POPDEN			
0.1787	9375	0.0000	0.0000	1.3		MEDHINC_CY	BLACKPCT	ASIANPCT	POPDEN	
0.1779	9377	0.0000	0.0000	1.2		BLACKPCT	ASIANPCT	POPDEN	SCH	

0.1769	9380	0.0000	0.0000	1.3		POVINCPCT	BLACKPCT	ASIANPCT	POPDEN	
0.1752	9384	0.0000	0.0000	1.1		BLACKPCT	ASIANPCT	POPDEN		
0.1737	9391	0.0000	0.0000	6.7		MEDHINC_CY	WHITEPCT	BLACKPCT	ASIANPCT	SCH
0.1729	9393	0.0000	0.0000	4.5		MEDHINC_CY	WHITEPCT	BLACKPCT	SCH	
0.1729	9393	0.0000	0.0000	1.2		BLACKPCT	HISPPCT	POPDEN	SCH	
0.1715	9398	0.0000	0.0000	1.5		MEDHINC_CY	WHITEPCT	ASIANPCT	HISPPCT	SCH
0.1712	9399	0.0000	0.0000	1.7		POVINCPCT	MEDHINC_CY	WHITEPCT	HISPPCT	SCH
0.1705	9401	0.0000	0.0000	1.8		POVINCPCT	MEDHINC_CY	WHITEPCT	ASIANPCT	SCH
0.1684	9408	0.0000	0.0000	1.4		MEDHINC_CY	BLACKPCT	ASIANPCT	HISPPCT	SCH
0.1677	9410	0.0000	0.0000	6.6		POVINCPCT	MEDHINC_CY	WHITEPCT	BLACKPCT	ASIANPCT
0.1669	9411	0.0000	0.0000	1.1		BLACKPCT	HISPPCT	POPDEN		
0.1660	9414	0.0000	0.0000	4.5		POVINCPCT	MEDHINC_CY	WHITEPCT	BLACKPCT	
0.1658	9416	0.0000	0.0000	1.7		POVINCPCT	MEDHINC_CY	BLACKPCT	POPDEN	SCH
0.1657	9416	0.0000	0.0000	1.7		POVINCPCT	MEDHINC_CY	WHITEPCT	ASIANPCT	HISPPCT
0.1642	9421	0.0000	0.0000	6.4		POVINCPCT	WHITEPCT	BLACKPCT	ASIANPCT	SCH
0.1631	9424	0.0000	0.0000	1.7		POVINCPCT	MEDHINC_CY	BLACKPCT	ASIANPCT	HISPPCT
0.1627	9424	0.0000	0.0000	6.4		MEDHINC_CY	WHITEPCT	BLACKPCT	ASIANPCT	
0.1625	9426	0.0000	0.0000	1.4		POVINCPCT	WHITEPCT	ASIANPCT	HISPPCT	SCH
0.1618	9427	0.0000	0.0000	6.2		WHITEPCT	BLACKPCT	ASIANPCT	SCH	
0.1614	9429	0.0000	0.0000	1.2		POVINCPCT	ASIANPCT	HISPPCT	POPDEN	SCH
0.1613	9428	0.0000	0.0000	4.3		MEDHINC_CY	WHITEPCT	BLACKPCT		
0.1608	9430	0.0000	0.0000	1.4		MEDHINC_CY	WHITEPCT	ASIANPCT	HISPPCT	
0.1606	9431	0.0000	0.0000	1.4		MEDHINC_CY	WHITEPCT	HISPPCT	SCH	
0.1603	9433	0.0000	0.0000	1.4		POVINCPCT	BLACKPCT	ASIANPCT	HISPPCT	SCH
0.1602	9432	0.0000	0.0000	1.6		POVINCPCT	MEDHINC_CY	BLACKPCT	POPDEN	
0.1601	9433	0.0000	0.0000	1.2		WHITEPCT	ASIANPCT	HISPPCT	SCH	
0.1599	9434	0.0000	0.0000	1.6		POVINCPCT	MEDHINC_CY	ASIANPCT	HISPPCT	POPDEN
0.1590	9436	0.0000	0.0000	1.4		MEDHINC_CY	WHITEPCT	ASIANPCT	SCH	
0.1580	9439	0.0000	0.0000	1.4		MEDHINC_CY	BLACKPCT	ASIANPCT	HISPPCT	
0.1579	9439	0.0000	0.0000	4.5		POVINCPCT	WHITEPCT	BLACKPCT	SCH	
0.1577	9440	0.0000	0.0000	1.1		BLACKPCT	ASIANPCT	HISPPCT	SCH	
0.1568	9442	0.0000	0.0000	1.1		POVINCPCT	ASIANPCT	HISPPCT	POPDEN	
0.1568	9442	0.0000	0.0000	4.4		WHITEPCT	BLACKPCT	SCH		
0.1561	9445	0.0000	0.0000	1.7		POVINCPCT	MEDHINC_CY	WHITEPCT	ASIANPCT	
0.1554	9447	0.0000	0.0000	1.3		MEDHINC_CY	BLACKPCT	POPDEN	SCH	
0.1552	9449	0.0000	0.0000	1.7		POVINCPCT	MEDHINC_CY	ASIANPCT	POPDEN	SCH
0.1545	9449	0.0000	0.0000	1.7		POVINCPCT	MEDHINC_CY	WHITEPCT	SCH	
0.1536	9451	0.0000	0.0000	1.3		MEDHINC_CY	BLACKPCT	POPDEN		
0.1534	9454	0.0000	0.0000	1.7		POVINCPCT	MEDHINC_CY	HISPPCT	POPDEN	SCH
0.1533	9453	0.0000	0.0000	1.6		POVINCPCT	MEDHINC_CY	WHITEPCT	HISPPCT	
0.1526	9455	0.0000	0.0000	1.4		POVINCPCT	WHITEPCT	ASIANPCT	SCH	
0.1525	9456	0.0000	0.0000	1.2		POVINCPCT	ASIANPCT	POPDEN	SCH	

0.1522	9455	0.0000	0.0000	6.1		WHITEPCT	BLACKPCT	ASIANPCT		
0.1513	9459	0.0000	0.0000	1.5		POVINCPCT	MEDHINC_CY	ASIANPCT	POPDEN	
0.1507	9460	0.0000	0.0000	1.1		WHITEPCT	ASIANPCT	HISPPCT		
0.1506	9460	0.0000	0.0000	1.4		MEDHINC_CY	WHITEPCT	ASIANPCT		
0.1497	9463	0.0000	0.0000	1.1		WHITEPCT	ASIANPCT	SCH		
0.1494	9464	0.0000	0.0000	1.1		POVINCPCT	ASIANPCT	POPDEN		
0.1490	9466	0.0000	0.0000	1.4		POVINCPCT	BLACKPCT	ASIANPCT	HISPPCT	
0.1490	9465	0.0000	0.0000	1.4		MEDHINC_CY	WHITEPCT	HISPPCT		
0.1485	9467	0.0000	0.0000	1.1		BLACKPCT	ASIANPCT	HISPPCT		
0.1484	9468	0.0000	0.0000	1.4		POVINCPCT	BLACKPCT	POPDEN	SCH	
0.1475	9471	0.0000	0.0000	1.5		POVINCPCT	MEDHINC_CY	HISPPCT	POPDEN	
0.1467	9472	0.0000	0.0000	1.1		ASIANPCT	HISPPCT	POPDEN		
0.1464	9473	0.0000	0.0000	1.1		BLACKPCT	POPDEN	SCH		
0.1462	9473	0.0000	0.0000	4.2	0.0000	WHITEPCT	BLACKPCT			
0.1459	9477	0.0000	0.0000	1.7		POVINCPCT	MEDHINC_CY	BLACKPCT	HISPPCT	SCH
0.1446	9477	0.0000	0.0000	1.0	0.0000	BLACKPCT	POPDEN			
0.1439	9481	0.0000	0.0000	1.4		MEDHINC_CY	WHITEPCT	SCH		
0.1434	9483	0.0000	0.0000	1.2		POVINCPCT	HISPPCT	POPDEN	SCH	
0.1430	9483	0.0000	0.0000	1.3		POVINCPCT	WHITEPCT	ASIANPCT		
0.1423	9485	0.0000	0.0000	1.0		WHITEPCT	ASIANPCT			
0.1399	9493	0.0000	0.0000	1.6		POVINCPCT	MEDHINC_CY	WHITEPCT		
0.1395	9494	0.0000	0.0000	1.1		POVINCPCT	HISPPCT	POPDEN		
0.1390	9497	0.0000	0.0000	1.7		POVINCPCT	MEDHINC_CY	POPDEN	SCH	
0.1377	9499	0.0000	0.0000	1.2		WHITEPCT	HISPPCT	SCH		
0.1361	9503	0.0000	0.0000	1.0		ASIANPCT	POPDEN			
0.1355	9506	0.0000	0.0000	1.5		POVINCPCT	MEDHINC_CY	POPDEN		
0.1351	9506	0.0000	0.0000	1.3		MEDHINC_CY	WHITEPCT			
0.1346	9509	0.0000	0.0000	1.1		HISPPCT	POPDEN	SCH		
0.1346	9509	0.0000	0.0000	1.1		MEDHINC_CY	HISPPCT	POPDEN		
0.1336	9510	0.0000	0.0000	1.1		HISPPCT	POPDEN			
0.1334	9513	0.0000	0.0000	1.4		MEDHINC_CY	BLACKPCT	HISPPCT	SCH	
0.1314	9518	0.0000	0.0001	1.2		POVINCPCT	POPDEN	SCH		
0.1297	9524	0.0000	0.0000	1.6		POVINCPCT	MEDHINC_CY	BLACKPCT	HISPPCT	
0.1292	9524	0.0000	0.0035	1.0		POVINCPCT	POPDEN			
0.1278	9528	0.0000	0.0000	1.1		WHITEPCT	HISPPCT			
0.1238	9541	0.0000	0.0000	1.4		MEDHINC_CY	BLACKPCT	HISPPCT		
0.1231	9542	0.0000	0.0000	1.1		WHITEPCT	SCH			
0.1208	9547	0.0000	0.0088	1.0	0.0000	POPDEN				
0.1194	9556	0.0000	0.0000	1.7		POVINCPCT	MEDHINC_CY	BLACKPCT	ASIANPCT	SCH
0.1155	9563	0.0000	0.0000	1.0	0.0000	WHITEPCT				
0.1126	9575	0.0000	0.0000	1.4		POVINCPCT	BLACKPCT	HISPPCT	SCH	
0.1123	9575	0.0000	0.0000	1.3		POVINCPCT	BLACKPCT	ASIANPCT	SCH	

0.1116	9577	0.0000	0.0000	1.6		POVINCPCT	MEDHINC_CY	BLACKPCT	ASIANPCT	
0.1114	9577	0.0000	0.0000	1.1		BLACKPCT	HISPPCT	SCH		
0.1065	9591	0.0000	0.0000	1.3		POVINCPCT	BLACKPCT	ASIANPCT		
0.1037	9598	0.0000	0.0000	1.0		BLACKPCT	HISPPCT			
0.1007	9608	0.0000	0.0000	1.1		BLACKPCT	ASIANPCT	SCH		
0.0989	9615	0.0000	0.0000	1.6		POVINCPCT	MEDHINC_CY	ASIANPCT	HISPPCT	SCH
0.0986	9613	0.0000	0.0000	1.1		BLACKPCT	ASIANPCT			
0.0961	9622	0.0000	0.0000	1.2		POVINCPCT	ASIANPCT	HISPPCT	SCH	
0.0910	9637	0.0000	0.0000	1.6		POVINCPCT	MEDHINC_CY	ASIANPCT	HISPPCT	
0.0894	9640	0.0000	0.0000	1.1		POVINCPCT	ASIANPCT	HISPPCT		
0.0753	9681	0.0000	0.0000	1.6		POVINCPCT	MEDHINC_CY	HISPPCT	SCH	
0.0707	9694	0.0000	0.0000	1.7		POVINCPCT	MEDHINC_CY	BLACKPCT	SCH	
0.0697	9695	0.0000	0.0000	1.1		POVINCPCT	ASIANPCT	SCH		
0.0673	9702	0.0000	0.0000	1.5		POVINCPCT	MEDHINC_CY	HISPPCT		
0.0671	9703	0.0000	0.0000	1.1		MEDHINC_CY	ASIANPCT	HISPPCT		
0.0659	9706	0.0000	0.0000	1.1		POVINCPCT	HISPPCT	SCH		
0.0658	9705	0.0000	0.0000	1.0		POVINCPCT	ASIANPCT			
0.0656	9706	0.0000	0.0000	1.0		ASIANPCT	HISPPCT			
0.0643	9710	0.0000	0.0000	1.6		POVINCPCT	MEDHINC_CY	BLACKPCT		
0.0602	9721	0.0000	0.0000	1.0		POVINCPCT	HISPPCT			
0.0545	9737	0.0000	0.0000	1.3		POVINCPCT	BLACKPCT	SCH		
0.0509	9746	0.0000	0.0000	1.2		POVINCPCT	BLACKPCT			
0.0487	9752	0.0000	0.0000	1.3		MEDHINC_CY	BLACKPCT			
0.0444	9763	0.0000	0.0000	1.0	0.0000	BLACKPCT				
0.0439	9764	0.0000	0.0000	1.0		HISPPCT				
0.0365	9785	0.0000	0.0000	1.1		MEDHINC_CY	ASIANPCT			
0.0351	9790	0.0000	0.0000	1.6		POVINCPCT	MEDHINC_CY	SCH		
0.0313	9799	0.0000	0.0000	1.4		POVINCPCT	MEDHINC_CY			
0.0297	9803	0.0000	0.0046	1.1		POVINCPCT	SCH			
0.0296	9802	0.0000	0.0000	1.0		ASIANPCT				
0.0271	9809	0.0000	0.1160	1.0	0.0000	POVINCPCT				
0.0008	9878	0.0000	0.0000	1.0	0.0000	MEDHINC_CY				