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“I DIDN’T CHOOSE THESE FOODS, MY BUILT ENVIRONMENT DID”: AN ASSOCIATION BETWEEN THE BUILT ENVIRONMENT AND ACCESS TO HEALTHY FOODS FOR ADOLESCENTS

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An abstract of

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Abstract

"I DIDN'T CHOOSE THESE FOODS, MY BUILT ENVIRONMENT DID": AN ASSOCIATION BETWEEN THE BUILT ENVIRONMENT AND ACCESS TO HEALTHY FOODS FOR ADOLESCENTS

By Diamond Spratling

Background: Adolescent prevalence of obesity has risen in North America, triggering serious health concerns across the US. In 2016, obesity prevalence was reported as 20.6% among US adolescents (Hales et al., 2017). Some studies show that this percentage is different between socioeconomic groups. Obesity prevalence among Black youth (22%) and Hispanic youth (25%) is higher in the US than for White youth (14.1%) and Asians (11%). (Hales et al., 2017). Although there are many causes of adolescent obesity related to SES, genetics, and physical activity, this thesis posits that the built environment may affect adolescent's access to healthy foods, placing them at risk for obesity. The goal of this thesis is to explain the relationship between food access and differences in the built environment of two neighborhoods in Atlanta, GA, and the role these neighborhood disparities play in the risk for adolescent obesity.

Methods: Two urban neighborhoods in Atlanta with different SES were chosen for this study. A network analysis using Geographic Information System identified proximity of food outlets to neighborhoods of adolescents. Additionally, four neighborhood audits were conducted using a Walkability Tool to observe eight attributes that determine an adolescent's ability to walk to different food outlets.

Results: The analysis focused on two themes: 1) proximity of food outlets and 2) features of the built environment that indicate a person's ability to walk to a nearby destination. In this analysis, the low-income neighborhood showed *unhealthy* food outlets in close proximity (0.77 miles) with low walkability scores versus the high-income neighborhood that had *healthy* food outlets in close proximity (0.83 miles) with high walkability scores. The findings highlighted disparity in the location, number of healthy food outlets, and built environment of a low-income vs high-income neighborhood in Atlanta.

Conclusion: We conclude that public health and public planning professionals need to address the built environment when developing interventions that target obesity prevention for adolescents.

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CHAPTER I: Introduction

Over the past several years, childhood and adolescent prevalence of obesity has risen in North America, triggering serious health concerns for children across the United States (Tyson & Frank, 2018). In 2016, obesity prevalence was reported as 20.6% among adolescents and 18.5% among children across the United States (Hales et al., 2017). However, some studies have shown that this percentage is different between socioeconomic groups (Tyson & Frank, 2018). Specifically, minority and low-income children and adolescents have the highest rates of obesity among all children and adolescents in the U.S. (Tyson & Frank, 2018). Obesity prevalence among non-Hispanic Black youth is 22%, and 25% for Hispanic youth in the U.S., both higher than non-Hispanic White youth in the U.S. which is 14.1% for non-Hispanic Whites and 11% for non-Hispanic Asians (Hales et al., 2017).

A person can be considered obese when they have accumulated an excess amount of body fat (Sahoo et al., 2015). Diagnosing children and adolescents with obesity is very difficult as there is no standard cut off for diagnosis as it is with adults (Tyson & Frank, 2018). Nevertheless, taking Body Mass Index (BMI) measurements has been the most successful method for an obesity diagnosis (Tyson & Frank, 2018). Obesity is most commonly measured by taking age and sex nomograms to determine the appropriate BMI of an individual (Hales et al., 2017). Waist circumference and skin-fold thickness have also been used to determine a person's status as obese (Sahoo et al., 2015).

Childhood obesity has many adverse effects on one's physical and mental health. It can affect almost every organ, potentially leading to more serious health complications such as fatty liver disease, hypertension, dyslipidemia, and diabetes (Han, Lawlor, & Kimm, 2010). In one

study, an association was found between obesity in adolescents ages of 14 to 19 and increased adult mortality (Han et al., 2010). High BMI among children and adolescents has also been associated with an increased risk of cardiovascular disease and pulmonary disorders during their adulthood (Han et al., 2010). In addition to physical health complications, there are detrimental mental health impacts. Specifically, adolescents who are obese often experience stigmatisms, low self-esteem, and poor body image, which increase their vulnerability for depression (Mannan, Mamun, Doi, & Clavarino, 2016). Weight stigmatism also has implications for adolescent mental health effects; like leading to low self-esteem, depression, suicide, etc. (Pont, Puhl, Cook, & Slusser, 2017). The teasing, bullying and victimization seem to be the adverse tools of the community of people who support or propagate the stigma (Pont et al., 2017). These experiences have thus been reported to reinforce behaviors in adolescents that are unhealthy and promote obesity (Pont et al., 2017).

Puberty and Adolescent Obesity

The adolescent stages of life begin at puberty and end at adulthood (Das et al., 2017). Although adolescence can range between the ages of 10 and 19 years, this range can also be subcategorized by early adolescence (ages 10-14) and late adolescence (ages 15-19) (Das et al., 2017). The life stage of adolescence is relatively crucial as various changes occur during this time period, both physical and mental (Mannan et al., 2016). Adolescents are beginning to take on adult roles and responsibilities such as employment and financial independence (Das et al., 2017). Nutrition becomes important during this time of growth because adolescents are making more of their own decisions about the foods they are eating with less input from their parents. During adolescence, appetites also increase and for those who have greater access to high-energy foods, they are more likely to accumulate fat (Das et al., 2017).

Obesity affects one in every three adolescents in the world (Das et al., 2017). Considering prevention approaches is the key to lowering the risk of obesity among adolescents (Tyson & Frank, 2018).

However, the causes behind adolescent obesity are extensive and range from personal behaviors such as dietary intake and physical activity, to family characteristics such as parenting styles (Sahoo et al., 2015). Environmental factors are also considered risk factors for adolescent obesity and include exposures at school and neighborhood safety, which influence the decision to walk or bike to nearby destinations (Sahoo et al., 2015).

Much of the research on adolescent obesity is focused on biological causes of obesity (Sahoo et al., 2015). For example, some studies found that genetics are a large contributing factor for obesity, with 25-40% of BMIs being heritable (Sahoo et al., 2015). However, when evaluating genetic susceptibility, both behavioral and environmental factors should also be considered (Sahoo et al., 2015). Having a poor, imbalanced diet is a significant contributing factor to obesity (Sahoo et al., 2015). Decisions behind poor diets are often influenced by peers, parents, and even governmental policies, like government taxation of crops or imports that have increased food prices (Sahoo et al., 2015). Other dietary factors like eating out often, portion size, and increased consumption of fast food, sugary beverages, and snack foods have also been attributed to adolescent obesity (Sahoo et al., 2015). What is less understood is how availability, or repeated exposure, to poor quality foods in a person's built environment are risk factors for accessibility to unhealthy foods for adolescents.

Adolescent Obesity and the Built Environment

Although there are many known causes of adolescent obesity, this thesis posits that the built environment has the capacity to have an association with an adolescent's access to healthy foods, putting them at risk for obesity. The built environment can best be defined as, "how communities are designed and its physical structure, including land use, retailer mix, street quality and connectivity, sidewalks, housing, and green space" (Carroll-Scott et al., 2013). The built environment can affect food access through differences in food availability and exposure (Reitzel et al., 2016). In considering the components of a built environment, increased exposure to inexpensive and energy-dense foods served in large portions, are commonly associated with poor diets and high BMI's. (Carroll-Scott et al., 2013). While increased access to healthy food vendors and large-scale grocery stores can promote healthier diets, exposure to corner stores and fast-food restaurants can often encourage high-calorie diets (Reitzel et al., 2016). However, these components of the built environment are not equally distributed across neighborhoods. Low income communities are at greater risk of being exposed to features of the built environment that encourage poor eating habits (Vargas, Stines, & Granado, 2017).

Components of the built environment are generally not considered as factors contributing to the relationship between food access and obesity among adolescents. It is essential for public health practitioners to pay closer attention to the built environment and its relationship to food access and obesity among adolescents in order to better understand the potential role of the built environment in obesity prevention.

Purpose of the Study

The goal of this thesis is to shed light on the relationship between food access among adolescents and differences in the built environment of two neighborhoods in Atlanta, GA and the

potential role that these neighborhood disparities may play in the risk for adolescent obesity. This goal will be met through the following objectives:

1. To evaluate components of the built environment in two neighborhoods in Atlanta, GA, Mechanicsville, and Inman Park
2. To compare the built environment of the Inman Park neighborhood— (high-income) and the Mechanicsville neighborhood (low-income), to see if there are differences in the built environment of these neighborhoods that may associate with differences in food access among adolescents and, increase risk for obesity

These objectives will be met by evaluating the literature, conducting neighborhood assessments, and performing spatial analysis using Geographic Information Systems (GIS).

Research Questions

The following research questions will guide the development of this thesis:

1. Using spatial analysis and conducting a neighborhood assessment, what are the features of the built environment in the Mechanicsville neighborhood (low-income) and the Inman Park neighborhood (higher income) of Atlanta, Georgia?
2. Using spatial analysis and conducting a neighborhood assessment, what differences exist in the built environment between Inman Park and Mechanicsville?
3. How do differences in the built environment place adolescents living in neighborhoods with disparate socio-economic status at a greater risk of obesity?

It is hypothesized that not only will the built environment be seen as a factor in the relationship between food access and obesity among adolescents, there will be differences in the built environment between low and high income neighborhoods that make adolescents in low

income communities more vulnerable to consuming foods that put them at a higher risk of becoming obese.

Significance of the Study

This study is significant to the development of preventative approaches that address adolescent and even, adulthood obesity. It brings attention to obesity associations that are beyond biological and genetic factors, by suggesting that the built environment in which an adolescent is exposed to, may also be a contributing factor. In addition, the study addresses how components of an adolescent's built environment may disproportionately influence poor eating habits among adolescents who live in low-income communities.

CHAPTER II: Literature Review

The purpose of this literature review is three fold: 1) to present what is already known about the relationship between food access and obesity among adolescents, 2) to identify gaps within this binary relationship, and 3) to discuss how this thesis may contribute to this relationship. An integrative literature review was conducted in which broad themes around school environments, societal barriers, and personal factors were summarized.

Known Factors Related to Food Access and Adolescent Obesity

Although, there are many known factors contributing to the relationship between food access and obesity among adolescents, three major factors are found in the literature: personal factors, the school environment, and societal barriers.

Personal Factors and Food Access

Costs

An array of personal factors was identified in the literature as contributing to food access among adolescents. One of these personal factors included economic and financial reasons. Healthy foods cost more than unhealthy foods, and fast food restaurants are becoming increasingly available; making it easier and more convenient for adolescents to access cheaper, unhealthy foods (Powell, Han, & Chaloupka, 2010). Most adolescents are unemployed or working only very short hours, so consuming foods that are less expensive is often a reasonable decision for most young people.

Cost factors also become clear when considering disparities in food outlets that sell healthier food items like supermarkets and grocery stores (Powell et al., 2010). A national adolescent data survey revealed that “lower fruit and vegetable prices, higher fast food prices, and

greater supermarket availability were related to higher fruit and vegetable consumption and lower BMI, in particular for BMI among teens who are overweight or at risk for overweight and who are low- to middle-socioeconomic status" (Powell et al., 2010). This survey showed that if healthier foods were less expensive and unhealthy foods were more expensive, then teens would potentially purchase the healthier food item.

In a qualitative study, the price of food was described as a strong factor when selecting what to eat during lunch, especially because middle school and high school students were only given a limited amount of spending money per day from their parents, encouraging them to purchase cheaper (and often less healthy) lunch items (Watts, Lovato, Barr, Hanning, & Mâsse, 2015).

Self-Empowerment

Another personal factor related to food access among adolescents is self-empowerment. One study suggested that youth empowerment programs have the potential to influence an adolescent's perceptions of healthy food choices, self-efficacy, healthy eating, and their overall motivation for becoming healthy human beings (Muturi et al., 2018). Increased focus on youth empowerment within preventative interventions seeking to reduce adolescent obesity are most effective when adolescents are invited to play an active role in decision-making (Muturi et al., 2018). When adolescents feel personally empowered and involved in healthy eating programs, they are more likely to feel encouraged to adopt healthier diets and even engage more in physical activities resulting in their overall well-being and decreased risk of obesity (Muturi et al., 2018).

Family Dynamics

Sibling relationships and family structure have also been identified as personal factors of food access and intake among adolescents. For example, having poor sibling relationships were associated with poor eating behaviors like binge eating and becoming over-weight and obese (Campbell, Franks, & Joseph, 2019). The frustration that is experienced at home can increase depression and the desire to pick up bad eating habits as a coping method (Campbell et al., 2019).

Additionally, one study evaluated family beliefs and practices of parents and their influence on immigrant adolescents' food choice. For immigrant adolescents, migrating to the U.S. had a negative influence on their eating habits as they adopted a more American diet that consisted of high-fat and high-calorie foods (Campbell et al., 2019). Although they grew up consuming healthier diets in their home countries, transitioning to a more fast-paced environment influenced their consumption of more accessible, less healthy foods thereby placing them, at higher risk of obesity.

Experiencing stress in the home had also been mentioned as a determinant of food choice for adolescents (Senguttuvan, Whiteman, & Jensen, 2014) (M. R. Winkler, Moore, Bennett, Armstrong, & Brandon, 2017) (Zeller et al., 2007). When adolescents experience stress at home, they often result to coping strategies such as binge eating, and increased time spent watching television (Campbell et al., 2019). Spending hours a day watching television can result in binge eating, a behavior that commonly underlies obesity. Other factors including living with parents or siblings who are experiencing stress, which may be stressful for the adolescent, resulting in the use of coping mechanisms that can possibly involve consuming a surplus of high calorie foods (Campbell et al., 2019).

School Environment and Food Access

Food Options in Schools

In addition to personal reasons that can contribute to variations in access to healthy foods among adolescents, there are many influences within the school environment. More than one third of adolescents' food consumption come from sources outside of the home including fast food restaurants and food sources from school (Briefel, Crepinsek, Cabili, Wilson, & Gleason, 2009). Fast food restaurants and the sale of less healthy food options in schools have contributed to poor diets in adolescents (Poti, Slining, & Popkin, 2014). One study interviewed adolescents at their school and learned that the supply of less healthy foods severely outweighed the supply of healthy foods, forcing the students to select the less healthy food option (Watts et al., 2015). Students even mentioned food outlets surrounding the school as being unhealthy, making it difficult to find a healthy food option for after school (Watts et al., 2015).

Classroom Environment

Classroom practices at school were also identified as having bad influences on adolescent food intake. For example, one study reported how teachers would give unhealthy treats such as pizza, candy, and ice cream to students as teaching tools or for good behavior (Isoldi, Dalton, Rodriguez, & Nestle, 2012). Further, the home economics course would teach the students how to make pies versus teaching them how to prepare healthier foods (Watts et al., 2015). Lastly, a lot of food intake for adolescents came down to accessibility and convenience for them especially when they were pressed for time, when the food outlet was closer to school, or when looking for food outlets after a sporting event. When looking for food outlets after sporting activities or practices, food outlets that served less healthy foods always seemed more convenient and the only accessible option during late hours (Watts et al., 2015).

Peers at School

In addition to food options served at school, adolescents also mentioned the issue of peer influence. Students expressed seeing their peers at school purchasing or bringing less healthy food options to lunch, triggered them to consume those kind of foods also (Lloyd-Richardson et al., 2012). Even hanging out with peers after school served as a risk for feeling pressured into consuming certain type of foods (Seliske, Pickett, Rosu, & Janssen, 2013). Often, adolescents tend to hang out at malls or fast food restaurants near their schools to engage in social activities with their friends, encouraging them to purchase snacks from these food outlets (Seliske et al., 2013; Watts et al., 2015).

Society Influence and Food Access

In addition to influences from the school environment on adolescent food access, there are many societal factors that have played a role in the food adolescents consume.

Television

The marketing of energy-dense and nutrient-poor (EDNP) foods have raised concerns in the obesity epidemic and the advertisement of food to children (Lee, Kim, Lee, Yoon, & Chung, 2014). One of the major societal influences on food intake for children and adolescents has been EDNP food advertising (Lee et al., 2014). One study found that children and adolescents who spend a significant amount of time watching television, are exposed to EDNP food advertising, and consume less fruit and vegetables as opposed to children and adolescents who watch less television (Lee et al., 2014). Additionally, as children and adolescents spend longer time watching tv, they are developing snacking behaviors that are predictive of obesity (Lee et al., 2014).

Cultural Impacts

Other studies have suggested that much of child and adolescent food intake is heavily supported by perceptions within their culture (Megan R. Winkler, Bennett, & Brandon, 2017). A study that focused on factors relating to obesity among Black adolescent girls in the U.S., found that much of their food consumption revolved around expectations in the traditional African American food culture. Traditionally, within this food culture, high-fat foods are prepared, increasing the risk of obesity and other health complications (Megan R. Winkler et al., 2017). It was also reported that Black adolescent girls in the study believed that consuming culturally African American foods would attract more Black men because the foods were high in fat and Black men preferred bigger women (Megan R. Winkler et al., 2017).

Gaps in the Relationship

Although it is evident that various factors have contributed to the relationship between food access, choice and obesity among adolescents, there is a component in this relationship that is often overlooked: "the built environment". The built environment is defined as "how communities are designed and its physical structure, including land use, retailer mix, street quality and connectivity, sidewalks, housing, and green space" (Carroll-Scott et al., 2013) For this thesis, I argue that the built environment has the capacity to have an association with an adolescent's access to healthy foods and could potentially, put them at higher risk of obesity.

Proximity and Identification of Food Outlets

Recent literature support the idea that the placement and accessibility to certain food outlets within a neighborhood influence adolescent food access (Mahendra et al., 2017). Food access is best understood in terms of the average number of food outlets, the relative density of unhealthy food retailers to healthy and unhealthy food retailers, and proximity (Mahendra et al., 2017).

Proximity to food outlets can be determined my assessing the distance between an area of interest and nearest food outlets. (Mahendra et al., 2017).

Food outlets can vary, but "unhealthy" food outlets have often been identified as convenience stores, fast food restaurants, and gas stations, whereas "healthy" food outlets are associated with grocery stores and markets (Mahendra et al., 2017) (Minaker et al., 2014; Polsky, Moineddin, Glazier, Dunn, & Booth, 2014). The distinction between the categorization of these food outlets are often based on differences in the distribution of nutritious foods (Minaker et al., 2014). However, it is understood that labels such as "unhealthy" food outlets and "healthy" food may be deceiving; e.g., a "healthy" food outlet may offer both healthy and unhealthy foods in terms of caloric content. For this thesis, the assumption will be that when someone wants an "unhealthy" food option they will likely commute to an "unhealthy" food outlet (like a gas station or convenience store) and when someone wants a "healthy" food option they will commute to an "healthy" food outlet (like a grocery store or market) (Mahendra et al., 2017).

Components of the Built Environment

Although examining proximity of food outlets in a neighborhood provides a good scope of a person's food environment, it is essential to also evaluate built environment features that may have an association with an adolescents' ability to access these food outlets.

There are a number of features in the built environment that can influence the accessibility of healthy foods among adolescents, the most common indicator being walkability. Different variables can be used to measure neighborhood walkability, including residential density, proximity and access to stores and facilities (land use mix diversity and access), street connectivity, aesthetics, walking facilities, and safety from traffic and crime (Chiang, Sullivan, & Larsen, 2017) (Cerin, Saelens, Sallis, & Frank, 2006). These neighborhood components can be attributed to a

person's ability to commute within or around their environment (Chiang et al., 2017). Increased crime and heavy traffic limit how much children and adolescents walk, whereas diverse land use and green environments increase the ability to walk around one's neighborhood (Chiang et al., 2017). In addition, if a person feels unsafe in their neighborhood, they are less likely to walk to nearby food retailers, possibly adapting their shopping routines to avoid unsafe areas even if this means a longer commute (Calise, Chow, Ryder, & Wingerter, 2019).

Walkability and Obesity

Reports on acceptable walking distances vary, but most literature state that an average person is willing to walk anywhere between 0.25 to 1 mile, or a 5 to 15 minute walk contingent on the built and social environment features in their neighborhood (Buehler, Pucher, Merom, & Bauman, 2011; Pucher, Buehler, Merom, & Bauman, 2011; Yang & Diez-Roux, 2012).

Research shows that people living within walkable neighborhoods are less likely to be overweight than less walkable neighborhoods. One study found that density of healthy food outlets were highest within high-walkable areas and lowest among low-walkability areas (Rundle et al., 2009). Proximity to supermarkets is also associated with the consumption of a healthy diet and low obesity rates whereas those living near corner stores have been associated with higher rates of obesity (Rundle et al., 2009).

Socio-economic Status and the Built Environment

There are many differences that exist within an adolescent's built environment depending on the average socio-economic status among the families living within that neighborhood. Areas with the highest healthy food outlet density are often composed of affluent and predominantly white neighborhoods, but neighborhoods with lower density of healthy food outlets are predominately low-income and comprised of Black and Latino families (Rundle et al., 2009).

One study concluded that high walkability, low crime, and social cohesion were statistically associated with ease of purchasing, affordability, and having a large selection of fruits and vegetables within a neighborhood (Calise et al., 2019). Neighborhoods that are designed to encourage walking can promote accessibility to affordable food outlets. However, neighborhoods that lack walking and biking options must rely on vehicle transportation forcing them to spend more time traveling, or to shop at the nearest food outlet that may have limited options for healthy foods (Calise et al., 2019). Unfortunately, many people living in neighborhoods without walking and biking options often do not have reliable transportation. This situation forces them to walk or bike to the nearest food outlet regardless of its limited options.

Summary of the Literature Review

This review of literature revealed existing knowledge of the binary relationship between food access and obesity among adolescents, while also suggesting a new area of study that may impact this relationship. The built environment may serve as a contributing factor and may be a target of prevention efforts to reduce the risk of obesity among adolescents. In evaluating the literature on this topic, it is evident that there are a number of potential factors that have an association with an adolescents' access to healthy foods, and the main themes that emerge are barriers to the accessibility of healthy foods are school environments, personal factors and societal environments.

However, there is a clear gap in information and preventative interventions aimed at the built environment of a neighborhood and its potential relationship to adolescent food access, especially in neighborhoods with disparate socio-economic status.

The findings from this thesis will be important for public health practitioners in opening another area of consideration and evaluation when developing public health preventions that target obesity among adolescents. It is also hoped that the results from this study will stimulate more collaboration between public health and public planning sectors.

CHAPTER III: Methods

INTRODUCTION

The goals of this thesis are to shed light on the relationship between food access among adolescents and differences in the built environment of two neighborhoods in Atlanta, GA and the potential role that these neighborhood disparities may play in the risk for adolescent obesity. The goals will be met through the following objectives:

1. To evaluate components of the built environment in two neighborhoods in Atlanta, GA, Mechanicsville, and Inman Park
2. To compare the built environment of the Inman Park neighborhood— (high-income) and the Mechanicsville neighborhood (low-income), to see if there are differences in the built environment of these neighborhoods that may be associated with differences in food access among adolescents and, increase risks for obesity

To achieve these objectives, a spatial analysis of Global Positioning System (GPS) coordinates retrieved from Google Maps and neighborhood audits of Mechanicsville and Inman Park were conducted.

Study Areas

The study areas selected for this thesis are two neighborhoods located in Atlanta, Georgia—Inman Park and Mechanicsville. A non-random sampling process was utilized to select the study area for this project. Given the researcher's area of interest in assessing the needs of vulnerable, high-risk populations, a low-income neighborhood was selected for this study first.

In determining which low-income neighborhood would be selected, Mechanicsville was considered because of its low median household income level of $17,701 as compared to the city

of Atlanta's median household income, $55,279 (Niche, n.d.-a). In addition, Mechanicsville has a high percentage of adolescents (12%) compared to other low-income neighborhoods in Atlanta, GA (Niche, n.d.-b).

Next, this researcher identified a higher income neighborhood with geographic features similar to Mechanicsville. The neighborhood of Inman Park was considered because of its relatively high median household income of $82,841 compared to Mechanicsville and Atlanta's median household income of $55,279 (Niche, n.d.-a). Furthermore, geographical features of Inman Park, including being located in the same county as Mechanicsville (Fulton County) and having a total population size similar to Mechanicsville, helped to justify the comparison of the neighborhoods for this thesis. The adolescent population size of Inman Park, however, is less than half that of Mechanicsville (at 5%) (Niche, n.d.-b).

Despite the differences in adolescent populations, Inman Park was still considered an appropriate comparison neighborhood because its obesity prevalence was half that of Mechanicsville (at 20.7%). It was expected that Inman Park would have low obesity rates because it is a high-income neighborhood and research studies have shown that there is an association between income and obesity. People of lower income status are associated with higher risks of obesity, while higher-income people are associated with lower risk of obesity (Dinsa, Goryakin, Fumagalli, & Suhrcke, 2012) (McLaren, 2007). Therefore, Inman Park was judged to reflect the natural experience of adolescents who live in that community.

Table 1. Comparison of Neighborhood Characteristics

Demographic Characteristics	Inman Park	Mechanicsville
Total Population	5,629	4,075
Adolescent Population	5%	12%
Obesity Prevalence	20.7%	41.5%
Median Household Income	$82,841	$17,701

Neighborhood Size	0.281 sq. miles	0.614 sq. miles

Footnotes: Data were retrieved from US Census and American Community Survey (census)

INSTRUMENT DESIGN

This study is a combination of spatial analysis using Global Positioning System (GPS) coordinates retrieved from Google Maps and a neighborhood audit using a walkability tool to assess built environment features between routes from (adolescent) dense areas of both neighborhoods to the food outlets identified from conducting the spatial analysis.

Spatial Analysis

A spatial analysis methodology was designed to answer the research questions identified in Chapter One of this thesis. Namely, what are the features of the built environment in the Mechanicsville neighborhood (low-income) and the Inman Park neighborhood (higher income) of Atlanta, Georgia and what differences exist in the built environment between Inman Park and Mechanicsville? This methodology was selected as it is the best approach to visually represent the placement of food outlets in the built environment for both neighborhoods. The methodology included a Geographic Information System (GIS) framework which analyzes spatial location and organizes layers of information into visualizations using maps (Esri, n.d.). The spatial analysis software selected for this thesis was ArcGIS 10.7, which creates, shares, and analyzes spatial data (Esri, n.d.).

Neighborhood Audit

In addition to the spatial methodology, a neighborhood audit was conducted by this researcher to evaluate attributes of both neighborhoods that could influence an adolescent's ability to walk to a food outlet in their neighborhood. As discussed in the literature review, neighborhood attributes related to adolescent food accessibility included walkability measures such as residential

density, proximity and access to stores and facilities (land use mix diversity and access), street connectivity, aesthetics, walking facilities, and safety from traffic and crime (Chiang et al., 2017) (Cerin et al., 2006).

The walkability measure instrument used in this assessment was adopted from a study conducted in 2017 that compared data collection methods for understanding walkability environments within two urban neighborhoods of Taiwan (Chiang et al., 2017). The first data collection method involved conducting Google Street View assessments where university students were recruited to observe the two neighborhoods from their computers using Google Street View. The second data collection method involved having people who lived in the neighborhoods of interest to complete a paper version of the walkability assessment based on what they remembered about their neighborhood. In the third and final methodology, people who did not live in the selected neighborhoods were recruited to physically walk around the neighborhoods and fill out the walkability assessment on site. Though there were three different methodologies utilized in this study, all observations were recorded using the same walkability tool.

The data collected from the Chiang et al., walkability assessments were compared between each methodology. It was concluded that the data collected by the local residents and people who lived outside of the neighborhood were very similar to the results that were found using Google Street View. In some cases, the data that were collected by the local residents and people who lived outside of the neighborhood, were more accurate than the observations using Google Street View. For example, while using Google Street View, it was more difficult for the university students to see small aesthetic features that the people who physically walked around the neighborhood and residents who were more familiar with the neighborhood, were able to identify more clearly. Therefore, the researcher in the study found that it would be better to conduct in-

person neighborhood audits verses using Google Street View to assess walkability (Chiang et al., 2017).

The Chiang et al., walkability tool is comprised of 27 different attributes and a total of 8 walkability categories (Chiang et al., 2017). Each attribute is scored between 1 and 5, with 5 being associated with the best possible walkability attribute (see Figure. 1).

Figure 1: Measuring Neighborhood Walkable Environments: A Comparison of Three Approaches Study Walkability Tool

Categories	Attributes	Levels
Street connectivity	Intersections	1 (very few) to 5 (numerous)
	Alternative paths	1 (very few) to 5 (numerous)
Social safety	Graffiti	1 (common) to 5 (none)
	Abandoned houses or cars	1 (common) to 5 (none)
	Pedestrian flow volume	1 (very few) to 5 (numerous)
	Security of the surroundings	1 (very unsafe) to 5 (very safe)
Traffic safety	Vehicle flow volume	1 (very high) to 5 (very low)
	Road safety	1 (unsafe) to 5 (safe)
	Traffic signs	1 (very insufficient) to 5 (very sufficient)
Aesthetics	Beautiful views in the surroundings	1 (none) to 5 (common)
	Attractive scenery	1 (none) to 5 (common)
	Shop window decoration	1 (none) to 5 (common)
	Roadside plantings	1 (none) to 5 (common)
	Roadside trees	1 (none) to 5 (common)
	Distinctive business signs	1 (none) to 5 (common)
Sidewalk quality	Sidewalk width	1 (very insufficient) to 5 (very sufficient)
	Pavement smoothness	1 (very coarse) to 5 (very smooth)
	Sidewalk cleanness	1 (very unclean) to 5 (very clean)
Physical barrier	Scooters occupying the sidewalk	1 (common) to 5 (none)
	Street vendors occupying the sidewalk	1 (common) to 5 (none)
	Cul-de-sac	1 (common) to 5 (none)
Amenities	Rain shelters	1 (none) to 5 (common)
	Benches	1 (none) to 5 (common)
	Lighting	1 (none) to 5 (common)
Others	Accessibility ramps	1 (none) to 5 (common)
	Bus stops	1 (none) to 5 (common)
	Street signs	1 (none) to 5 (common)

Footnote: This tool was used in the "Measuring Neighborhood Walkable Environments: A Comparison of Three Approaches Study Walkability Tool" Study (Chiang et al., 2017).

For the purposes of this thesis, the original tool was modified to provide more detailed observations of each neighborhood. The first modification was to provide a thorough description

of each score in order to clearly define and differentiate each possible score. Also, in a modified score sheet, an "additional notes" column was added so that the researcher could provide justification for the selection of each specified score when appropriate, or any other relevant details. The Modified Walkability Tool can be found in the Appendix.

SELECTION OF DATA POINTS & INDICATORS

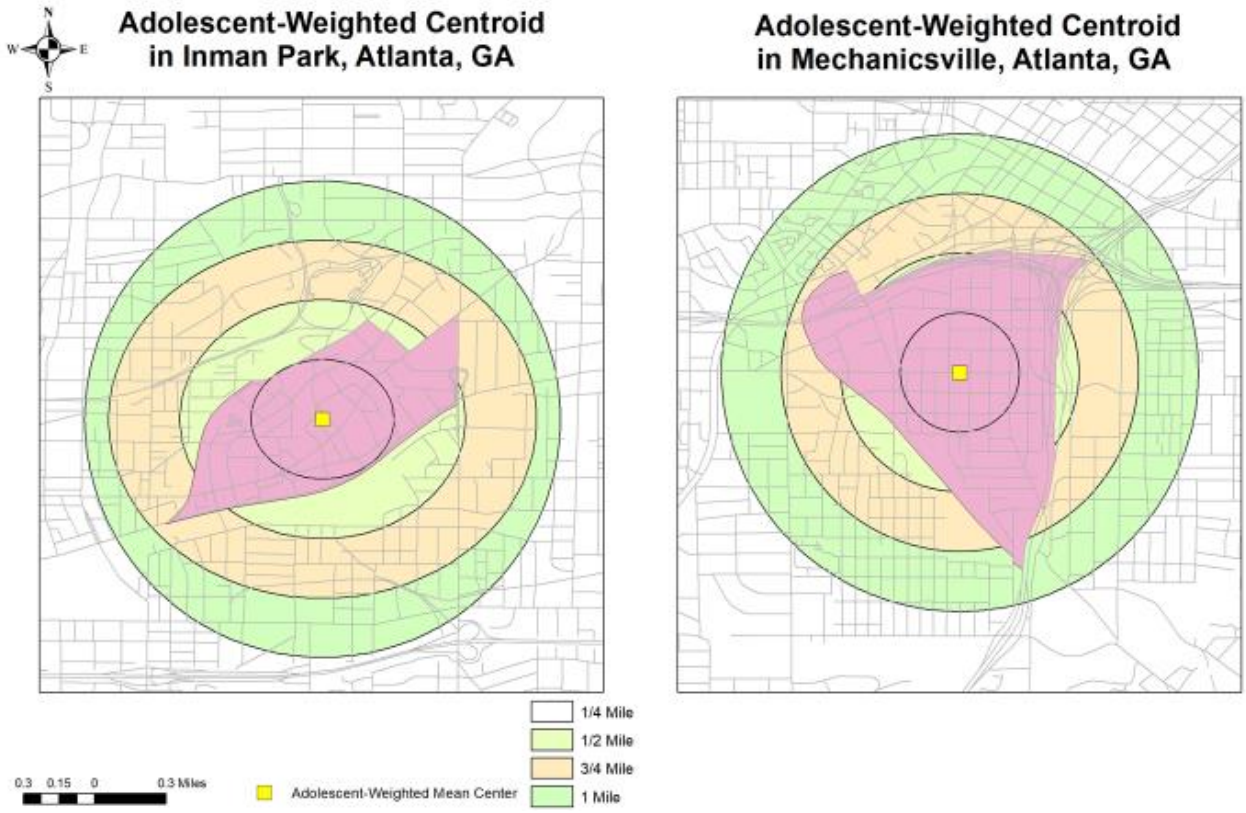
For this thesis, different data points were selected to conduct the spatial analysis. Centroids were identified so that the researcher could calculate the distance from each neighborhood center to the selected food outlets.

Spatial Analysis

Incident Areas

Population-weighted centroids of Mechanicsville and Inman Park (Figure. 2) were selected as starting points for the analysis. This allowed for the distance to each food outlet to be calculated from the center of both neighborhoods based on the density of adolescents. The centroid of both neighborhoods was selected because it provided the most appropriate representation for a starting point for adolescent residents of each neighborhood.

Figure 2. Location of adolescent-weighted centroids for Mechanicsville and Inman Park



Facilities

A variety of food outlets including grocery stores, markets, convenience stores, gas stations, sit-down restaurants, and fast food restaurants were selected as facilities. Collecting X,Y coordinates for each of these food outlets helped to determine the distance from the incident areas to each food outlet.

Table 2. Description of Spatial Analysis Variables

Variable	Description
Neighborhood Centroids (Incident Areas)	
Inman Park	Identifies the adolescent-weighted center of the neighborhood
Mechanicsville	Identifies the adolescent-weighted center of the neighborhood
Food Outlets (Facilities)	
Grocery Stores / Markets	Businesses retailing a general line of food products
Convenience / Corner Stores	Small scale stores retailing convenient products
Gas Stations	Retails snack foods and provides vehicle services
Fast Food Restaurants	Restaurants servicing convenient, inexpensive foods
Sit Down Restaurants	Casual dining restaurants with table service

Neighborhood Audit

For the neighborhood audit, walkability indicators were identified to assess built environment factors that may serve as barriers to accessing the different food outlets identified through spatial analysis.

Built Environment Indicators

Different built environment indicators of food access among adolescents were selected for evaluation based on the findings in the review of literature. Components of the built environment including safety, connectivity, ability to bike, and mass transportation of one's neighborhood, were identified as factors that may influence a person's ability to travel to a specified location. These features will be used to assess potential differences in barriers to walking to select food outlets for adolescents in Mechanicsville and Inman Park.

Table 3. Description of Neighborhood Audit Indicators

Walkability Indicator	Description
Street Connectivity	The continuity of the walking space network
Social Safety	Components of a neighborhood that make someone feel safe to participate in activities in their surrounding neighborhood
Traffic safety	The ability to safely maneuver through traffic without having to be at risk for harm from moving vehicles
Aesthetics	The beauty of an area; trees along the roadside, beautiful buildings, public art, and attractive landmarks
Sidewalk Quality	Measured by Sidewalk width, maintenance, pavement material, and accessibility
Physical Barriers	Barriers that prevent pedestrians from walking on sidewalks
Amenities	Useful features within an area that are accessible
Others	Street signs, bus stops, and accessibility ramps

DATA COLLECTION

Spatial Analysis

Coordinate data for all food outlets located a maximum of 1 mile from each neighborhood (Mechanicsville and Inman Park) were collected from Google Maps. Different terms for food outlets were searched based on literature review and what other researchers identified as common food outlets. Search terms on Google Maps included: “grocery store”, “gas station”, “market”, “restaurant”, “convenience store”, and “fast food restaurant”. The neighborhood centroids, or incident areas, were collected through ArcGIS. Population-weighted centroids were created where adolescents were identified as the population of interest. Longitude and latitude coordinates for all

locations were stored in Microsoft Excel and then uploaded onto ArcGIS to be transformed into a shapefile for analysis.

Neighborhood Audit

Data for the neighborhood audit were collected by conducting walkability assessments of both neighborhoods. In facilitating this audit, the researcher visited each neighborhood and made in-person observations using a paper score sheet, as illustrated in *Table 3.* Each indicator was scored on a scale between 1 and 5, with 1 meaning poor and 5 meaning excellent. The paper walkability tool can be found in *Appendix A*.

The neighborhood audit involved walking through Mechanicsville and Inman Park to observe specific components of their built environments as described in *Table 3.* Both neighborhoods were observed one time on a weekday from 3:30pm-4:30pm based on the dismissal times for middle and high school students in the Atlanta Public School District. To observe the built environment from the adolescent-weighted centers to the different food outlets, the researcher followed two different routes in each neighborhood. The first route was from the adolescent-weighted center to a grocery store, market, and sit-down restaurant and the second route was from the adolescent-weighted center to a fast food restaurant, convenience store, and gas station. Walking these routes served to evaluate the indicators identified in *Table 3.* A total of four audits were completed to account for each route in both neighborhoods.

DATA MANAGEMENT

All data selected for this study were stored electronically on a password protected laptop.

DATA ANALYSIS

Spatial Analysis

The spatial analysis software ArcGIS 10.7 was utilized in order to conduct a Geographic Information System (GIS) analysis. Using ArcGIS, a network analysis (closest facility analysis) was performed to provide an in-depth analysis of potential differences in distance to selected food outlets in Inman Park and Mechanicsville. Food outlets included gas stations, grocery stores, markets, corner/convenience stores, and fast food restaurants. A network analysis can use satellite navigation systems in order to pinpoint the travel distance from a selected incident area to a selected facility. For this thesis, a network analysis was used to track distances from the centroid of both neighborhoods to the different food outlets that were identified in *Table 2*. The network analysis began with collecting X,Y coordinates for the population-weighted centroid of each neighborhood using ArcGIS and collecting point data for each food outlet using Google Maps. The population-weighted centroid was determined by locating where the most adolescents in each neighborhood lived. For each neighborhood centroid selected, the distance to each food outlet was calculated. For the network analysis, we looked at ¼, ½, ¾, and 1 mile distant buffer zones to the food outlets that were collected. This analysis was important for understanding what type of food outlets adolescents in both neighborhoods had access to.

Neighborhood Audit

In addition to the network analysis, a neighborhood audit was performed in order to identify potential walkability determinants between the routes from the incident area (neighborhood centroids) to the selected facility (food outlets). This analysis was performed by assessing built environment features of each neighborhood that may influence an adolescent's ability to walk to different food outlets in close proximity to their neighborhood. The built environment features of

both neighborhoods were evaluated by assessing walkability indicators including street connectivity, social safety, traffic safety, aesthetics, sidewalk quality, physical barriers, amenities, and others.

These walkability indicators attempt to evaluate an adolescents' ability to walk to food outlets in their neighborhood. Scores for each indicator category were compared between both neighborhoods. The results from this analysis were used to help determine the ability of an adolescent in each neighborhood to walk to a food outlet in close proximity to their neighborhood's center. Lastly, photographs were taken to provide visual representation of the current state of both neighborhoods to support rankings for each indicator in the neighborhood audit. Photographs are shown in the Results section.

ETHICAL CONSIDERATIONS

Obtaining IRB approval was waived for this thesis given that no human research subjects were used in the study.

CHAPTER IV: Results

Study Population

Inman Park, Atlanta, Georgia

Inman Park is a neighborhood located in Atlanta, Georgia within Fulton County. Inman Park has a population size of 5,629 people with a median household income of $82,841 (Niche, n.d.-a). Seventy-seven percent of its residents identify as White and 43% of the residents have earned a bachelor's degree (Niche, n.d.-a). Thirty-seven percent of Inman Park residents are between the ages 25-34, while 5% of residents are adolescents (Niche, n.d.-a).

Figure 3. Neighborhood photograph of Inman Park

Mechanicsville, Atlanta, GA

Mechanicsville is also a neighborhood located in Atlanta, Georgia with a population size of 4,075 people (Niche, n.d.-b). Mechanicsville is a part of Fulton County and has a median household income of $17,701 compared to the national median household income of $55,322 (Niche, n.d.-b). The neighborhood is comprised of 92% African Americans and 12% of the residents are adolescents between the ages of 10 and 17 years (Niche, n.d.-b). Education levels in the neighborhood vary with 22% of residents having less than a high school diploma, 30% completing some college or associate degree, and 14% earning a bachelor's degree (Niche, n.d.-b).

Figure 4. Neighborhood photograph of Mechanicsville

SPATIAL ANALYSIS

The spatial analysis methodology showed the proximity of each food outlet at ¼, ½, ¾ and 1 mile radiuses from the adolescent mean center of each neighborhood. Proximity was measured by recording the number of food outlets within the 1 mile radius and the location of the food outlets in relation to the adolescent mean center.

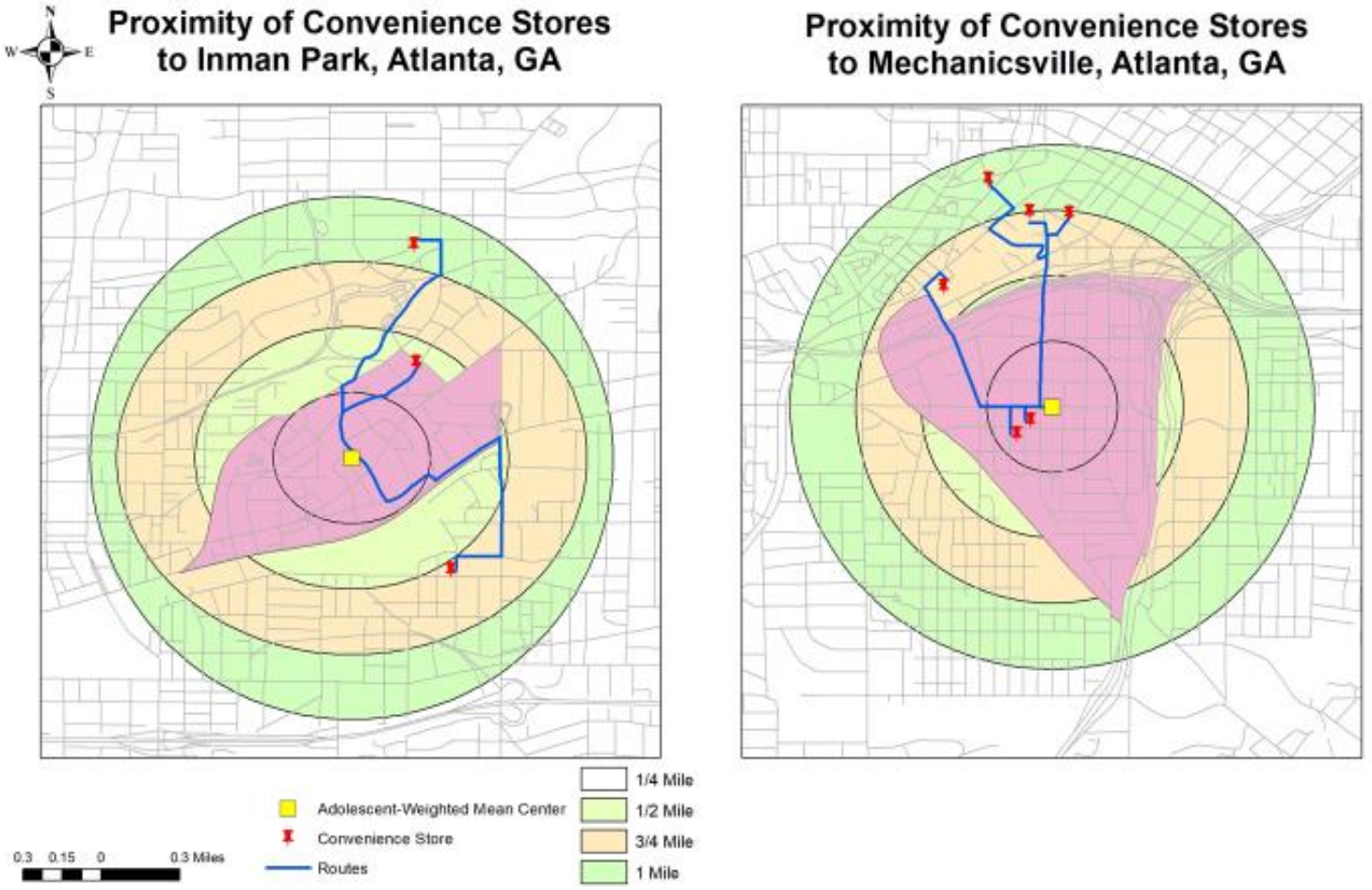
Convenience Stores

As a result of conducting the closest facility network analyses from the adolescent mean centers to convenience stores within a distance of one mile or less, it was found that Mechanicsville had a total of six convenience stores while Inman Park had three convenience stores. In addition, on average, Mechanicsville convenience stores were located closer to where adolescents resided in comparison to Inman Park. Two of the convenience stores in Mechanicsville were located within a quarter mile away from the adolescent mean center, equaling to approximately a 5-minute walk. In contrast, the closest convenience store to Inman Park's adolescent mean center was half a mile which would take the average person 10-minutes to walk. However, in Inman Park, the average convenience store was almost a mile away from where most adolescents lived, equaling to about a 20 minute walk.

Table 4. Proximity of Convenience Stores

	Inman Park	Mechanicsville
Number of Convenience Stores	3	6
Average Distance (miles)	0.96	0.67

Figure 5. Comparison of Convenience Store Proximity in Mechanicsville and Inman Park



Fast Food Restaurants

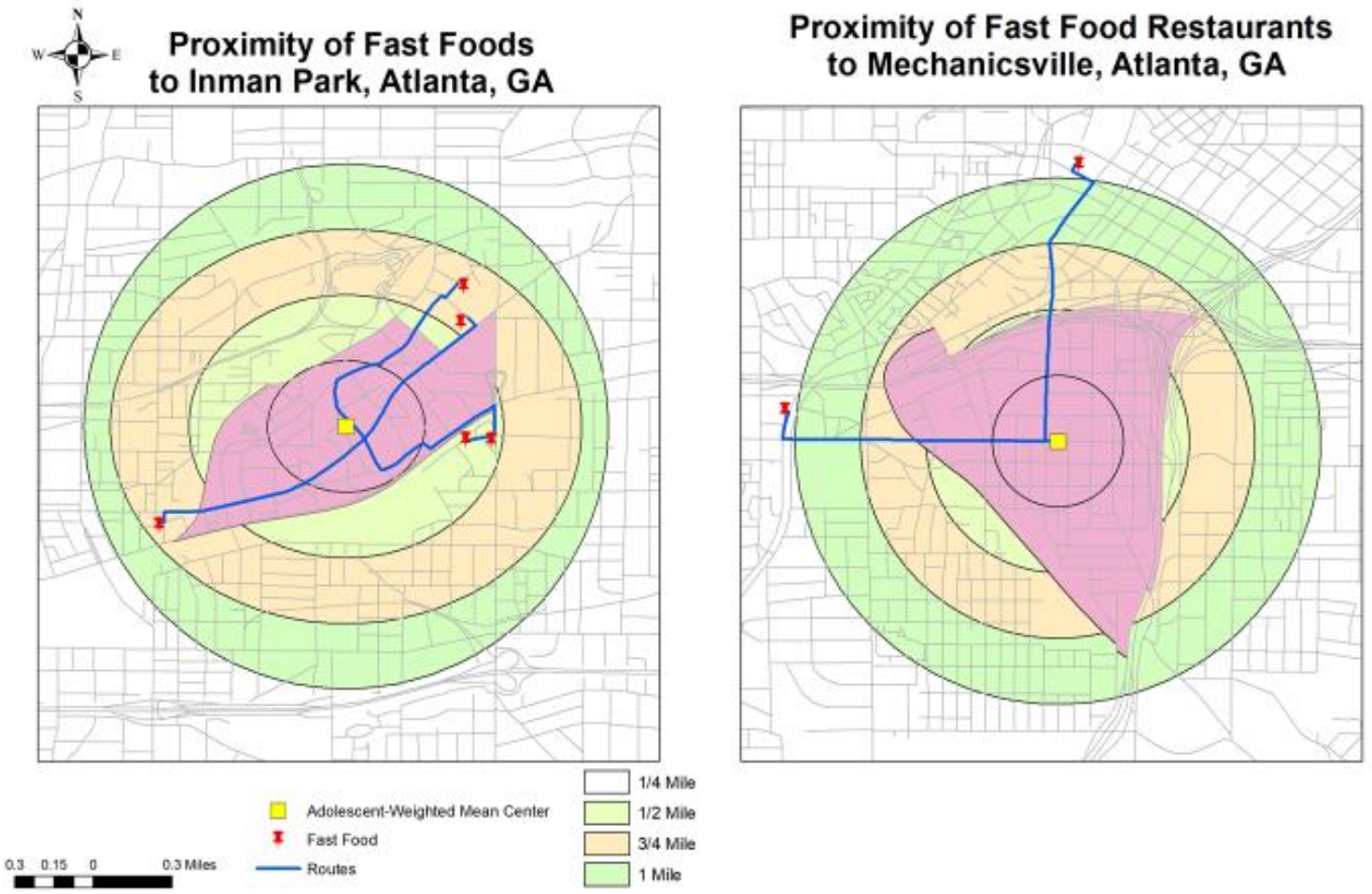
After conducting closest facility network analyses from the adolescent mean centers to fast food restaurants within one mile or less, it was found that Mechanicsville had a total of two fast food restaurants nearby, while Inman Park had five fast food restaurants. All fast food restaurants in Inman Park were less than a ¾ mile distance from the adolescent mean center which would take the average person 15 minutes to walk to, whereas in Mechanicsville, the two fast food restaurants identified, were over the 1 mile buffer.

However, the fast food restaurants that were located in proximity to Inman Park's adolescent mean center were mostly hamburger restaurants, sandwich shops, and an Indian restaurant. The fast food restaurants in proximity to Mechanicsville were fast food restaurants like McDonald's restaurant.

Table 5. Proximity of Fast Food Restaurants

	Inman Park	Mechanicsville
Number of Fast Food Restaurants	5	2
Average Distance (miles)	0.79	1.08

Figure 6. Comparison of Fast Food Proximity in Mechanicsville and Inman Park



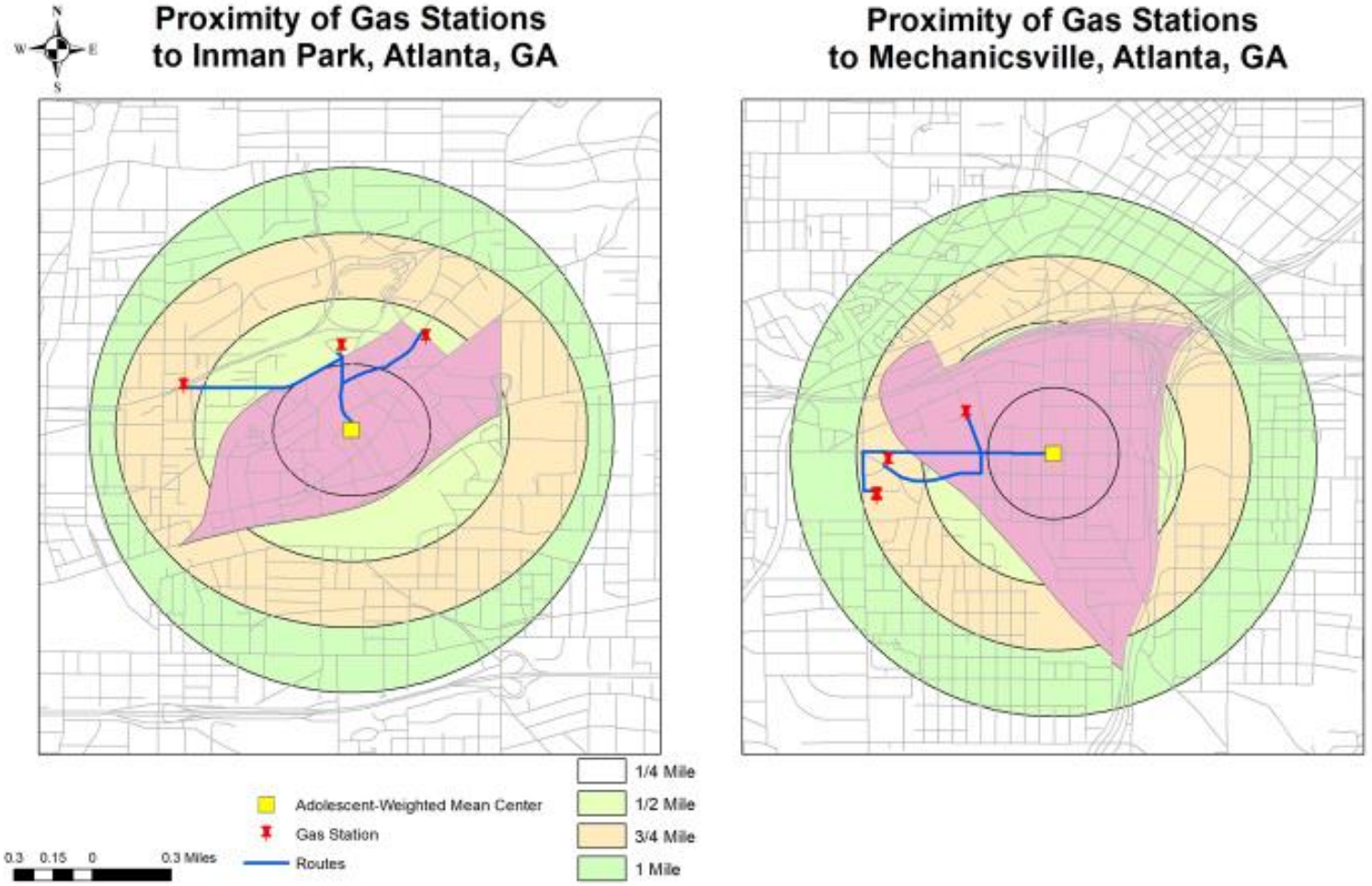
Gas Stations

After conducting the closest facility network analyses from the adolescent mean centers to gas stations at each mile radius (1/4, ½, ¾, and 1), it was found that Mechanicsville had a total of seven gas stations while Inman Park had three gas stations. In Mechanicsville, gas stations were located an average of 0.56 miles from the adolescent mean center, while the gas stations in Inman Park were located an average of 0.72 miles from the adolescent mean center.

Table 6. Proximity of Gas Stations

	Inman Park	Mechanicsville
Number of Gas Stations	3	7
Average Distance (miles)	0.72	0.56

Figure 7. Comparison of Gas Station Proximity in Mechanicsville and Inman Park



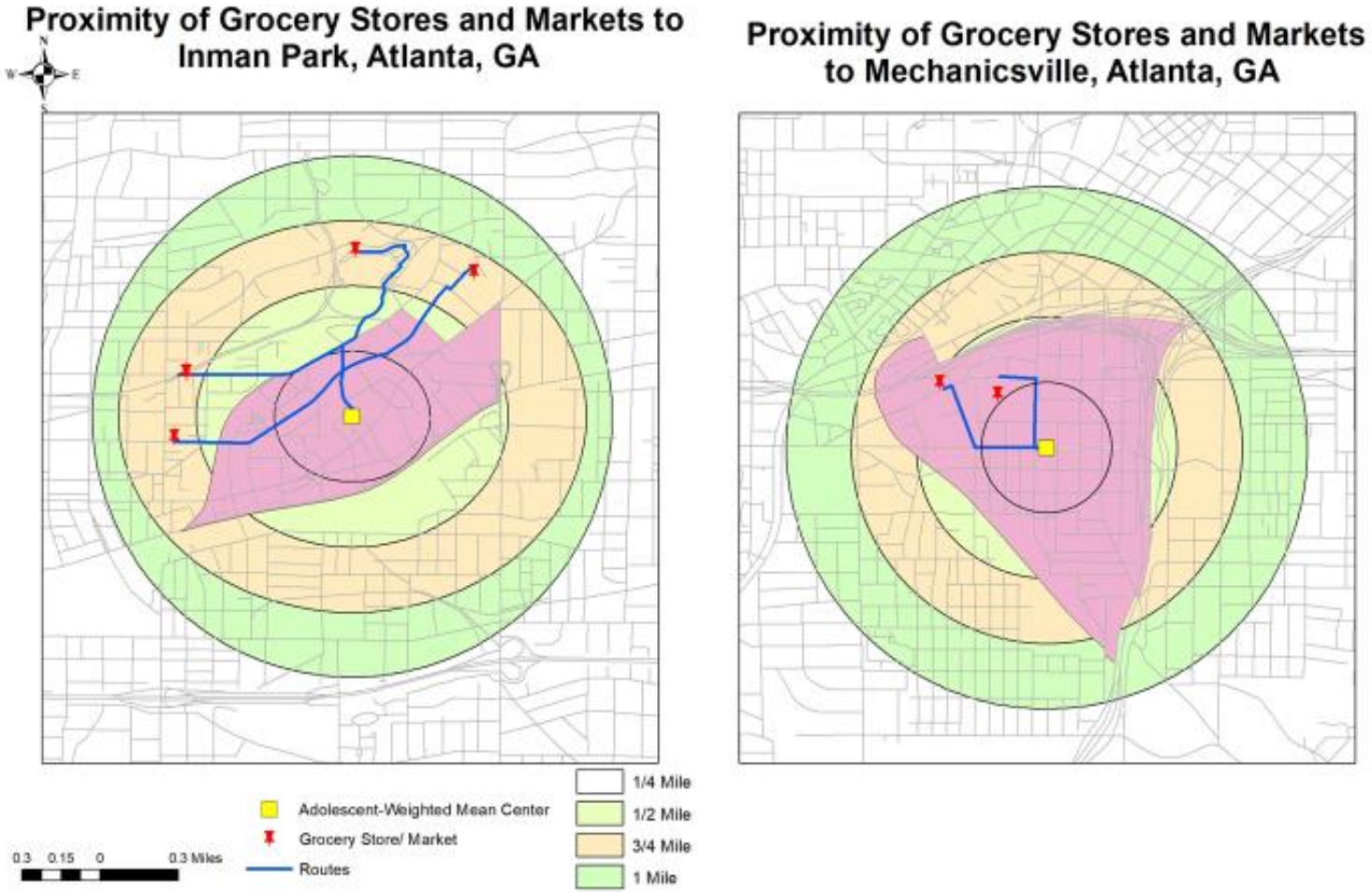
Grocery Stores and Markets

In the closest facility network analyses from the adolescent mean centers to grocery stores and markets within a distance of one mile or less, it was found that Mechanicsville had a total of two grocery stores while Inman Park had four grocery stores and markets. In addition, the average Mechanicsville grocery store was located less than ½ a mile away from the adolescent mean center, while the average grocery store/ market in Inman park was almost a mile away. However, in Mechanicsville, Windsor Convenience Store was classified as a grocery store when in actuality, it is a convenience store. Additionally, it was unclear whether Marks Organic Food Store, also identified as a grocery store in Mechanicsville, is currently open.

Table 7. Proximity of Grocery Stores and Markets

	Inman Park	Mechanicsville
Number of Grocery Stores and Markets	4	2
Average Distance (miles)	0.84	0.47

Figure 8. Comparison of Grocery Store and Market Proximity in Mechanicsville and Inman Park



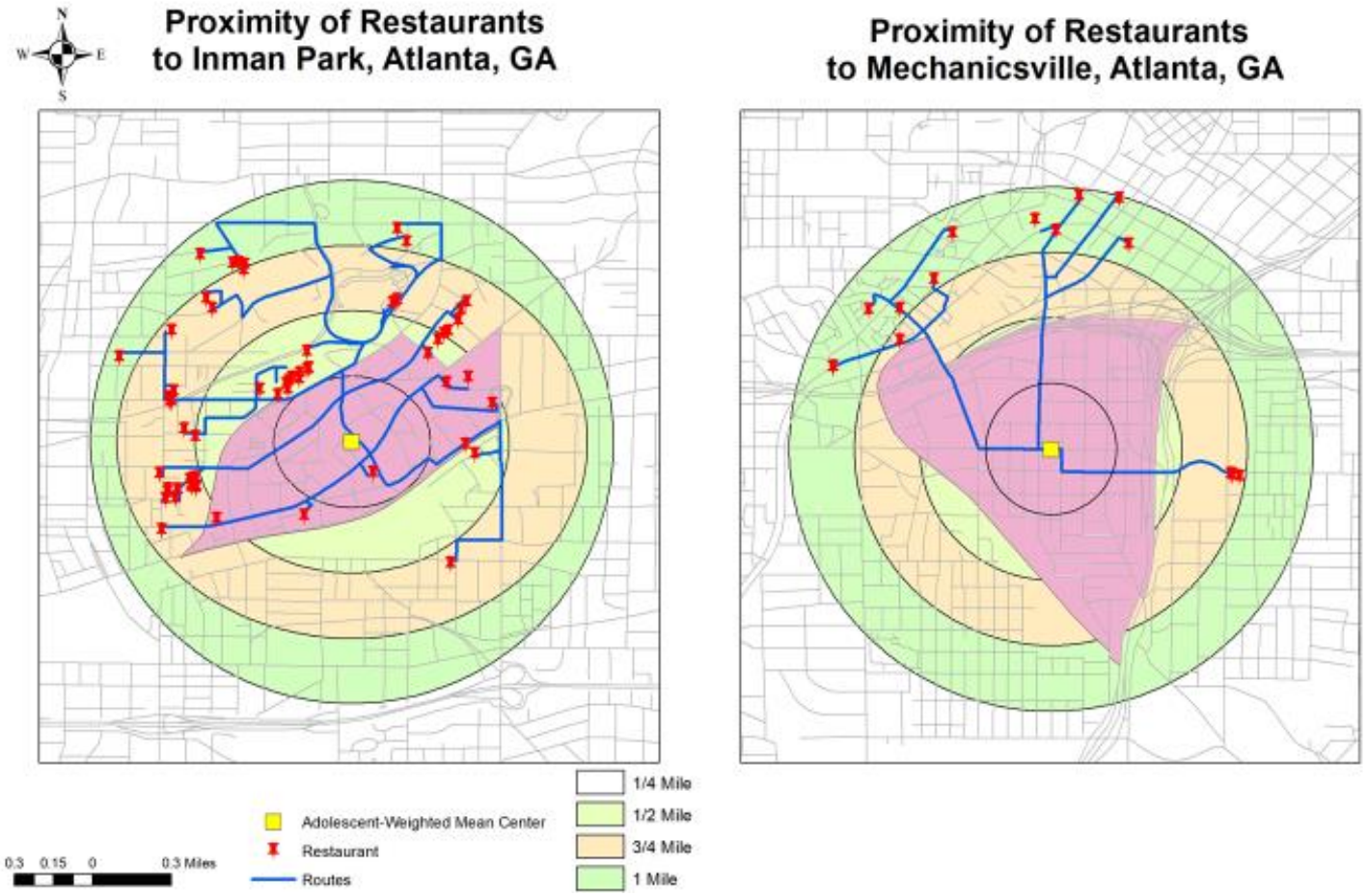
Sit-down Restaurants

As a result of conducting closest facilities network analyses from the adolescent mean centers to sit-down restaurants within one mile or less, it was found that Mechanicsville had a total of fifteen sit-down restaurants while Inman Park had sixty-five sit-down restaurants. Moreover, the restaurants in proximity to Inman Park were closer in distance to the adolescent mean center and they were diversely spread around the perimeter of the neighborhood making the sit-down restaurants more accessible to adolescents. However, the sit-down restaurants in Mechanicsville are almost a mile away from the adolescent mean center equating to a 20-25-minute walk and many of the sit-down restaurants were located near the northern half of the neighborhood.

Table 8. Proximity of Sit-down Restaurants

	Inman Park	Mechanicsville
Number of Restaurants	65	15
Average Distance (miles)	0.82	0.93

Figure 9. Comparison of Sit-down Restaurant Proximity in Mechanicsville and Inman Park



NEIGHBORHOOD AUDIT

For the neighborhood audits, four different routes were walked-- two unhealthy food outlet routes to convenience stores, fast food restaurants, and gas stations, and two healthy food outlet routes to grocery stores/ markets and sit-down restaurants.

Table 9. Routes Walked for Each Audit

Route	Neighborhood	Food Outlet Types	Destinations
1	Mechanicsville	Gas station, fast food restaurant, and convenience store	BP, McDonald's, and Papi Grocery and Deli
2	Inman Park	Gas station, fast food restaurant, and convenience store	Shell, Subway, and Circle K
3	Mechanicsville	Grocery store/ market and sit-down restaurant	Windsor Convenience Store and Kelz Kitchen
4	Inman Park	Grocery store/ market and sit-down restaurant	Irwin Street Market, Everyday Market, and Playa Bowls

During all four walking routes, eight walkability indicators (street connectivity, social safety, traffic safety, aesthetics, sidewalk quality, physical barriers, amenities, and others) were observed using the Walkability Tool located in the Appendix section.

Table 3. Description of Neighborhood Audit Indicators

Walkability Indicator	Description
Street Connectivity	The continuity of the walking space network
Social Safety	Components of a neighborhood that make someone feel safe to participate in activities in their surrounding neighborhood
Traffic safety	The ability to safely maneuver through traffic without having to be at risk for harm from moving vehicles
Aesthetics	The beauty of an area; trees along the roadside, beautiful buildings, public art, and attractive landmarks
Sidewalk Quality	Measured by Sidewalk width, maintenance, pavement material, and accessibility
Physical Barriers	Barriers that prevent pedestrians from walking on sidewalks
Amenities	Useful features within an area that are accessible
Others	Street signs, bus stops, and accessibility ramps

Table 10. Neighborhood Audit Results for Routes 1 and 2: Walking to Convenience Stores, Fast Food Restaurants, and Gas Stations in Inman Park and Mechanicsville (Unhealthy Food Outlets)

Neighborhood Walkability Audit (Unhealthy)			
Categories	**Attributes**	**Score**	
		Mechanicsville	**Inman Park**
Street Connectivity		2.5	3.5
	Intersections	4	4
	Alternative paths	1	3
Social Safety		3.0	3.8
	Graffiti	3	3
	Abandoned houses or cars	3	5
	Pedestrian flow volume	4	4
	Security of the surroundings	2	3
Traffic Safety		2.7	2.3
	Vehicle flow volume	4	2
	Road safety	2	2
	Traffic signs	2	3
Aesthetics		1.2	2.6
	Beautiful views in the surrounds	2	3
	Attractive scenery	1	2
	Shop window decoration	1	2
	Roadside plantings and trees	1	2
	Distinctive business signs	1	4
Sidewalk Quality		2.3	3.7
	Sidewalk width	4	4
	Pavement smoothness	1	3
	Sidewalk cleanness	2	4
Physical Barriers		4.3	5.0
	Scooters occupying the sidewalk	3	5
	Street vendors occupying the sidewalk	5	5
	Cul-de-sac	5	5
Amenities		2.3	2.0
	Rain shelters	2	2
	Benches	2	1
	Lighting	3	3
Others		2.7	3.3
	Accessibility ramps	1	4
	Bus stops	4	2
	Street signs	3	4

Footnotes: The highest score possible is a 5 whereas the lowest score possible is a 1. Descriptions of scores can be found here

Route 1: Walking to gas stations, convenience stores, and fast food restaurants in Mechanicsville

Street Connectivity in Mechanicsville (Score 2.5/5)

Street connectivity can be defined as the continuity of the walking space network in a given neighborhood. For each neighborhood audit, street connectivity was calculated by evaluating the quality and number of intersections and alternative routes identified during the route from the adolescent mean center to the different food outlets the researcher walked to.

Many intersections were crossed during the route to Papi Grocery and Deli (convenience store), BP (gas station), and McDonald's (fast food restaurant). The intersections had stop signs, but the crosswalk lines were less visible. Compared to the crosswalks in the Inman Park area. Also, there were no clear alternative routes or paths in sight for pedestrians.

Figure 10. Intersection in Mechanicsville

Social Safety in Mechanicsville (Score 3/5)

Social Safety can be described as components of a neighborhood that make someone feel safe to participate in activities in their surrounding neighborhood. In this observation, graffiti, abandoned houses or cars, pedestrian flow volume, and security of the surrounding area were utilized to assess social safety.

While walking Route 1, there were two abandoned buildings, one building being directly next to the McDonalds and occasional graffiti on building walls and on other public infrastructure. Pedestrian flow was moderate as many people were either sitting outside of their homes or standing near the Rosa L Burney Park and at the Dunbar Teen Center. The only security measure visible was a sign that read “security camera in area”. However, there were no security cameras or safety lights visible.

Figure 11. Abandoned building in Mechanicsville

Figure 12. Abandoned building next to McDonald's restaurant near Mechanicsville

Traffic Safety in Mechanicsville (Score 2.7/5)

Traffic safety can be described as the ability to safely maneuver through traffic without having to be at risk for harm from moving vehicles. Traffic safety was evaluated by observing the level of vehicle flow volume, level of road safety, and the quality and number of traffic signs identified throughout the route.

BP and Papi Grocery and Deli were no more than ½ a mile from the adolescent mean center of Mechanicsville which meant both food outlets were located within the border lines of the Mechanicsville residential neighborhood. Vehicle flow volume was very light up until the ½ mile radius. However, the McDonalds restaurant was located 1 mile away from the adolescent mean center, outside of the residential neighborhood's border lines. This walk required traveling outside of the residential neighborhood onto the main streets

where vehicle flow volume increased. There were few separations between pedestrian walkways and vehicles in motion. This made the route less safe when walking alongside the main roads where cars are driving faster. As the route continued, there were less traffic signs in sight and some of the pedestrian crosswalk light signals were broken.

Figure 13. Minimal separation between the sidewalk and the street in Mechanicsville

Aesthetics in Mechanicsville (Score 1.2/5)

Aesthetics can be described as the beauty within an area and is determined by observing physical features of an environment which can include trees planted along the roadside, beautiful buildings, public art, and attractive landmarks. Aesthetic attributes observed in this audit were beautiful views in the surroundings, attractive scenery, shop window decoration, roadside plantings and trees, and distinctive business signs.

The views during Route 1 to Papi Grocery and Deli, BP, and McDonald's were not visually appealing. There was a park with a basketball court, playground, and tennis court but the area looked run down and the court lines and ground gravel at the basketball and tennis courts needed to be updated. The grass that lined the sidewalk was not cut and there was a significant amount of litter on the grass. However, as the walking route led out of the neighborhood toward the McDonald's restaurant, the scenery improved slightly with tall buildings in sight on the main street as the route was heading toward downtown Atlanta. There was no window shop decoration, distinctive business signs, or roadside plantings throughout the route.

Figure 14. Uncut grass and shrubbery in Mechanicsville next door to Papi Grocery and Deli

Figure 15. Broken walking light signal in Mechanicsville

Sidewalk Quality in Mechanicsville (Score 2.3/5)

Sidewalk quality can be defined as the ability of a pedestrian to utilize a sidewalk for leisure walking or to travel to a destination with no barriers. Sidewalk quality can be calculated by observing sidewalk width, pavement smoothness, and sidewalk cleanness.

Sidewalk quality was very poor during most of Route 1. While the sidewalk width was average size, the sidewalks had significant cracks, bumps, potholes, and ditches filled with trash making it difficult for walkability.

Figure 16. Sidewalk in Mechanicsville

Figure 17. Trash placed in a hole on a sidewalk in Mechanicsville

Physical Barriers in Mechanicsville (Score 4.3/5)

Physical barriers can be defined as barriers that block a pedestrian from being able to walk on the sidewalk to reach their destination. Physical barriers can include scooters and street vendors occupying the sidewalk and cul-de-sacs.

When scooters and street vendors occupy sidewalks, this makes it difficult for pedestrians to walk on the sidewalk, sometimes requiring them to step onto the street in order to get by. Fortunately, no scooters occupied the sidewalk while walking through the neighborhood (1/2 mile radius). However, while walking closer to the McDonald's restaurant (between ¾ mile and 1 mile), more scooters began to occupy the sidewalks. There were no street vendors or cul-de-sacs in sight.

Amenities in Mechanicsville (Score 2.3/5)

Amenities can be described as useful features for pedestrians within an area. The amenities evaluated in this audit included rain shelters, benches, and lighting.

During Route 1 to Papi Grocery and Deli, BP, and McDonald's restaurant, there were some benches in sight, most of which were located near the park in the neighborhood. Outside of the neighborhood, between the ¾ and 1 mile radius, there were less benches, but there were a few rain shelters including the tunnel underneath the bridge and at the MARTA bus station. The route seemed relatively bright due to natural lighting and there were streetlights in sight. However, they were not turned on at the time of the observation.

Figure 18. A bench near the park in Mechanicsville

Others in Mechanicsville (Score 2.7/5)

Other attributes that were observed included accessibility ramps, bus stops, and street signs. There were no accessibility ramps throughout this route and the poor quality of sidewalks would make it difficult for someone with accessibility needs to travel to any of the food outlets in this route. However, there were many bus stops and even a Greyhound bus station. There were some street signs throughout the route, but pedestrian walk signs seemed to be lacking especially on busy main streets.

Figure 19. MARTA bus stop in Mechanicsville

Route 2: Walking to gas stations, convenience stores, and fast food restaurants in Inman Park

Street Connectivity in Inman Park (Score 3.5/5)

The route to Subway (fast food), Circle K (convenience store), and Shell (gas station), had many intersections and alternative paths for people wanting to bike, jog, or walk to their destination within the ¼ and ½ mile radiuses. However, the intersection leading out of the neighborhood and into the main road after passing the ½ mile radius, was slightly difficult to cross as vehicles were moving fast and there was no pedestrian walk light signal.

Figure 20. Alternative path sign in Inman Park

Figure 21. Intersection leaving Inman Park's residential neighborhood onto the main street

Social Safety in Inman Park (Score 3.8/5)

Route 2 had no abandoned buildings or abandoned cars in sight and there were many people outside walking to destinations, walking their dogs, and walking for exercise within the ½ mile radius. However, there was some graffiti in sight after exiting the residential area at the ½ mile radius especially while walking under the tunnel to get to the Subway restaurant. Security measures included one sign that read “neighborhood watch”.

Figure 22. Tunnel with graffiti to get to food outlets in Inman Park

Traffic Safety in Inman Park (Score 2.3/5)

After traveling out of the Inman Park residential neighborhood, Route 2 led to a main street where people were driving relatively fast on the road. The intersections became less clear and vehicle flow volume increased. While walking on this street, there was very limited separation between pedestrians and vehicles. Traffic lights and traffic signs were relatively common in most areas through the route, but one pedestrian walk signal was broken.

Figure 23. Minimal street to sidewalk separation near Inman Park

Figure 24. Broken pedestrian walk signal near Inman Park

Aesthetics in Inman Park (Score 2.6/5)

At the beginning of the walk, between the ¼ and ½ mile radius, there was abundant green space with a park and a playground. However, as the route moved out of the neighborhood after the ½ mile radius, there were fewer aesthetic views of green space and more concrete and street views. The only mixed land-use was in the shopping structure where the Subway restaurant was located. Shop window decoration was minimal and business signs were most visible when entering the shopping center complex. There was moderate roadside plantings and trees during this route and once the route led out of the residential neighborhood, there was uncut grass and weeds in sight.

Figure 25. Landscaping in Inman Park

Figure 26. Park space in Inman Park

Figure 27. Mixed land-use infrastructure in Inman Park

Sidewalk Quality in Inman Park (Score 3.7/5)

Sidewalk width was average during most of the route, which is 4 feet, but smaller on busier roads at approximately 2.5 feet wide. While some sidewalk pavements were smooth, other areas had cracks, litter, potholes, and inconsistencies in the width. The sidewalk to Shell and Circle K was closed due to construction.

Figure 28. Sidewalk cracks in Inman Park

Figure 29. Disruption sidewalk in Inman Park

Figure 30. Closed sidewalk during Route 2 in Inman Park

Physical Barriers in Inman Park (Score 5/5)

There were no scooters or street vendors occupying the sidewalk during the walk and no dead end streets.

Amenities in Inman Park (Score 2/5)

The tunnel to get to the Subway restaurant was the only rain shelter in route and there were no benches in sight. However, there were streetlights and natural sunlight except for while walking through the tunnel.

Others in Inman Park (Score 3.3/5)

The route seemed relatively accessible as there were no steps, but the cracks in the road may be difficult for someone needing accessibility. In addition, there were very few bus stops, with one sign pointing to the nearby MARTA train station. There was also a significant number of street signs including stop signs and a sign that read "stop for pedestrians".

Figure 31. "Pedestrian walk signal" sign

Figure 32. MARTA train station sign

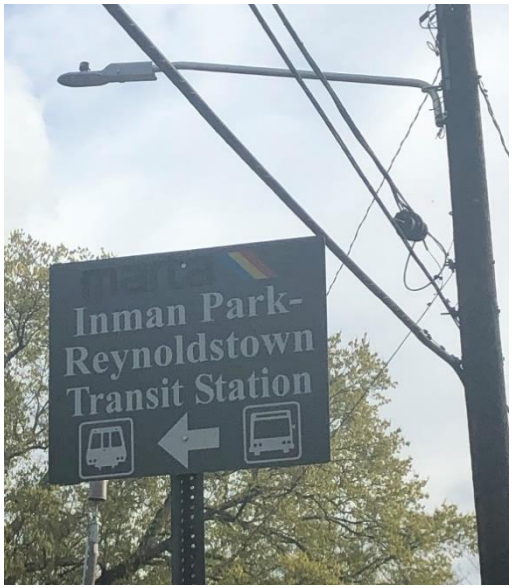


Table 12. Neighborhood Audit Results for Routes 3 and 4: Walking to Grocery Stores, Markets, and Sit-down Restaurants in Inman Park and Mechanicsville (Healthy Food Outlets)

Neighborhood Walkability Audit (Healthy)			
Categories	**Attributes**	**Score**	
		Mechanicsville	**Inman Park**
Street Connectivity		3.0	4.0
	Intersections	5	5
	Alternative paths	1	3
Social Safety		3.3	4.0
	Graffiti	3	4
	Abandoned houses or cars	3	4
	Pedestrian flow volume	5	5
	Security of the surroundings	2	3
Traffic Safety		2.0	4.3
	Vehicle flow volume	2	3
	Road safety	2	5
	Traffic signs	2	5
Aesthetics		1.4	4.6
	Beautiful views in the surrounds	2	5
	Attractive scenery	1	5
	Shop window decoration	1	4
	Roadside plantings and trees	2	4
	Distinctive business signs	1	5
Sidewalk Quality		2.3	4.7
	Sidewalk width	4	5
	Pavement smoothness	1	4
	Sidewalk cleanness	2	5
Physical Barriers		4.6	5.0
	Scooters occupying the sidewalk	4	5
	Street vendors occupying the sidewalk	5	5
	Cul-de-sac	5	5
Amenities		3.0	3.7
	Rain shelters	2	1
	Benches	3	5
	Lighting	4	5
Others		3.0	3.0
	Accessibility ramps	2	4
	Bus stops	4	1
	Street signs	3	4

Footnotes: The highest score possible is a 5 whereas the lowest score possible is a 1. Descriptions of scores can be found here

Route 3: Walking to grocery stores, markets, and sit-down restaurants in Mechanicsville

Street Connectivity in Mechanicsville (Score 3/5)

Walking to Windsor Convenience Store (grocery store) and Kelz Kitchen (sit-down restaurant), there were numerous intersections that had to be crossed. Some of the white stripes on the street that indicate pedestrian walking areas were chipped, but most of the intersections seemed to have stop signs or stop lights. There was no alternative bike or walk paths for pedestrians.

Figure 33. Intersection in Route 3 of Mechanicsville

Social Safety in Mechanicsville (Score 3.3/5)

There were a few abandoned buildings during the walk, but there was a "security camera" sign and many pedestrians in sight, especially in the residential neighborhood. However, the restaurant was located next door to a building that seem abandoned. Graffiti was moderate and one graffiti artwork, looked very artistic (and possible intentional).

Figure 34. Security sign in Mechanicsville

Figure 35. Graffiti art in Mechanicsville

Traffic Safety in Mechanicsville (Score 2/5)

There was heavy vehicle flow volume once the route led out of the residential neighborhood, and into the downtown area toward Kelz Kitchen. Cars were driving faster and there was little separation between vehicles and pedestrians. Traffic signs and cross walks were visible although not all of the walk signals were working. Stop signs were also lacking in some areas.

Figure 36. Vehicle flow in Route 3 in Mechanicsville

Aesthetics in Mechanicsville (Score 1.4/5)

Inside of the neighborhood, was a playground, tennis court, and basketball court but these areas seemed out of date and unattractive. There were mostly views of concrete and uncut grass. While walking closer to the restaurant, the scenery began to improve

as there were views of tall attractive buildings. However, there were no shop window decorations, roadside plantings and trees, or distinctive business signs. In fact, it was very difficult to find Kelz Kitchen restaurant.

Figure 37. Park area in Mechanicsville

Figure 38. Abandoned building next to Kelz Kitchen

Sidewalk Quality in Mechanicsville (Score 2.3/5)

Sidewalk quality varied throughout the route. For most of the walk, the sidewalk width was average (at 4 feet), but on some of the busy streets, sidewalk width decreased 2 feet. The pavement was also inconsistent where most areas were rough and difficult to walk on while others were relatively smooth. Trash also occupied some of the sidewalk areas.

Figure 39. Small sidewalk width, close to street in Mechanicsville

Figure 40. Lifted sidewalk in Mechanicsville

Physical Barriers in Mechanicsville (Score 4.6/5)

No street vendors or cul-de-sacs were visible during this route. However, a few scooters did occupy the sidewalk near the restaurant.

Amenities in Mechanicsville (Score 3/5)

There was a rain shelter area underneath the bridge and near the MARTA bus station. Some benches were also located near the bus station and near the park in the neighborhood. Many streetlights were seen during the route, but none of them were on during the time of the audit.

Figure 41. Underpass during Route 3

Figure 42. Streetlight in Mechanicsville

Others in Mechanicsville (Score 3/5)

No accessibility ramps were in sight, but it may be possible for someone with accessibility needs to utilize areas of the sidewalk that had smooth pavement. There were many of visible bus stops and two bus stations throughout this route. The number of street signs were moderate, but there were no clear pedestrian walking signs visible.

Figure 43. Covered MARTA bus stop in Mechanicsville

Route 4: Walking to grocery stores, markets, and sit-down restaurants in Inman Park

Street Connectivity in Inman Park (Score 4/5)

In completing the Everyday Market (grocery store), Irwin Market (market), and Playa Bowls (sit-down restaurant) route, it was observed that there was many intersections between streets that made the route very smooth. Almost all intersections had stop signs and pedestrian walkways. Alternative paths were also an option for people who were looking for trail or bike paths.

Figure 44. Bike lanes in Inman Park

Figure 45. Alternative routes in Inman Park

Figure 46. Street intersection in Inman Park

Social Safety in Inman Park (Score 4/5)

During this route through Inman Park, social safety was very good. Through the neighborhood, there was graffiti on sides of buildings and on dumpsters, but none of the graffiti had elements that were offensive to the public (and seemed intentional). There was only one abandoned house in sight and there were numerous pedestrians walking, biking, and participating in other social activities outside. In addition, two "neighborhood watch" signs were in sight and one police car was also circling the area.

Figure 47. Dumpsters with graffiti in Inman Park

Figure 48. Abandoned building in Inman Park

Traffic Safety in Inman Park (Score 4.3/5)

Some people were driving around the neighborhood, but they were driving at a slow speed. Although some vehicles were driving in the area, there were several “no parking” signs on some streets that prohibited parking on that street. Also, most of the route required a person to walk on the Atlanta “Beltline” which also prohibits motor vehicles from driving on this path. The Beltline is a multi-use trail surrounded by restaurants and located in the core of Atlanta. A speed limit sign was on sight which displayed a speed limit of 30mph. Sidewalks were clearly separated from vehicles by trees and other shrubbery. Numerous traffic signs and traffic lights were in sight at each intersection.

Figure 49. “No parking” sign in Inman Park

Figure 50. “Speed limit” sign in Inman Park

Aesthetics in Inman Park (Score 4.6/5)

During this route there were many scenic views including views of attractive buildings, parks, and a pond. There were also several mixed land-use infrastructures especially across the Beltline area. The buildings were very bright, and some had paintings on the side of the buildings. There were also areas for outdoor recreation including a playground and sand area. Stores seemed inviting and displayed window shop decorations and distinctive signs making it easy to find businesses. Many landscape features like flowers and trees were also planted on the roadside.

Figure 51. Mixed land-use infrastructure on the Beltline near sit-down restaurants

Sidewalk Quality in Inman Park (Score 4.7/5)

The sidewalks were very wide ranging from 60 inches to 144 inches in width. The pavement was very smooth and easy to walk on and some sidewalks had different textures and designs. The sidewalks were very clean with no liter or animal feces in sight. There were many "dog poop" clean up stations throughout the path (See Figure. 53).

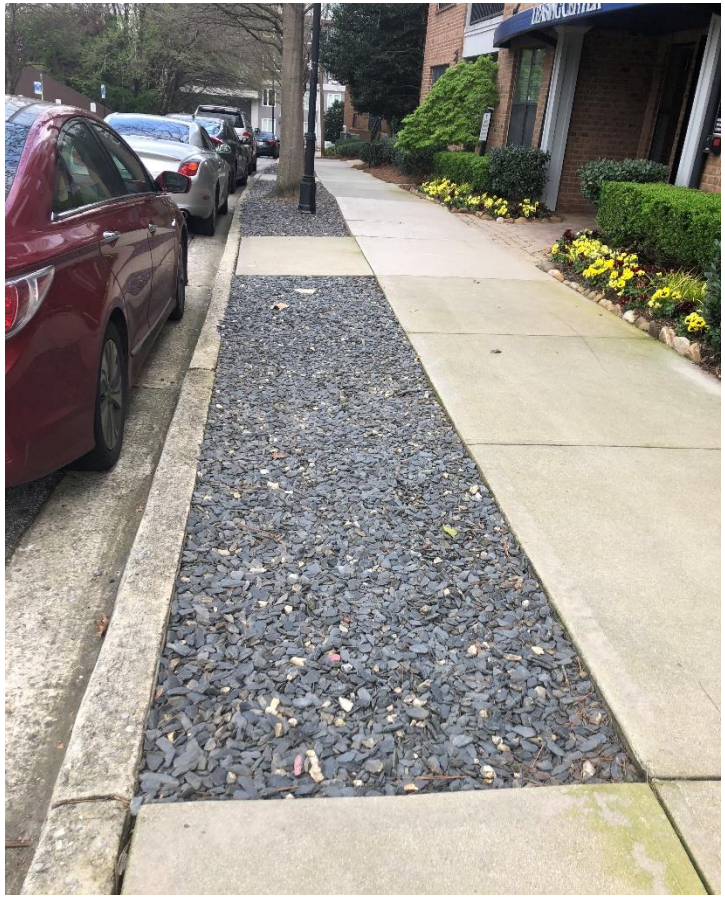


Figure 52. Clear separation between sidewalk and

Figure 53. "Dog poop" clean up station on the sidewalk

Figure 54. Clean, textured sidewalk

Physical Barriers in Inman Park (Score 5/5)

There were several scooters on the sidewalk, but they were posted to the side of the walking area, still allowing pedestrians a walkway. In addition, there were signs on the pavement discouraging people with scooters from riding on the sidewalk. No street vendors were occupying the sidewalk and there were no cul-de-sacs throughout the route.

Figure 55. Scooters posted to the side of the sidewalk

Figure 56. Sign to discourage scooters from riding on the sidewalk

Amenities in Inman Park (Score 3.7/5)

There were no rain shelters in sight during this route. There were many benches and sitting areas for pedestrians, but none of these areas were shaded. At the time of the audit, there was a great deal of natural lighting and streetlights that were also turned on.

Others in Inman Park (Score 3/5)

Although no distinct accessibility ramps existed, the entire route seemed wheelchair accessible as there were no stairs or hills. No bus stops were in sight during this route, but there were various street signs. One street sign was a “watch for children” sign.

CHAPTER V: Discussion

The goals of this thesis were to shed light on the relationship between food access among adolescents and differences in the built environment of two neighborhoods in Atlanta, GA and the potential role that these neighborhood disparities may play in the risk for adolescent obesity. The goals were met through the following objectives:

1. To evaluate components of the built environment in two neighborhoods in Atlanta, GA, Mechanicsville and Inman Park
2. To compare the built environment of the Inman Park neighborhood— (high-income) and the Mechanicsville neighborhood (low-income), to see if there are differences in the built environment of these neighborhoods that may influence differences in food access among adolescents and, increase risks for obesity

The thesis identified two main themes from the spatial analysis and neighborhood audit that may influence food access among adolescents: 1) the proximity of food outlets and 2) features of the built environment that indicate a person's ability to walk to a nearby destination. In general, there were several differences in the built environment between Mechanicsville and Inman Park.

Proximity of Food Outlets

In Mechanicsville, food outlets that tend to sell unhealthy foods, like gas stations and corner stores, were located inside of the residential neighborhood at a ¼ mile radius. This allowed adolescents to easily access these foods, as the gas station and corner store were only a 5-minute walk away from where most adolescents lived. The grocery store was also located inside of the residential neighborhood at a 5-minute walk. However, this grocery store was not a grocery store

as Google Maps had identified it. Instead, it was a small convenience store. The other food outlet that was identified as a grocery store, had no indications that the store was still operational. These findings indicate the existence of high-calorie, low nutrient value foods and the lack of healthy nutrient-rich foods within close proximity of adolescents in low-income areas. These findings are consistent with previous studies, one of which identified fast food restaurants and convenience stores as 4.61 times more accessible than grocery stores near people's homes as an important factor in meeting appropriate fruit and vegetable consumption (Zhang & Huang, 2018).

The sit-down restaurants and the fast food restaurants were the farthest away from Mechanicsville's adolescent mean center, equaling to a 20-minute walk. Fast food restaurants being located farther from a low-income neighborhood like Mechanicsville was surprising and inconsistent with many other studies.

In Inman Park, there were less gas stations and convenience stores than in Mechanicsville. The gas stations and convenience stores were also farther out from the adolescent centroid than the grocery stores and sit-down restaurants. Most of the gas stations, convenience stores, and fast food restaurants were located in the same area, on the right side of the neighborhood. Inman Park did have more fast food restaurants than Mechanicsville, but most of those fast food restaurants sold healthier, lower calorie food options compared to the average fast food restaurant. Some of these healthier fast food options included sandwich shops, Indian cuisine, and hamburgers. There were many grocery stores, markets, and 65 sit-down restaurants in proximity to Inman Park within an average of 0.83 miles, allowing adolescents to easily access these food outlets.

Access to Healthy Foods

It was found that in the higher-income neighborhood of Inman Park, adolescents have more access to healthy foods as distributed in grocery stores, markets, and sit-down restaurants. There were many of these food outlets less than ½ a mile away from where most adolescents in Inman Park lived. However, unhealthy food outlets including gas stations and corner stores were less assessible as they were farther in distance and fewer existed within the 1-mile radius. Although a fair amount of fast food restaurants existed within the 1-mile radius, the type of foods sold by these fast food restaurants were not high-fat, nutrient poor foods.

Conversely, in Mechanicsville, a low-income neighborhood, adolescents appear to have less access to healthy foods. The area lacked grocery stores, markets, and sit-down restaurants (15 vs. 65 in Inman Park), while having a surplus of gas stations and convenience stores located only a ¼ mile away from the adolescent mean center. Fast food restaurants were harder to access as they were farther and fewer existed within the 1-mile radius. However, the fast food restaurants near Mechanicsville were different than the fast food restaurants near Inman Park. They fit the stereotypical fast food restaurant of serving high fat, high-calorie foods, while Inman Park restaurants were known to be healthier restaurants, like Subway - a restaurant that serves healthier sandwiches and promotes physical activity in their advertisements.

Walkability to the Food Outlets

To measure walkability, four different routes were walked across the two neighborhoods-- two unhealthy food outlet routes to convenience stores, fast food restaurants, and gas stations (Route 1 and 2), and two healthy food outlet routes to grocery stores/ markets and sit-down restaurants (Route 3 and 4). During all four walking routes, eight walkability indicators (street

connectivity, social safety, traffic safety, aesthetics, sidewalk quality, physical barriers, amenities, and others) were observed using the Walkability Tool identified in the Appendix section.

Walkability during the routes from Mechanicsville's adolescent mean center to nearby food outlets were poor overall. Mechanicsville's lowest scores were in "aesthetics" 1.2/5 in Route 1 and 1.4/5 in Route 2. There were also low scores for "sidewalk quality" 2.3/5 in Route 1 and 3 and "traffic safety" 2.7/5 in Route 1 and 2.3/5 in Route 3. In general, the routes were not aesthetically pleasing as there were abandoned buildings and no roadside plantings or attractive views. Sidewalk quality was also poor, making it difficult for one to walk on the sidewalk. The route to the grocery store, market, and sit-down restaurant had very similar walkability features as the route to the gas station, convenience store, and fast food restaurant.

Overall, it was evident that regardless of the type of food outlet an adolescent chose to walk to from Mechanicsville, it would be difficult for them to walk there because of the walkability barriers identified in the Results Section. The findings in Mechanicsville are consistent with those found in other studies in concluding that the food environment is significantly associated with the body weight of an individual along with neighborhood characteristics and walkability, and that low-income neighborhoods experience very poor walkability attributes (Rundle et al., 2009). In one study, it was found that poor walkability attributes of the built environment accounted for a 10% increase in the prevalence of obesity (Rundle et al., 2009).

Walkability during the routes from Inman Park's adolescent mean center were significantly different than the routes from Mechanicsville's adolescent mean center. While walking to gas stations, convenience stores, and fast food restaurants, Inman Park scored higher than Mechanicsville in every category of walkability, except for "other" and "traffic safety". In contrast

to Mechanicsville's lowest categories, Inman Park scored a 2.6/5 in Route 2 and a 4.6/5 in Route 4 for "aesthetics"; a 3.7/5 in Route 2 and a 4.7/5 in Route 4 for "sidewalk quality"; and for "traffic safety", a 2.3/5 in Route 2 and a 4.3/5 in Routes 4. Inman Park was socially safe, had a lot attractive and street connectivity, and sidewalk quality was very good. The route to the grocery store, market, and sit-down restaurant led out of the residential neighborhood and straight into Atlanta's Beltline where motor vehicles are prohibited, and many amenities and traffic safety measures existed.

However, the route from Inman Park's adolescent mean center to the gas station, convenience store, and fast food restaurant, was slightly less walkable than the route to the grocery store, market, and sit-down restaurant. Both routes led to opposite sides of the Inman Park neighborhood, which bordered different neighborhoods (Old Fourth Ward and Chandler Park).

The walkability differences between these routes may also mean that these are the areas where less healthy foods are served (i.e. fast food, convenience stores, and gas stations), are not cared for or maintenance as much as the areas where healthy foods are served, or unhealthy food outlets are placed in areas that are harder to reach by foot. Previous literature support the theory that neighborhoods with supermarkets have significantly higher income families, higher housing value, a large population with education levels above the high school level, lower minority populations, and fewer people living below the poverty line (Lamichhane et al., 2013). Beginning in the 1960s, white middle class families began to leave urban centers for homes in the suburbs, and supermarkets left with them (Martinez, United, Department of, & Economic Research, 2007). This meant that people who were not able to migrate to suburban areas, were left without grocery stores and other food outlets that sell more diverse, healthier food items.

Further, the walkability differences between both neighborhoods may have implications for physical activity among adolescents. This could mean that adolescents living in neighborhoods that are less walkable, are participating in physical activity less than adolescents who live within very walkable neighborhoods.

Adolescent Obesity

Mechanicsville's obesity prevalence (41.5%) is double the rate of obesity in Inman Park (20.7%). When an adolescent has increased access to unhealthy foods served in gas stations, convenience stores, and fast food restaurants, they are more likely to consume these foods (Carroll-Scott et al., 2013) (Mahendra et al., 2017). As an adolescent continues to consume unhealthy calorie-dense foods, this can significantly increase their chances of becoming obese. Likewise, a neighborhood where adolescents have access to healthy foods, and difficulty walking to unhealthy food outlets, this may lower their risk of becoming obese.

Significant differences in food access and walkability exist between Inman Park and Mechanicsville. These differences may help to understand the large gap in obesity prevalence between the two neighborhoods. Low-income neighborhoods like Mechanicsville tend to have increased exposure to unhealthy foods in close proximity which may lead to high obesity prevalence among adolescents.

Limitations

There were several limitations to this research project. First, by using a maximum buffer of 1-mile, the researcher assumed that adolescents only purchase foods within a 1-mile or less radius from where they live. However, it is possible that an adolescent may travel a farther distance to a food outlet outside of the 1-mile boundary identified in the thesis. For example, an adolescent may

walk to food outlets that are near their school or near their after-school activities where they spend a majority of time. Also, adolescents may be consuming most of their meals at school or at home, instead of within their neighborhood food environments.

Secondly, the researcher made assumptions about the quality of foods sold in different food outlets. For example, if the food outlet was classified as a fast food restaurant, gas station, or convenience store, the researcher assumed that mostly unhealthy foods were sold at that food outlet. Similarly, if the food outlet was classified as a grocery store, market, or sit-down restaurant, it was assumed that healthy foods were sold at that food outlet. However, the researcher did not physically visit any of the food outlets or review their menus to observe the type of foods sold at each food outlet.

Lastly, the large difference between the number of adolescents in Inman Park (5%) and Mechanicsville (12%) may have also explained the significant differences between their built environments. Inman Park, having less adolescents and a large adult population, may mean that community developers may have built more food outlets like grocery stores and sit-down restaurants to cater to adults rather than to an adolescent population. Whereas in Mechanicsville, by having a larger adolescent population, a surplus of corner stores and gas stations could have been placed there to meet the desires of a large adolescent population that probably consumes more snack foods than the average adult would.

Conclusion

The findings from the thesis highlight that there is a disparity in the location and number of healthy food outlets in Mechanicsville in comparison to Inman Park. The thesis also revealed that the built environment near Mechanicsville has poor walkability for adolescent access to

healthy food outlets. The built environment observations in Mechanicsville may contribute to the high obesity rates and may be a factor in determining preventative obesity measures for adolescents in the future. However, what is not known are the characteristics of food outlets and walkability beyond one mile of this neighborhood and the type of foods these food outlets may serve. To fill this gap, future research will need to be conducted including surveying adolescents to understand where they consider their neighborhood to be and from what food outlets they purchase their food. It may also be beneficial to evaluate the type of foods each food outlet serves.

APPENDIX

Figure 1.A Neighborhood Audit Walkability Tool

Category	Attributes	Neighborhood Score	Additional Notes
Street Connectivity	Intersections	1 (no intersections)	
		2 (very few intersections)	
		3 (some intersections)	
		4 (many intersections)	
		5 (numerous intersections)	
	Alternative Paths	1 (no alternative routes)	
		2 (very few alternative bike or walk paths)	
		3 (some alternative bike or walk paths)	
		4 (a lot of alternative bike or walk paths)	
		5 (numerous alternative bike or walk paths)	
Social Safety	Graffiti	1 (numerous offensive graffiti)	
		2 (a lot of offensive graffiti)	
		3 (some offensive graffiti)	
		4 (very few graffiti, non-offensive)	
		5 (no offensive street graffiti)	
	Abandoned houses or cars	1 (more than 5 abandoned buildings)	
		2 (4-5 abandoned buildings)	
		3 (2-3 abandoned buildings)	
		4 (1 abandoned building in sight)	
		5 (no abandoned buildings in sight)	
	Pedestrian flow volume	1 (no pedestrians in sight)	
		2 (very few pedestrians)	
		3 (some pedestrians)	
		4 (good number of pedestrians)	
		5 (numerous pedestrians in sight)	

	Security of the surroundings	1 (no security measures visible)	
		2 (very few security measures visible)	
		3 (some security measures visible)	
		4 (many security measures visible)	
		5 (numerous law enforcement, safety and neighborhood watch signs, and safety lights)	
Traffic safety	Vehicle flow volume	1 (numerous driving vehicles)	
		2 (a lot of driving vehicles)	
		3 (some driving vehicles)	
		4 (very few driving vehicles)	
		5 (zero driving vehicles in sight)	
	Road safety	1 (not safe, no infrastructure to separate pedestrians and motor vehicles, no speed limit)	
		2 (a little safer, some pedestrian-vehicle separation, speed limit)	
		3 (somewhat safe)	
		4 (safe, pedestrian and motor vehicles separated)	
		5 (very safe, clear separation between pedestrians and motor vehicles, low speed limit))	
	Traffic signs	1 (no visible traffic signs or cross walks)	
		2 (very few traffic signs and cross walks)	
		3 (some traffic signs and cross walks)	
		4 (many traffic signs and crosswalks)	
		5 (numerous visible traffic signs and crosswalks)	
Aesthetics	Beautiful views in the surroundings	1 (no beautiful views visible)	
		2 (very few beautiful views)	
		3 (some beautiful views)	
		4 (many of beautiful views)	
		5 (numerous views of greenery, city views, or bodies of water)	

	Attractive scenery	1 (not attractive, dull, no activities or mixed land-use)	
		2 (a little attractive, few activities, dull)	
		3 (somewhat attractive, some color and mixed land-use)	
		4 (attractive colorful, bright, mixed land-use)	
		5 (very attractive, colorful, bright, outdoor activities, and mixed land-use)	
	Shop window decoration	1 (no shop window decoration)	
		2 (very little shop window decoration)	
		3 (some window shop decoration)	
		4 (many window shop decorations)	
		5 (numerous window shop decorations)	
	Roadside plantings and trees	1 (no appeasing landscape features)	
		2 (very few landscape features)	
		3 (some landscape features)	
		4 (many landscape features)	
		5 (numerous appeasing landscape features)	
	Distinctive business signs	1 (no appealing business signs)	
		2 (very few appealing business signs)	
		3 (some business signs)	
		4 (many business signs)	
		5 (numerous, very distinctive business signs)	
Sidewalk Quality	Sidewalk width	1 (no sidewalk)	
		2 (24 inches in width)	
		3 (36 inches in width)	
		4 (48 inches in width)	
		5 (60 inches in width)	
	Pavement smoothness	1 (very rough sidewalks with cracks and bumps)	
		2 (rough, with cracks and bumps)	

		3 (somewhat smooth, some cracks and bumps)	
		4 (smooth, few cracks)	
		5 (very smooth with no cracks or bumps)	
	Sidewalk cleanness	1 (very dirty, litter, gum, animal feces on sidewalk)	
		2 (dirty, a lot of litter)	
		3 (somewhat clean, some litter)	
		4 (clean, little litter)	
		5 (very clean, no litter or animal feces)	
Physical Barriers	Scooters occupying the sidewalk	1 (numerous scooters occupying the sidewalk)	
		2 (a lot of scooters)	
		3 (some scooters)	
		4 (very few scooters)	
		5 (no scooters occupying the sidewalk)	
	Street vendors occupying the sidewalk	1 (numerous street vendors)	
		2 (a lot of street vendors)	
		3 (some street vendors)	
		4 (few street vendors)	
		5 (very few street vendors)	
	Cul-de-sac	1 (numerous dead end streets)	
		2 (good amount of dead end streets)	
		3 (some dead end streets)	
		4 (very few dead end streets)	
		5 (no dead end streets)	
Amenities	Rain shelters	1 (no rain shelters)	
		2 (very few rain shelters)	
		3 (some rain shelters)	
		4 (good number of rain shelters)	
		5 (numerous rain shelters)	
	Benches	1 (no benches)	
		2 (few benches, little shade)	

		3 (some benches, moderately shaded)	
		4 (good number of shaded benches)	
		5 (numerous shaded benches)	
	Lighting	1 (no streetlights, very dark areas)	
		2 (very few streetlights, somewhat dark)	
		3 (some streetlights, somewhat bright)	
		4 (good number of streetlights, bright areas)	
		5 (numerous streetlights and bright areas)	
Other	Accessibility ramps	1 (no accessibility ramps)	
		2 (very few accessibility ramps)	
		3 (some accessibility ramps)	
		4 (good amount of accessibility ramps)	
		5 (numerous accessibility ramps)	
	Bus stops	1 (no bus stops in sight)	
		2 (very few bus stops)	
		3 (some bus stops)	
		4 (good amount of bus stops, some sitting and shaded areas)	
		5 (numerous, bus stops with sitting and shaded area)	
	Street signs	1 (no street signs)	
		2 (very few street signs, covered in graffiti)	
		3 (some street signs, somewhat visible)	
		4 (good number of visible street signs)	
		5 (numerous, visible street signs)	

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