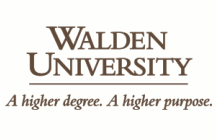

2019

Built Environments and Childhood Obesity Epidemic in the Immigrant Population

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This is to certify that the doctoral dissertation by

Monique M. Nurse

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

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The Office of the Provost

Walden University
2019

Abstract

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by

Monique M. Nurse

MS, Argosy University, 2013

BS, Clayton State University 2010

Dissertation Submitted in Partial Fulfillment

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Abstract

A lack of adequately built environments can negatively affect obesity rates among adolescents. The purpose of this quantitative cross-sectional study was to determine if there is a relationship between the presence of built environments and childhood obesity among the immigrant population living in Cobb County Georgia. The social ecological model was used to explain how environmental factors may influence behavior. The research questions addressed whether walkability and elements of built environments such as to healthy foods and access to parks and recreational areas of census tracts affect childhood obesity when adjusting for race/ethnicity and immigrant population in Cobb County. Data was collected from government websites. Student enrollment, school ethnicity, and free/reduced lunch data were retrieved from the website, School Digger, which gathered their information from the National Center for Education Statistics, U.S. Department of Education, the U.S. Census Bureau, and the Georgia Department of Education data sources. Average BMI data were gathered from the Georgia Department of Education 2016-2017 Georgia fitness assessment report. Data were analyzed using independent *t*-test, Pearson correlation and 1-way ANCOVA. Findings showed a statistical significance with the existence of farmer's markets and child obesity but no significance among the other built environment variables. The results from this study can help community leaders develop an inclusive plan to reduce the occurrence of obesity in adolescents within the target area.

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Dedication

The process of earning a doctorate degree has been one of the most trying, and in some instances, daunting tasks I have set out to accomplish. At the same time, it has given me a sense of accomplishment to know that I am capable of completing a life-long dream. This journey began because of my desires, but as I progressed, I realized I am not only doing it for myself; I am doing this for my family. Earning my Doctorate will show my little cousins and future children, nieces, and nephews that if I can do it, they can as well. I hope it will remove all doubt and discouragement, helping them to realize the sky is the limit and they can do anything that they desire.

Also, to my grandparents, Clarence and Yvonne David and Audrick and Elaine Nurse, thank you for leaving your homes in Barbados and Guyana in hopes of giving your children a better life than you had growing up. Thank you for the lessons you taught my parents and the stories you shared with me. Some of those stories made great videos. Because of you, my parents were able to give my sisters and me an amazing upbringing. Thank you for the love and support you have given me my entire life. For that, I dedicate this accomplishment to you.

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To my sisters Shaneca Stewart and Shantell Sims, you two are the strongest individuals I know, only second to mom. Your strength amazes me to no end. I have seen you go through the most unimaginable pain and come through stronger for it. I can never thank you enough for being great examples.

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stay the course even when it got hard as well as provided each other with noteworthy advice to help with our research. To my friends who have supported me from the beginning, you have been there for my highs and lows. When it seemed like a lot, you always encouraged me to keep going, never failing to remind me when it is all over every step of this journey will have meaning and be worth it. I thank you for your support and for being a listening ear. To the Lake Oconee Alumnae Chapter of Delta Sigma Theta Sorority, Inc., thank you for mentoring me through this process. You have been a wealth of information and support to me through this part of my journey.

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Chapter 1: Introduction to the Study

Introduction

Childhood obesity has increased over the years, and in recent decades it has been reaching distressing proportions. Obesity is the leading cause of chronic diseases found in children. It causes a decrease in quality of life and longevity, and it hurts U.S. economic stability. These concerns are even more apparent in children with a migrant background. Gualdi-Russo et al. (2014) stated that outside of genetics, the cause of the worldwide increase of obesity includes environmental and cultural factors, such as a lack or reduction of physical activity, resulting in the acceptance of sedentary lifestyle and developing eating habits that are not conducive to a healthy lifestyle (p. 40).

Most immigrants are likely to enter the country at their healthiest point. Malmusi, Borrell, and Benach (2010) stated that newly arrived immigrants from poorer countries have better health than the native population (p. 1611). As immigrants acculturate and settle into life in the United States, they tend to adopt an unhealthy lifestyle similar to what the native population is accustomed, such as exposure to food products containing high amounts of fats, sugars, and salts, instead of continuing the healthy eating habits they are used to in their native land. Acculturation is a multifaceted concept that includes factors such as psychosocial, socioeconomic, political, and historical variables (Tonsing, 2014, p. 410). Acculturation explains the changes that occur when groups with different cultural background intertwine on a consistent basis, resulting in a noticeable difference in the original cultural patterns of either group.

In this study, I addressed the importance that built environments have on immigrant populations. The comparison of the presence of built environments in immigrant and native populations will aid in the determination of whether built environments positively impact obesity in children. In Chapter 1, I address the scope of the obesity epidemic in Georgia and how it affects the immigrant population. I also identify and explain the theoretical frameworks, social, as well as the methodology used to understand the importance of access to built environments and cultural competence amongst the immigrant population. Chapter 1 provides the flow of the study, beginning with the background, problem statement, the purpose of the study, research questions and hypothesis, theoretical and conceptual framework, significance, nature of the study, definitions, assumptions, scope and delimitations, limitations, significance, and summary.

Problem Statement

Childhood obesity is a life-altering disease that is increasing among immigrant minorities (Center for Disease Control and Prevention [CDC], 2015b). Childhood obesity has been studied and debated. It affects the child, and it also affects the community. Obese adolescents are at a higher risk of developing life-threatening diseases such as diabetes, hypertension, and cancer (Georgia Department of Public Health [GDPH], 2014). Childhood obesity costs an estimated 19,000 dollars in medical cost over an obese child's lifetime (GDPH, 2014). In Georgia, 17% of adolescents are overweight, and 12% of adolescents are obese (CDC, 2016g). Forty-two percent of high school students living in Georgia do not meet the recommended requirements for physical activity set by the

CDC (GDPH, 2014, para. 2). According to Kibble et al. (2016), Georgia is 17th in the United States when it comes to childhood obesity among ages 10-17 years (p. 197).

Obesity in children is seen among boys and girls throughout all socioeconomic lines and all ethnic and racial groups; however, Hispanic American and African American cultures are affected at a disproportionate rate (Association of State and Territorial Health Officials, 2007). Minority children are at a higher risk of developing obesity compared to European American children. The CDC (2015e) determined that Mexican American children develop obesity at a higher rate than African American and European American children in the same age group. Factors that can increase the possibility of children developing obesity are diet, lack of exercise, family history, and psychological, such as stress.

Liu and Waldorf (2012) stated that most immigrants who enter the United States come from countries where obesity is lower or nonexistent compared to the United States (p. 1). The process of migration and acculturation is often met with stressful feelings, trying to keep a hold on their values and norms they are accustomed to and adapting to a new culture. Acculturation can hurt immigrant individuals, and there is a competing pressure from the new environment to conform and maintain the lifestyle of their origin country (Marsiglia, Booth, Baldwin, & Ayers, 2013, p. 49).

The conflict of acculturation is seen more in second- and third-generation immigrants than first-generation immigrants. First-generation immigrants have a stronger connection to their land of origin, beliefs, and values, making it harder for them to operate outside of their norm. However, second-generation immigrants have little

connection to the land of their ancestors and thus assimilate and integrate into the host society easier. Acculturating to the host nation's customs often proves detrimental to their health and results in unhealthy behavior and the development of disorders, such as obesity in children. Lui and Waldorf (2012) stated that second-generation immigrants have a higher chance of weighing more than their foreign-born parents. The obesity trajectory suggests that environmental and cultural factors have more of an effect on the development of obesity compared to genetics.

Ethnicity and race of a child influence his or her perceptions of his or her environment. A person's culture shapes his or her understanding as well as his or her experiences. Culture is learned by observing others' normative and pragmatic behavior within the group, and these practices are ingrained in the community and seen as appropriate and reasonable. It is also the reason acceptable body image varies depending on a person's association with an ethnic group.

According to Caprio, Daniels, Drewnowski, and Kuafman (2008), satisfactory body mass index (BMI) for European Americans is usually lower than African Americans (p. 2,116). According to Fitzgibbon (2009), African Americans are less likely to report an inconsistency between their current and ideal body image until they are obese. African Americans and Mexican Americans are less likely to recognize they are overweight compared to European Americans (Fitzgibbon, 2009). Weight status misperception is also a common problem associated with race and ethnicity. It is unlikely for parents to react to the concerns of childhood obesity if they do not feel there is a

problem due to cultural acceptance of high BMI and large body image; thus, not linking obesity and adverse health outcomes for their children.

The CDC (2015b) determined that, over the last 3 decades, the obesity rate has doubled in children and quadrupled among adolescents (para. 1). The prevalence of obesity in children was 17% in the United States (Ogden, Carroll, Kit, & Flegal, 2014, p. 806). In addition to health problems associated with childhood obesity, children also suffer from developmental disorders (Ogden, Carroll, Lawman, Fryar, Kruszon-Moran, Kit, & Flegal, 2016). For instance, being overweight can hurt a child's self-esteem, due to the ridicule that may occur from other children. The ridicule may hinder their ability to deal with stress and inevitably their health.

Ogden et al. (2014) determined that there had not been a notable change in the occurrence of obesity among children between 2003-2004 and 2011-2012 (p. 812). The state of obesity in children is consistently high and has not decreased within the time previously reported. With the increase in childhood obesity, there has been an increase in chronic diseases, such as hypertension and diabetes (Wang, 2001, p. 1129). Obesity is caused by an imbalance of caloric intake and the ability of the body to expend the calories as energy (Karnik & Kanekar, 2012, p. 1). Immigrant children who are accustomed to being physically active in their native land are likely to come to the United States and adopt a sedentary lifestyle due to the lack of safe opportunities and places to be physically active.

Built environments are the availability of healthy foods, infrastructures, space, and open areas such as open fields and sidewalks (CDC, 2011a). Built environments

provide children with the opportunity to engage in physical activity. However, if the community does not have infrastructures, such as sidewalks, that offer a safe place for pedestrians to walk, run, or even bike throughout the neighborhood, it is highly unlikely physical activity of that nature will occur. Powel, Slater, Mirtcheva, Bao, and Chaloupka. (2007) determined that adolescents living in areas with a higher representation of convenience stores than grocery stores were at a higher risk of an increased BMI (p. 305). The presence of built environments also encourages immigrant children to continue to be physically active even though it is not in the same matter they are not accustomed.

Purpose

The goal of this quantitative study was to examine whether the presence or absence of built environments influences the prevalence of childhood obesity among the immigrant population living in Cobb County Georgia. Understanding the presence of sidewalks in communities will contribute to the realization of the importance of built environments and the effect it will have on the fight against childhood obesity. Gordon-Larsen, Nelson, Page, and Popkin (2006) suggested that lower socioeconomic status and high-minority groups have less access to indoor and outdoor facilities promoting physical activity. Camarota and Zeigler (2015) stated that 43.8 million immigrants lived in the United States. In the same year, the poverty and uninsured rate among foreign-born adolescents reached 27.4% and 20.6%, respectively (Camarota and Zeigler, 2015). Low socioeconomic status increases the likelihood of children becoming obese. According to Kachi, Otsuka, and Kwada (2015), indicators such as educational attainment, income,

low maternal education, and professional class have been consistently linked to childhood and adolescent obesity (p. 464).

Understanding economic factors that influence the occurrence of obesity in immigrant children population will help in the development of prevention programs. In this study, I identified factors that either directly or indirectly affect the development of obesity in immigrant children. Investigating the effects of built environments on obesity among the immigrant children population may identify other contributing factors, such as the different socioeconomic status areas. Immigrants entering the country are more likely to live within a community of familiarity. The presence of built environments is commonly seen in areas with a lower childhood obesity rate.

Examining the rate of obesity in areas with little or no built environments can assist in the implementation of recreational areas and sidewalks. By using the socioeconomic status data from the Youth Risk Behavior Surveillance System (YRBSS) database, I determined the prevalence of childhood obesity among districts not currently participating in the program. The study dependent variable was the prevalence of obesity among the immigrant population, and the independent variable was the presence of built environments. The covariates were socioeconomic status and immigrant status.

Background

Childhood obesity affects many people in the United States. Childhood obesity is caused by the ingestion of more calories than calories released through physical activity. According to the CDC (2015d), the occurrence of obesity among children aged 6–11 years in the United States increased from 7% in 1980 to nearly 20% in 2008. In the same

period, the obesity rate of adolescents aged 12–19 years increased from 5% to 18% (CDC, 2017h). As technology influences every aspect of a person's life, obesity in children is rising. Children are finding more entertainment using electronic devices than physical activity. Immigrant children are primarily affected by the lack of physical activity due to technology as they become acculturated into U.S. culture. The prevalence of obesity is higher among Hispanic American residents than among non-Hispanic Whites, 21.9% and 14.7%, respectively (CDC, 2017h). Health disparities should be addressed to understand why minority children are at a higher risk of developing obesity than other children. According to Braveman (2009), understanding disparity perspectives will help explain why one ethnic group is affected more than another (para. 2). Government organizations on all levels have provided funding and assistance to help rectify childhood obesity.

Obesity increases the likelihood of developing diabetes and cardiovascular disease, and it has the potential to reduce a person's life expectancy (Lee et al., 2012, p. 219). The causes of obesity in children is related to several interlinking factors. There is an association between childhood obesity and educational development of the parents and child, region of residence, race, socioeconomic status, ethnicity, and country of origin (Popkin, Adair, & Wen Ng, 2012).

Caprio et al. (2008) identified cultural and biological aspects that can affect the outcome of various ethnic groups differently. Caprio et al. used the diversity of ethnicities to show that the effectiveness of intervention also relies on the ethnic group

being reached (p. 2,222). Understanding how to reach the target audience contributes to the efficiency and effectiveness of any program, especially obesity prevention programs.

Gill, Kumanyika, and Swinburn (2005) claimed that it is important to understand the economic factors that affect and are associated with obesity when developing a remedy. Gill et al. acknowledged the importance of evidence-based development and decision making when preventing health disparities related to childhood obesity (p. 24). Gill et al. also covered the development of the Prevention Group of the International Obesity Task Force (IOTF). According to Gill et al., the purpose of the group is to identify problems within prevention programs and provide recommendations to correct issues.

Understanding which ethnic groups are at a higher risk of disparity for obesity will help to reduce selection bias. Kilbourne, Switzer, Hyman, Crowley-Matoka, and Fine (2006) provided a blueprint for the creation and development of health service research to guide future researchers in understanding and identifying determinants that influence disparities. The purpose was to create interventions that will reduce or eliminate disparities in healthcare systems as well as identify differences in healthcare between ethnicities. Kilbourne et al. suggested that there are various levels of disparity health determinants that include organizational culture and individual beliefs and preference (p. 2,113).

Scholars have not addressed socioecological factors based in Georgia. There were gaps in the literature regarding the effects that acculturation has on adolescents migrating to the United States in the last 10 years. This study was necessary to evaluate the impact

that relocating from individuals' native country with their beliefs and traditions to a country rich in unhealthy behaviors.

Theoretical Framework

The cause of obesity is complex for any individual. It is complicated for children due to their reliance on their parent's decisions. Most children do not shop for groceries, leaving them to eat what their parents or guardians provide. The framework used in this study was the social-ecological model (SEM). According to the SEM, not only does individual-level factors such as gender and age change individual outcomes, but also the association with economic, social, environmental, and cultural contexts on a larger scale play a role in how a person lives (Ohri-Vachaspati et al., 2015, p. 2056).

There has been research on individual factors within the SEM that influence weight status in children. However, research involving community-level factors such as built environments, physical activity, and access to healthy foods have yielded inconsistent results, warranting more investigation. The multilevel model will help to address the multiple facets that are associated with factors related to childhood obesity in the immigrant population. SEM provides insight on the effectiveness of intervention throughout the multiple levels of influence on health behaviors such as intrapersonal, interpersonal, organizational, community, and public policy levels (Sallis, Owen, & Fisher, 2008, p. 466). When intervention approaches effect factors from all the levels, they increase the chances of a long-lasting change among individuals within the community.

According to Huang, Drewnowski, Kumanyika, and Glass. (2009), cross-disciplinary research will allow the researcher to inquire about various areas within the field of study (p. 1). The study of childhood obesity is not different; biological aspects of the body's ability to metabolize food into energy relies on a person's external ability to encourage the breakdown of dietary substance into productive energy. The model was used to examine behaviors and health outcomes by considering the relationship between the individual, relationship, community, and societal factors, such as built environments. I used the SEM to illustrate the cause of action at one level and the effect it will have on another level.

Operationalization of the Framework

The complexity of obesity has baffled many professionals. The increase of obesity in children is due to many factors (Rezapour, Mostafavi, & Khalkhali, 2016). First, the advancement of technology has encouraged a sedentary lifestyle. Second, the availability of healthy foods in underserved areas, which forces individuals to make unhealthy food choices. Third, the migration of immigrants into a country that does not have the same beliefs or attitudes as their native land can affect healthy choices. For example, immigrants arrive in the United States and are less active than in their home country. In their native country, an active lifestyle may be more likely due to activities that are needed to live and provide for the family.

In this study, I wished to determine whether the type of area an immigrant adolescent lives in will influence the development of obesity. Immigrant adolescents living in rural areas are often exposed to an unhealthy lifestyle compared to immigrant

adolescents living in suburban areas. Access to healthy foods can improve an adolescent's health as effectively as the lack of access to healthy foods can impinge an adolescent's health and quality of life (Cobb et al., 2015). An individual's genetic makeup can influence a child's likelihood of developing obesity.

Figure 1 illustrates the conceptual framework used in the study. Genetics, coupled with other covariate factors such as age, gender, physical activity, dietary intake, parental education level, socioeconomic status, and parental BMI, play a role in adolescents' susceptibility to obesity. The availability of a built environment in immigrant populations will aid in the increase of physical activity among adolescents. Another factor that influences obesity within the immigrant population is the reduction of physical activity due to the migration from their native land and the emersion in their culture.

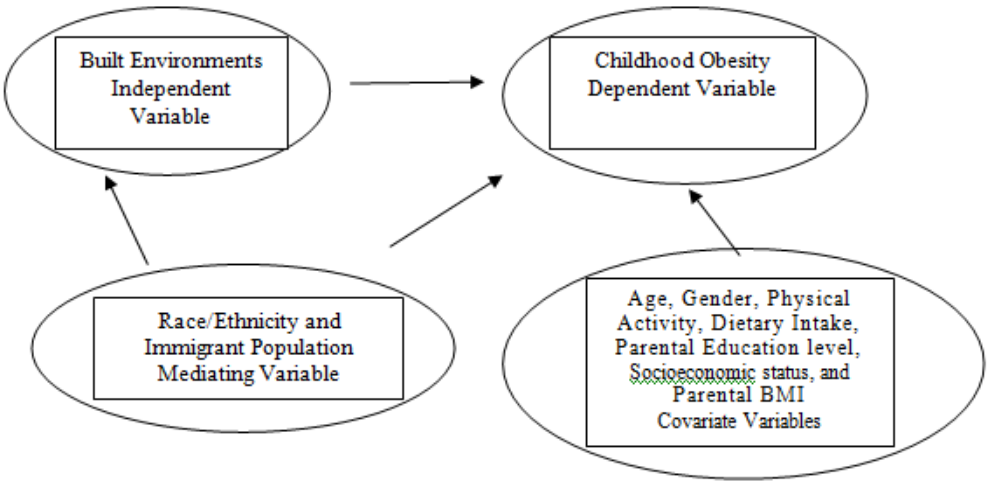


Figure 1. The conceptual framework.

The purpose of this study was to determine if immigrants recently entering the United States are affected by obesity in the same way as individuals born in the United

States. The SEM was used to understand the effects of personal and environmental factors that influence a person's behavior (see CDC, 2015f). The assumption was the presence of built environments, and the availability of fresh foods and markets options, will contribute to the reduction of obesity over time. They will also decrease the development of obesity in immigrant children by providing them with the ability to continue the level of activity they are accustomed to in their native country.

Research Questions

1. Is the prevalence of childhood obesity affected by walkability and elements of built environments such as access to healthy foods and access to parks and recreational areas of census tracts in Cobb County GA?

$H_0$1a: There is no statistically significant association between prevalence of childhood obesity and walkability according to the census tracts in Cobb County GA.

H_a1a: There is a statistically significant association between prevalence of childhood obesity and walkability, according to the census tracts in Cobb County GA.

$H_0$1b: There is no statistically significant association between prevalence of childhood obesity and the access to elements of built environments such as healthy foods according to the census tracts in Cobb County GA.

H_a1b: There is a statistically significant association between prevalence of childhood obesity and the access to elements of built environments such as healthy foods according to the census tracts in Cobb County GA.

$H_0$1c: There is no statistically significant association between prevalence of childhood obesity and the access to elements of built environments such as parks and recreational areas according to the census tracks in Cobb County GA.

H_a1c: There is a statistically significant association between prevalence of childhood obesity and the access to elements of built environments such as parks and recreational areas according to the census tracks in Cobb County GA.

2. Is the association between prevalence of childhood obesity and attribute of built environments which include walkability, access to healthy foods, and access to parks and recreational areas, modified by race/ethnicity and immigrant population in the state of Georgia?

$H_0$2a: There is no association between prevalence of childhood obesity and walkability, modified by race/ethnicity and immigrant population in the state of Georgia.

H_a2a: There is an association between prevalence of childhood obesity and walkability, not modified by race/ethnicity and immigrant population in the state of Georgia.

$H_0$2b: There is no association between prevalence of childhood obesity and access to fresh fruits and vegetables, modified by race/ethnicity and immigrant population in the state of Georgia.

H_a2b: There is an association between prevalence of childhood obesity and access to fresh fruits and vegetables, not modified by race/ethnicity and immigrant population in the state of Georgia.

$H_0$2c: There is no association between prevalence of childhood obesity and built environments, defined by access to parks and recreational areas, modified by race/ethnicity and immigrant population in the state of Georgia.

H_a2c: There is an association between prevalence of childhood obesity and built environments, defined by access to parks and recreational areas, not modified by race/ethnicity and immigrant population in the state of Georgia.

Nature of the Study

A cross-sectional study was used to address each research question. The quantitative methodology provides several benefits: (a) it can be used to investigate causal relationships, (b) it identifies independent and dependent variables, and (c) it is highly reliable due to the reduction of researcher bias and controlled observations (University of Southern California, 2017). Comparisons were made between areas that have adequate built environments that encourage physical activity such as park and recreational areas and communities that lack quality built environments. The study dependent variable was average BMI among middle and high schools in Cobb County Georgia, and the independent variable was the presence or absence of built environments. The covariates were socioeconomic status and immigrant status. Spatial and historical comparative research was used to establish if there was a significant change in the prevalence of obesity in Cobb County Georgia. The spatial factor was used to determine whether there was a significant change between immigrant and nonimmigrant children in Georgia.

I focused on the cross-tabulation of the relationship between built environments and average BMI among adolescents in Cobb County schools. Potential confounding factors were cross-tabulated to identify the existence of relationships between variables. Student *t*-test analysis was used to determine the statistical significance and whether the null hypothesis is rejected or accepted. Relative risk was used to determine an association between obesity and poverty, household income, access to healthy foods, immigrant status, and access to recreational areas. The relative risk was used to confirm whether there was a risk of obesity due to the presence of poverty, immigrant generational status, access to healthy foods, and access to parks and recreational areas of census tracts. Bivariate analysis, *t*-tests, Pearson's product-moment correlation and multivariate analysis, and analysis of covariance (ANCOVA) were used to examine the relationships between variables. It was also used to assess effect modification.

Effect modification addressed the biological impact of exposure under different circumstances (Boston University School of Public Health, 2013). It will allow for the separate evaluation of each aspect of built environments and the effects on the development of childhood obesity. Also, effect modification assisted with the determination of synergism between causes that may increase the potential of developing childhood obesity. Secondary data were obtained from sources such as the Georgia Department of Education, YRBSS, Georgia Bureau of Investigation, the United States Census Bureau, and the National Survey of Children's Health conducted by the National Center for Health Statistics. The analysis software SPSS was used to analyze data.

Definitions

A. *Built environments:* Are human-made surroundings in which people live and work; it includes recreational areas, buildings, recreational parks to neighborhoods and cities that include sustaining infrastructure, such as water supply, or energy networks (CDC, 2015c; Definitions.net, 2017). Built environments are the independent variable.

B. *Childhood obesity prevalence:* Childhood obesity prevalence is the proportion of childhood obesity by county and state, attained by the CDC (2017h). Childhood obesity prevalence was the dependent variable.

C. *Immigration status:* Nonnative born individuals entering or living in the United States legally or illegally (Association of State and Territorial Health Officials, 2010, p.1). Immigrant status was a dependent variable.

D. *Socioeconomic status:* Socioeconomic status is considered the social standing of an individual or group. It is measured as a combination of factors such as literacy level (education), household income, and occupation (American Psychological Association, 2017). Socioeconomic status was a mediating independent variable.

Assumptions

The overarching assumption of the study was that child obesity prevalence is higher in areas that lack adequate built environments, and immigrant or ethnic status will have an effect on the development of obesity. Another assumption used in the study was the "all other things being equal" assumption; isolates unevaluated variables from

independent variables that have the potential to affect the dependent variable (Girod & Scholz, 2011; Investopedia, 2015).

Scope and Delimitations

The scope of the study covered children in middle and high school in Cobb County Georgia. The results of this study were generalizable to children who (a) are immigrants from other countries, (b) living in Cobb County Georgia, (c) living in underserved areas with the absence of built environments, and (d) or the presence of built environments in their communities. The findings of this study were not generalizable for other groups outside of the study parameters and populations with different ethnic make-up.

I determined the effects of built environments on the development of childhood obesity and how immigrant status affects children's health. The study was limited to middle and high school adolescents who lived in Georgia. I focused on the comparison of adolescents who lived in communities that did and did not have built environments. I compared the average BMI among middle and high school students in areas with and without built environments.

Limitations

The study was limited to one dependent variable and several covariates. Scholars have shown that factors such as race, psychosocial influence, socioeconomic status, and genetics are associated with obesity (O'Reily, Cook, Spruijt-Metz, & Black, 2014). The different attributes between the communities added to the potential for confounding the results. The validity of findings may be affected by the variation in BMI levels not

initially implemented in the study by the independent variables. Regarding this study, there was no potential for participant and researcher bias outside of the possible bias during the initial collection of primary data. Factual data from third parties and government agencies were used to reduce current research bias. The study's statewide span and dependence on government data was intended to make the most of the efficacy of the results.

Significance

I investigated the association of the presence of built environments on the development of obesity in adolescents. I also looked into how immigrant status influenced obesity in adolescents. I focused on areas that are considered high and low socioeconomic areas. The use of these areas helped to determine whether built environments are effective at reducing the prevalence of childhood obesity. The results provided insight into the effectiveness of built environments that have the potential to decrease the prevalence of obesity among adolescent in Cobb County, GA.

The results of this study may provide more evidence on the necessity of the presence of built environments within all communities, especially within the immigrant population. More children will choose to live healthier lives that will empower individuals and the community. Another positive change associated with the study was to increase awareness of the importance of exercise among adolescents within the immigrant population. Reducing the prevalence of childhood obesity will cause a decrease in obesity-related deaths.

Addressing socioeconomic elements that may aid in the development of childhood obesity will contribute to policy changes. For instance, if the study finds the lack of built environments in low socioeconomic areas is contributing to the increase of childhood obesity, then more funding should be given to support the development of recreational areas. Also, I provided insight into the different areas needed to affect childhood obesity positively. The information derived from comparing the different socioeconomic areas should aid in the implementation of new policies, interventions, and most importantly the needs of the communities.

Possible Types and Sources of Data

The focus of this study was placed on socioeconomic status, access to healthy foods, opportunity to exercise, access to recreational areas, BMI, and aerobic capacity. Data related to the study were gathered from sources such as the Census Bureau, the National Health and Nutrition Examination Survey (NHANES), and the Georgia Department of Education. The collected data consisted of obesity rate, socioeconomic status, gender, race/ethnicity, and age.

Summary

In 2013, one in three Georgia students were considered overweight or obese (Kumar et al., 2013, p. 6). Immigrant children are more susceptible to developing obesity due to the stressful nature of wanting to fit in with their native friends and stay true to their family values. Understanding how adolescents' immigrant status will affect them will contribute to developing policy and intervention to reduce obesity, and potentially eliminate the development of new cases. In this quantitative study, I aimed to identify an

association between built environment and childhood obesity and how an adolescent immigrant status affects their development of obesity.

In Chapter 2, I explore immigration history, obesity research, theoretical and conceptual framework, built environments, and the effects of immigrant status on childhood obesity.

Chapter 2: Literature Review

Introduction

Migration is a universal occurrence that can prove to be a determining factor of an individual or community's health status. Obesity among low-income countries is far less prevalent than it is in Western countries with energy-rich diets and sedentary lifestyles. In 2010, the prevalence of childhood obesity in the United States among children ages 2-19 was 16.3%, and overweight children reached a height of 31.9% (Curtin, Anderson, Must, & Bandini, 2010, p. 1). In the last 6 years, childhood obesity has increased to range from 19.2% to 37.7% (Segal, Rayburn, & Martin, 2017). These figures are similar to the current state of childhood obesity in Georgia. Georgia is ranked 17 in the country for obesity among school-aged children, 10-17 (Kibbe et al., 2016, p. 197).

Immigrants are bombarded with advertisements for inexpensive food of questionable nutritional value. There is also access to an abnormal amount of fast food establishments that are not usually seen in their country of origin. Over the past 30 years, childhood obesity has doubled in children and quadrupled in adolescents (CDC, 2015b). U.S. children learn unhealthy habits over their lifetime, and immigrant children adopt these practices to acculturate in society. Immigrant children also learn these unhealthy eating habits through lunches and access to vending machines within schools. The harmful behavior learned when immigrating to the United States accumulates over time and results in more immigrant children becoming overweight and obese the longer they reside in the United States. The steady state of obesity in the community calls for a look at the effectiveness of built environments.

The purpose of the study was to examine whether the presence or absence of built environments impacts the prevalence of childhood obesity among the immigrant population in the United States within the past 10 years. Perez, Ritvo, Brown, Holowaty, and Ardern (2011) suggested that environmental and demographic determinants should be investigated with a focus on new immigrant and low-socioeconomic status. Minorities and new immigrant groups living in low socioeconomic areas are less likely to be physically active than other cultural groups living in higher income areas. In this study, I sought to determine whether built environments influence immigrant population lifestyles and improve the likelihood of being active or succumbing to a sedentary lifestyle.

In Chapter 2, I will explore the literature on (a) association between the prevalence of obesity in children and socioeconomic status and (b) adolescent obesity. I will also identify whether access to built environments, such as healthy foods, causes any change in the development of childhood obesity. I will explore how walkability and other elements of built environments, such as access to parks and recreational areas, impact childhood obesity. The goal of this study was to examine the effect that the presence or absence of built environments may have on the prevalence of childhood obesity in Cobb County Georgia. The organization of this literature review is as follows: the introduction, literature search strategy, theoretical framework, conceptual framework, literature related to key variables and concepts, and summary.

Review of Relevant Research

Xu and Wang (2015) indicated that obesity risks factors are geographically specific and differ between men and women. The presence of built environments has an

effect on an individual's health and behavior as well as the need to promote geographically specific public policies. Ishizawa and Jones (2016) found that first-generation Asian American immigrants are healthier than second- and third-generation immigrants. Within the Hispanic American culture, the likelihood of developing obesity is higher for second- and third-generation immigrants (Ishizawa & Jones, 2016). However, immigrants living in isolated areas are less likely to develop obesity, due to the lack of acculturation. The isolation from the native population acts as a buffer against developing health problems related to obesity.

Tiedje et al. (2014) focused on immigrant population's perceptions of healthy eating, eating patterns, food decisions, generational differences in eating practices, and barriers and facilitators to healthy food choices. Tiedje et al. suggested that participants had similar perspectives about barriers and the importance of healthy foods. There were some generational and gender differences between adults and adolescents. Martin, Van Hook, and Quiros (2015) examined whether the socioeconomic status was associated with a healthier diet among Mexican American children and determined that there was segmented assimilation among Mexican American children. High-income families are more likely to provide their children with healthier food. This is an option that low-income parents do not have; thus, ensuring a continued cycle of unhealthy food choices.

The quality of the park or recreation facility can influence adolescents' decision to frequent an area. Edwards, Hooper, Knuiman, Foster, and Giles-Corti. (2015) focused on the associations between the amenities of parks and adolescent use to identify which environmental park features and combination encouraged adolescents to use the facility.

In this study, only 27% of participants used the closest park to them for physical activity (Edwards et al., 2015). Parks with features such as skate parks, trails, picnic areas, public access restrooms, and lighting around the facility were used more often than those that did not have desirable features (Edwards et al., 2015). Edward et al. also found that the attractiveness score of the parks increased by every additional feature added. However, in Dunton, Almanza, Jerrett, Wolch, and Pentz's (2014) study of proximity and use of parks, only 16% of adolescents used the park for more than 15 minutes, and 11% used it between 5 and 15 minutes. Parks that were 100 meters closer were used four times more than parks further away (Dunton et al., 2014). Although overall park usage was low, it increased if it were closer in proximity and possessed a high vegetation density.

Relevance and Limitations of the Existing Literature

There is evidence linking where an immigrant resides to their risk of developing obesity. There are a variety of methods used to investigate the relativity of the occurrence of obesity and built environments. However, scholars have not focused on how a longitudinal study would affect the overall picture of the effectiveness of built environments on obesity. Xu and Wang (2015) outlined the need for longitudinal studies that may shed light on whether neighborhood factors cause residents to live healthy or healthy people choose to live in neighborhoods with a high concentration of built environment amenities.

Childhood Obesity. The rates of childhood obesity have risen worldwide in less than a generation. In the United States, the average child's weight has increased over 10 pounds within the last 30 years (Lobstein et al., 2015). There is a link between obesity in

children and family socioeconomic status. Jin and Jones-Smith (2015) stated that low socioeconomic status has proven to be a barrier to developing healthy habits, such as having the option to choose healthier foods and performing physical activities. Jin and Jones-Smith also determined that low-income children were twice as likely to be obese, which may be due to the lack of physical activity. Children living in low-income areas are faced with minimal or no safe spaces to play and be physically active due to crime, the availability of built environments, or free resources available to the community.

Almost 18% of children are obese (Wippold & Tucker, 2016). In Georgia, nearly 13% of high school students were considered obese in 2013 (Trust for America's Health, 2018). National organizations such as National Institute of Child Health and Human Development and state organizations have allocated funding to conduct obesity research. Scholars have shown that racial/ethnic minorities are at a disproportionately higher risk of obesity (Wippold & Tucker, 2016). Researchers have also demonstrated disparities associated with socioeconomic status and racial/ethnic groups have a higher prevalence of early life risk factors for obesity than their European American counterparts (Taveras, Gillman, Kleinman, Rich-Edwards, & Rifas-Shiman, 2013). Ishizawa and Jones (2015) determined that Hispanic American and Asian American adolescent immigrants were 21% and 11%, respectively, more prevalent to develop obesity than their European American counterparts. The percentage of obesity increased across immigrant generations.

Built Environments. Built environments can positively affect the obesity rate among all age groups and genders. Built environments are all physical aspects where a

person lives and works, such as buildings, streets, open spaces, and infrastructures (Robert Wood Johnson Foundation [RWJF], 2018). Physical aspects such as sidewalks, pedestrian pathways, and parks attribute to a higher occurrence of physical activity, and the absence or inaccessibility of built environments will promote a sedentary lifestyle among adolescents. The current interest among policymakers is weighing place-based approaches to fight childhood obesity (CDC, 2015c). These policies will target locations such as schools and neighborhoods to include access to grocery stores and supermarkets to provide healthy foods and fresh produce that are not common in low-income areas.

Walkability. The occurrence of obesity among individuals living in urban communities is likely to be lower than in rural areas. The possible cause of the difference between the two types of areas is due to the availability of sidewalks, better street connectivity, mixed land uses, and more playgrounds in urban areas than rural areas (Xu & Wang, 2015). However, when comparing urban and suburban areas, adolescents living in the inner city perform physical activity at a lower rate than their counterparts in suburban areas (Xu & Wang, 2015). Better street connectivity increases walkability within the area, which reduces obesity risk among individuals living in suburbia of large metropolitan areas (Xu & Wang, 2015). Large immigrant-rich neighborhoods are seen as low quality. These neighborhoods have poor quality or absence of walkability, safety, and available physical activity resources (Ishizawa & Jones, 2015).

Access to Healthy Foods. The health of any community is determined by the quality of living that includes housing, access to healthcare, healthy foods, and the feeling of security while exercising in a safe place. Xu and Wang (2015) stated that people who

consume fast foods and sugar-sweetened beverages more than they exercise are at a higher risk of developing obesity. The local food influences an individual's food choice in his or her environment, such as the accessibility of grocery stores, farmer's markets, supermarkets, fast food restaurants, and convenience stores, as well as full-service restaurants. The RWJF (2014) determined that communities that have grocery stores within proximity to where people live are more likely to have residents with lower blood pressure and BMI. More fast food restaurants in a neighborhood equals higher BMI (RWJF, 2014).

Access to Parks and Recreational Areas. Physical activity is essential to healthy living. However, 80% of adolescents worldwide perform fewer than the 60 minutes of the recommended daily amount of physical activity (Edwards et al., 2015). Among adolescents, there is an association between the level of activity and the increased presence of parks and other recreational facilities near housing areas. Physical activity increased by an average of 17 minutes if there were parks within a half a mile of an adolescent girl's home (Dunton et al., 2014).

Immigration Laws. Immigration laws in the United States have evolved since the conception of this country. In 2015, over 1 million immigrants were allowed admission into the United States (Department of Homeland Security, 2017). The increase of the immigrant population in the United States over the decades has allowed for the opportunity to compare health problems, such as childhood obesity in the immigrant and nonimmigrant populations.

Since 2010, there has been a steady rise of immigrant people entering the United States. In 2012 and 2013, 2.3 million new immigrants arrived (Camarota & Zeigler, 2015). With new people from other countries coming at a rate of 1 million a year, there will be a shift in the demographics of the population. In 1963, the prevalence of overweight children was 4.2% in the United States (Camarota & Zeigler, 2015). By 2016, the incidence of obesity in children increased exponentially to 32.2% (Camarota & Zeigler, 2015).

U.S. Influence on Immigrants. Some cultures associate the United States as the land of abundance. The United States has a reputation for being a place where a person can come poor and die rich. Those same sentiments can be used when addressing obesity. Between the 1960s to the 1990s, obesity slowly increased by 10% (Lui & Waldorf, 2012). However, in half the time, obesity rate increased at a quicker rate; between 1990 and 2008 obesity increased by 13% (Lui & Waldorf, 2012). The average BMI for individuals in the 1970s was 14.7, whereas, in 2008, the BMI for the same group was 33.8 (Lui & Waldorf, 2012). The CDC (2017h) determined that the prevalence of obesity in adolescents was 18%, and Hispanic American adolescents were 25% more likely to develop obesity in 2015-2016.

Martin et al. (2015) stated that Mexican-origin immigrants and first- and second-generation children born to immigrant parents are more likely to be overweight or obese compared to their counterparts in Mexico and children born to Mexican American parents. Children who are born in another country, however, have some exposure to traditional foods common to their native country and are less likely to become obese.

Reyes-Rodriguez et al. (2016) suggested that the act of emigrating from a person's native land can change his or her eating habits, making him or her four times more likely to develop obesity.

Several factors influence the development of obesity in an immigrant population. Most ethnic foods are usually made with whole grains, vegetables, and fruits grown fresh and locally. Also, in some smaller areas, the absence of a refrigerator adds to the need to buy food daily, grow vegetation, or raise livestock, which promotes an active lifestyle. Activities such as walking to the market, harvesting produce, and tending to livestock daily encourage physical activity and reduce the likelihood of becoming overweight or developing obesity.

Processed foods loaded with additives such as steroids, fillers, and other ingredients are more prevalent in the United States. The difference in food quality increases the calories consumed by immigrant children. It is not unusual for immigrant people to believe that the healthier foods such as produce and meats are more expensive, which forces them to choose processed foods due to their affordability (Reyes-Rodriguez et al., 2016). For most immigrants, the daily activity associated with raising livestock and growing vegetation cease when they arrive in the United States. Living abroad is different from living in the United States. It is typical for families residing aboard not to have personal transportation, ensuring a more active lifestyle to provide for their families.

When U.S. grocery stores, schools, and other facilities are too far to walk, this forces them to use automobiles to get from one place to the next. The reduction of daily physical activity promotes the development of childhood obesity (Lui & Waldorf, 2012).

Also, the availability of a refrigerator unit to store food, coupled with the distance traveled to the grocery store, encourages immigrant families to buy larger portions of food than they would if they were living in their country of origin. Lui and Waldorf (2012) suggested that these factors contribute to the promotion of obesity in immigrant children.

Newly arriving immigrant children tend to take on a sedentary lifestyle while increasing their caloric intake creating an environment ideal for the development of obesity. The behavior displayed by some immigrant adolescents helped to illustrate a positive association between immigrant adolescent obesity and the duration of time they reside in the United States. In 2004, Singh and Miller concluded the health of immigrant children declined the longer they lived in the United States.

Kaplan, Huguet, Newsom, & McFarland (2004) conducted a study to analyze the association between immigrants' length of residence and obesity. The study indicated that acculturation and assimilation into American culture improved social standing and obesity in immigrant population (Kaplan et al., 2004). The study showed participants living in the United States over 15 years were at four times higher risk of developing obesity. Ten years later another study was conducted by Tiedje et al. (2014) that suggests little has changed among immigrant children. Immigrant individuals who have recently migrated to the United States show a better health status than immigrants who have resided in the United States for more than a decade (Tiedje et al., 2014).

Adolescent immigrant. Baker, Rendall, & Weden (2015) conducted a survey to determine whether the immigrant epidemiological paradox diminishes the longer they

reside in the United States. Immigrant epidemiological paradox suggests immigrants have more health advantages compared to their American-born counterparts (p. 1295). The researchers chose to explore child obesity as a variance from the paradox for second-generation immigrant children. The study found there is an opposite reaction than what is predicted from the immigrant epidemiological paradox. Second-generation immigrant children with mothers who are considered to have low BMI were two-thirds more likely to be obese than children born to American-born mothers (third-plus-generation children).

Literature Search Strategy

Database. The following online databases were explored: ProQuest, Academic Search Premier, JSTOR, EBSCOhost, Google Scholar, and PubMed. The following childhood obesity-related websites were searched: National Alliance for Nutrition and Activity (NANA), Center for Disease Control and Prevention (CDC), United States Department of Agriculture (USDA), Robert Wood Johnson Foundation (RWJF), Center for Science in the Public Interest (CSPI), and U.S. Department of Health & Human Services (U.S. DHHS). Google search engine was commonly used to research subjects unless an internal review of topics was required by database or website.

Search terms. The maturity and creation of key search terms and keywords were intensive. The initial keywords in the search of websites and databases were: childhood obesity, socioeconomic status, government nutrition regulation, ramification of childhood obesity, obesity prevention in schools, built environments and obesity rate, and obesity rate and socioeconomic status, poverty, immigrating to the United States, immigrant

childhood obesity, demographics of obesity, cultural competency, and the prevalence of obesity.

Inclusion and exclusion criteria for articles. The literature review included books, peer-reviewed journal articles, dissertations, and related search. The timeline used in the literature review spanned from 2000 to 2017. However, earlier works were utilized to develop a clear understanding of childhood obesity and the associated effects. A total of 300 individual works was assessed. Out of those, 200 were referenced, and 100 provided valuable content used in this dissertation. More than half of the studies were quantitative, and the remaining materials used were either theory or qualitative.

The articles used in the dissertation focused on childhood obesity, the effects of socioeconomic status on childhood obesity, childhood obesity rate and prevalence of obesity in Georgia, childhood obesity epidemic, presence and absence of built environments, immigrant population, governmental policies regarding school nutrition, and the health effects caused by childhood obesity. Also, an exhaustive examination was conducted of children emigrating to the United States and the risk of becoming overweight or obese. Within the search, particular attention was placed on the availability and the effectiveness of built environments in immigrant communities.

Theoretical Framework

Social Ecological Model (SEM). The Social Ecological Model (SEM) derived from System theory was used in this dissertation. It identified several levels that influenced a person's behavior such as individual and social factors to institutional, community, built environment, and policy factors (Sallis, Floyd, Rodriguez, & Saelens,

2012, p. 729). SEM is a multi-level approach to efficiently combating childhood obesity. The model focused on the individual and population level determinants of health and interventions (Healthy Campus 2020, 2016). In other words, SEM concentrated on how people and their environment influenced each other. It targeted social, institutional, and cultural environments in addition to biologic processes and geographical issues. SEM inferred that behavioral changes have a high chance of succeeding in supportive environments.

According to Raingruber (n.d), a person's behavior is shaped by the recurring patterns of activity that takes place in structured environments such as home, school, workplace, religion sectors, and healthcare environments (n.d). These environmental circumstances can influence individual and community well-being. They also can be used by public health officials as a leverage point to accomplish the optimal amount of behavioral change possible. One aspect SEM identified was the lack of oversight by health professionals. For instance, recreation facilities, schools, and community designs can have a positive or negative effect on a person's health. However, they are not overseen by health professionals. SEM addressed the need for health professionals to develop partnerships with professionals from other sectors of society (Sallis et al. 2012, p.731).

In the Social Ecological Model, actions that occur in one sphere can affect another field. There are four systems in this theory: Microsystem (interpersonal sphere), mesosystems (organizational or institutional), exosystem (community-level), and macrosystem (cultural). Microsystem consisted of roles an individual play within their

social circle. They included parents, siblings, children, employees, or friends. They are oftentimes ingrained based on generational influence, gender, culture, and ethnicity. In this sphere, knowledge, beliefs, and personality are all significant and are continuously shaped by individuals with whom a person comes in contact (Raingruber, n.d).

Mesosystem consisted of organizational factors such as policies, acceptable behavior, and norms that shape individual behavior. Exosystems are community-level influences such as social network, media, and standards. For example, a person can be influenced by any culture even if they were introduced recently to the culture. According to Sallis et al. (2012), a national study showed adolescents were more likely to participate in physical activities when there were more recreation facilities nearby. A study conducted in Atlanta, GA proved adolescents between the ages of 5-20 years completed more walking trips when recreation space was within 1 km of their home (p. 732). Lastly, macro systems are cultural influences. Examples of cultural influences are religious entities and the military.

Built environments are man-made physical aspects of where people live to include buildings, parks, recreation centers, and infrastructure (CDC, 2011a, p.1). SEM is used in this study to determine the effectiveness of built environments on the community. Sallis et al. (2012) stated interventions are useful when they successfully change individuals' attitude and behaviors, social environment, and built environment (p.729). Changing or improving the built environments in a community will have a lasting effect on the aesthetics of the community.

Also, physical activity was critical when impacting childhood obesity and chronic diseases found in immigrant communities. Cohen, Ashwood, Scott, Overton, Evenson, Staten, Porter, McKenzie, & Catellier. (2006) suggested adolescent girls are more likely to participate in after-school physical activities if recreational areas are equipped with amenities such as swimming pools, multi-purpose rooms, walking trails, playgrounds, basketball courts, and tracks. In addition to Cohen's et al. findings, Harris, Paul, Young, Zhang, & Fultom (2015) determined girls living in rural areas were more likely to be physically active compared to their counterparts living in suburban and urban areas (p.S94).

Conceptual Framework

Childhood obesity is an occurrence that is caused by an unhealthy lifestyle. A child is considered obese when they possess an excess of body fat. The excess fat adds to their risk of developing health problems. The CDC (2017i) stated a child is overweight when they have a surplus body weight for a specific height from fat, muscle, bone, water, or a combination of these factors. BMI is used to determine whether a child is obese. BMI is the measure of body fat using a person's height and weight (DHHS, n.d.). A child is considered overweight if their BMI is at or above the 85th percentile and less than the 95th percentile. If a child is at or above 95th percentile, they are considered obese (CDC, 2017I).

Childhood obesity is robbing children of their childhood. Obesity in children causes chronic disorders that will have a significant impact on psychological and physical health (Sahoo, Sahoo, Choudhury, Sofi, Kumar, & Bhadoria, 2015). It is evident that

childhood obesity plays a factor in the development of type 2 diabetes and coronary heart disease (Sahoo et al., 2015). Obese youth are more likely to develop health problems such as high cholesterol, hypertension, and respiratory disorders (CDC, 2018k). Overweight adolescents are 70 percent more likely to become overweight or obese adults (DHHS, n.d., para. 1). Chances increase to 80 percent if one or more parents are overweight or obese (DHHS, n.d., para. 1). Obesity at any age is preventable; it is avoidable in children due to a highly active lifestyle. According to the National Health and Nutrition Examination Survey, childhood obesity has increased since the 1960s (DHHS, n.d.).

Research has shown, Mexican American children ages twelve to nineteen suffer from obesity more than African American or Caucasian children in the same age bracket (Ogen, Carroll, Lawman, Fryar, Kruszon-Moran, Kit, Flegal, 2016). The obesity cases in children could be reduced if more children and adults made an effort to live a more active lifestyle and make healthier food choices. Understanding the family and cultural dynamic in the fight against childhood obesity will help public health officials develop effective interventions and educational programs as well as create and implement a policy that will prove to be useful for the community (Ash, Agaronov, Young, Aftosomes-Tobio, & Davison, 2017).

Key Variables and Concepts. Social determinants such as race, gender, age, sexual identity, socioeconomic status, and physical location have a significant impact on health outcomes of particular communities (Healthy People, 2014, para. 1). Childhood obesity is not an exception, and these social determinants can have a negative impact on

the prevalence of obesity in any community. A study conducted by the U.S. Department of Health and Human Services (2014) indicated children in rural areas were more likely to be obese, use tobacco and other substances than children living in urban areas (para. 1).

Summary

There was a cycle associated with obesity. Children who suffer from poor health are at a higher risk of living in lower socioeconomic status as an adult. The prevalence of childhood obesity has increased by 10% for all children living in the United States (Rogers, Eagle, Sheetz, Woodward, Leibowitz, Song, Sylvester, Corriveau, Kline-Rogers, Jiang, Jackson, & Eagle, 2015). However, obesity increased by 23-33% for children living in low socioeconomic status areas (Rogers et al., 2015). Consequently, the low socioeconomic status of the parent adds to the poor health status of the next generation (Perreira & Ornelas, 2011, p. 195). Immigrant families eventually succumb to the same fate. Initially, when immigrants enter the country, they have a lower mortality and morbidity risk than children born to immigrant parents.

However, over time and as generations matriculate and acculturation occur the health advantages of the immigrant children diminish. Ecological theories suggest the resources available to adolescent's families, schools, and communities influence their way of life, daily experiences, and developmental outcomes (Perreira & Ornelas, 2011, p. 197). Migration exposed children to different developmental concerns as well as stressors associated with acculturation which ultimately redefined children’s normative growth.

Chapter 3 identified the study design, data analysis, methodology, research design, and data collection.

Chapter 3: Research Method

Introduction

In this study, I addressed the importance that built environments have on immigrant populations. The comparison of the presence of built environments in immigrant and native populations will aid in the determination of whether built environments positively impact obesity in children. The research was significant because I studied the effects that built environments have on obesity in children immigrant populations. Understanding how the presence of built environments affect obesity in immigrant populations will aid in the formulation of effective policies and interventions to reduce and eliminate the occurrence of obesity in children. The presence of built environments in disadvantaged areas can improve access to fresh foods, and safer neighborhood (i.e., sidewalks and increased opportunity for exercising), which can contribute to the reduction of obesity in immigrant children (Gullotta, Plant, & Evans, 2015, p. 294).

This chapter provides insight into the study design, data analysis, and sample power. Also, it includes the justification for the methodology, research design, and data collection procedure. Data used in the study were collected from secondary sources such as governmental agencies. Chapter 3 includes study participants, treatment, ethical considerations, instrumentation, recruitment, and archival data sources due to the absence of participants in the study.

Research Design and Rationale

Cross-sectional survey and quantitative method are appropriate for investigating the research questions because the independent and dependent variables contain continuous numeric data with a temporal connection. The study dependent variable was the prevalence of obesity among adolescents, measured using average BMI per eligible school in Cobb County, and the independent variable was the presence of built environments. The covariates were socioeconomic status and immigrant status. I sought to measure the effectiveness of built environments among immigrant population while testing the association between childhood obesity and access to healthy food options and increased physical activity.

The cross-sectional design was appropriate because there was no need to manipulate the study environment, and secondary data were gathered from government agencies. The cross-sectional design also allowed me to compare different variables at the same time. Although there were only two research questions, there were several sub questions for each research question. Also, a cross-sectional study can compare different population groups at a specific point in time (Institute for Work & Health, 2015). There were no time restraints that affected my decision to use a cross-sectional study.

I chose a cross-sectional design with a quantitative methodology to aid in the advancement of the knowledge associated with the immigrant population and the prevalence of childhood obesity. The dependent variable was continuous, and independent variables were categorical, and they were obtained from reliable sources. I used inferential statistics to determine whether the hypotheses are rejected or accepted.

Inferential statistics are used to determine if it is probable that an observed difference between groups is dependable or happens by chance (Trochim, 2006). The quantitative methodology is frequently used to investigate causal relationships, identify independent and dependent variables, and reduce researcher bias (University of Southern California, 2017).

The exploratory data analysis (EDA) approach was used to summarize the main points, using visual methods. The purpose of EDA is to explore the data beyond formal modeling. The goal was to maximize insight into a data set, extract important variables, detect outliers and anomalies, and test underlying assumptions (Nist/Sematech, 2015). EDA uses graphical tools to gain an understanding of the data. In this study, the graphical techniques were used but not limited to scatter plots, histograms, probability plots, and box plots.

Methodology

Population. The target populations in the study were foreign-born and nonforeign-born adolescents in Cobb County Georgia. In 2013, according to the YRBS, 1,898 participants responded to a survey questionnaire that they were obese (Online Analytical Statistical Information System, 2017). The adolescent obesity rate in Georgia in 2016 reached 32.2%, ranking Georgia number 18 out of 51 states (The State of Obesity, 2017).

Sampling and Sampling Procedure. The study sample size included the entire Cobb County Georgia adolescent population. There was no need for sampling strategy. Sampling size was determined by the population within the community. The Online

Analytical Statistical Information System (2017) reported in 2016 that the adolescent population in the Cobb County area was 70,898. According to the sample Check Market (2018) calculator, the minimum sample size was 383. The sample size was derived from the input of the study population, 5% margin of error, and 95% confidence interval (Check Market, 2018). The sampling size for the small population neared 100% of the population. SPSS was used to calculate the G power with the assumption α= .05 and *p*= 0.05 (Faul, Erdfelder, Buchner, & George-Lang, 2009). The formula used to determine the sample size is listed below (Kadam & Bhalerao, 2010):

Equation 1

$$n = \frac{2(Z_a + Z_{1-\beta})^{2}\sigma^{2},}{\Delta^2}$$

α-error	5%	1%	0.1%
2-sided	1.96	2.5758	3.2905
1-sided	1.65	2.33	

Where:
n: Sample size
Z1-,β, Z: Constant
σ: Standard deviation
Δ: Difference in effect of two interventions
Zα: α error and whether it is a one-sided or two-sided effect (see α table)

Procedures for Data Collection. Indirect and intermediate measurement data sources were used to examine the relationship between the presence of built environments and prevalence of obesity among immigrant children. Data for the study were collected from several government websites. The United States Census Bureau (USCB) provided the most benefit to the study, with data regarding state and county demographic and socioeconomic status. The CDC, National Survey of Children's Health,

and National Center for Health Statistics were all instrumental in providing obesity-related data as well as race and ethnicity distribution within Georgia. Average BMI data were gathered from the Georgia Department of Education 2016-2017 Georgia fitness assessment report.

Data Analysis Plan

SPSS was used to calculate means and frequencies as well as to describe continuous and categorical descriptive data respectively. It used a combination of graphs, tables, as well as discussing the results yield (Laerd Statistics, 2013). I used a combination of tabulated and graphical description and statistical commentary. Skewed distribution was used to determine the normal distribution of the sample and the result and type of variable was used to determine the best measure of central tendency. Childhood obesity and factors about built environments was measured using the mean test (Laerd Statistics, 2013). Both research questions and hypotheses were analyzed using bivariate and multivariate analysis.

An independent *t*-test was used to answer the first research question and hypothesis pair. I compared the variables to determine whether they were related. According to Laerd Statistics (2013), the assumption of a *t*-test is that the dependent variable should be measured on a continuous scale. Independent variables consist of two categorical independent groups. Pearson correlation was used to test the significance of the absence and presence of parks.

Childhood obesity prevalence data were retrieved directly from the CDC website. Immigration data and built environment factors such as farmer's markets for Georgia and

Cobb County were retrieved from various government websites. The dependent and independent variables were analyzed using SPPS.

3. Is the prevalence of childhood obesity affected by walkability and elements of built environments such as access to healthy foods and access to parks and recreational areas of census tracts in Cobb County GA?

$H_0$1a: There is no statistically significant association between prevalence of childhood obesity and walkability according to the census tracts in Cobb County GA.

H_a1a: There is a statistically significant association between prevalence of childhood obesity and walkability, according to the census tracts in Cobb County GA.

$H_0$1b: There is no statistically significant association between prevalence of childhood obesity and the access to elements of built environments such as healthy foods according to the census tracts in Cobb County GA.

H_a1b: There is a statistically significant association between prevalence of childhood obesity and the access to elements of built environments such as healthy foods according to the census tracts in Cobb County GA.

$H_0$1c: There is no statistically significant association between prevalence of childhood obesity and the access to elements of built environments such as parks and recreational areas according to the census tracks in Cobb County GA.

H_a1c: There is a statistically significant association between prevalence of childhood obesity and the access to elements of built environments such as parks and recreational areas according to the census tracks in Cobb County GA.

4. Is the association between prevalence of childhood obesity an attribute of built environments which include walkability, access to healthy foods, and access to parks and recreational areas, modified by race/ethnicity and immigrant population in the state of Georgia?

$H_0$2a: There is no association between prevalence of childhood obesity and walkability, modified by race/ethnicity and immigrant population in the state of Georgia.

H_a2a: There is an association between prevalence of childhood obesity and walkability, not modified by race/ethnicity and immigrant population in the state of Georgia.

$H_0$2b: There is no association between prevalence of childhood obesity and access to fresh fruits and vegetables, modified by race/ethnicity and immigrant population in the state of Georgia.

H_a2b: There is an association between prevalence of childhood obesity and access to fresh fruits and vegetables, not modified by race/ethnicity and immigrant population in the state of Georgia.

$H_0$2c: There is no association between prevalence of childhood obesity and built environments, defined by access to parks and recreational areas, modified by race/ethnicity and immigrant population in the state of Georgia.

H_a2c: There is an association between prevalence of childhood obesity and built environments, defined by access to parks and recreational areas, not modified by race/ethnicity and immigrant population in the state of Georgia.

In the second research question, I used the regression analysis, ANCOVA. One-way ANCOVA was used to control covariates and eliminate unwanted variances that increased test sensitivity (see Tabachnick & Fidell, 2013). The one-way ANCOVA statistical test helped to remove biases from the study caused by variables influencing the dependent variables (see Fields, 2014, p. 492).

The assumption of a one-way ANCOVA test is similar to any linear model. The first consideration was the independence of the covariates and treatment effects, meaning the covariate should be similar between the groups being analyzed. One-way ANCOVA tests the interactions that categorical variables have on continuous dependent variables (Statistic Solution, 2017). The covariates in this study were continuous, and isolating the covariates helped to determine if the independent variables have a significant effect on the dependent variable.

Pearson correlation was used to answer the second research question and hypothesis pair. The statistical test was used to determine the relationship between demographic data and socioeconomic status and to assess confidence intervals, level of significance, and variance. The Pearson correlation coefficient measures the strength of the association between variables (University of the West of England, 2018). The assumptions associated with Pearson correlation coefficient were each variable should be continuous and there should be a straight-line relationship between variables (Statistics Solutions, 2017).

Threats to Validity

The validity of a study is an indication of the strength and soundness of the research. It is dependent on the accuracy of the conclusions drawn from the results (Center for Innovation in Research and Teaching, n.d.). Validity suggests that the findings are an accurate representation of the occurrence measured. Within the study parameters, there were no known threats to external validity. However, due to the group studied, the results may not be generalized enough to accurately depict children from other ethnic groups, populations, and ages. Childhood obesity is an epidemic that has increased over several decades. This well-known but less understood health problem plaguing communities does not possess any threat to construct validity.

There were a few possible threats to the study's internal validity:

1. Statistical regression: Statistics Solutions (2018) stated that the study measures the effect that several dependent variables have on the independent variable. These variables have the potential to affect the study populations in different ways (Statistics Solutions, 2018).
2. History: A considerable amount of time has passed between the host website collection of data and the adolescent prevalence of obesity (Laerd Dissertation, 2012).
3. The presence of built environments in various areas before the study period and during the study period can affect the prevalence of obesity.

4. The factors that could influence the relationship between the presence of built environments and prevalence of adolescent obesity such as functionality or proximity of the facility to the target population.

Ethical Procedures

Secondary data were analyzed in the study. The data contained zip codes solely to categorize respondents' geographical location, and it did not provide any personal information that could be used to identify participants. The data were evaluated by host websites such as the CDC, National Survey of Children's Health, United States Census Bureau, and National Center for Health Statistics to ensure appropriate information was redacted and the necessary data remained. Datasets used came from public use data websites. Data were collected and analyzed after the proposal was approved and institutional review board approval received.

Summary

The cross-sectional survey with quantitative methodology was used in the study. The purpose of the study was to determine the effects of built environments on childhood obesity among the immigrant population. The cross-sectional survey was appropriate for the study due to its ability to manipulate independent and dependent variables containing continuous numeric data with a temporal connection. I used descriptive and inferential statistics to describe the findings and test the hypotheses.

Chapter 4 provides a characterization of the study sample, results and findings and discusses discrepancies in data collection that arise during the research process.

Chapter 4: Results

Introduction

Childhood obesity affects everyone, whether directly or indirectly. The purpose of the study was to determine if the absence or presence of built environments influence childhood obesity among the immigrant population in Cobb County. I explored any potential connection between socioeconomic status and immigrant childhood obesity. I sought to address the importance that built environments may have on childhood obesity. Comparing the presence of built environments in immigrant populations has the potential to determine if built environments have a positive impact on obesity in adolescents. The goal was to identify whether there was an association between childhood obesity and the attribute of built environments, such as access to healthy foods and access to parks and recreational areas, after modifying for immigrant and socioeconomic status.

Chapter 4 includes a discussion of data collection methods, research design issues, and study findings. Descriptive and demographic statistics are presented for Cobb County Georgia. Hypothesis, statistical analyses, and results are discussed in this chapter. Study findings are summarized.

Data Collection

The study sample included 38 schools in the Cobb County district. Data were collected from middle schools and high schools. There was a total of 56,259 students enrolled in the schools. The data collected were specific to the schools and the area in which the schools were located. Study data were collected from all 38 schools, average BMI, student enrollment, school ethnicity, and free/reduced lunch. The schools and

average BMI information was gathered from the Georgia Department of Education (2018). Student enrollment, school ethnicity, and free/reduced lunch data were retrieved from the website, School Digger, which gathered their information from the National Center for Education Statistics, U.S. Department of Education, the U.S. Census Bureau, and the Georgia Department of Education data sources (School Digger, 2018).

Also, data from the surrounding area were collected to provide insight on built environments in the same area, such as farmer's markets, trails, parks, recreation centers, average BMI, and median income per school. Data on parks, trails, and recreation were collected from several sources. For instance, Cobb Parks was a branch within the Cobb County Government, and it was also a resource in this study that provided a list of parks, trails, recreation centers, and the cities they are located (Cobb County Government, n.d.).

Other sources were Cobb County Trails, an interactive map system that showed the location of the trails in the target area (Cobb County Government, n.d.). Lastly, Rec Planet was another tool used to determine the acreage and amenities found within each park and recreation center (RecPlanet.com, 2017). Socioeconomic status, crime status, and population data to include urban, rural, and foreign-born population were collected using City-Data, which was powered by Onboard Informatics (City-Data.com, 2018). The list of farmer's markets was provided by the Georgia Department of Agriculture Community Farmers Market division, and it tracked all the known markets within Georgia and categorized them by county (GA Dept of Agriculture, 2019).

The average BMI data were collected using the 2016-2017 Georgia Fitness Assessment (GA Department of Education, 2018). Because I focused on adolescents,

elementary and K12 schools were removed, and an emphasis was placed on middle and high schools within Cobb County and throughout the state of Georgia. The average BMI for each school was separated by gender, female and male. To determine the total average BMI for each school, the sum of both gender values was calculated and divided by two. Five schools were missing average BMI value for either gender. Because of the missing value, the total average BMI was not calculated; instead, those total schools' average BMI was coded missing for the gender that did not have a value. Figure 2 and 3 depicts the middle and high schools within the Cobb County school district.

Figure 2. *Cobb County School District: High school attendance zones.*

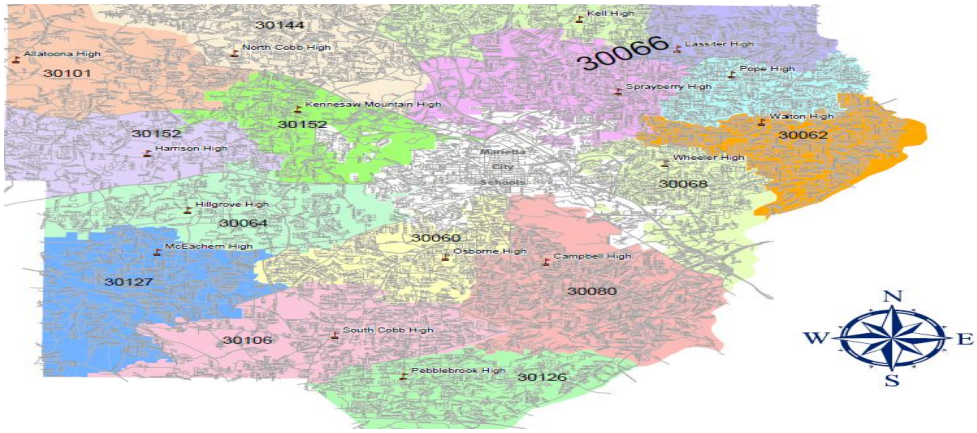
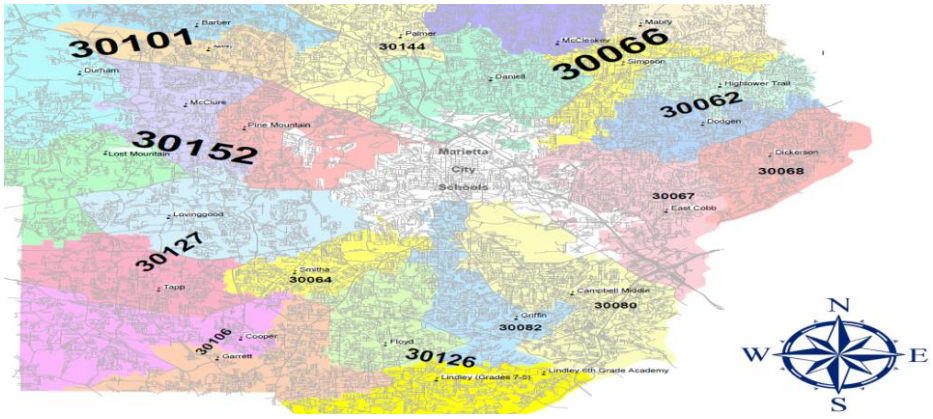


Figure 3. *Cobb County School District: Middle school attendance zones.*



Results

As shown in Table 2, the mean student average BMI for Cobb County was 22.01(*SD*=1.49). The Cobb County household income was $70,948.94. The Cobb County population mean by zipcode was 46,785. The smallest zip code had 20,238 inhabitants, and the largest zipcode had 66,497 inhabitants. In addition, 98.92% of Cobb County population lived in urban areas. The rural population living in Cobb County was 1.07%. The foreign-born population mean in Cobb County was 7,191.78 (*SD*=2,600.15). Zipcode 30106 had the least number of foreign-born individuals; whereas, 11,337 foreign-born individuals lived in 30080 zipcode. The free/reduced lunch percentage in Cobb county was 42.51% (*SD*=27.90). Cobb County's household income and urban population percentage are higher than the State of Georgia's means.

Table 2

Body Mass Index and Mean Socioeconomic Status Descriptive Statistics

	N	Sum	Mean	Std. Deviation
Number of Students Enrolled	38	56259.00	1480.5000	657.85465
Total BMI	38	836.57	22.0149	1.49523
Med. Inc. Per School Zipcode	38	2696060.00	70948.9474	14716.09683
Avg. Housing Price	38	9271100.00	243976.3158	60856.49684
Foreign Born Cobb Co	14	100685.00	7191.7857	2600.15343
Cobb County Pop. by Zipcode	14	654995.00	46785.3571	13666.78479
Urban Pop. %	14	1384.90	98.9214	3.22924
Rural Pop. %	14	15.08	1.0771	3.22615
Frgn brn pop %	14	218.36	15.5971	3.81788
Free/Reduced Lunch (%)	38	1615.70	42.5184	27.90614

Table 3 summarizes student enrollment by race and ethnicity within Cobb County. The mean number of students enrolled in schools throughout all Cobb County zip codes in 2016 was 1,480.50. There were more European American students enrolled in schools in Cobb County. The mean European American student enrolled in Cobb County was 593.28. There were 40% of European American students enrolled. Cobb County African American student enrollment mean was 486.65. There were 32.8% of African American students enrolled. The Asian American student enrollment mean for Cobb County was 77.89. There were 5.2% of Asian American students enrolled. The Hispanic American student enrollment mean for Cobb County was 275.76. There were 18.6% of Hispanic American students enrolled. The American Indian/Alaska Native enrollment mean rate for Cobb County was 2.44. There was 0.16% of American Indian/Alaska Native students enrolled. Cobb County's mean for two or more race students enrolled was 48.78. There were 3.2% of two or more race students enrolled.

Table 3

Student Enrollment and Race/Ethnicity Data

	Number of students enrolled	European American	African American	Asian American	Hispanic American	Native American	Mixed Raced
N	38	38	38	38	38	38	38
Mean	1480.5000	593.2895	486.6579	77.8947	275.7632	2.4474	48.7895
Median	1240.5000	516.5000	374.5000	43.0000	174.5000	2.1111	42.0000
Mode	521.00	18.00	69.00	41.00	42.00	4.00	32.00
Sum	56259.00	22545.00	18493.00	2960.00	10479.00	93.00	1854.00

Table 4 summarized trails, recreational centers, farmers markets, and parks data by zipcode. There were 14 zipcodes within Cobb County. There were several zipcodes

that did not have any trails such as 30062, 30064, 30066, 30082, and 30106. Zipcodes 30127 and 30144 had the most trails with 18.43 miles and 19.54 miles, respectively. Zipcodes 30062, 30064, 30068, and 30106 only had one recreational center; whereas, zipcodes 30101 and 30060 had the most with six and five recreational centers. Farmers markets were represented evenly across the county with the exception of zipcode 30080, which also had one of the highest populations within Cobb County. Zipcode 30101 had the largest collection of parks measured in acres with 2,220 acres, and zipcode 30082 had the least number of parks with 2.25 acres.

Table 4

Trails, Recreational Centers, Farmers Markets, and Parks Data by Zipcode

Zipcode	Trail (miles)	Recreation Center	Farmers Market	Parks (acres)
30060	3.7	5	3	213.828
30062	0	1	2	2.3
30064	0	1	3	112.45
30066	0	0	0	130.85
30067	0.75	0	2	71.53
30068	8.6	1	2	228.54
30080	4.4	3	7	282.8
30082	0	0	1	2.25
30101	2.3	6	1	2220.29
30106	0	1	1	93
30126	3.8	2	1	228.79
30127	18.43	2	1	258.15
30144	19.54	3	3	199.06
30152	1.3	0	1	301.75

Table 5 summarized the sum of student enrollment and race/ethnicity data by zipcode. The schools in the study spanned across 14 zipcodes. Schools in zipcode 30066

had the most students enrolled; whereas, schools in zipcode 30064 had the least number of students. The European American student body was the largest group represented among the target zipcodes. The largest group of European American students was in zipcode 30101, and the smallest group was in zipcode 30064. Schools in the 30126 zipcode had the most African American students, and schools in zipcode 30062 had the least amount of African American students.

Table 5

Sum of Student Enrollment and Race/Ethnicity Data by Zipcode

Zipcode	Student enrollment	European American	African American	Asian American	Hispanic American	Native American	Mixed Race
30101	3680	2220	822	142	354	5	136
30152	7043	4403	1375	322	714	16	209
30080	4106	564	1772	130	1485	3	148
30127	6881	2276	3325	141	855	16	265
30126	4016	292	2335	37	1272	5	74
30068	3440	1456	973	457	445	5	102
30060	1967	98	633	47	1154	4	30
30144	3873	1636	1245	177	616	8	183
30066	8906	5205	1542	533	1127	15	378
30064	966	63	389	17	467	0	30
30106	3901	338	2834	44	880	3	100
30067	1230	280	582	54	278	3	32
30062	5039	3528	306	819	242	9	133
30082	1211	186	360	40	590	1	34

The largest group of Asian American students was in zipcode 30066, and the smallest group was found in zipcode 30064. Schools in the 30080 zipcode had the highest amount of Hispanic American students, and schools in the 30062 zipcode had the lowest. Native American students were the least represented group among the target zipcodes. Zipcodes 30152 and 30127 had the highest amount of Native American students, and zipcode 30064 did not have any Native American students represented. Schools in the 30066 zipcode had the most mixed-race students, and 30060 and 30064 tied for the least amount of mixed raced students.

Table 6 summarized elements of Cobb County Socioeconomic status by school and zipcode. Thirty-eight schools were studied. In this study, the location of the schools was used to determine the socioeconomic status of the surrounding community. The median income per school ranged from $37,162 to $99,036. Most of Cobb County population lived in urban areas except for 11% and 3% living in rural areas, zicodes 30101 and 30127, respectively. The foreign-born population in Cobb County ranged from 9% to 27%.

Table 6

Cobb County Socioeconomic Status by Zipcode

Schools	Zip code	Median Inc. Per School $	Urban (2016 Pop. Est.) %	Rural (2016 Pop. Est.) %	Foreign Born Pop. %	Avg. BMI by Zip code	Student Enrollment
Osborne HS	30060	37,162	100	0	27.16	24.64	1967
Dodgen MS Hightower Trail MS Walton HS	30062	87,302	100	0	15.66	20.75	5039
Smitha MS	30064	75,597	100	0	9.59	22.27	966

Daniell MS Kell HS Lassiter HS Mabry MS McCleskey MS Simpson MS Sprayberry HS	30066	80,409	100	0	13.72	21.66	8906
East Cobb MS	30067	49,933	100	0	20.74	21.54	1230
Dickerson MS Wheeler HS	30068	99,036	100	0	14.11	21.61	3440
Campbell HS Campbell MS	30080	51,697	100	0	20.05	23.19	4106
Griffin MS	30082	70,023	100	0	15.67	21.46	1211
Allatoona HS Barber MS	30101	74,094	88.11	11.89	12.18	21.62	3680
Durham MS Cooper MS Garrett MS South Cobb HS	30106	44,120	100	0	17.41	23.04	3901
Floyd MS Lindley 6th Grade Academy Pebblebrook HS	30126	66,525	100	0	18.24	23.44	4016
Hillgrove HS Lovinggood MS McEachern HS	30127	72,406	96.81	3.19	9.47	22.04	6881
Tapp MS North Cobb HS Palmer MS	30144	58,492	100	0	14.12	22.5	3873
Harrison HS Kennesaw Mtn HS Lost Mtn MS McClure MS Pine Mtn MS	30152	75,257	100	0	12.42	21.51	7043

Research Question 1. Is the average student BMI affected by walkability and elements of built environments such as access to healthy foods and access to parks and recreational areas of census tracts in Cobb County GA?

An independent *t* test or Pearson's correlation was run to determine if there was a difference in average BMI scores between the presence and absence of independent

variables, such as farmers markets, trails, parks, and recreation center, according to the census tracts in Cobb County GA. The results for each test are represented in Table 7.

Table 7

Study Variables and Results Matrix

Independent Variable	t	Independent T-Test Sig. (2-tailed)	D	95% Confidence Interval	
				Lower	Upper
Farmers Markets	-.687	.496	-.28	-1.71	.84
Trails	-1.165	.252	-1.21	-1.57	.42
Recreation Center	-1.379	.176	-.46	-1.69	.32
	r(36)	**Pearson's Correlation Sig. (2-tailed)**			
Parks	.151	.364			

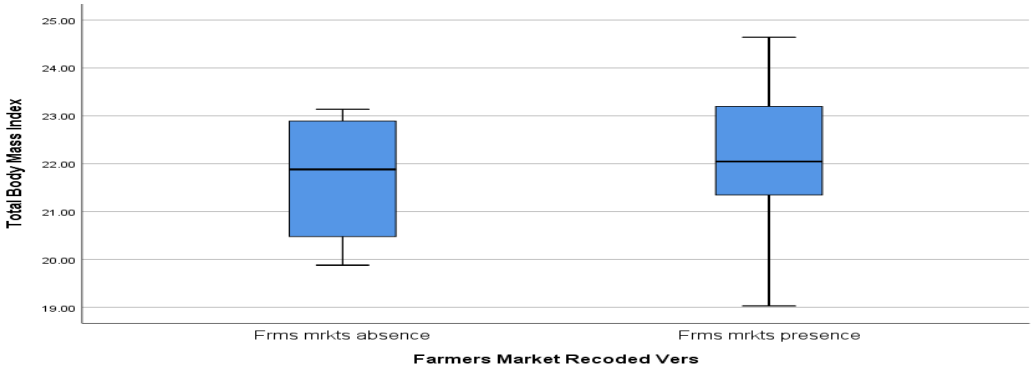
Farmers Markets

An independent *t* test was conducted to determine if there was a difference between the presence and absence of farmers markets on average BMI scores. There were 38 schools; seven cases were in areas with no farmers market (*M*=21.66, *SD*=1.37), and 31 schools had at least one farmers market in the area (*M*=22.09, *SD*=1.53). There were no outliers in the data, as assessed by inspection of a boxplot in figure 4. Farmer's market data were normally distributed, as assessed by the Shapiro-Wilk's test. There was homogeneity of variances for farmer's markets for presence and absence, as assessed by Levene's test for equality of variances; *p*-value was .975. There was no statistically significant difference in average BMI scores between the presence and absence of farmers markets, according to the census tracts in Cobb County GA; a *p*-value of .496. The alternative hypothesis was rejected. The 95% confidence interval was -1.71 to .84.

Areas without farmers markets scored -.28 standard deviations lower than the area with farmers markets. Therefore, the effect size was small.

Figure 4

Presence and absence of farmer's markets



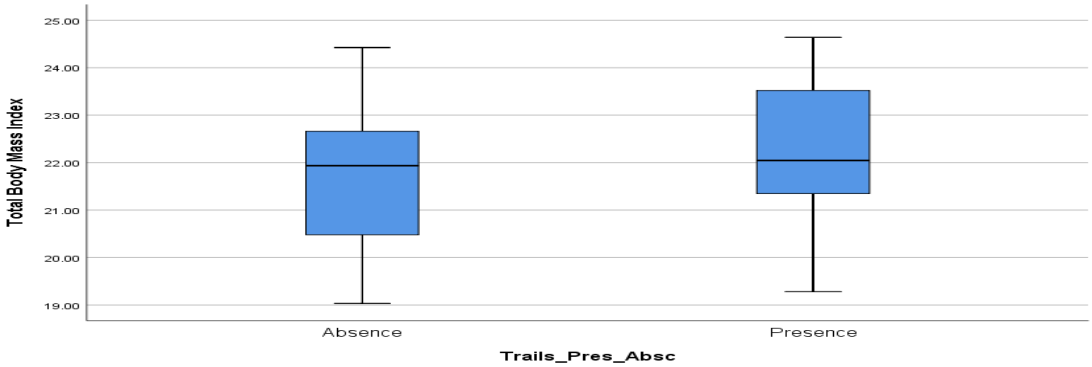
Trails. An independent *t* test was conducted to determine if there was a difference between the presence and absence of trails on average BMI scores. There were 38 schools, 15 cases were in areas with no trails (M=21.66, SD=1.51), and 23 schools with trails in the area (M=22.24, SD=1.47). A single box plot was created to verify the presence or absence of outliers in figure 5. The Shapiro-Wilk method showed normal distribution among trails located within Cobb County. There was homogeneity of variances for trails for presence and absence, as assessed by Levene's test for equality of variances; p-value was .985.

There was no statistically significant difference in average BMI scores between the presence and absence of trails according to the census tracts in Cobb County GA; a p-value of .252. The alternative hypothesis was rejected. The 95% confidence interval of the difference was -1.57 to .42. Areas with a low volume of trails scored -1.21 standard

deviations lower than the area with a high volume of trails. Therefore, the effect size was large.

Figure 5

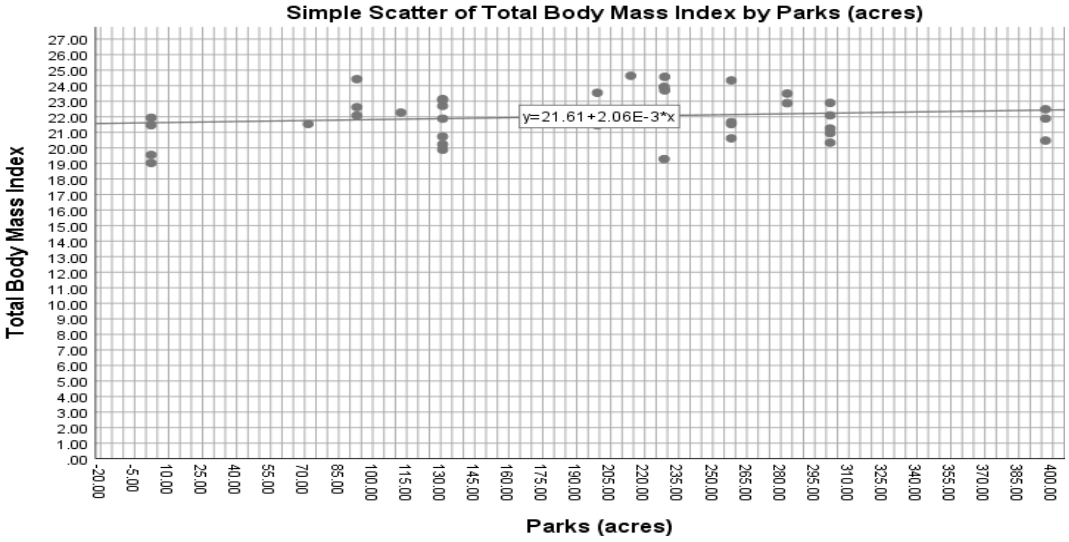
Presence and absence of trails



Parks. Pearson correlation was run to determine the relationship between parks and average BMI scores. Thirty-eight schools were studied. Scatterplot analysis in figure 6 proved there was a linear relationship between average BMI and parks. The Shapiro-Wilk method showed both variables were normally distributed, and there were no outliers. There was no statistically significant correlation between the average BMI scores and parks; a r(36) was .151 and p-value was .364. The alternative hypothesis was rejected.

Figure 6

Total body mass index and parks



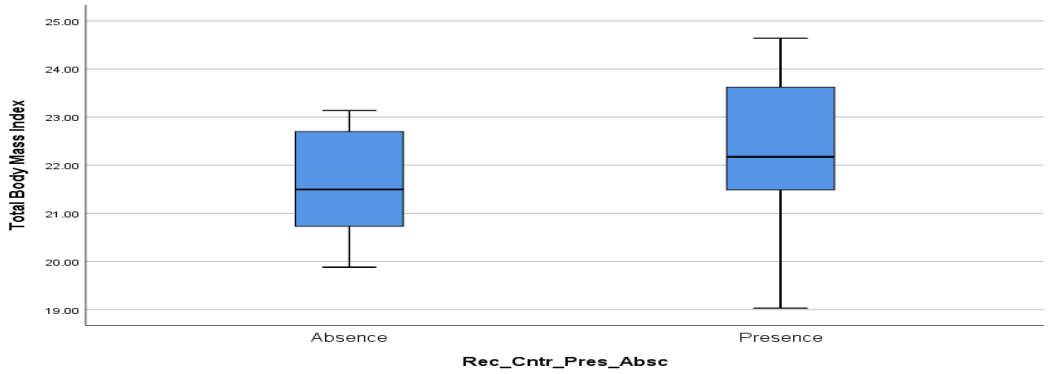
Recreational Centers. An independent *t* test was conducted to determine if there was a difference between the presence and absence of recreational centers on average BMI scores. There were 38 schools; 14 schools were in areas with no recreational centers (M=21.58, SD=1.09), and 24 schools with recreational centers in the area (M=22.26, SD=1.65). There were no outliers in the data, as assessed by inspection of a boxplot in figure 7. Recreational center data was normally distributed, as assessed by the Shapiro-Wilk's test. There was homogeneity of variances for recreational centers for presence and absence, as assessed by Levene's test for equality of variances; p-value was .164.

There was no statistically significant difference in average BMI scores between the presence and absence of recreational centers to the census tracts in Cobb County GA; a p-value of .176. The alternative hypothesis was rejected. The 95% confidence interval

was -1.69 to .32. Areas with no recreational centers scored -.46 standard deviations lower than the area with recreational centers. Therefore, the effect size was medium.

Figure 7

Presence and absence of recreational centers



Research Question 2. Is the association between prevalence of childhood obesity an attribute of built environments, which include walkability, access to healthy foods, and access to parks and recreational areas, modified by race/ethnicity and immigrant population in Cobb County GA?

Pearson correlation was ran to determine the relationship between the presence or absence of independent variables such as access to exercise opportunities, percentage of physical inactivity, percentage of food insecurity, and percentage of limited access to healthy foods against the dependent variable, average BMI of middle and high school students in Georgia. A one-way ANCOVA test was used to determine if the independent variables affect the average BMI levels after controlling for foreign-born population. The results from the study is depicted in table 8.

Table 8

Study variables and results matrix

Independent Variable	r(36)	Pearson's Correlation Sig. (2-tailed)
Farmers Markets	.200	.230
Trails	.117	.486
Parks	.151	.364
Recreational Centers	.218	.189

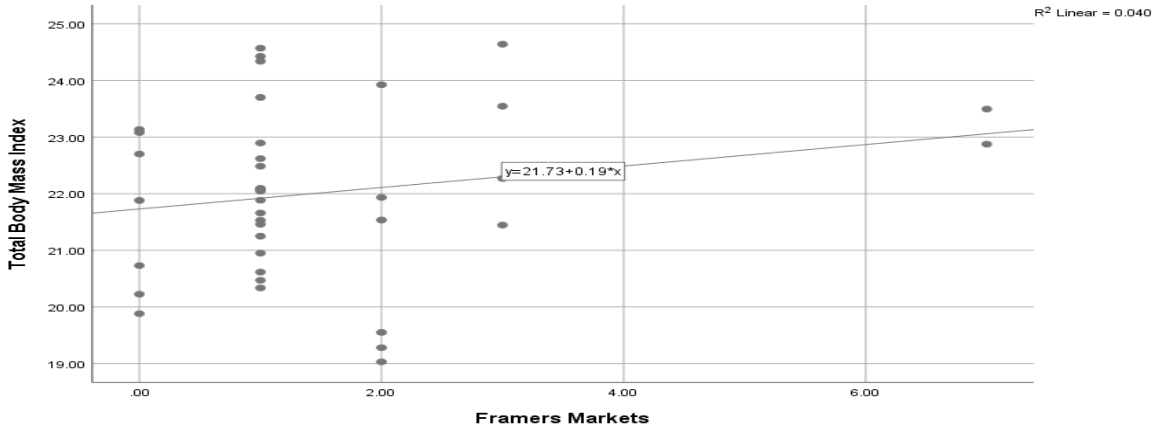
Farmers Market. Pearson correlation was run to assess the relationship between farmers market and average BMI scores. Thirty-eight schools were studied. The scatterplot analysis in figure 8 proved there was a linear relationship between average BMI and farmers market. There was no statistically significant correlation between the average BMI scores and farmers market, a r(36) was .200 and p-value was .230. The alternative hypothesis was rejected.

An ANCOVA test was run to determine if there was a difference between the presence and absence of farmers markets on average BMI scores after controlling for economic disadvantage indicators such as the number of recipients receiving free or reduced lunches within the schools. There was a linear relationship between average BMI and farmers markets, assessed by visual inspection of a scatterplot. After adjusting for economic disadvantage indicator, recipients of free or reduced lunches within the schools, there was no statistically significant difference in the presence of farmers markets and average BMI; $F(1, 30) = 1.050$, $p = .314$, partial $\eta 2 = .034$, and therefore, fail to reject the null hypothesis. Also, after modifying for race/ethnicity and immigrant population, there was no statistically significant difference in the presence of farmers

markets and average BMI; F(1, 30) = 1.607, p = .215, partial η2 = .051, and therefore, fail to reject the null hypothesis.

Figure 8

Total body mass index and farmers markets



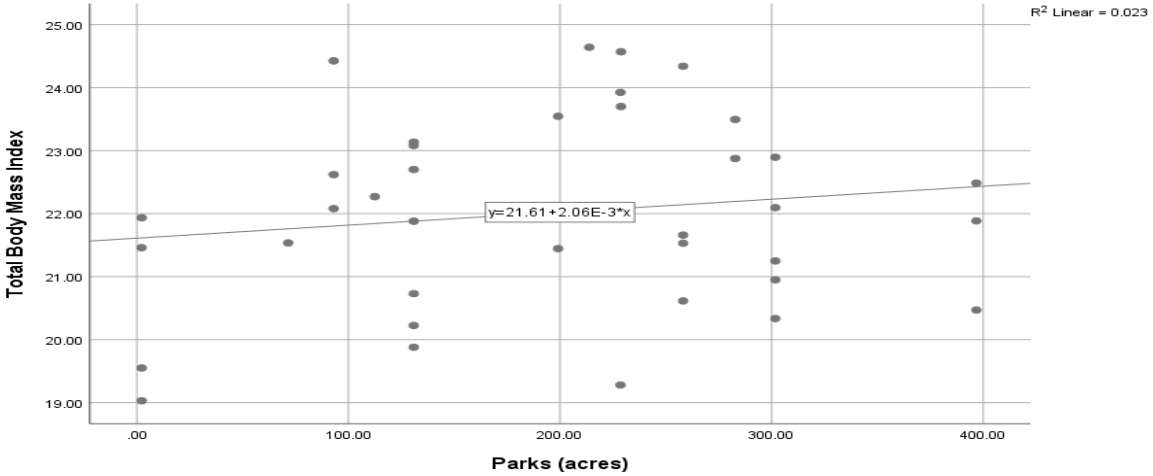
Parks. Pearson correlation was run to determine the relationship between parks and average BMI scores. Thirty-eight schools were studied. The scatterplot analysis in figure 9 proved there was a linear relationship between average BMI and parks. There was no statistically significant correlation between the average BMI scores and parks; a r(36) was .151 and p-value was .364. The alternative hypothesis was rejected and failed to reject the null hypothesis.

An ANCOVA test was conducted to determine if there was a difference between the presence and absence of parks on average BMI scores after controlling for economic disadvantage indicators, such as students on the free or reduced lunch program. There was a linear relationship between parks in an area and average BMI, assessed by visual inspection of a scatter plot. After adjusting for economic disadvantage indicators, such as students on the free or reduced lunch program, the data suggested there was no

statistically significant difference between parks and average BMI; F(3, 28) = .149, p = .929, partial η2 = .016, and therefore, we fail to reject the null hypothesis. Also, after modifying for race/ethnicity and immigrant population, there was no statistically significant difference in the presence of parks and average BMI; F(3, 28) = 1.069, p = .378, partial η2 = .103, and therefore, fail to reject the null hypothesis.

Figure 9

Total body mass index and parks



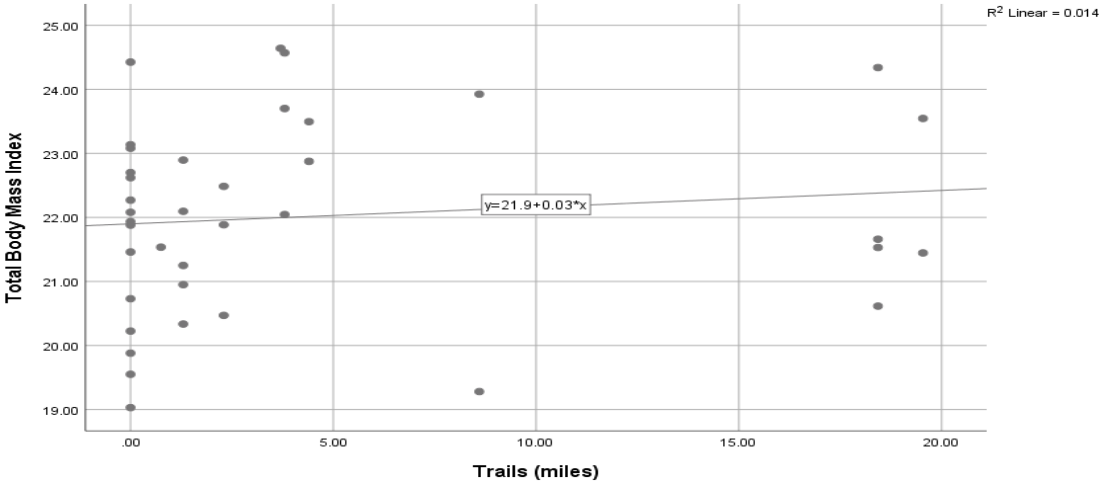
Trails. Pearson correlation was run to determine the relationship between trails and average BMI scores. Thirty-eight schools were studied. The scatterplot analysis in figure 10 proved there was a linear relationship between average BMI and trails. There was no statistically significant correlation between the average BMI scores and trails; a r(36) was .117 and p-value was .486. The alternative hypothesis was rejected.

An ANCOVA test was used to determine if there was a difference between the presence and absence of trails on average BMI scores after controlling for economic disadvantage indicators, such as students on the free or reduced lunch program. There was a linear relationship between trails in an area and average BMI, assessed by visual

inspection of a scatter plot. After adjusting for economic disadvantage indicators such as students on the free or reduced lunch program, the data suggested there was no statistically significant difference between trails and average BMI; $F(2, 29) = .269$, $p = .766$, partial $\eta 2 = .018$, therefore, we fail to reject the null hypothesis. Also, after modifying for race/ethnicity and immigrant population, there was no statistically significant difference in the presence of trails and average BMI; $F(1, 30) = .282$, $p = .600$, partial $\eta 2 = .009$, and therefore, fail to reject the null hypothesis.

Figure 10

Total body mass index and trails

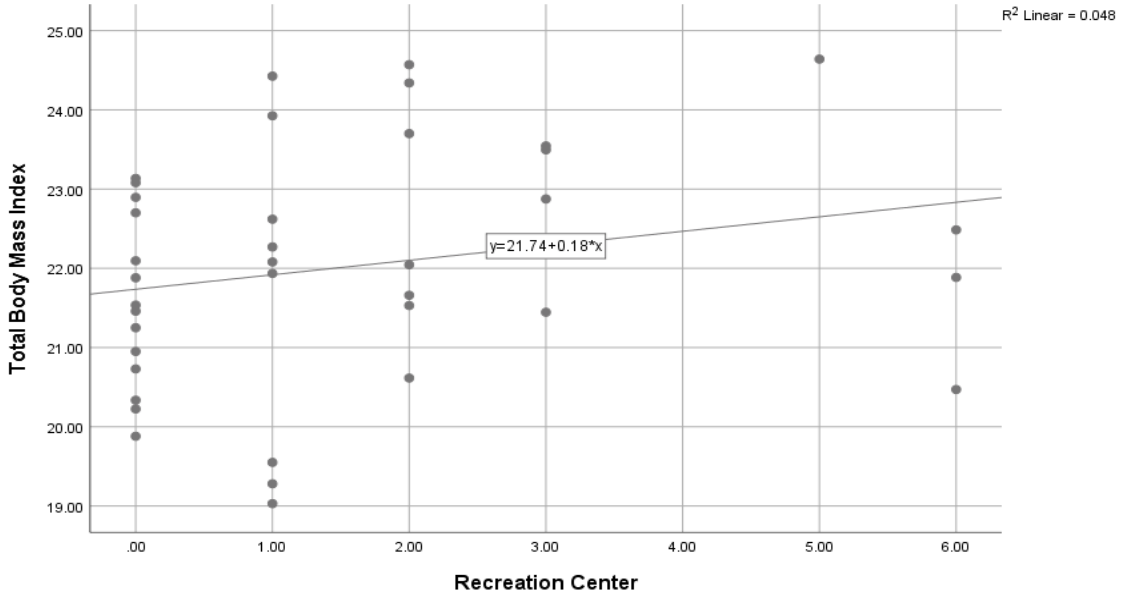


Recreational Centers. Pearson correlation was run to determine the relationship between recreational center and average BMI scores. Thirty-eight schools were studied. The scatterplot analysis in figure 11 proved there was a linear relationship between average BMI and recreational center. There was no statistically significant correlation between the average BMI scores and recreational center; a $r(36)$ was .218 and p-value was .189. The alternative hypothesis was rejected and failed to reject the null hypothesis.

An ANCOVA test was used to determine if there was a difference between the presence and absence of recreational centers on average BMI scores after controlling for economic disadvantage indicators, such as students on the free or reduced lunch program. There was a linear relationship between recreational centers in an area and average BMI, assessed by visual inspection of a scatter plot. After adjusting for economic disadvantage indicators, such as students on the free or reduced lunch program, the data suggested there was no statistically significant difference between recreational parks and average BMI; $F(1, 30) = .416$, $p = .524$, partial $\eta 2 = .014$, and therefore, reject the alternative hypothesis and fail to reject the null hypothesis. Also, after modifying for race/ethnicity and immigrant population, there was no statistically significant difference in the presence of recreational centers and average BMI; $F(1, 30) = .038$, $p = .846$, partial $\eta 2 = .001$, and therefore, fail to reject the null hypothesis.

Figure 11

Total body mass index and recreational centers



Summary

The purpose of this quantitative study was to examine the prevalence of childhood obesity affected by walkability and elements of built environments such as access to healthy foods and access to parks and recreational areas of census tracts in Cobb County GA. The mean student average BMI for Cobb County was 22.01 (SD=1.49). The mean middle and high school student enrollment for Cobb County in 2016 was 1,480.50(SD=657.85). The foreign-born population mean in Cobb County was 7,191.78 (SD=2,600.15). A list of schools in Cobb County was provided by the Georgia Department of Education, Georgia fitness assessment report.

BMI data were collected from the previously stated report. BMI data were collected from schools that met the desired requirements. The BMI data were separated by gender in the assessment report. For the study, the value for each gender was combined and the average was calculated. All data was annotated in an excel spreadsheet.

Independent-sample *t* test was used to test the first research question. The results from the test suggest there was no statistically significant difference between average student BMI and the independent variables. Since there were no significant results, there was no need to determine if there was an association between the prevalence of childhood obesity and the attribute of built environments, modified by race/ethnicity and immigrant population in Cobb County. However, to confirm analysis and to ensure continuity of the research questions, the results of the second research question were included. The second research question was tested using Pearson correlation and one-way ANCOVA. Chapter 5 includes a discussion of the findings, conclusion, and suggestions for future research.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

The purpose of this quantitative study was to determine whether the presence or absence of built environments influence childhood obesity with an emphasis on the immigrant population. Childhood obesity is considered a public health problem throughout the United States. To help understand the continued surge of obesity, there is a need to explore and identify factors that may foster an environment that encourage the increase of obesity within certain populations (CDC, 2016g).

There have been several scholars who found a connection between childhood obesity and genetics, race, socioeconomic status, and several psychological variables. Obesity affects all ethnicities; however, in minority and immigrant populations, the prevalence of obesity across the board is higher (Albrecht & Gordon-Larsen, 2013). Researchers have suggested more research should be conducted on the influence that culture, environment, demographics, and physical activity have on the obesity rate among the immigrant population (Harvard School of Public Health, 2014).

Significance of Hypotheses

I did not confirm the hypotheses of the study. However, there was no statistically significant difference in average BMI scores between the presence and the absence of walkability and elements of built environments, such as access to healthy foods and access to parks and recreational areas of census tracts in Cobb County GA. The results for the second research question confirmed there was no statistically significant association between prevalence of childhood obesity and attributes of built environments

that include walkability, access to healthy foods, and access to parks and recreational areas, modified by race/ethnicity and immigrant population in Cobb County GA. Because there was no statistically significant difference between the presence or absence of the independent variables and the dependent variables, there was no expectation to find any statistically significant results for the second research question.

Interpretation of Findings

I found that modeling the relationship between spatial distributions of childhood obesity and whether the presence or absence of built environments affect the community was much more difficult than first anticipated. The results were clear concerning the relationship between childhood obesity prevalence associated with walkability and elements of built environments. However, all the tests rendered statistically insignificant results. Despite the results, it does not mean that childhood obesity is not affected by elements of built environments and walkability in Cobb County.

Fresh Markets

The independent *t* test was used to determine if farmer's markets affected childhood obesity. I concluded there was a no statistically significant difference in average BMI scores between presence and absence of farmers markets according to the census tracts in Cobb County GA. Pearson’s product-moment correlation was used to assess the association between the prevalence of childhood obesity and the attribute of built environments, modified by race/ethnicity and immigrant population in Cobb County GA. After controlling for economic disadvantage, recipients of free or reduced lunches within the schools and by race/ethnicity and immigrant population in Cobb County GA,

using one-way ANCOVA it was determined that there was no statistically significant difference between the presence of farmers markets and average BMI. These outcomes may be due to uneven population distribution within the county, gentrification within communities, and purchasing power between socioeconomic classes.

Uneven distribution of population within the county may influence the bivariate test used in this study. For instance, communities with a larger population may have more food service establishments compared to the entire zipcode. It may place parents and children within close proximity of these stores in that area, even though there may be fewer people living in the whole zip code. Gentrification in Cobb County can also play a role in the outcome of the analyses conducted. High-income households may be relocating into areas that were once considered a low-income area, and as a result, encouraging and influencing more food service establishments whether supermarkets, farmers markets, or fast food restaurants to move into the area.

Uneven distribution and gentrification can negatively influence the proximity of healthy food options to children living with obesity. Another possibility is the buying power of households. A low-income family may live in an area where farmer's markets are available; however, they may not be able to afford the healthier option. On the other hand, a high-income family may live far away from a farmer's market, which makes purchasing better quality foods harder.

Parks, Trails, and Recreational Centers

The independent *t* test was used to determine if trails and recreational centers affect childhood obesity. Pearson's correlation test was used to determine if the presence

and absence affect childhood obesity. Both tests confirmed that there was no statistically significant difference in the presence and absence of trails, parks, or recreational centers. After controlling for economic disadvantage and by race/ethnicity and immigrant population in Cobb County GA, there was no association between the prevalence of childhood obesity and the access to elements of built environments, such as parks, trails, and recreational areas.

Perhaps these variables were not the most appropriate variables to determine physical activity. For instance, the purpose of this study was to determine if the presence or absence of either influenced the outcome. However, the quality of the features associated with each variable was not considered in this study. Also, I did not take into account that other locations can offer an opportunity for physical activity, such as schoolyards, open fields, or streets with little to no traffic. I also did not consider the quality of the parks, trails, or recreational center and the features associated with each element.

On the other hand, adolescents living in proximity to parks, trails, or recreational centers may decide not to use those elements even though the facilities have the ideal amenities. Also, adolescents may not use the built environments enough to have positive influence on obesity in adolescents. They may choose to spend their free time at home or doing other activities that would not be considered physical activity for this study.

Limitations

Childhood obesity is complex, and it is the result of many factors. Obesity in children is influenced by genetics, race, socioeconomic status, and several psychological

variables (CDC, 2017h). In this study, I aimed to determine the importance that built environments have on childhood obesity. There are several factors that may influence the generalizability of the study results. First, county-level data were used for all variables. Data used in the study were retrieved from government and public databases. The data collected may have used self-reported data, such as height and weight, to calculate BMI. This may pose a problem due to an individual's tendency to underreport his or her weight, which has the potential to affect BMI estimates and likely underestimation of obesity prevalence and risk (CDC, 2018j).

Second, unmeasured covariates such as psychosocial factors and medical conditions could influence the results. Third, there were BMI data missing from several schools. Some schools opted out of the program, which affects results. Limited surveillance and the duration of time may have an adverse effect on the results due to collecting BMI data for one school year. Fourth, there was a potential for researcher bias or misunderstanding requirements. Between state, county, and district levels, there were variations of appropriate BMI for students of various ages. These expectations have the potential to add a level of subjectivity when inputting and calculating data in the designated systems that were not accounted for before or during the time the study was conducted. The use of secondary data eliminated the potential for participant bias directly. Researcher bias was limited by the use of factual data provided by reliable third parties. I primarily used county-specific data from reliable websites to maximize the efficacy of the findings.

Recommendations

Future recommendations are to conduct a large-scale study on the efficacy that built environments have on childhood obesity. I also suggest using schools that opt-out of the program as a control sample for schools that are participating in the Fitnessgram program. Other scholars have found higher obesity rates in children living in more disadvantaged and rural areas (Hulst, Gauvin, & Barnett, 2013). I observed the effects that elements of built environments have on childhood obesity in Cobb County, which is comprised mostly of urban areas. To determine whether built environments have an effect on childhood obesity, future researchers should focus on comparing entirely rural and urban areas with one another.

A more intense examination should be undertaken to determine how important socioeconomic factors are when explaining disparities between ethnic groups and weight-related behavior. This will provide policy makers with more insight and understanding of how to positively influence environmental inequalities. I examined the effect that the presence and absence of built environments had on childhood obesity; however, I did not take into account adolescents' home environment. Future investigations should explore if there is a relationship between adolescents' eating habits and diets and their parent's habits.

There are many ways to measure body mass index such as using skin calipers, when used correctly it will assess the skin folds from several different sites on the body and use those measurements to determine a person's body fat percentage (DuVall, 2018). The most basic way to calculate BMI is to use height and weight data. However, either

method has its benefits and shortcomings. According to the Harvard T.H. Chan, School of Public Health (2015), there are several ways to calculate BMI either by using the BMI chart, performing the mathematical equations, or use an online calculator. In regards to future studies, it is my recommendation that even though there are many ways to measure BMI, all schools should use a standardized method to calculate BMI. Standardizing how data is collected will reduce the chances of introducing inaccurate data and ensure consistency within the study.

Implications and Conclusion

I investigated the effects that walkability and elements of built environments had on the development of obesity in adolescents amongst the immigrant population. I concluded that the association between walkability and the availability of adequate built environments, the real use of the facilities, and childhood obesity are more complicated than proximity or physical location. I deduced that there were other factors that should be taken into consideration when investigating the different aspects that may affect childhood obesity. Socioeconomic status has an influence on whether a child would become overweight and eventually obese (Rogers et al., 2015). Other variables that should be investigated, along with socioeconomic status, are the parental influence, food dependency, and psychological factors that may impact obesity in children.

Even though there was no statistically significant association between childhood obesity and built environments found in this study, it could be due to adolescent's genetic makeup and cultural beliefs. A child's race and ethnicity is an underlying factor in how children understand and experience life. Minority children living in low-income areas are

more likely to be subjected to discrimination because of their race and ethnicity, which may cause increased stress (McIntosh, 2015). If a child is under constant stress, it can affect weight gain, which can develop into obesity. According to McIntosh (2015), fat distribution among racial and ethnic groups is substantially different and may influence the development of obesity. For instance, African American children have less visceral and hepatic fat than European American and Hispanic children (Caprio et al., 2008).

A child's cultural beliefs shape how they feel, understand, and how they act. It is a shared understanding that is taught from the time a person is born. Culture is shaped by a person's experience in life and the lives of those around them. Understanding someone's cultural belief can help shed light on what they perceive as a healthy body image. For instance, African American people usually are more muscular and taller than any other race. Also, cultural norms heavily influence perception and beliefs. African American women are more likely to become shapelier once they reach puberty age. In some cultures, a voluptuous woman is more acceptable even if she is considered overweight or obese. Cultural beliefs were not taking into account in this study. However, I believe that understanding a person's cultural belief is essential when trying to bring about a long-lasting change within a community.

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Appendix A: Key Search Terms

Key Search Terms/ Keywords
Association between adolescent obesity and built environments
Association between adolescent obesity and built environments race/ethnicity and immigrant population
Body mass index
Body mass index among children
Built environments
Built environment and childhood obesity
Census bureau immigrant population Georgia 2016
Childhood obesity
Childhood obesity and the built environment modified by emigrating to the US within the past 10 years
Childhood obesity immigrant
Childhood obesity immigrant population in Georgia
Childhood obesity intervention
Childhood obesity and walkability
Child obesity population rate in 1985
Childhood obesity statistics
Childhood obesity facts and statistics
Childhood obesity increased
Childhood obesity pandemic or epidemic
Cobb county Ga child obesity population rate in 1985
Cobb county Ga child obesity population rate
Conceptual framework effect modification
Disparities in obesity and overweight prevalence among US immigrant children and adolescents by generational status
Emigrating to the US influence childhood obesity
Effect modification
Effects of socioeconomic status on childhood obesity
Factors Associated with Immigrant childhood Obesity in Ga
Farmer's market uses among adolescent's population
First generation immigrant dietary experience
First generation immigrant acculturation
Georgia immigrant population data
Healthy immigrant effect
Historical internal validity in a study
Immigrant acculturation
Immigrant and childhood obesity
Immigration and length of stay within the U.S. as it relates to obesity
Immigrant built environment US

Immigrant population by state 2013 to 2017
Immigrants poverty statistics
Immigrants poverty childhood obesity statistics
Low socioeconomic status and immigrant population
Obesity immigrant children Georgia built environment
Obesity immigrant children Georgia
Parks and recreation use among adolescent's population
Pediatric immigrant obesity
Pediatric immigrant obesity Georgia
Relationship between SES and immigration status
Relationship between childhood obesity and socioeconomic status
Social Ecological Model
Social ecological model and immigrant's childhood obesity
Socioeconomic status affecting childhood obesity
Trails uses among adolescent's population
U.S. foreign born population by country of origin
U.S. foreign born population
Walkability uses among adolescent's population

Appendix B: Study Variables

Cobb County	T BMI	F BMI	M BMI	Parks	Trails	Rec Cntr	Farmers Markets	Economic Disadvantage
Allatoona High School	22.49	22.37	22.76	2220.29	2.30	6.00	1	18.00
Barber Middle School	21.89	22.94	20.83	2220.29	2.30	6.00	1	55.20
Campbell High School	23.50	22.50	24.49	282.80	4.40	3.00	7	57.40
Campbell Middle School	22.88	23.21	22.54	282.80	4.40	3.00	7	74.60
Cooper Middle School	22.08	23.04	21.12	93.00	0.00	1.00	1	72.10
Daniell Middle School	20.73	20.80	20.66	130.85	0.00	0.00	0	46.70
Dickerson Middle School	19.28	19.21	19.35	228.54	8.60	1.00	2	4.90
Dodgen Middle School	19.55	19.76	19.34	2.30	0.00	1.00	2	5.80
Durham Middle School	20.47	20.49	20.45	2220.29	2.30	6.00	1	13.60
East Cobb Middle School	21.54	21.74	21.33	71.53	0.75	0.00	2	63.50
Floyd Middle School	24.57	24.57		228.79	3.80	2.00	1	78.20
Garrett Middle School	22.62	23.10	22.14	93.00	0.00	1.00	1	88.40
Griffin Middle School	21.46		21.46	2.25	0.00	0.00	1	74.70
Harrison	22.10	21.78	22.41	301.75	1.30	0.00	1	8.10

High School								
Hightower Trail Middle School	19.03		19.03	2.30	0.00	1.00	2	6.20
Hillgrove High School	21.66	21.72	21.60	258.15	18.43	2.00	1	20.50
Kell High School	23.14	22.95	23.32	130.85	0.00	0.00	0	32.50
Kennesaw Mountain High School	22.90	22.61	23.18	301.75	1.30	0.00	1	29.40
Lassiter High School	22.70	22.43	22.97	130.85	0.00	0.00	0	8.50
Lindley 6th Grade Academy	22.05	22.70	21.39	228.79	3.80	2.00	1	86.60
Lost Mountain Middle School	20.34	20.60	20.07	301.75	1.30	0.00	1	10.70
Lovinggood Middle School	20.62	21.02	20.21	258.15	18.43	2.00	1	23.90
Mabry Middle School	19.88	19.91	19.85	130.85	0.00	0.00	0	9.00
McCleskey Middle School	21.88	21.83	21.93	130.85	0.00	0.00	0	36.80
McClure Middle School	20.95	21.03	20.87	301.75	1.30	0.00	1	21.30
McEachern High School	24.34	24.34		258.15	18.43	2.00	1	58.20
North Cobb High School	23.55	23.24	23.85	199.06	19.54	3.00	3	39.30
Osborne High School	24.64	25.17	24.11	213.83	3.70	5.00	3	79.00
Palmer Middle School	21.45	21.41	21.48	199.06	19.54	3.00	3	44.10
Pebblebrook	23.70	23.38	24.02	228.79	3.80	2.00	1	72.70

High School								
Pine Mountain Middle School	21.25	22.01	20.49	301.75	1.30	0.00	1	49.50
Simpson Middle School	20.23	20.30	20.15	130.85	0.00	0.00	0	13.10
Smitha Middle School	22.27	22.39	22.15	112.45	0.00	1.00	3	84.20
South Cobb High School	24.43	24.72	24.13	93.00	0.00	1.00	1	73.90
Sprayberry High School	23.08	22.70	23.46	130.85	0.00	0.00	0	40.40
Tapp Middle School	21.53		21.53	258.15	18.43	2.00	1	65.10
Walton High School	21.94	19.91	23.96	2.30	0.00	1.00	2	4.20
Wheeler High School	23.93	23.97	23.88	228.54	8.60	1.00	2	45.40

Notes: (1) Georgia Department of Education (GADOE, 2019).
(2) Cobb County Parks (2018).
(3) Cobb County Trails (2018).
(4) Cobb County Recreational Centers (2018).
(5) School Digger (2018).