Examining Access to Recreational Facilities in Danville, Virginia

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ABSTRACT

Obesity is a growing issue in the United States, and it affects millions of people. Obesity-related illness accounts for billions of dollars in medical expenses each year, heightening the need for prevention and intervention strategies. Physical activity is essential in maintaining a healthy weight, yet population groups have unequal access to physical activity opportunities. This research utilizes an environmental justice framework to examine variations in access and quality of recreational facilities among different socio-demographic groups in Danville, VA. Data for this research include secondary and primary sources. Race data were obtained from the 2010 U.S. Census. The Physical Activity Resource Assessment (PARA) tool was utilized to audit all recreational facilities within the City of Danville for features, amenities, and incivilities. Telephone survey data provided individual level-BMI, physical activity minutes per week, and variables of socioeconomic status, including income, education attainment, employment status, and gender. Analysis included ANOVAs, linear, and bivariate logistic regression. Predominant block group race was a significant predictor of incivilities at physical activity outlets. Proximity to recreational facilities was not a predictor of physical activity or BMI. Interventions must be made to improve the quality of recreational facilities in black or African American block groups.

Keywords: environmental justice, physical activity, access, obesity, built environment

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Attribution

Dr. Kolivras is my academic advisor and committee co-chair. With her background in Medical Geography, she helped form the framework of this research as well as interpret the results for public health applications. She supervised this research from inception to completion.

Dr. Hill is my committee co-chair. Her expertise in examining the effects of the built environment and social factors on physical activity helped fuel this research. She oversaw the design and implementation of the telephone survey and statistical testing.

Dr. Oliver is my committee member. With his background in Urban Geography, he provided expertise in studies of the built environment. He helped strengthen the theoretical background of this research.

Dr. Carstensen is my committee member. With his background in Geographic Information Systems, he offered valuable insight in effectively displaying geospatial data.

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Chapter 1: Introduction and Statement of Purpose

1.1 Introduction

Obesity is an increasing problem in the United States, and the condition affects millions of people (figure 1.1). According to the Centers for Disease Control and Prevention (CDC 2010), over seventy-eight million adults have body mass indexes (BMIs) that are considered in the obese range (≥30). Obesity at the individual level is generally regarded as a response to an increase in energy sources (WHO 2006). Rates of obesity have doubled in adults and tripled in children since the nineteen-eighties, ushering in a myriad of related health issues (CDC 2010). Obesity has been linked with a number of illnesses, including type two diabetes, coronary heart disease, hypertension, sleep apnea, stroke, and certain types of cancer (CDC 2010). Every state in the U.S. is affected by obesity, making it an obvious problem of national public health (Ogden 2012).

In addition to obesity directly affecting individuals through related health issues, the increase of an entire population's BMIs can indirectly affect people through the financial burdens associated with an increase in hospitalization and medical treatments (Finkelstein et al. 2009). A recent report from the Institute of Medicine estimates that obesity-related health expenses in the United States are $190 billion per year (Glickman 2012). When people utilize hospital treatments and cannot pay due to lack of insurance coverage or other financial issues, the cost is transferred to the taxpayers and future hospital patients. Additionally, the expensive treatments of obesity-related illness can increase the cost of private insurance for all policyholders. For these reasons, obesity has the ability to affect everyone within a country, whether or not the individual is obese.

The increase of obesity in the United States has prompted researchers to consider the contributing factors. Most researchers agree that it is a matter of energy balance, by which calories consumed exceed calories expended. However, there is no magic pill by which to encourage energy balance and weight maintenance. Recent research has begun to consider the role of upstream or environmental factors such as the built environment, socioeconomic status, and cultural factors associated with race and ethnicity that may play key roles in influencing healthy choices (Feng et al. 2010). Physical activity plays an integral role in preventing and treating obesity itself and is beneficial for managing many obesity-related conditions. For this reason, providing opportunities to engage in daily physical activity is of great interest to researchers from a variety of disciplines. For example, urban planners are focusing on the ways in which the built environment can encourage or discourage physical activity (U.S. Department of Health and Human Services 2008).

Recreational facilities can provide opportunities to engage in physical activity and aid in obesity prevention and treatment. There is a lack of consensus whether or not poor and minority residents have access to recreational facilities comparable with high socioeconomic status (SES) or white residents (Taylor et al. 2006). Access is defined by the Transportation Research Board as the "distance to or from destinations or facilities (TRB 2005)." For the purpose of this study, access will be operationally defined by spatial proximity, or geodetic distance to facilities (Wolch, Wilson and Fehrenbach 2005). This straightforward measure of access combined with qualities including cost, hours of operation, safety, amenities, and incivilities provides a more holistic view of accessibility to resources if they do exist. Amenities are features that promote use, including high quality play equipment, well maintained ball fields, and clean restrooms (Lee et al. 2005). Incivilities are features which may deter use of the facility, and include litter,

overgrown grass, broken glass, and vandalism, among others (Lee et al. 2005). By assessing facilities using the Physical Activity Resource Assessment (PARA) tool in this study, we gain a better understanding of the quality of recreational facilities available to residents (Lee et al. 2005, Heinrich et al. 2007, McAlexander et al. 2009).

1.2 Statement of Purpose

Physical inactivity plays a major role in the obesity epidemic taking place in the United States, yet the majority of adults do not meet the current recommendations for physical activity (Division of Nutrition 2010). In Virginia, 50.5% of adults have failed to meet recommendations for leisure time physical activity (Division of Nutrition 2010) and statewide trends for obesity mirror the upward trend seen in the nation. (CoV 2010). Additionally, studies have shown that communities of color and those of low-SES status are at particular risk for obesity and obesity-related illness (U.S. Surgeon General 2007). In Virginia, south-central portions of the state include large numbers of low-SES and minority residents. The residents of these regions are at high risk for negative health outcomes including diabetes, heart disease, and hypertension (VDH 2008, Woolf et al. 2010). One such region, Danville, VA is selected as the study area for this research. Factors of the built environment, such as the availability, accessibility, and quality of recreational facilities could prove to be barriers of healthy lifestyles for the inhabitants of Danville. This study uses an environmental justice approach to examine accessibility and quality of recreational facilities in Danville, Virginia. The U.S. Environmental Protection Agency (EPA) defines environmental justice as, "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies

(EPA 2010)." Despite the traditional use of environmental justice as a framework to examine inequalities in environmental policies, it can also be applied to inequalities in the built environment (Taylor et al. 2006, Dahmann et al. 2010). This study seeks to evaluate the extent to which residents of Danville have equitable access to physical activity opportunities. We will operationalize access in terms of availability (i.e. number of facilities) and quality of outlets. Previous studies examining environmental justice and access to recreational facilities have yielded conflicting results (Cutts et al. 2009, Powell, Slater and Chaloupka 2004). The inconsistency in findings prompts the need for further research. To address these issues, assessments must be made on the overall accessibility and quality of recreational facilities for the inhabitants of Danville, VA.

In this context, this research has both basic and applied goals:

> **<u>Basic Goal</u>: Using an environmental justice framework, what is the relationship between access to recreational outlets and underlying population characteristics in Danville, VA?**

> **<u>Applied goal</u>: How can community groups and the local government of Danville better meet the needs of those at highest risk of obesity and obesity-related illness with respect to access to recreational facilities?**

This study is part of a larger community-based participatory research (CBPR) project focused on providing Danville, Virginia with healthy living opportunities. The Virginia Tech Department of Human Nutrition, Foods and Exercise has partnered with the Dan River

Partnership for a Healthy Community to collect data for use in future planning ventures. Data from this specific study can be utilized for planning and implementing policies to benefit residents with limited access to recreational facilitates. Additionally, recommendations can be made to improve the quality of existing features. Community members welcomed our presence and are actively involved in participatory elements of the project.

This document contains two additional chapters: a literature review and a manuscript prepared for submission to the *Journal of Community Health.*

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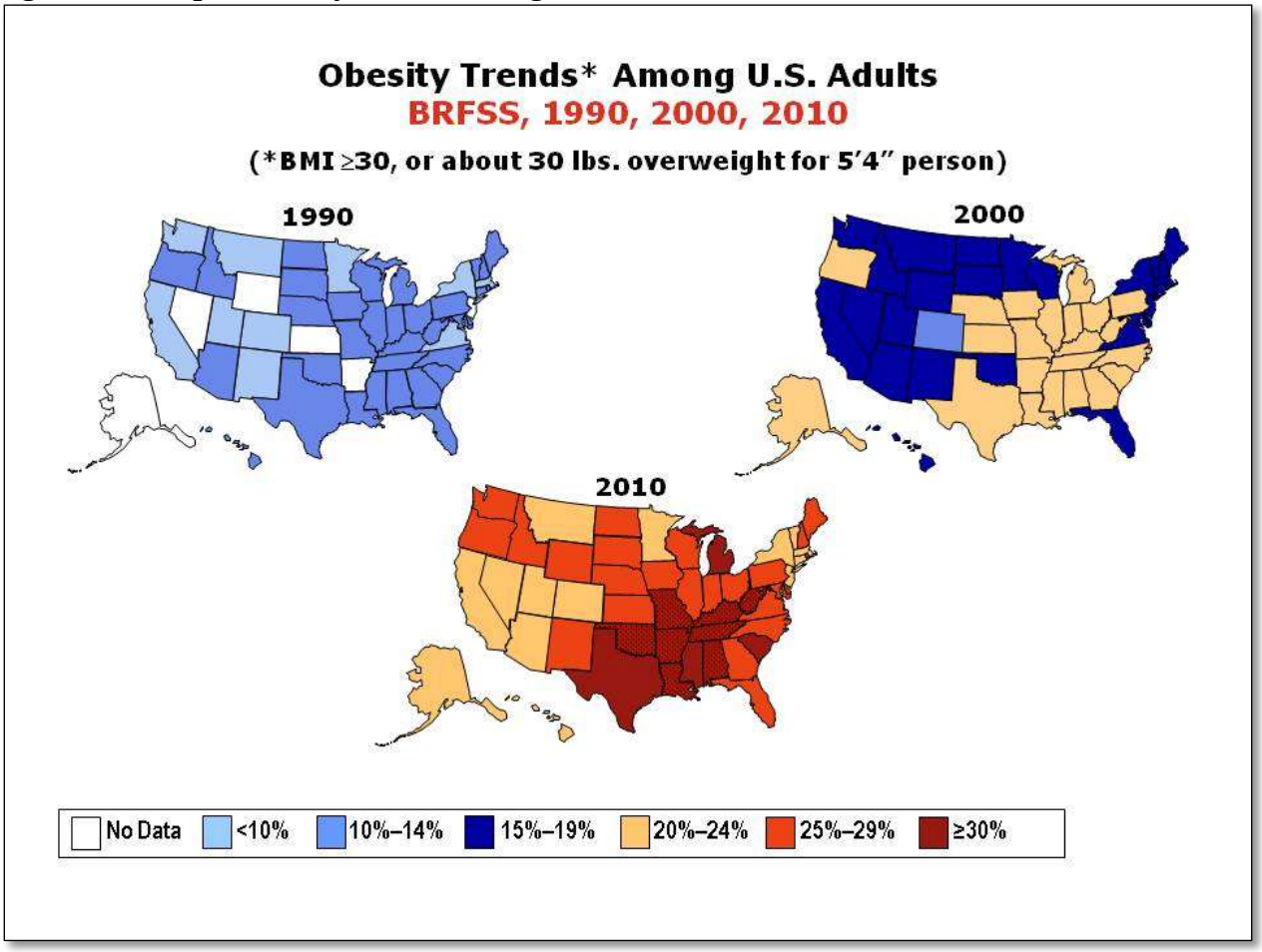
Figure 1.1. Map of obesity trends among U.S. Adults from 1990 to 2010



Source: Division of Nutrition, Physical Activity, and Obesity, National Center for Chronic Disease Prevention and Health Promotion.
URL: http://www.cdc.gov/obesity/data/adult.html

Chapter 2: Literature Review

2.1 Introduction

Physical activity is important to weight loss and weight maintenance when considering the prevalence of overweight and obesity (Glickman et al. 2012). While recreational facilities are not required for people to engage in physical activity, the presence of recreational facilities has the ability to increase physical activity in the residents of a neighborhood (Roux et al. 2007, Giles-Corti and Donovan 2002a, Cohen et al. 2007). Geographic proximity to a recreational facility does not necessarily mean it will be utilized; however the lack of recreational facilities greatly reduces the options for residents who wish to engage in physical activity. In addition to proximity, factors such as cost, hours of operation, types of exercise opportunities offered, and perception of quality and safety influence use or perceptions of availability. A person may be unable to utilize a recreational facility across the street from their home if they cannot afford the cost of membership. If the facility's hours of operation are not conducive to the resident's work schedule, it is no longer an available option. It is important to consider multiple factors affecting use of recreational facilities, particularly quality (Sallis et al. 1997, Lee, Cubbin and Winkleby 2007, Estabrooks, Lee and Gynresik 2003).

In order to experience the healthful benefits of exercise, current guidelines recommended 150 minutes per week of moderate physical activity for adults (U.S. Department of Health and Human Services 2008). Given the wide range of health benefits of physical activity, including weight loss/maintenance, reduction in health complications associated with obesity, and psychosocial benefits (i.e. stress reduction), all persons should have the opportunity to engage in physical activity (Ogilvie et al. 2011). Currently, in the U.S. some sectors of the population are at increased risk for obesity, including those living in areas of low-SES and some minority populations (Adler and Stewart 2009). These population groups also engage in the lowest

amount of physical activity (Abercrombie et al. 2008). It is important for groups that may already be at high risk for obesity to have accessible physical activity outlets.

Previous studies examining access to recreational facilities and low-SES and minority populations have produced conflicting results. Some studies have shown low-SES or minority populations to have increased access to recreational facilities (Cutts et al. 2009), while others have found decreased access in these populations (Powell, Slater and Chaloupka 2004). Estabrooks et al. (2003) found similar levels of access to pay-for-use recreational facilities in low and high income neighborhoods, but far fewer free-for-use facilities available in low income areas (Estabrooks, Lee and Gynresik 2003). Therefore, additional research is needed to further explore the relationship between recreational facilities and physical activity in areas with low income and/or ethnic or minority residents. The primary aim of this study is to examine accessibility and quality of recreational facilities in at-risk population groups. Access is determined by nearest point-to-point distance and quality of recreational outlets is measured using the Physical Activity Resource Assessment (PARA) tool by assessing features (ex: baseball fields, playground equipment), amenities (ex: landscaping efforts, lighting), and incivilities (ex: overgrown grass, evidence of drug use) of recreational facilities (Lee et al. 2005).

2.2 Medical Geography

This research is situated within the realm of medical geography, which utilizes geographic concepts to analyze disease and health. This discipline combines factors of the built environment with population characteristics to gain a holistic perspective of health issues. Medical geography relies on an interdisciplinary school of thought, combining social sciences, biological sciences, and environmental sciences (Meade and Emch 2010). The combination of

multiple disciplines along with quantitative and qualitative research methods provides a unique way of approaching questions of health.

Further within the discipline of medical geography lies the concept of disease ecology, which focuses on the underlying factors affecting the spatio-temporal patterns of disease. Traditionally, disease ecology focused on infectious disease but currently conceptualizations include degenerative diseases (Meade and Emch 2010). Disease ecology takes a comprehensive approach to health as evidenced by the triangle of human ecology, which includes factors of population, habitat, and behavior (figure 2.1). This study examines factors of population characteristics, the built environment, and social behavior and is therefore best situated within the realm of human ecology.

2.3 The Built Environment

The design of a city can be a crucial component in the health of a population (Meade and Emch 2010). The integration of urban planning and public health disciplines has been essential in the reduction of illness in our cities (Kochtitzky et al. 2006). Public health efforts of the 19th century focused on reducing the spread of infectious disease though improved sanitation and water systems of urban areas. In the early 20th century urban planners sought ways to alleviate health problems associated with overcrowding and exposure to noxious industrial waste by reducing housing densities and implementing zoning laws to prevent inappropriate intermingling of land-use (TRB 2005). This, of course, has had an unintended consequence of increased reliance on automobile travel and reduction of active transport such as walking or biking to destinations (Ewing et al. 2003, Sallis et al. 2012). Currently, collaboration between public health and urban planning is shifting to focus on how design can assist in creating healthy

environments, focusing on features that are important for obesity (Jackson 2001, Kochtitzky et al, 2006). For example, the presence of nearby parks and recreational facilities is linked to increased physical activity (Joassart-Marcelli 2010, Roux et al. 2007, Cohen et al. 2007). This study examines the ways in which the built environment, specifically proximity to recreational facilities, can affect physical activity and obesity in Danville, VA.

2.4 Study Area

Danville, VA is a health disparate region in south-central Virginia, along the border of North Carolina (figure 2.2). The village was founded in 1793, soon becoming a booming textile and tobacco town as well as the last capital of the Confederacy. Until 1963, Danville was racially segregated, with separate libraries, healthcare facilities, schools, and water fountains for black/African-Americans and whites. This history of racial segregation may offer explanation as to why neighborhood racial patterns exist to this day (figure 2.3).

In its prime, Danville thrived with tobacco and textile industries. As these industries closed and withdrew from the community over the years, they left behind high unemployment and poverty rates. Unemployment remains high in Danville at 8.3% (U.S. Dept. of Labor 2012). Additionally, 24.4% of Danville residents live below the poverty line (Census 2008). This, coupled with a high (48.3%) African-American population sets the tone for potential social and environmental inequalities (Census 2008). The economic and racial history of Danville offers insight into the ways that inequalities may have been built into the environment over time.

2.5 Environmental Justice and Healthy Living Opportunities

This research uses an environmental justice approach to examine access to recreational facilities in Danville, Virginia. According to the U.S. Environmental Protection Agency (EPA), "Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies (EPA 2010)." Several studies have been conducted regarding environmental justice and the ways in which already disadvantaged populations are given additional burdens, such as the location of chemical factories or oil refineries near low-income communities of color (Pearce et al. 2010, Cohen et al. 2012, Brown et al. 2012). Applying an environmental justice framework and geographic analysis to consider equitable distribution of recreational facilities is relatively new. Studies have shown a connection between environmental justice and obesity (Taylor et al. 2006). Race, SES, and ethnicity are all associated with obesity (Wang and Beydoun 2007, U.S. Surgeon General 2007). African-American and Hispanic females make up a disproportionate percentage of the overweight and obese population when compared to non-Hispanic white females (CDC 2009, Flegal et al. 2002, Cossrow and Falkner 2004). Additionally, evidence suggests that the highest rates of obesity occur among groups of low SES, which supports the use of an environmental justice framework to ascertain access to healthy living opportunities (Wang and Beydoun 2007, Drewnowski and Specter 2004).

Studies have utilized an environmental justice approach to look at a variety of different elements of access to healthy food and physical activity opportunities. Studies of environmental justice and dietary habits have shown that residents of low SES areas consume fewer fruits and vegetables and more high-fat meats than people of higher SES due to a lack of available and

affordable healthy food options (Taylor et al. 2006). Environmental justice studies focusing on access to recreational facilities have produced more varied, and in some respects contradictory, results than those focusing on dietary habits, however. Cutts et al.(2009) predicted that population groups displaying high vulnerability for obesity, including minority populations and people living in low income areas, would have less walkable neighborhoods and lower access to parks than majority populations with high SES. Their findings indicated the opposite - minority and low-income population groups were actually more likely to live in walkable neighborhoods with access to parks. These public spaces also displayed high crime rates, however, which may account for the population's lack of use of these parks for obesity-alleviating exercise (Cutts et al. 2009). Estabrooks et al. (2003) found residents of low and medium income neighborhoods to have similar levels of access to pay-for-use recreational facilities as those living in high income neighborhoods, but far fewer free-for-use facilities available, potentially limiting use based on cost. Additionally, Powell et al. (2004) found that a high poverty rate and/or a high percentage of African-Americans in an area was significantly associated with decreased access to recreational facilities, including parks, bike paths, and green spaces. Given the contradictory nature of these results, further research must be conducted in order to clarify discrepancies about links between environmental justice and access to recreational facilities.

2.6 Recreational Facilities and Obesity

Proximity to recreational facilities is shown to positively impact exercise levels (Sallis et al. 1990, Roux et al. 2007). In addition to the basic physical presence of facilities, it is essential that they are affordable, safe, and visually appealing to the populations they serve. Previous studies focus on access defined as distance to physical activity outlets or counts of facilities

within a certain geographic radius (Roux et al. 2007). Access is also inferred in studies that focus on categorizing facilities as public or private facilities or free versus pay. Yet few studies use a combination of distance, type and quality (Ries, Yan and Voorhees 2011). Conceptualizing access as a single factor may account for the varied results seen in the current literature, thereby creating a need for studies that include measures of quality, including features, amenities, and incivilities, in order to gain a better understanding of why residents choose to utilize or not utilize public and private recreational facilities (Lee et al. 2005).

2.7 Socioeconomic Status and Physical Activity

The socioeconomic status of a neighborhood is negatively related to BMI levels of its inhabitants (Inagami et al. 2006, Baum Ii and Ruhm 2009). People of low socioeconomic status (determined by income, education, and occupation) are more inclined to purchase unhealthy, fattening foods than are people of higher socioeconomic status (Drewnowski and Specter 2004). Additionally, residents of income deprived areas in developed countries engage in less physical activity than higher income residents (Yen and Kaplan 1998, Giles-Corti and Donovan 2002b). This combination of poor diet and physical inactivity places low-SES residents at high risk for obesity and obesity-related illness.

Environmental characteristics play a large role in utilization of recreational facilities. Low-SES neighborhoods are often densely populated and associated with high levels of crime, both of which can be major deterrents for the utilization of public parks and facilities (Rutt and Coleman 2005). Attractiveness and safety of neighborhood recreational opportunities are associated with increased physical activity in populations (Giles-Corti et al. 2005, Carnegie et al.

2002). Therefore, it is worth pursuing a definition of access that includes counts of facilities, as well as distance and features or amenities of that facility.

2.8 Race and Physical Activity

Different racial groups are affected differently by obesity (Taylor et al. 2006, Cutts et al. 2009, Fletcher 2012, Ogden et al. 2006). According to the 2009 Behavioral Risk Factor Surveillance System Report (BRFSSR), African-Americans are at a 51% higher risk for obesity than Caucasians (BRFSS 2010). Although Hispanics have lower risk percentages than African-Americans, they are still 21% more likely to be obese than are non-Hispanic whites (BRFSS 2010). The CDC mapped state-specific obesity percentages by race and showed that white non-Hispanic populations had lower percentages of obesity than Hispanic and black non-Hispanic populations between the years 2006 and 2008 (figure 2.4).

It is important to consider the ways in which disparities in physical activity outlets may explain the obesity rates of minority populations. A lack of accessible recreational facilities in minority neighborhoods could contribute to the higher rates of obesity and obesity-related illness. A 2006 study of adolescents found that the higher the percentage of racial minority residents, the lower their chances of having at least one nearby recreational facility (Gordon-Larsen et al. 2006). This presents a potentially serious health disadvantage to minority populations who are already at highest risk for negative health outcomes associated with obesity.

2.9 Conclusion

There is overwhelming evidence of the adverse health effects of obesity, including coronary heart disease, type two diabetes, stroke, hypertension, sleep apnea, and certain types of cancer

(CDC 2010). The expensive medical treatment required of these illnesses increases the cost of private insurance and places a financial burden on taxpayers.

Studies have examined links between factors of the built environment and obesity, as well as the relationship between population characteristics and obesity (Feng 2010). In these studies, it has been determined that African-Americans and populations with the lowest SES experience the highest rates of obesity (Drewnowski and Specter 2004, CDC 2009). Previous studies examining obesity through an environmental justice framework that examined levels of access to recreational facilities have produced contradictory results, some reporting more facilities in disadvantaged areas (Cutts et al. 2009), and some reporting fewer (Powell et al. 2004). Regular exercise is essential in maintaining health, and therefore, having access to physical activity opportunities is very important. If access to these opportunities is absent, an individual who may have been willing to adopt a healthier lifestyle may not be able to do so. This is a key element for achieving environmental justice, or getting as close as possible to having availability to resources equally. It is important to determine if already disadvantaged populations have less access to physical activity outlets than other population groups, or if the quality of these outlets differs so that the necessary changes can be made to achieve balance. Additionally, research should consider the potential factors affecting use of facilities. Analysis of the relationship between the built environment and population characteristics needs to be applied to obesity research at different scales and across various geographic locations in order to better understand the effects of the built environment and population characteristics on obesity.

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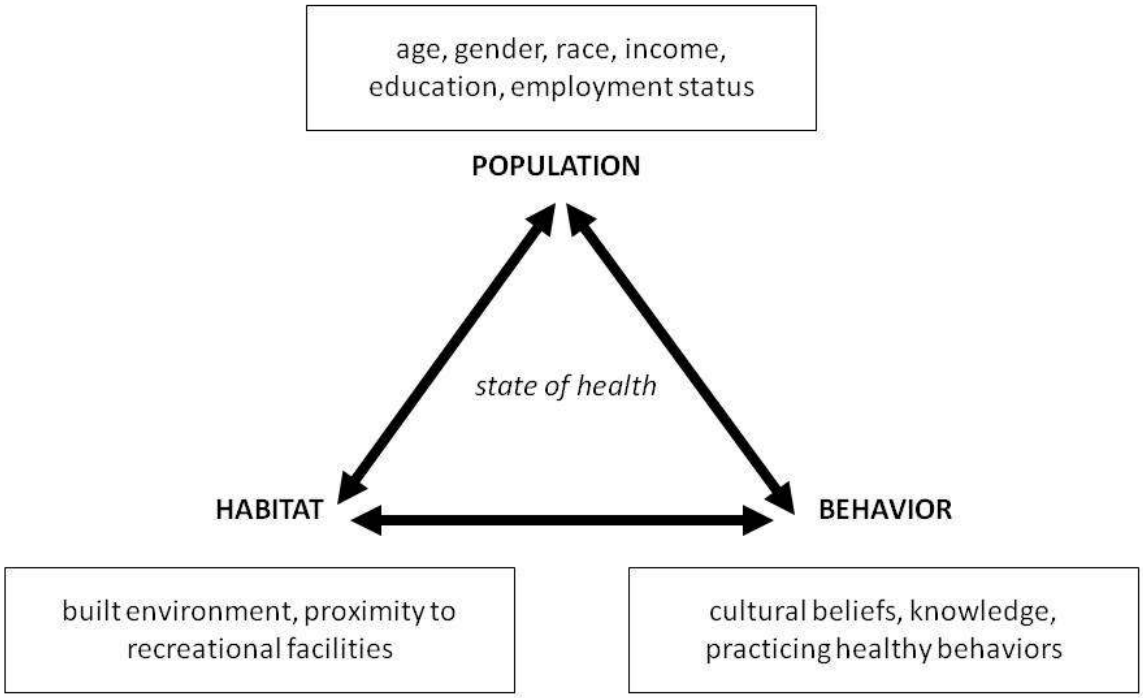
Figure 2.1. The triangle of human ecology as it relates to this study



Source: Adapted from Meade, M., and Earickson, R. 2000. *Medical Geography*, 2nd ed. Page 35. The Guilford Press, New York, NY.

Figure 2.2. Map of Danville, Virginia

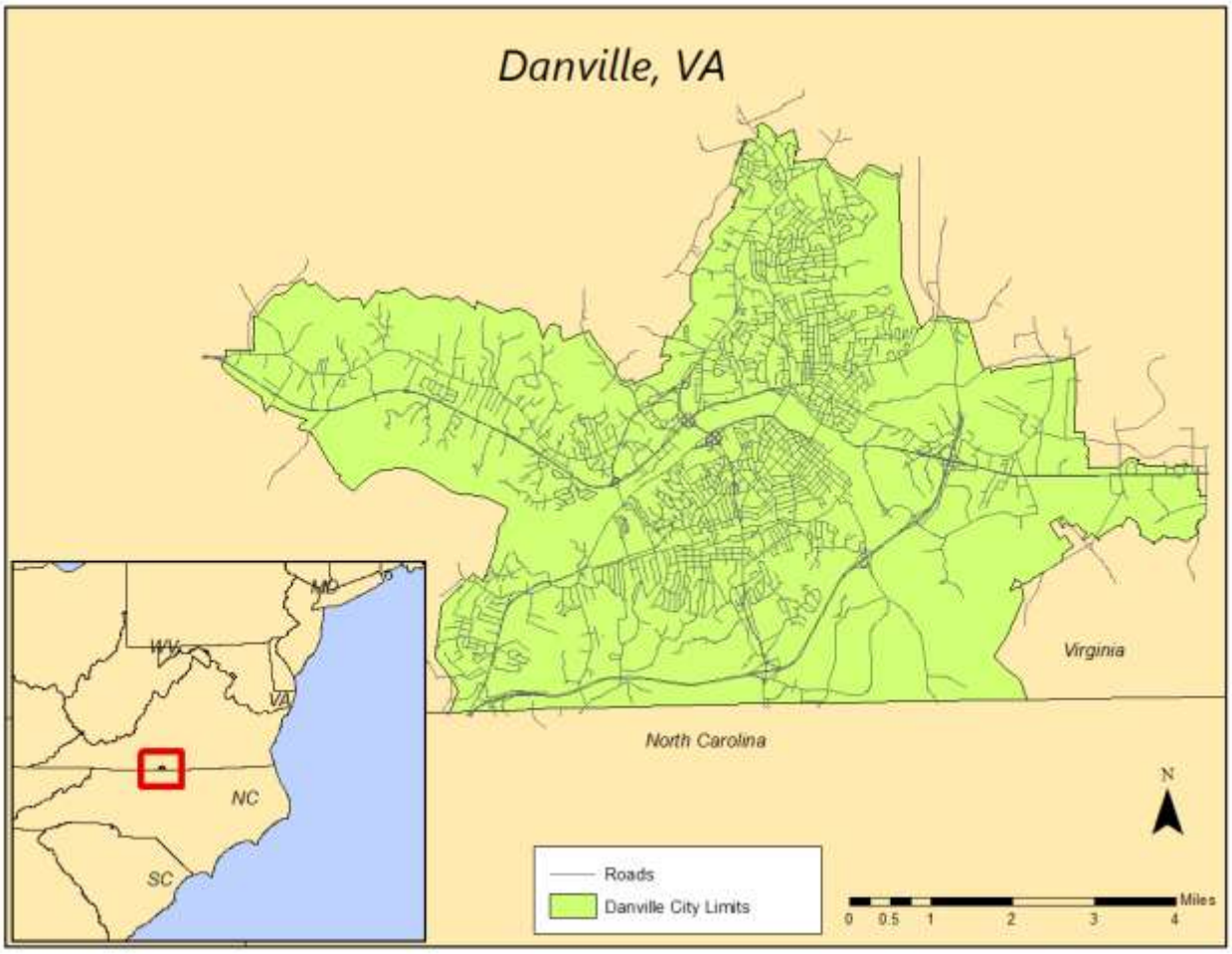


Figure 2.3. Map of racial distribution by census block-group in Danville, Virginia

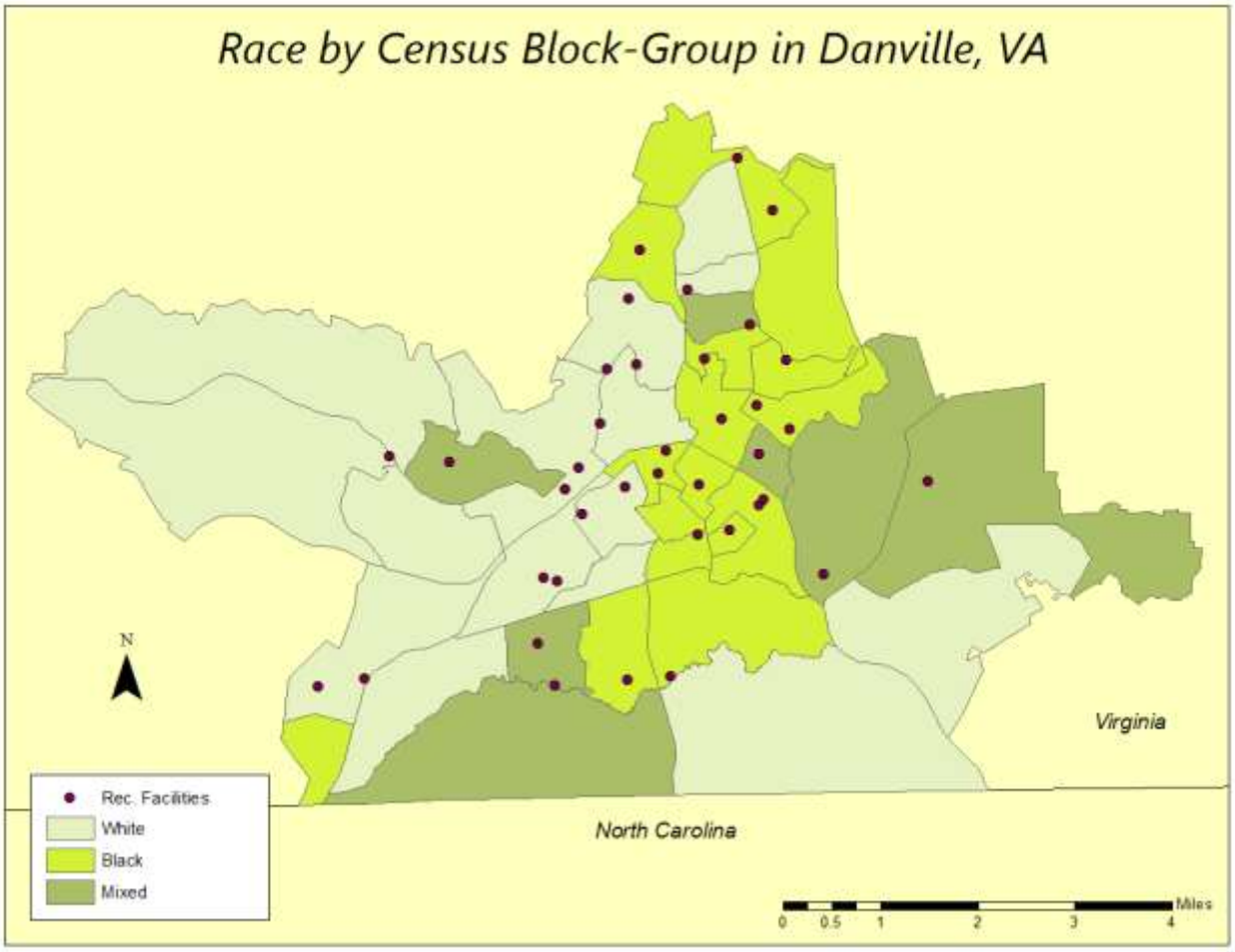
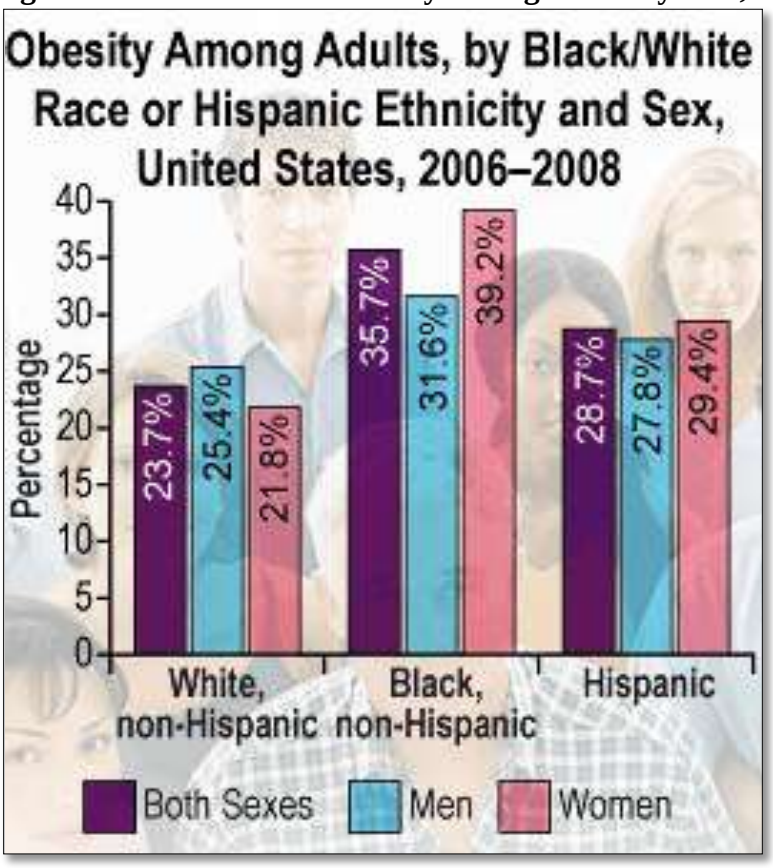


Figure 2.4. Differences in obesity among adults by race, ethnicity, and sex



Source: National Center for Health Marketing, Division of eHealth Marketing
URL: http://www.cdc.gov/Features/dsObesityAdults/

Chapter 3: Manuscript

Examining Access to Recreational Facilities in a Health Disparate Region*

*This chapter is in manuscript format for submission in the *Journal of Community Health.*

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Abstract

The benefits of exercise in preventing and alleviating overweight and obesity are widely documented, yet not all population groups have equal access to physical activity opportunities. This community-based participatory research (CBPR) project takes an environmental justice approach in examining the differences in quality of and access to recreational facilities between various socio-demographic groups in Danville, VA. Recreational facilities were enumerated and systematic audits of all facilities were conducted using the PARA tool. Block-group race data were acquired from the 2010 United States Census. Individual level body mass index (BMI), physical activity minutes per week, education, income, employment status, race, and gender were derived from a telephone survey (n=269). Point to point distance was computed between individual survey respondents and recreational facilities using ArcMap ™ 10. Analysis included ANOVA and linear and logistic regression. Thirty-nine outlets within the city limits were audited. The majority were parks (n=17), followed by schools (n=10), community centers (n=7), fitness clubs (n=3), and sport facilities (n=2). Facilities located in predominately black block groups had more incivilities. Proximity to facilities did not predict BMI or physical activity. To maximize the use of physical activity outlets, interventions must be made to improve the incivilities present in predominately Black block groups.

Keywords: environmental justice, physical activity, access, obesity, parks

Introduction

Obesity is a growing public health issue, with over sixty-five percent of Americans considered to be overweight or obese (1). Several illnesses are caused or worsened by obesity, including type two diabetes, coronary heart disease, hypertension, sleep apnea, stroke, and certain types of cancer (2). Physical activity, along with dietary restraint is key to prevention of weight gain and reduction of obesity (3) Further, there are many physiological and psychological benefits to physical activity beyond weight control/loss that can improve health (4). Despite these benefits, more than 80 percent of adults in the U.S. do not meet the current recommendations for physical activity, 150 minutes of moderate physical activity per week (4) .

While the prevalence of overweight, obesity and physical inactivity continues to rise, there is unequal distribution with the population (2, 5). A disproportionate percentage of overweight and obese Americans are low-income and racial minorities (6-8). These groups also report the lowest levels of leisure-time physical activity (5, 9, 10). It becomes important to examine the levels of access and quality of recreational facilities available to minority and low-income population groups for use in obesity alleviating exercise.

The increase in overweight and obesity in Virginia in the past decade mirrors the national trend (11). Obesity rates differ by region, however, with the highest percent of overweight and obesity in the southern portion of the state (11). Additionally, southern VA displays high poverty rates and large proportions of racial and ethnic minorities (12). When traditionally disadvantaged population groups display a disproportionate burden of hazards, it becomes an issue of social and environmental justice. Although traditionally, environmental justice has referred to equitable treatment of all population groups regarding environmental policies, it can also be applied as a framework to examine access (or lack thereof) to resources in the built

environment (13-15). Previous studies of environmental justice and access to recreational facilities have produced varied, often contradictory results, furthering the need for additional research (16-18).

Recreational Facilities and Obesity

The benefits of physical activity in alleviating and preventing overweight and obesity are well documented (3, 4, 19). Although not required, recreational facilities offer residents the opportunity to engage in physical activity (20-22). In order to promote use in the populations they serve, it is essential for facilities to be accessible, safe, affordable, and appealing. Previous studies predominately focus on access by proximity or counts of facilities within an area (21). While geographic proximity indicates access, it doesn't provide information on other factors relevant to use. Multiple factors can affect use, including hours of operation, cost, perceptions of safety, and perceptions of quality, among others (23). Despite having walking access, residents may not utilize a recreational facility due to cost, poor lighting, or unsuitable hours of operation. Therefore, exploring access with expanded operational definitions, such as count, distance and quality of facility may be more useful to determining accessibility and use.

Socioeconomic Status and Physical Activity

A negative relationship exists between neighborhood socioeconomic status (SES) and BMI levels (9, 10). People of low-SES are more likely to purchase unhealthy foods than are people of higher-SES (24). Further, residents of low-income areas report lower levels of physical activity than residents of higher-income areas (25, 26). A 2004 study found that poverty was significantly associated with a decreased number of accessible parks in a

community (17). Similarly, Gordon-Larsen et al. (2006) reported fewer recreational facilities in low-SES block-groups when compared to higher-SES block groups (27). In addition to accessibility, it is important to examine factors preventing or promoting use of recreational facilities. High population density and crime rates are often associated with low-income areas, and can be major deterrents for the utilization of public parks and facilities (28). Negative perceptions of safety and attractiveness of recreational facilities could inhibit use (25, 29). The combination of decreased physical activity, poor diet, and factors inhibiting use of recreational facilities places low-SES residents at high risk for obesity and obesity-related illness.

Race and Physical Activity

Different racial groups are affected by obesity in varying ways. African-Americans are at a 51% higher risk for obesity than Caucasians, according to the 2009 Behavioral Risk Factor Surveillance System Report (30). While displaying lower risk percentages than black/ African-Americans, Hispanics display 21% higher obesity rates than non-Hispanic whites (30). Disparities s in physical activity outlets may explain the heightened obesity rates of minority populations. Areas with high percentages of black or African-American residents have been linked with decreased access to recreational facilities (17, 27). Due to the fact that black/African-American and Hispanic populations are already at highest risk for obesity and obesity related illness, a lack of accessibility to safe and attractive recreational facilities presents a potentially serious health disadvantage.

This research examines accessibility and quality of recreational facilities in Danville, Virginia within the framework of environmental justice. As defined by the U.S. Environmental Protection Agency (EPA), "Environmental justice is the fair treatment and meaningful

involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies (10)." Traditionally, environmental justice frameworks are utilized to examine the ways in which already disadvantaged populations are given additional environmental burdens, for example, placing a chemical factory in a low-income neighborhood (31). Environmental justice can also be applied to assess inequalities in public health and parks and recreation (32). In this sense, the study examines any differences by race/ethnicity in access, quality, and features of available recreational facilities. Few studies have utilized similar frameworks to the geographic analysis of accessibility and utilization of recreational facilities, but those that did have produced varied results (16-18). Powell et al. (2004) found that areas with high percentages of black or African-American residents had decreased access to recreational facilities, including green spaces, parks, and bike paths (17). Contradictory results have shown that minority populations had increased access to parks compared to majority populations (18). Additionally, Estabrooks et al. (2003) found similar levels of pay for use recreational facilities in low and medium income neighborhoods when compared to high income neighborhoods, but significantly fewer free-for-use facilities (16). Cost could potentially deter use in this case. Further research is needed to clarify these contradictions in the literature.

We seek to address these contradictions by examining the following research objectives: 1) To examine access to recreational facilities with the potential to promote exercise in the population of Danville, VA. 2) To determine the quality of each facility and explore differences in features, amenities, and incivilities by racial characteristics of the surrounding neighborhood. 3) To examine the effect of access defined as distance to recreational facilities on individual-level BMI and physical activity. We hypothesized that: 1) distance from the nearest facility

would positively predict total physical activity minutes as well as meeting recommendations for physical activity; and 2) shorter distance to nearest facility would positively predict lower BMIs.

Methods

Study Area

Danville, VA, an independent city located within Pittsylvania County in south-central Virginia, experiences high levels of obesity and obesity-related illness (Figure 3.1). According to the Centers for Disease Control and Prevention's (CDC) county level estimates for Pittsylvania County, 28.3% of adults living in Danville city were obese, which is slightly higher than the state average of 28.1%. The percentage of adults in Danville diagnosed with diabetes (10.6%) is also higher than the state average (9.8%), and the percentage of adults in Danville who were physically inactive (27%) was higher than the state average of 24.8% (33). The percentage of people living below poverty level was much higher for Danville than the percentages for the state of Virginia or the nation as a whole (34). In 2010, 24.4% of Danville citizens were living under the poverty line as compared to 10.3% of Virginia residents and 13.8% of the US population (34). Additionally, Danville has a high percentage (48.3%) of black or African-American residents (34).

The data for this study are a result of a larger ongoing community based participatory (CBPR) partnership focused on reducing obesity in the region (35). The Dan River Partnership for a Healthy Community (DRPHC) formed in 2010, and has prioritized several key areas for obesity prevention/reduction including environmental or geographical influences. The research partners, in collaboration with the DRPHC, have initiated a series of environmental studies to examine obesity in the area. Evaluations of available nutritional and physical activity

opportunities were prioritized, and this research will provide Danville community members with more information on the accessibility and quality of all physical activity outlets in the city.

Data Collection/Measures

Census Data Collection

Danville, VA consists of 16 census-tracts and 39 block groups. Race data were obtained at the block group level from the 2010 United States Census (36). Block group race was categorized into "white," "black or African-American," and "mixed." These categories were calculated by predominant race percentage (>55% of one race). In the case of block groups without a dominant race (two or more races >45% but <55%), the category "mixed race" was applied. At the time of this study, 2010 census income data had not been released for the study area. For this purpose, we utilized the 2000 United States Census median household income for descriptive purposes but did not utilize those data for statistical test. Block group level income was obtained using "median household income" from the 2000 census (37).

Systematic Audits of Physical Activity Environment.

Recreational outlets were identified from the Danville Parks and Recreation Department, internet keyword searches, and drive by observation. Research staff created a database of all enumerated outlets including parks, public buildings with exercise spaces, private gyms and sports facilities. Each facility was reclassified according to the protocol and definitions set forth by the Physical Activity Resource Assessment (PARA) tool (23). These categories include fitness clubs, parks, sport facilities, community centers, and schools. For the scope of this study, we did not include churches or trails. After reclassifying, excluding duplicates, and removing

closed/out of business resources, a total of 39 facilities remained. Each facility was given an individual resource identification (ID) number and mapped in ArcMap ™ 10 (Figure 3.2).

Systematic audits of all recreational facilities were conducted using the Physical Activity Resource Assessment (PARA) instrument (23). The PARA is a one-page survey used to rank physical activity outlets based on features, amenities, and incivilities (23). The "features" category contains thirteen items to rank, including baseball fields, basketball courts, soccer fields, bike racks, exercise stations, play equipment, pools > 3 feet deep, sandboxes, sidewalks, tennis courts, trails, volleyball courts, and wading pools < 3 feet deep. Scores for presence and quality range from zero to three (0=not present, 1=poor, 2=mediocre, 3=good). Amenities are scored identically to features and include access points, bathrooms, benches, drinking fountains, decorative fountains, landscaping efforts, lighting, picnic tables (with and without shade), shelters, shower/locker rooms, and trash containers. Incivilities include graffiti/tagging, litter, no grass, overgrown grass, sex paraphernalia, and vandalism and are scored zero to three (0=not present, 1=little/few, 2=some, 3=a lot). Average scores for features, amenities, and incivilities are computed by adding the items in the category and dividing by the total number of items in each category.

Training of Auditors and Fieldwork

Prior to fieldwork, auditors completed an intensive two day training session consisting of didactic sessions on the protocol and the PARA instrument and definitions and supervised field practice the principal investigator and project coordinator. The auditing team consisted of six undergraduate and graduate researchers, who were required to consistently meet an *a priori*

kappa coefficient of 0.60 or greater prior to participating in fieldwork. A kappa of 0 indicates chance agreement, while a 0.60 kappa is 60% better than chance.

In the field, auditor pairs rated features, amenities, and incivilities for each of the 39 identified facilities within the City of Danville. All audits were completed during daylight hours for temporal consistency. Auditors were not allowed to discuss survey answers with their partner to prevent bias. At the end of each day, auditors checked all PARA forms for completion. Each auditor's scores were entered into SPSS®20. Kappa coefficients were calculated for each facility and any facilities with coefficients <0.60 were re-audted. Final kappa scores ranged from 0.66 to 1, with a mean of 0.90, indicating confidence in inter-rater agreement 90% better than chance. Statistical t-tests were run in order to verify the similarities and reliability of the pairs of auditors. Given the high levels of inter-rater reliability, a random delete strategy was utilized to eliminate one auditor's PARA score for each facility.

Access-Proximity

To determine access based on distance, physical activity facility addresses were geocoded and mapped using ArcMap ™ 10.

Telephone Survey Data

As part of the larger DRPHC activities, a telephone survey was completed in the region from September-December 2011. The telephone survey replicated BRFSS methods to gain a representative dataset on chronic disease (e.g. diabetes, CVD, obesity), physical activity, nutrition behaviors and psycho-social indicators such as perceptions of neighborhoods, social support, food insecurity, and food assistance participation. In addition to the random sample, a

targeted sampling strategy was used to include persons living public housing in the city of Danville. An independent survey company administered the questionnaire to 930 survey respondents in Danville and surrounding areas. All survey respondents outside the Danville City limits were removed from the sample, leaving 269. The final sample included 135 survey respondents acquired from random sampling and 134 respondents from targeted sampling within the city of Danville. Home address point data for the 269 respondents were mapped with the 39 PARA facilities for spatial analysis (Figure 3.3). Continuous distance to the nearest facility was calculated for each respondent. BMI was calculated for each of the 269 respondents based on self-reported height and weight, after removing outliers. Minutes of reported physical activity per week were categorized into meeting recommended physical activity guidelines (150 minutes per week of moderate physical activity) or "not meeting guidelines (<150 minutes per week) (39).

Analyses

All PARA scores were entered into SPSS®20for analysis. Multiple descriptive statistical tests were run in order to summarize the data, including frequencies, mean, median, mode, range, percents, and standard deviations. Each facility was assigned the demographic characteristics (race, income) of the block-group in which it was located (Table 3.1). One way analysis of variance (ANOVA) tested differences in features, amenities, and incivilities by block-group race.

All telephone survey data were entered into SPSS®20and cleaned and recoded when necessary. All respondent addresses were geocoded and mapped in ArcMap ™ 10. Continuous distance from recreational facilities was utilized in linear regression.

The research questions were tested were tested using ANOVA, multiple logistic and multiple linear regression models: 1) Quality of recreational facilities would differ by block-group race; 2) Distance from the nearest facility would positively predict physical activity minutes as well as meeting recommendations for physical activity; and 3) distance from nearest facility would positively predict BMI. We hypothesized that predominately black or mixed race block groups would have fewer facilities and facilities would have fewer amenities. Further we hypothesize that residents who live close to a recreational facility will engage in more physical activity and have lower BMIs than those who live further from a facility.

Results

Assessment of Audits of Physical Activity Facilities

Table 3.2 provides detailed results of the PARA audits. The majority of facilities were parks (n=17), followed by schools (n=10), community centers (n=7), fitness clubs (n=2), sport facilities (n=2), and a combination fitness club/sport facility (n=1). The majority (69%) of facilities were free-for-use. Twelve out of 39 block groups contained no recreational facilities, 1 block-group contained 3, and 10 block groups contained 2 facilities. Predominantly white block-groups had more facilities (n=21) than did black/African-American block-groups (n=13). Additionally, white block-groups had more free facilities available (n=14) than did black/African-American block-groups (n=9). Table 3.3 displays the results of the ANOVA test examining differences in features, amenities, and incivilities by race. Mean number of features and amenities did not differ by predominant block-group race, but incivilities per facility were significantly higher (α=0.05) in black/African-American block-groups than white block-groups (figure 3.4).

Table 3.4 highlights the descriptive characteristics of the telephone survey. The majority (63.9%) of respondents was black or African-American and had an annual household income less than $10,000 (40.5%). The average respondent had a BMI in the obese category (average 30.9, standard deviation (SD 7.8) and was not meeting physical activity recommendations of ≥ 150 minutes of moderate physical activity per week (39). The average distance to recreational facility 762.7 meters (SD 601.9).

Proximity to Recreational Facilities to Predict BMI, Physical Activity

The results of the linear regression models indicated that when controlling for age, gender, race, income, education, and employment status, continuous distance to recreational facilities did not predict physical activity minutes per week or whether or not physical activity recommendations were met (table 3.5). Further, continuous distance from a recreational facility did not predict BMI.

Discussion and Conclusion

The goals of this study were to determine the quality and accessibility of recreational facilities for residents of Danville, VA and to examine any differences in accessibility and quality by block-group race. Additionally, we tested the predictive nature of access to recreational facilities on individual-level BMI and physical activity. Features and amenities of facilities did not differ by predominant block-group race; however, there were significantly more incivilities in recreational facilities in black/African-American block-groups than in white or mixed block-groups. It is important to keep in mind that people may choose whether or not to use a recreational facility not only by the features they offer, but also the condition and upkeep of

the facility (40). Given that incivilities may be a deterrent for use, recreational facilities in predominantly black/African-American block-groups may be less appealing to residents or perceived as lower quality compared to facilities in predominantly white or mixed race block-groups.

Previous studies have produced similar results, reporting decreased access to recreational facilities in predominantly black/African-American or minority communities (17, 27). This lack of equitable distribution among higher minority block-groups coupled with already low numbers of accessible recreational facilities is cause for alarm. Environmental justice has not been achieved in regards to quantity and quality of available recreational facilities. As discussed in the Background section, general agreement related to race and access to recreational facilities has not been reached in the literature. Contradictory to our findings, Cutts et al. (2009) found that minority populations had access to more parks than majority populations (18).

We hypothesized that continuous distance to recreational facilities would predict individual-level BMI and physical activity behaviors. While our results did not support these hypotheses, they were consistent with findings in several previous studies (41-43). The contradictory results of previous studies could be explained by differences in defining access to recreational facilities. Additionally, the types of recreational facilities vary from study to study.

The main limitations of this study are related to the small sample size of recreational facilities and limitations inherent to the PARA tool. Although the telephone survey sample size was considerably larger than that of the recreational facilities, data from each respondent were ultimately tied to one of 39 facilities. In this situation, a small population size limited statistical power. Survey respondents may have answered based on perceptions of a "correct" response, potentially introducing bias to the data set. Oversampling of public housing villages accounted

for roughly half of the survey respondents (n=134). This caused clustering of data, as multiple respondents are tied to the same physical address. Additionally, the use of the PARA tool is not without limitations. Higher scores are designated to facilities with multiple features, potentially making single-purpose facilities appear less desirable due to a lack of variety. There is potential for temporal variability in conducting PARA audits. Audits conducted during daylight hours may produce different results from those during darkness. Further, two of the incivilities (lack of grass and overgrown grass) could receive drastically different rankings depending on the season. Audits were conducted in the middle of summer in temperatures capable of scorching grass. Additionally, approximately one-quarter of the recreational facilities audited were schools (n=10) which may experience variations in grounds keeping during summer break. The high number of schools included in the population could be a limitation itself. We are unaware of the availability of schools for public use and recommend future research to determine school policies and community perceptions regarding public use of school grounds for physical activity. Additionally, further research is recommended regarding the types of physical activity taking place in each facility, and how this affects use. It may prove beneficial to community planners to know whether or not the presence of structured activities (aerobics classes, softball leagues) has any influence on utilization of facilities when compared to non-structured free play.

Obesity continues to be an issue of public health, both nationally and regionally. The average BMI of our sample was in the obese range, posing a host of health and financial burdens to community members. We found fewer an inequitable distribution of incivilities in predominantly black/African-American block-groups when compared to white and mixed-race block-groups. Although our hypotheses regarding accessibility, PA, and BMI lacked significant results, there are practical implications of the study. The results of the study will be shared with

community members and leaders for use in planning efforts to increase equitable access to resources. Since we audited all recreational facilities in the area, this study illustrates the only recreational facility options available to Danville residents. Focus should be placed on improving security, grounds keeping, and the removal of incivilities of recreational facilities in predominantly black/African-American areas.

In addition to the theoretical contributions of this study to the literature, these findings provide insight for planning and prevention strategies at multiple scales. Injustices in the built environment exist nationally, regionally, and locally, creating the need for tailored planning and intervention strategies. Given our findings on the association between predominantly black/African-American block-groups and increased incivilities, planning efforts should focus on making safe, clean, and attractive recreational facilities available to residents of all races. The increased obesity rates and lower self-reported physical activity in the black/African-American population as a whole make this an important task in achieving equitable access to physical activity opportunities.

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Figure 3.1. Map of Danville, Virginia

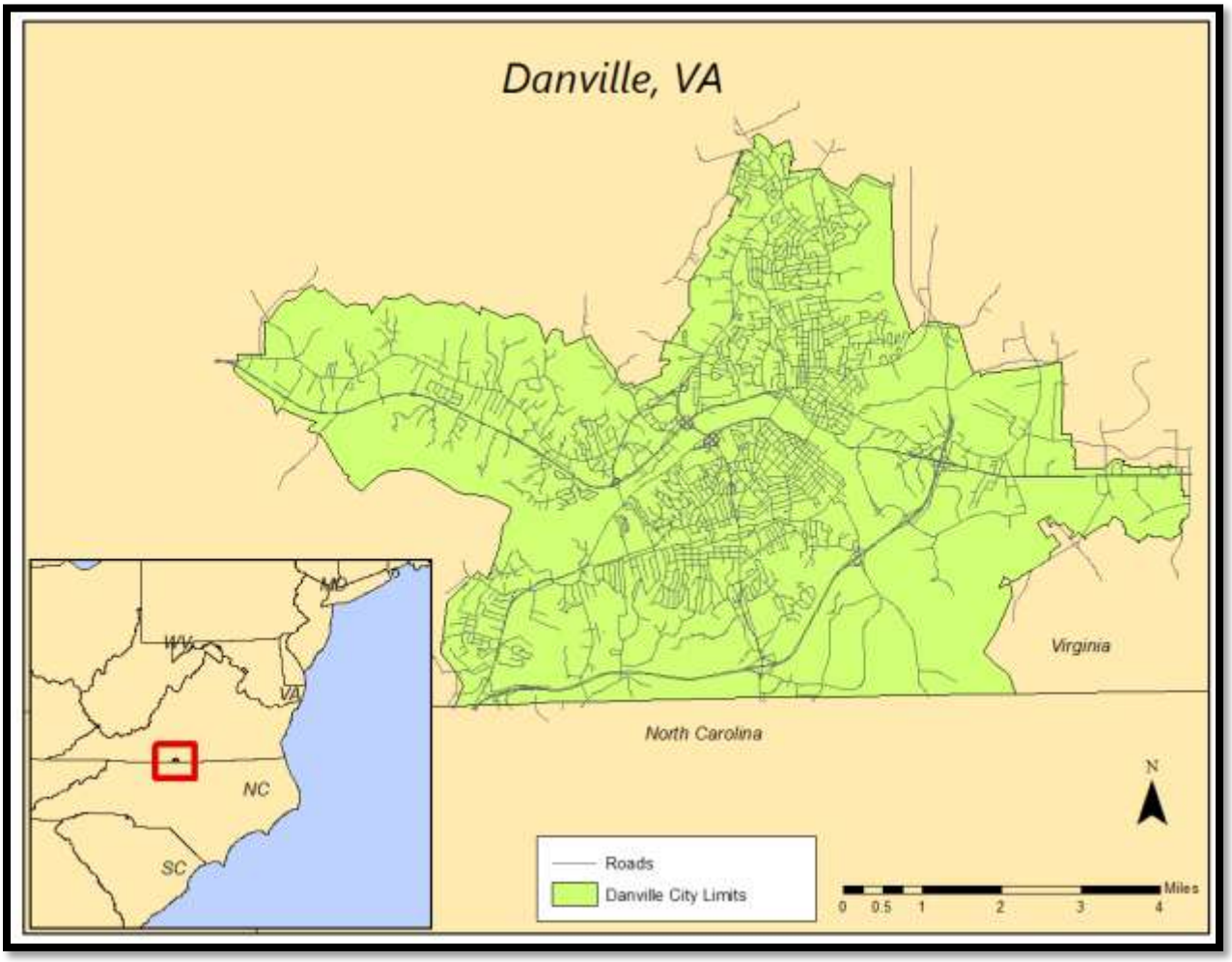

Figure 3.2. Map of all recreational facilities in Danville, Virginia.

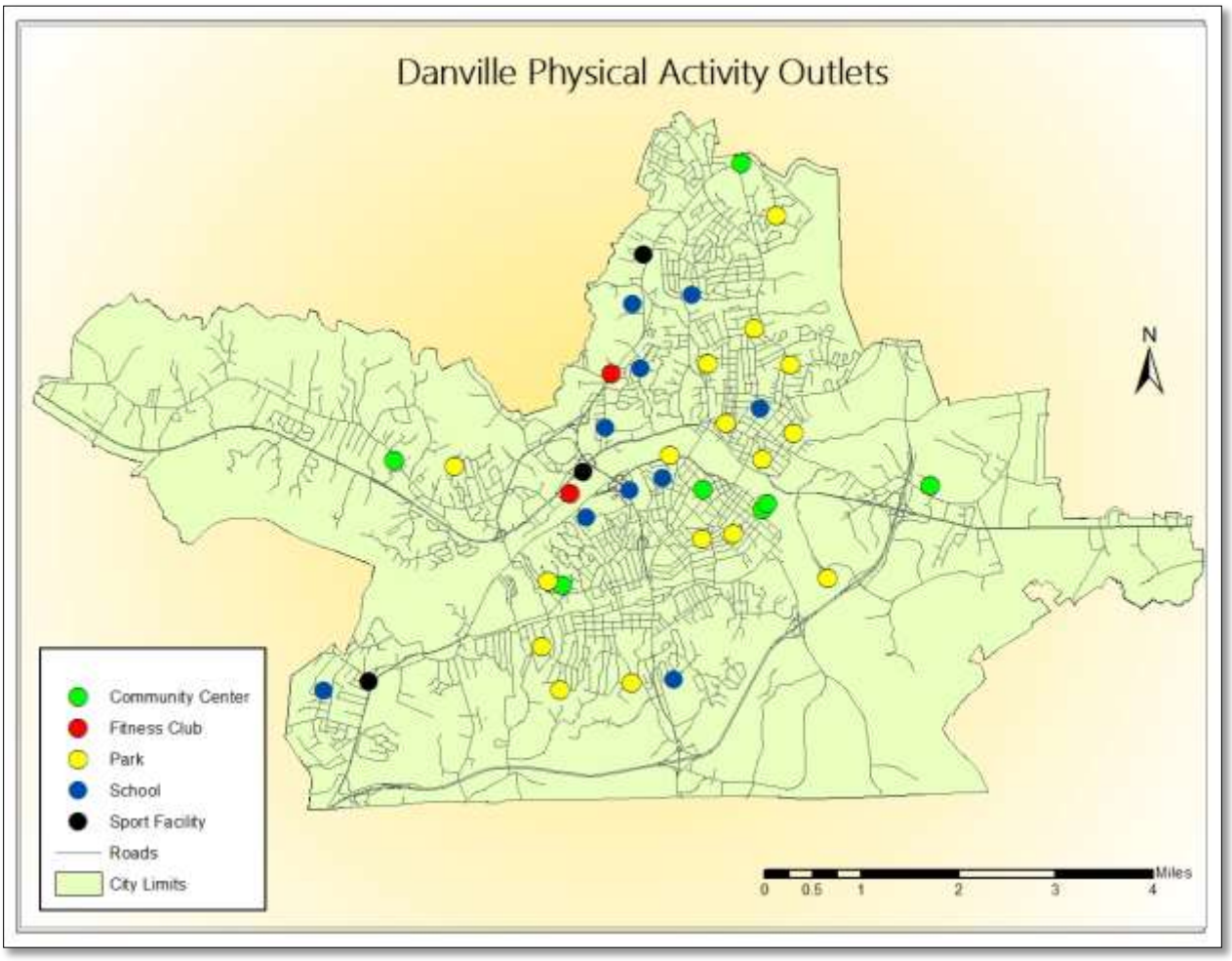

Figure 3.3. Map of the distribution of telephone survey respondents and recreational facilities

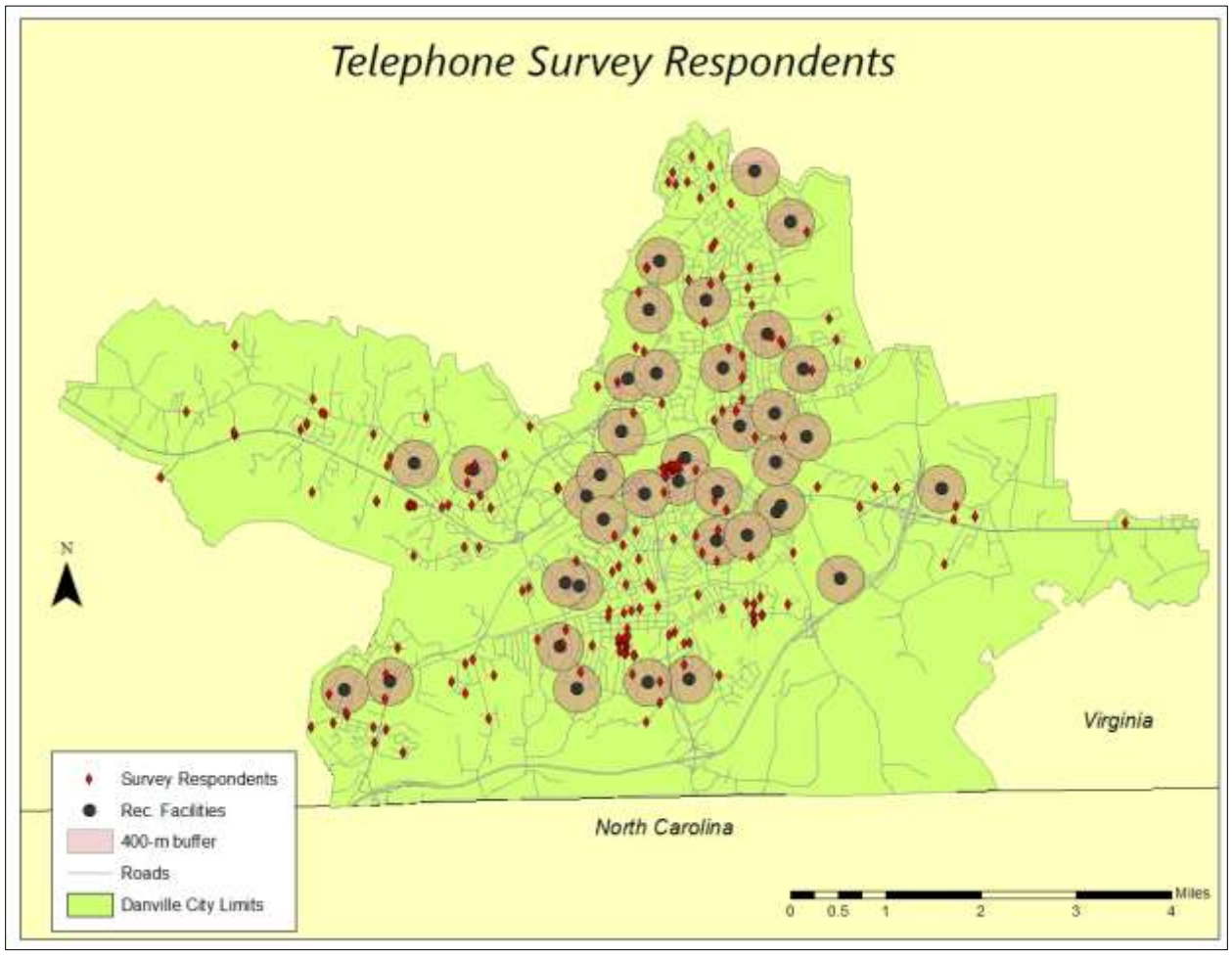

Figure 3.4. Map of the distribution of incivilities by block-group race

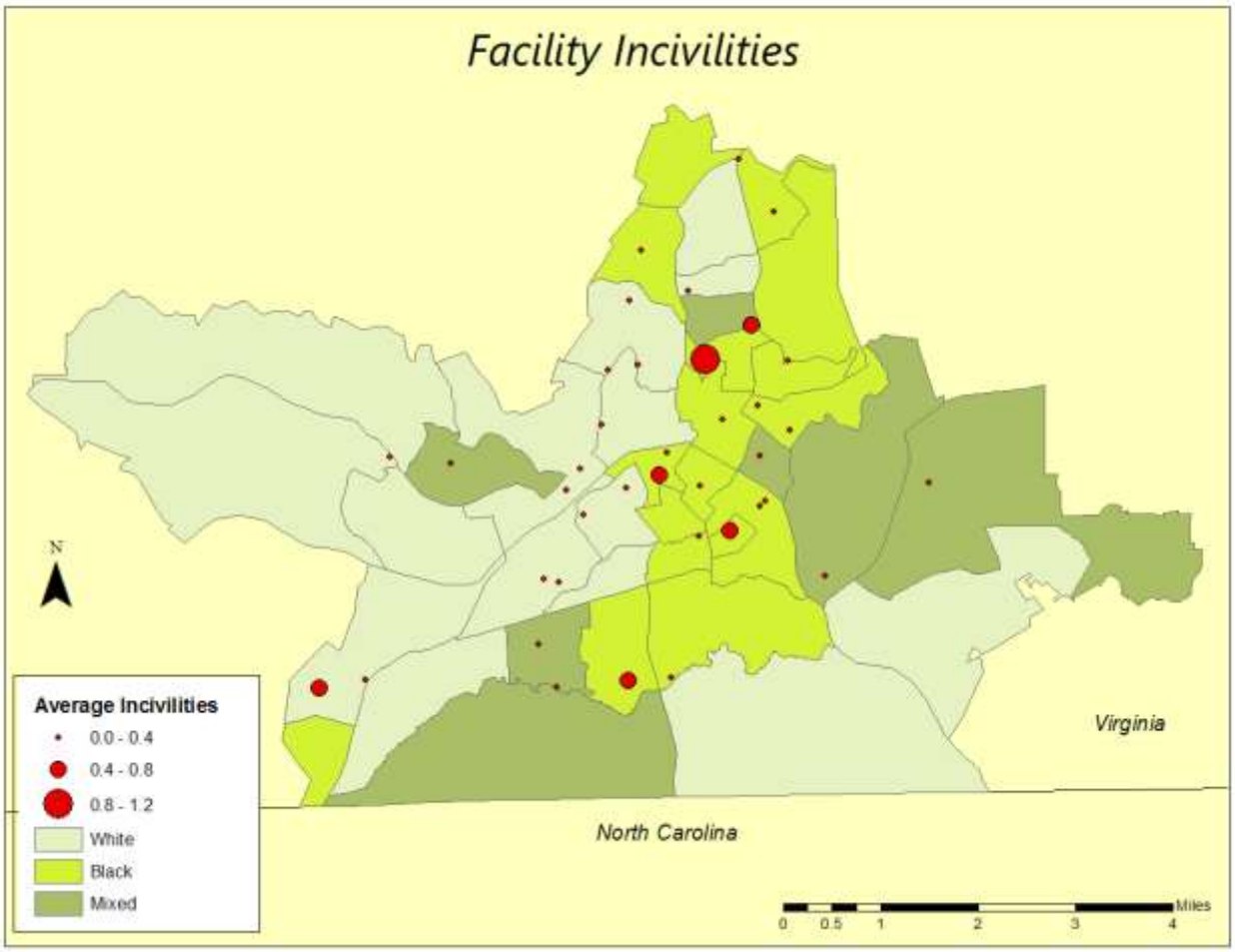

Table 3.1. Descriptive characteristics of physical activity outlets

CT-BG	Total population	% White	% Black	% Other	Median Family Income ($)[a]	Average Features[d]	Average Amenities[e]	Average Incivilities[f]	Cost
CT 1 BG 1	2149	40	56	4	51,071	-	-	-	-
CT 1 BG 2	1745	59	38	3	42,375	0.46	1	0	Pay
CT 1 BG 3	765	60	36	4	41,845	0.62	1	0.25	Free
CT 1 BG 4	1044	33	65	2	45,000	0.23	1.25	0.25	Free
CT 2 BG 1	1173	32	64	4	34,301	0	0.92	0	Pay
CT 2 BG 2	1278	55	40	5	48,889	0.23, 0.46, 0.85	1.5, 0.42, 0.67	0, 0.33, 0.25	Pay(1), Free (2)
CT 2 BG 3	1363	60	35	5	38,159	1.15	0.75	0.08	Free (2)
CT3 BG 1	1016	46	52	2	33,500	0.38	0.75	0.67	Free
CT 3 BG 2	1101	21	78	1	25,058	-	-	-	-
CT 3 BG 3	1389	23	75	2	26,964	0.62, 0.69	1, 1.5	0.92, 0.08	Free (2)
CT 4 BG 1	1372	16	81	2	17,202	-	-	-	-
CT 4 BG 2	877	20	77	3	16,638	0.46 , 0.69	1.17, 0.83	0.33, 0.17	Free (2)
CT 4 BG 3	417	46	48	6	18,077	0.15	1.17	0.08	Free
CT 4 BG 4	1101	39	60	1	29,500	0.15	0.92	0.25	Pay
CT 5 BG 1	362	29	68	3	23,929	0.46	1.42	0	Pay
CT 5 BG 2	778	31	66	3	19,625	0, 0.23	1.5, 1.5	0, 0	Pay (2)
CT 5 BG 3	497	5	94	1	[b]	0.15	0.92	0.5	Free
CT 6 BG 1	679	3	94	3	19,750	0.46, 0.54	1.17, 0.58	0.08, 0.42	Free (2)
CT 6 BG 2	786	34	62	4	30,875	-	-	-	-
CT 6 BG 3	884	24	75	2	25,109	0.51	1.08	0.33	Free
CT 7 BG 1	1346	74	23	3	55,208	0.77, 0.46	1.42, 1.75	0, 0.08	Free (2)
CT 7 BG 2	861	87	11	3	77,869	0, 1.15	1.17, 2.33	0, 0.08	Pay (1), Free (1)
CT 7 BG 3	1134	83	12	4	65,195	-	-	-	-
CT 8 BG 1	302	62	27	11	32,045	0.23, 0.23	1.42, 1.17	0.08, 0	Pay (2)
CT 8 BG 2	1390	45	52	4	37,500	0.23	0.67	0.17	Free
CT 8 BG 3	998	64	30	65	49,167	-	-	-	-
CT 9 BG 1	1913	56	40	4	42,120	0.23, 0.52	1.5, 1.42	0, 0.42	Pay (1), Free (2)
CT 9 BG 2	1191	81	13	6	36,250	-	-	-	-
CT 9 BG 3	667	40	55	4	39,659	-	-	-	-
CT 10 BG 1	1932	18	78	4	18,846	0.62	1.5	0.58	Free
CT10 BG 2	1771	44	51	5	38,672	0.46, 0.46	1.5, 2	0.08, 0.08	Free (2)
CT 11 BG 1	1401	28	70	2	14,107	0.54	1	0.25	Free
CT 12 BG 1	1121	54	35	11	72,656	-	-	-	-
CT 12 BG 2	645	76	21	3	28,750	-	-	-	-
CT 13.01 BG 1	1296	53	41	6	29,978[c]	0.92	1.58	0.08	Pay
CT 13.02 BG 1	1077	43	48	9	29,978 [c]	1.08	2	0.25	Free
CT 14 BG 1	1613	84	8	8	45,033	-	-	-	-
CT 14 BG 2	1619	89	8	3	46,875	0.23, 0.46	1.17, 1.42	0, 0.08	Pay (1), Free (1)
CT 9801 BG 1	2	100	0	0	29,978 [c]	-	-	-	-

[a]Median family income based on 2000 Census Data
[b]Unavailable/geographic boundary did not exist in 2000
[c] Boundary did not exist in 2000 (total from 2000 census tract 13)
[d]Features include 13 resource items (e.g. baseball fields, play equipment, exercise stations, and sidewalks, etc).
[e]Amenities include 12 items (e.g. access points, lighting, drinking fountains, and bathrooms, etc).
[f]Incivilities include 12 items (e.g. litter, overgrown grass, vandalism, and unattended dogs, etc).

Table 3.2. PARA scores by facility type (n=39)

Facility ID	Resource Type	Cost	Features	Avg. Features	Amenities	Avg. Amenities	Incivilities	Avg. Incivilities
1	Fitness club	Pay	3	0.23	18	1.5	0	0
2	Fitness club	Pay	3	0.23	17	1.42	1	0.08
3	Park	Free	3	0.23	15	1.25	3	0.25
4	Park	Free	5	0.38	9	0.75	8	0.67
5	Park	Free	9	0.69	18	1.5	1	0.08
6	Park	Free	8	0.62	12	1	11	0.92
7	Park	Free	6	0.46	14	1.17	4	0.33
8	Park	Free	2	0.15	14	1.17	1	0.08
9	Park	Free	2	0.15	11	0.92	3	0.25
10	Park	Free	6	0.46	14	1.17	1	0.08
11	Park	Free	7	0.54	13	1.08	4	0.33
12	Park	Free	2	0.15	11	0.92	6	0.5
13	Park	Free	15	1.15	28	2.33	1	0.08
14	Park	Free	3	0.23	8	0.67	2	0.17
15	Park	Free	8	0.62	18	1.5	7	0.58
16	Park	Free	6	0.46	18	1.5	1	0.08
17	Park	Free	6	0.46	24	2	1	0.08
18	Park	Free	14	1.08	24	2	3	0.25
19	Park	Free	6	0.46	17	1.42	1	0.08
20	Sport facility	Pay	0	0	11	0.92	0	0
21	Sport facility	Pay	3	0.23	18	1.5	0	0
22	Center	Pay	6	0.46	12	1	0	0
23	Center	Pay	6	0.46	17	1.42	0	0
24	Center	Pay	3	0.23	18	1.5	0	0
25	Center	Pay	0	0	18	1.5	0	0
26	Center	Pay	0	0	14	1.17	0	0
27	Center	Pay	12	0.92	19	1.58	1	0.08
28	Center	Pay	3	0.23	14	1.17	0	0
29	School	Free	8	0.62	12	1	3	0.25
30	School	Free	6	0.46	5	0.42	4	0.33
31	School	Free	11	0.85	8	0.67	3	0.25
32	School	Free	15	1.15	9	0.75	1	0.08
33	School	Free	9	0.69	10	0.83	2	0.17
34	School	Free	7	0.54	7	0.58	5	0.42
35	School	Free	10	0.77	17	1.42	0	0
36	School	Free	6	0.46	21	1.75	1	0.08
37	School	Free	7	0.54	17	1.42	5	0.42
38	School	Free	7	0.54	12	1	3	0.25
39	Fitness /Sport	Pay	3	0.23	14	1.17	0	0

Table 3.3. One-way ANOVA of PARA features, amenities, and incivilities by race (n=39)

	Features				Amenities				Incivilities			
	n	M (SD)	F	Sig.	n	M (SD)	F	Sig	n	M (SD)	F	Sig[a]
By Race			0.679	0.513			0.721	0.493			3.296	0.048*
White	11	0.524 (0.374)			11	1.327 (0.428)			11	0.059 (0.075)		
Black	16	0.399 (0.236)			16	1.141 (0.283)			16	0.260 (0.255)		
Mixed	12	0.499 (0.301)			12	1.265 (0.528)			12	0.201 (0.198)		

[a] Significance $p<0.05$

Table 3.4. Summary data for survey (n=269)

Demographic Category		(%)
Race		
	White	30.5
	Black or African American	63.9
	Asian	0 .00
	Native Hawaiian/Pacific Islander	0.00
	American Indian/Alaskan Native	1.1
	Other	2.6
Age (average)		47.90 (SD 19.6)
Education		
	Never attended school	0.00
	Elementary	1.5
	Some High School	16.4
	High School Graduate or GED	36.4
	1 to 3 years of college or Technical School	30.9
	4 or more years of college	14.9
Annual Household Income		
	<$10,000	40.5
	Between $10,000 and <$15,000	14.1
	Between $15,000 and < $20,000	7.4
	Between $20,000 and < $25,000	7.4
	Between $25,000 and < $35,000	3.3
	Between $35,000 and < $50,000	4.5
	Between $50,000 and < $75,000	4.8
	Between $75,000 and < $100,000	4.1
	>$100,000	3.7
Employment		
	Employed for wages (not self)	28.3
	Self Employed	5.2
	Out of work for more than 1 year	10.4
	Out of work for less than 1 year	6.7
	Homemaker	2.2
	Student	10.0
	Retired	21.2
	Unable to work	14.5
BMI (average)		30.9 (SD 7.8)
BMI category		
	Underweight (<18.5)	1.5
	Normal weight (18.5-24.9)	20.1
	Overweight (25.0-29.9)	30.1
	Obese (30-39.9)	33.8
	Morbidly Obese (>40)	13.4
Moderate physical activity minutes per week		138.3 (SD 189.7)
Meeting physical activity recommendations[a]		
	Yes	102 (37.9)
	No	105 (39.0)
PA outlet within 400-meters		
	Yes	27.1
	No	72.9
Distance to nearest PA outlet (meters)		762.7 (SD 601.9)

[a]Recommended ≥150 minutes of moderate physical activity per week (6)

Table 3.5. Regression models (n=269)

	Meeting PA recommendations [a, b]		BMI overweight/obese [c]		PA minutes per week [a]	BMI [d]
	β (SE)	**OR (95% CI)**	**β (SE)**	**OR (95% CI)**	**β (SE)**	**β (SE)**
Distance to nearest facility	0.00 (0.00)	1.00	0.00 (0.00)	1.00	0.01 (0.02)	0.00 (0.00)

[a] Controlling for demographic variables of gender, age in 2011, race, household income, education level, and employment status
[b] Dichotomized (yes/no) variable for meeting physical activity recommendations per week (≥150 minutes of moderate intensity physical activity per week). (6)
[c] Dichotomized (yes/no) variable for categorizing respondent as underweight/normal weight or overweight/obese/morbidly obese
[d] Underweight/normal weight BMI ≤ 24.9; overweight/obese/morbidly obese BMI ≥ 25.0)(26).

Appendix A: PARA instrument

Physical Activity Resource Assessment Instrument (PARA)

1) **Date** _____ 4) **Time** **start:**_____ **stop:**_____	2) **Data col** _____ 5) **Phone Call** **departure:**_____ **arrival:**_____	3) **HD/PA Resource ID** _____
6) **Type of Resource** **1** fitness club **2** park **3** sport facility **4** trail **5** community center **6** church **7** school **8** combination _____		7) **Approximate Size:** **1** sm **2** med **3** lg 8) **Capacity (indoor)** _____ 9) **Cost** **1** Free **2** Pay at the door **3** Pay for only certain programs **4** Other _____
10) **Hours** a) open _____ b) close _____		
11) **Signage** – Hours yes ☐ no ☐		12) **Signage** – Rules yes ☐ no ☐

Feature	**Rating**				**Amenity**	**Rating**			
13) Baseball field	0	1	2	3	26) Access Points	0	1	2	3
14) Basketball courts	0	1	2	3	27) Bathrooms	0	1	2	3
15) Soccer field	0	1	2	3	28) Benches	0	1	2	3
16) Bike Rack	0	1	2	3	29) Drinking fountain	0	1	2	3
17) Exercise Stations	0	1	2	3	30) Fountains	0	1	2	3
18) Play equipment	0	1	2	3	31) Landscaping efforts	0	1	2	3
19) Pool > 3 ft deep	0	1	2	3	32) Lighting	0	1	2	3
20) Sandbox	0	1	2	3	33) Picnic tables shaded	0	1	2	3
21) Sidewalk	0	1	2	3	34) Picnic tables no-shade	0	1	2	3
22) Tennis courts	0	1	2	3	35) Shelters	0	1	2	3
23) Trails – running/biking	0	1	2	3	36) Shower/Locker room	0	1	2	3
24) VB courts	0	1	2	3	37) Trash containers	0	1	2	3
25) Wading Pool < 3 ft.	0	1	2	3					

Incivilities	**Rating**				**Incivilities**	**Rating**			
38) Auditory annoyance	0	1	2	3	44) Graffiti/tagging	0	1	2	3
39) Broken glass	0	1	2	3	45) Litter	0	1	2	3
40) Dog refuse	0	1	2	3	46) No grass	0	1	2	3
41) Dogs Unattended	0	1	2	3	47) Overgrown grass	0	1	2	3
42) Evidence of alcohol use	0	1	2	3	48) Sex paraphernalia	0	1	2	3
43) Evidence of substance use	0	1	2	3	49) Vandalism	0	1	2	3

Comments:

Appendix B: Photo Examples of Features, Amenities, Incivilities

Feature: Basketball Court

Poor: Hoop of court is in very bad condition, almost unstable

Mediocre: Hoop is missing a net, rim is bent, and court has cracks or weeds

Good: Hoop is straight and has a net or chain, court is playable

Amenity: Shelters

Poor: Structures are not intact-so rain would get into area. Seating/tables are in major need of repair or are missing

Mediocre: Structures are in need of some repair, provide protection from weather, seating/tables are usable but need minor repair

Good: Structures are intact, provide protection from weather, and contain clean seating/tables

Incivility: Litter

1: A Little - A few items (<5) are on the ground

2: A Moderate Amount - Several items (5-10) are on the ground

3: A Lot - Many items are on the ground (11+)

Appendix C: Final PARA Kappa Summary by Block Group

Table 1 Final PARA Kappa Summary by Block Group.

CT-BG	Total Audits	Mean Kappa	Median Kappa	Range, Low	Range, High
CT 1 BG 2	1	1.00	1.00	1.00	1.00
CT 1 BG 3	2	0.80	0.80	0.60	1.00
CT 1 BG 4	1	0.66	0.66	0.66	0.66
CT 2 BG 1	1	0.89	0.89	0.89	0.89
CT 2 BG 2	5	0.71	0.88	0.38	1.00
CT 3 BG 3	1	0.83	0.83	0.83	0.83
CT 3 BG 1	2	0.73	0.73	0.64	0.82
CT 3 BG 3	3	0.71	0.78	0.52	0.82
CT 4 BG 2	2	0.77	0.77	0.72	0.82
CT 4 BG 3	1	1.00	1.00	1.00	1.00
CT 4 BG 4	1	0.84	0.84	0.84	0.84
CT 5 BG 1	1	0.94	0.94	0.94	0.94
CT 5 BG 2	2	1.00	1.00	1.00	1.00
CT 5 BG 3	1	1.00	1.00	1.00	1.00
CT 6 BG 1	2	0.95	0.95	0.89	1.00
CT 6 BG 3	1	0.90	0.90	0.90	0.90
CT 7 BG 1	2	0.93	0.93	0.90	0.95
CT 7 BG 2	2	0.93	0.93	0.86	1.00
CT 8 BG 1	2	0.95	0.95	0.94	0.95
CT 8 BG 2	1	1.00	1.00	1.00	1.00
CT 9 BG 1	2	0.80	0.80	0.75	0.84
CT 10 BG 1	1	0.95	0.95	0.95	0.95
CT 10 BG 2	2	0.93	0.93	0.90	0.95
CT 11 BG 1	1	0.90	0.90	0.90	0.90
CT 13.01 BG 1	1	0.95	0.95	0.95	0.95
CT 13.02 BG 1	1	0.86	0.86	0.86	0.86
CT 14 BG 2	2	0.93	0.93	0.90	0.95

CT, Census Tract; BG, Block Group