PHYSICAL ACTIVITY AND GREENWAY USAGE AMONG PROXIMATE AND NON-PROXIMATE RESIDENTS

by

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Regular physical activity can reduce the risk of obesity and can help people live longer, healthier lives. One mechanism to increase physical activity and reduce the risk of obesity is to facilitate active living. Greenways can be used for active living purposes and can be seen as a strategy for physical activity promotion in a community. More research is needed to quantify the value of greenway development and the ability of greenways to increase physical activity levels in those living proximate to a greenway.

The purpose of this study was to examine the relationship between physical activity levels and residential proximity to a greenway. Proximate was defined as one half mile or less and non-proximate was defined as one half to two miles to a greenway. In addition, the relationship between greenway proximity, overall physical activity levels, and social support were examined. Questionnaires were distributed to adults living within two miles of a greenway located in Greenville, North Carolina using mail and door-to-door administration. T-test analysis indicated that site-specific physical activity such as walking and vigorous physical activity (VPA) were related to greenway proximity. Correlation analysis indicated a relationship between social support and site-specific physical activity on the greenway. However, overall physical activity levels did not increase in respondents living proximate or non-proximate to a greenway.

In conclusion, people who live proximate to a greenway potentially alter their physical activity with greenway usage instead of using other recreational amenities.

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TABLE OF CONTENTS

LIST OF TABLES

CHAPTER 1: INTRODUCTION

The relationship between health and physical activity is well-documented (Hardman & Stensel, 2003 & Sallis, Owen, & Fotheringham, 2000). Frequent physical activity is an important behavior for individual and population health (Haskell et al., 2007). An increase in physical activity has been associated with a lower prevalence of major chronic diseases including cardiovascular disease, type 2 diabetes, and obesity. Achieving an increase in physical activity is one of the most important public health issues in the United States and internationally due to its contribution to premature mortality and economic costs (Brownson, Hoehneer, Day, Forsyth, & Sallis, 2009).

Regular physical activity can reduce the risk of obesity and can help people live longer, healthier lives **(**Ogden, Carroll, McDowell, & Flegal, 2007**).** Obesity has reached epidemic proportions across age, race/ethnic, and socioeconomic groups. Obesity refers to excess fat tissue that leads to the onset of heart disease, type 2 diabetes, and disabilities (Ogden et al., 2007). Obesity is considered to be a body mass index (BMI) of $\geq$30 $kg \cdot m^2$. Obesity is often associated with chronic health conditions. As a result of chronic health conditions associated with obesity, health care costs continue to increase in the United States. According to National Health Accounts (NHA), in 2008 147 billion medical spending dollars were attributed to obesity (Finkelstein, Trogden, Cohen, & Dietz, 2009). Over the past 40 years, the obesity rate has quadrupled in children (from 4.2% to 17%), tripled in adolescents (4.6 to 17.6%), and 64.5% of adults are classified as overweight and obese (Ewing, Killingsworth, Zlot, & Raudenbush, 2003).

One mechanism to increase physical activity is to facilitate active living. Active living is defined as “the integration of physical activity within everyday lives” (Gobster, 2005, p. 368). Leisure programs and parks and recreation settings can aid people to become physically active

and may augment active living to possibly reduce the onset of obesity. Healthy People 2010 (U.S. Department of Health and Human Services, 2000) emphasized that the design of communities and provision of parks, trails, and other recreational facilities can aid people in achieving the recommended amount of daily physical activity. This suggestion relates to built environment features which are community design features such as urban design factors, land use, and available public transportation for a region and the available activity options for people within that space (Booth, Pinkston, & Carlos, 2005). Parks and recreation has collaborated with other government agencies such as task force committees and community services to develop strategies to address the environmental impact of having a variety of recreational facilities available for residents within the built environment.

Greenways are a component of the built environment and can be seen as a strategy for physical activity promotion in a community. A greenway has been defined as "a linear open space along a natural corridor, such as riverfront, stream valley, or ridgeline, or overland along a railroad converted to recreational use, a canal, a scenic road, or other route connecting parks, nature reserves, cultural features, or historic sites with each other with populated areas" (Little, 1990, p. 1). Public parks and recreation staff are typically responsible for the control and maintenance of city recreational facilities including neighborhood parks, trails, and greenways. Greenways have the potential to influence neighborhood accessibility and increase physical activity levels in residents living in close proximity to the space. However, it has not yet been established how greenways can complement built environment features to increase physical activity levels (Coutts, 2008). In addition, few investigations have examined the role of social support in contributing to physical activity in outdoor environments such as parks or trails (Mowen, Orsega-Smith, Payne, Ainsworth, & Godbey, 2007). More research is needed to

quantify the value of greenway development and the ability of greenways to increase physical activity levels in those living in close proximity and those exhibiting social support on greenways. Future research regarding greenway development may help parks and recreation staff and communities quantify the importance of having greenways. In turn, this change may potentially increase physical activity levels specifically for those residents who have social support and those residents living in close proximity to greenways.

Statement of the Problem

Research on park use (e.g., Giles-Corti et al., 2005; Brownson, Baker, Body, Houseman, Brennan & Bacak, 2001; Sallis, Bauman, & Pratt, 1998; Kaczynski, Potwarka, & Saelens, 2008) have primarily focused on large, urban spaces. The current study investigated a city greenway. This research examines the relationship between proximity to greenways and increased levels of physical activity in adults aged 18 and over. This research has the ability to quantify physical activity benefits associated with greenways. More opportunities to be physically active can create a better quality of life for individuals as well as the community.

Purpose of the Study

The primary purpose of this research was to examine the relationship between residents' proximity to greenways and those residents' physical activity levels in an urban city located in eastern, North Carolina. The second purpose of this study was to examine the relationship between social support and resident's physical activity levels. This research may help communities understand the relationship of built environment features such as greenways and its effects on physical activity levels for different sub-groups of residents.

Research Questions

The primary research question was to determine whether having a greenway in close proximity will increase physical activity levels in those residents compared to residents who live farther from the greenway.

I. Is having an accessible greenway within ½ mile *proximity* of residence related to higher physical activity levels in those residents compared to non-proximate residents?

The second research question was to determine whether people who exhibited *social support* would exhibit higher levels of physical activity on the greenway.

II. Is having *social support* related to higher physical activity levels in those proximate residents compared to non-proximate residents?

Hypotheses

H_a^1: Residents who live within one half mile of a greenway will report higher levels of physical activity than non-proximate residents.

H_a^2: Residents who exhibit higher levels of social support will report higher levels of physical activity on the greenway.

Limitations

1. This study was cross-sectional in nature. Causation cannot be determined from the results of the study.
2. The overall total cost of mailing and receiving the questionnaires for data collection was relatively expensive (see APPENDIX A). Thus, this study was limited to 1,011 participants in the mail sample.

3. Using the modified Dillman method for sampling, a measurement error for this study included results from inaccurate answers to questionnaire questions that resulted from biased and poor wording (Dillman, 1991).
4. Research on the built environment has shown that a number of contextual factors such as street connectivity, residential density, land use mix, aesthetics, amenities, and safety are associated with use of physical activity. Measuring all these built environment factors is outside the scope of this study. Therefore, one limitation is that these factors may account for some of the observed difference in greenway use which this study assumed were related to greenway proximity.

Delimitations

1. The sample was limited to English speaking residents who were 18 years of age and older who live within two miles of the South Tar River Greenway located in Greenville, North Carolina.
2. Sampling for door-to-door non-proximate residents was delimited to exclude high crime areas due to safety concerns for volunteers.

Assumptions

1. All participants answered the questions honestly.
2. All answers reported in the self-administered questionnaire reflect the reality of the participants.
3. All participants geographically understood where the greenway was located after reading the description and viewing the enclosed map.

Definitions of terms

Active Living – "the integration of physical activity and fitness into the course of everyday lives" (Gobster, 2005, p. 368).

Body Mass Index (BMI) – A number calculated from a person's height and weight that is a reliable indicator of body fatness for most people and is used to screen for weight categories that may lead to health problems (Centers for Disease Control and Prevention, 2010).

Built Environment – Urban design factors, land use, and available public transportation for a region as well as activity options for people within that space (Booth et al., 2005).

Greenway – "a linear open space established either along a natural corridor, such as riverfront, stream valley, or ridgeline, or overland along a railroad converted to recreational use, a canal, a scenic road, or other route connecting parks, nature reserves, cultural features, or historic sites with each other with populated areas" (Little, 1990, p. 1).

Moderate Intensity Physical Activity – On an absolute scale, physical activity that is done at 3.0 to 5.9 times the intensity of rest including activities such as brisk walking, slow biking, and gardening (Centers for Disease Control and Prevention, 2010).

Obese – Classified as an adult having a body mass index (BMI) of 30 $kg \cdot m^2$ or higher" (Centers for Disease Control and Prevention, 2010).

Overweight – Classified as an adult having a body mass index (BMI) between 25 $kg \cdot m^2$ and 29.9 $kg \cdot m^2$ (Centers for Disease Control and Prevention, 2010).

Obesity – Excess of fat tissue that encourages the onset of type 2 diabetes, heart disease, and disabilities (Ogden et al., 2007).

Physical Activity – Bodily movement produced by skeletal muscles that requires energy expenditure (World Health Organization, 2005).

Proximity – The closeness to parks for residents (Mowen et al., 2007).

Sedentary – "activities that do not increase energy expenditure substantially above the resting level and includes activities such as sleeping, sitting, lying down, and watching television, and other forms of screen-based entertainment" (Pate, O'Neill, & Lobelo, 2008).

Social Support – Resources provided to a person from another person with the goal of improving well-being (Gleeson-Kreig, 2008).

Vigorous Intensity Physical Activity – On an absolute scale, physical activity that is done at 6.0 or more times the intensity of rest including activities such as running, fast biking, and heavy gardening" (Centers for Disease Control and Prevention, 2010).

CHAPTER 2: REVIEW OF LITERATURE

This chapter presents literature on the relationship between physical activity and the built environment, specifically proximity, social support, and greenway use. This chapter covers seven sections. Section one reviews the health benefits associated with physical activity. Section two reviews the relationship between the Social-Ecological Model and its relationship toward greenway use for physical activity. Section three notes components of the built environment that have demonstrated a relationship to physical activity. Section four specifically links the research variable *proximity* to physical activity. Section five specifically links the research variable *social support* to physical activity. Section six reviews research that specifically links greenways to physical activity. The final section reviews studies linking greenways to both research variables *proximity* and *social support*.

Section One: Health Benefits Associated with Physical Activity

According to Behavioral Risk Factor Surveillance System (BRFSS) data, fewer than 20% of adults achieve the recommended amount of regular physical activity on a weekly basis (CDC, 2009). In addition, 25% of all adults are completely sedentary. An increase in physical activity levels among adults has been seen to reduce the onset of major life threatening diseases that include the following: cardiovascular disease, type 2 diabetes, some cancers, and obesity (Schilling, Giles-Corti, & Sallis, 2009). Furthermore, routine physical activity has been shown to improve psychological well-being through reduced stress, depression, and anxiety (Warburton, Darren, Nicol, & Bredin, 2006).

One consequence of low physical activity levels is obesity. The obesity epidemic continues to increase across various age, race/ethnic, and socioeconomic groups. Over the past

four decades, the obesity rate in children has gone from 4.2% to 17%, in adolescents from 4.6 to 17.6%, and 64.5% of adults are classified as overweight and obese (Ewing et al., 2003). With the global rise in obesity, chronic health conditions continue to develop as well as health care costs. Therefore, regular physical activity such as walking has the potential to reduce the risk of obesity and help people live longer, healthier lives.

Leisure programs and parks and recreation settings can help people become physically active. Substantial health benefits appear to occur when going from a completely sedentary lifestyle to introducing moderate amounts of physical activity. For example, walking is physical activity that effectively reduces blood pressure, and decreases the risk of death from cardiovascular disease, cancer, and obesity, while lowering the risk of injury or sudden death (Brownson et al., 2000). Walking is an effective way to become physically active and requires little to no equipment at a low economic cost. Walking is the most common form of physical activity in parks and trails among the general population as well as in older adults, and racial/ethnic minorities (Brownson, et al., 2000). However, until recently, provision of opportunities for walking as a community resource had not been investigated. A growing body of evidence indicates that a range of perceived and objectively measured environmental factors are associated with walking.

Section Two: Social-Ecological Model

The Social-Ecological Model is a framework that has been utilized in academic fields such as public health, epidemiology, and medicine (Stokols, 1996). More recently, the Social-Ecological Model has been utilized in the parks and recreation field for physical activity promotion as it emphasizes built environment features (Kaczynski et al., 2008). The Social-

Ecological Model was created in the mid-1960s and early 1970s based upon early versions of human ecology.

Human ecology is the study of relationships between organisms and the environment. Within ecology, four levels contribute to the model's framework. These include the microsystem, mesosystem, exosystem, and macrosystem. The microsystem focuses on the individual in relationship to the physical features the environment has to offer it. This includes factors such as place, time, physical features, and physical activity (Bronfenbrenner, 1977). The mesosystem involves the relationship between an individual and a structured setting. This includes school, church, workplace, and camp. The exosystem extends upon the mesosytem. The exosystem looks at structured institutions such as government (local, state, and national) in relationship to the individual. Finally, the macrosystem differs from the previous systems mentioned. The macrosystem incorporates all institutional factors contributing to a person's particular behavior. The macrosystem includes structured factors as well as factors affecting public policy.

The Social-Ecological Model was created to give attention to social, institutional, and cultural contexts and how they relate to the environment (Stokols, 1996). The Social-Ecological Model specifically integrates intrapersonal variables, interpersonal factors, cultural factors, and the physical environment to influence behavior (Sallis et al., 1998). The core assumption of the Social-Ecological Model involves a five level model of why a person would or would not participate in a particular behavior. These levels include intrapersonal, interpersonal, institutional, community, and public policy. The intrapersonal level focuses solely on the individual for a behavior change. The interpersonal level involves working in groups to achieve a behavior change. The institutional level involves organization of practice and policy to achieve

an intervention. The community level involves creating target group activities to focus on the problem of concern. Finally, the public policy level involves contacting stakeholders and policy makers to propose legal provisions to a specific behavior. The Adapted Social-Ecological Model of active living developed by Sallis et al. (2006) uses the core concepts of the Social-Ecological Model applied specifically to physical activity and the environment. The Adapted Social-Ecological Model shown in this study is a more updated framework created by the author to help organize this study (see Figure 1 in APPENDIX B).

The Social-Ecological Model is a framework that can be used to promote behavior change in addressing physical activity. Parks and recreation professionals are interested in community efforts to change behaviors. The macrosystem of ecology can promote change in community and public policy to establish construction for new recreation and park developments. The Social-Ecological Model recognizes the influences of multiple domains on human activity (e.g., one's residence, neighborhood workplace, and surrounding communities). Therefore, the Social-Ecological Model has the potential to facilitate a better understanding of the physical and environmental effects on physical activity within parks and recreation settings. The Social-Ecological Model is an appropriate framework for understanding how the number of parks, trails, and greenways may influence physical activity.

Section Three: The Built Environment and Physical Activity

The Social-Ecological Model is a framework that can be utilized in the parks and recreation field to promote built environment features for physical activity. Perceived and objective environmental factors are referred to as the built environment. According to Booth et al. (2005), the built environment includes urban design factors, land use, and available public transportation for a region as well as the available activity options for people within that space.

Three factors in the built environment have consistently demonstrated a relationship with physical activity. These three factors include: street accessibility, residential density, and land use mix. Street accessibility or street connectivity is defined as the length and size of city blocks (Ewing et al., 2003). Residential density is defined as gross and net densities in proportion to the population living in a certain area (Frank, Anresen, & Schmid, 2004). Land use mix is defined as the degree of land that is mixed or balanced within a certain area (Ewing et al., 2003). With increased land use mix, there is a positive association with physical activity (Frank et al., 2004).

Built environment factors such as street accessibility/connectivity, residential density, and land use mix affect physical activity of activity users on the public policy level of the Social-Ecological Model. Other built environment factors such aesthetics/amenities, safety, and proximity affect the built environment of activity users at the community level of the Social-Ecological Model (Sallis et al., 2006). Aesthetics refers to the attractiveness of a facility. In parks and recreation, aesthetics refers to the attractiveness of a park or trail. According to Giles-Corti et al. (2005), attractive public open space is associated with increased physical activity levels. Although neighborhood aesthetics affects physical activity levels, park and trail amenities affect this relationship as well. Amenities refer to the resources available within a given facility. Examples of amenities include: restrooms, sidewalks, bicycle lanes, and bicycle racks. Parks with more facilities and amenities such as adjacent sidewalks have the potential to increase physical activity levels. The presence of trails, paved and unpaved, along wooded areas have been seen to increase physical activity. With a paved trail, individuals are 26 times as likely to use the area for physical activity (Kaczynski et al., 2008). Therefore, parks and trails having facilities with a variety of aesthetics and amenities promote more physical activity for users and impact the built environment.

Safety is another important factor related to physical activity that may occur in parks or trails. People lacking social networks among their neighborhoods often have lower levels of physical activity because of their fear of crime **(**Painter, 1996**).** In this situation, residents are more likely to utilize a park or trail than their neighborhood for physical activity**.** Improvements in lighting have been associated with less crime as well as increasing neighborhood surveillance (Painter, 1996). Physical inactivity is higher among groups who perceive their community as unsafe. Reports of feeling unsafe have been associated with women, older adults, youth, and those with lower educational attainments (Foster & Giles-Corti, 2008).

Built environment factors such as street accessibility/connectivity, residential density, and land use mix affect public policy based physical activity according to the Social-Ecological Model. Other built environment factors such as aesthetics/amenities, safety, and proximity affect community-based physical activity. Social support affects intrapersonal based physical activity according to the Social-Ecological Model and has shown a connection to physical activity levels to people in parks and open spaces. Understanding the different usage rates at parks, trails, and greenways within the built environment is imperative for parks and recreational professionals. In addition, more detailed studies linking proximity and social support to physical activity within greenway settings is beneficial for stakeholders interested in greenway development.

Section Four: Proximity and Physical Activity

Proximity is the distance between places. More specifically within parks and recreation settings, proximity has been defined as the closeness to parks for residents (Mowen et al., 2007). The relationship of proximity to greenspace has been observed among parks, trails, and greenways. Research studies in parks, trails, and greenways have mainly examined the relationship between proximity and user rates and proximity and physical activity.

The relationship between proximity and user rates is well known. Past findings related to proximity and user rates support a general relationship between them (Mowen et al., 2007). Research has shown that proximity to outdoor recreation opportunities is a critical variable for explaining user rates (Godbey, 2009). Since the 1960s, studies have shown an inverse relationship between recreation user rate participation and distance between a place of residence and recreation opportunity (Cicchetti, Seneca, & Davidson, 1969). The relationship between proximity and user rates has been examined across various age groups. Roemmich et al. (2006) summarized that youth having neighborhoods with a greater proportion of park areas were associated with increased usage. Adults who had park access in their neighborhood were more likely to use it (Brownson et al., 2005). Among older adults in Portland, overall walking and user participation was significantly associated with the number of parks and trails within that neighborhood (Fisher, Li, Michael, & Cleveland, 2004). Past studies have mainly observed active forms of user participation such as walking. However, it should be noted that passive forms of user participation such as picnicking have also been observed (Giles-Corti et al., 2005).

The relationship between physical activity and proximity is also well documented. Having accessible parks and trails in close proximity are seen as positive influences toward physical activity participation. A study conducted by Brownson et al. (2005) concluded that adults who used parks in the past month were more than four times more likely to have engaged in physical activity at least five times per week for more than thirty minutes. Close proximity has been commonly associated with higher levels of physical activity. In a national survey of U.S. adults, close distance or walkability to a park or trail was associated with higher levels of physical activity (Brownson et al., 2001).

As noted earlier, proximity has shown a direct relationship between user participation and physical activity. In some instances, proximity has been associated with higher user rates and physical activity across a wide range of populations (Kaczynski & Henderson, 2007). Some studies indicated increased physical activity levels among residents having proximate based recreational based outdoor facilities (Mowen et al., 2007). Other studies have not shown increased physical activity levels among those residents living in close proximity to recreational based outdoor facilities (Kaczynski et al., 2007). Regardless of previous findings, parks, trails, and greenways serve a purpose for influencing physical activity within the built environment. As shown in this section, more research has been conducted on proximity and park-based environments. Less is known about the relationship between proximity and greenway-based environments. Therefore, this research is needed to quantify the importance of proximity specifically on greenways.

Section Five: Social Support and Physical Activity

Social support involves people or resources that have been provided to a person by another person with the goal of enhancing well-being (Gleeson-Kreig, 2008). There are various types of social support which include instrumental, informational, emotional, and appraisal. Instrumental social support involves help in the form of money, time, in-kind assistance, and other explicit interventions on the person's behalf (House, 1981). Informational social support involves telling someone about a program or facility that promotes physical activity. Emotional social support involves calling a friend or family member to see how their physical activity training is going. Appraisal social support is providing encouragement or reinforcement for learning a new activity or skill (Isreal & Schurman, 1990).

Social support from families, spouses, and friends seems to play a significant role in physical activity participation (Courneya & McAuley, 1995; King, Taylor, Haskell, & DeBusk, 1990). Social support has been related to physical activity across a variety of different populations. Various cross-sectional studies have found relationships between social support and physical activity in both male and female adults (Booth, Bauman, Clavisi, & Leslie, 2000). In one study, women stated that social support provided by friends, acquaintances, and family members led to feelings of safety and enjoyment with continued participation in organized park activities (Krenichyn, 2004). In some instances, rather than solely physical activity participation, social support has been associated with higher physical activity levels (Gleeson-Kreig, 2008).

Social support is another factor in determining physical activity participation. As with proximity, there is a direct relationship between social support and physical activity. Social support seems to resemble proximity studies in that they have both provided mixed results regarding the influence of increasing overall physical activity levels in adults (Mowen et al., 2007). Similar to proximity based studies, more research on social support has been conducted in park-based environments. There is little research showing the relationship between social support and physical activity in greenway-based environments. This research is needed to quantify the importance of social support as a factor for greenway usage.

Section Six: Greenways' Association with Physical Activity

Greenways have the potential to promote physical activity with the built environment. A greenway is defined as a linear public open space established either along a natural corridor, such as a riverfront, stream valley, ridgeline, or overland by a railroad right-of-way converted for recreational use or for scenic purposes (Little, 1990). They include trails for active recreation such as walking, running, biking, and skating. Fewer than 5% of users of a greenway use it for

commuting (Lindsey & Nguyen, 2004). Instead, greenways are typically utilized as open-space in connecting parks, nature reserves, cultural features, or historic sites with each other within a populated area (Little, 1990). The evolution of greenways traces back three generations. The first generation of greenways occurred between the 1700s through the 1960s. These greenways were considered boulevards and parkways that connected urban spaces. They represented long-term urban planning creating adaptations for a particular community. The second generation of greenways occurred between 1960 through 1985. These greenways were used for recreational purposes that provided river and railroad access to urban communities. The third generation of greenways started in 1985, which was used for multi-purposes. These greenways were used for wildlife conversation, flood reduction, water quality, and for recreational purposes (Searns, 1995).

More recently, greenways have become one of the fastest growing forms of open space in urban and suburban settings. As parks and trails, greenways are a component of the built environment and are designed to influence accessibility and physical activity (Sallis et al., 1998). Greenways are associated with maintaining recommended levels of physical activity and increasing physical activity achieved through walking (Brownson et al., 2000). Physical activity is thought to be influenced by proximity residentially zoned lands to the greenway and the convenience that this spatial-proximity offers (Giles-Corti & Donovan, 2002). Greenway development can be seen as a strategy for physical activity promotion within a community. Greenway development can promote inaccessible modes of physical activity for residents of a particular city. The potential for greenway use is valuable in an urban and suburban setting due to its localness or proximity to a large number of people.

Greenways have typically been utilized for recreational purposes. These include walking, jogging, biking, inline skating, horseback riding, and other activities. Greenways have the potential to balance accessibility within a city. If a city offers high land use mix and greenway accessibility is provided, more residents will desire to use it. Having a balance of built environment features such as land use mix, residential density, and street connectivity will increase the likeliness for trail use (Frank et al., 2004). Environmental factors including greenways have the potential to increase physical activity among proximate residents.

Section Seven: Greenways' Association with Proximity and Social Support

There appears to be mixed results regarding the relationship between proximity and greenway usage. In some studies, proximity to greenways in residential land areas has been shown to influence physical activity (Giles-Corti et al., 2002; Gold, 1980; Humpel et al., 2004; and Owen, Leslie, Bauman, & Sallis, 2004). Further, studies have shown a demonstrable link between proximity to greenways and physical activity (Brownson et al., 2004; Wolter & Lindsay, 2001). However, other studies have not shown a demonstrable link between proximity to greenways and physical activity (Evenson & Huston, 2005). This literature suggests that more research is needed for clarification on the importance between proximity and greenway use.

Research to date indicates that social support may be equally important as environmental characteristics for physical activity behavior. However, few investigations have examined these variables in public parks or trail environments (Mowen et al., 2007). More specifically, there appears to be even less research regarding the relationship between social support and greenway usage. Past studies have studied social interaction on greenways rather than solely social support on the greenway. In one study, people mentioned positive encounters with people engaged in different activities with families on a greenway (Lee, 1999).

There appears to be little research focused on the relationship between greenway use and proximity and social support. The research that is available tends to have mixed outcomes. Specifically, there is little research established that indicates how proximity encourages greenway use (Coutts, 2008). More research that measures proximity and social support is needed to quantify the importance of greenways toward physical activity.

Conclusion

There is little research focused on the importance of the built environment, and the relationship of greenway development to increased physical activity levels in adults. Research on greenway use has primarily focused on large, urban planning and design rather than community greenway participation for increased physical activity levels. For this study, the Social-Ecological Model has been used solely as an organizing framework for proximity at the community level and for social support at the interpersonal level rather than a testing model. Further, proximity and social support were examined in association with greenway users' physical activity levels. Demographic and contextual variables were also examined at the interpersonal and intrapersonal level of the Social-Ecological Model for further insight about the study population.

CHAPTER 3: METHODOLOGY

The primary purpose of this study was to examine whether residential proximity to the South Tar River Greenway was associated with residents' physical activity on the greenway. The second purpose of this study was to examine whether the presence of social support was related to higher levels of physical activity in those residents compared to non-proximate residents. The research design was a quantitative, non-experimental design. The study used a cross-sectional data collection process. This section will address the implementation of these variables and describe participants, data collection procedures, instrumentation, and analysis.

Study Setting

Data for this study was collected near the South Tar River Greenway located in eastern, North Carolina in the city of Greenville. The total population of Greenville, NC is 84,554 (U.S. Census Bureau, 2010). The residents of Greenville are predominately Caucasian/white (56.3%) or African American/black (37%) (U.S. Census Bureau, 2010). Socioeconomic status within households in Greenville is widely dispersed across various income levels. Seventeen percent of households reported annual earnings of less than $16,000, 14% earned $35,000-$49,999, and 15.4% earned $50,000-$74,999. With regard to marital status, 37.1% of males 18 years and older are married and 30.8% of females 18 years and older are married. With regard to educational attainment, 56% of residents 18-24 years old have either an associate's degree or higher, 22.2% of residents older than 25 years old have a high school diploma, 21.6% have some college or no degree, and 22.6% have a Bachelor's degree (U.S. Census Bureau, 2000).

The South Tar River Greenway was first established in 2009 as a federal funding project passed by Greenville City Council and in collaboration with Greenville Recreation and Parks Department and a not-for-profit organization, Friends of Greenville Greenways (FROGGS). This

organization is an all volunteer organization that fosters awareness of greenways and promotes funding for greenways within the city of Greenville and Pitt County (FROGGS, 2006). Currently, the South Tar River Greenway is a public 1.3-mile linear trail located between a downtown Greenville Park known as the Town Commons and extends through neighborhoods along the Tar River until reaching the Greenville Recreation and Parks Dog Park. A majority of residents who live proximate to the greenway are of low to middle socioeconomic status. Based on the rules and regulations enforced by the Greenville Recreation and Parks Department, pets are allowed on the South Tar River Greenway. Therefore, the South Tar River Greenway is used for multiple recreational purposes including walking, running, biking, skateboarding, inline skating, and dog walking.

Selection of Participants

For this study, 1,011 adult residents between the ages of 18-65 who live within two miles or less of the existing Greenville South Tar River Greenway (Town Commons through the Greenville Recreation and Parks Dog Park) were invited to participate in this study. The research sampling frame was all residents who lived two miles or less to the South Tar River Greenway as determined using Euclidean distance measures based on residential address and geographic information system (GIS) site coordinates. Two miles was chosen as the cutoff distance for sampling in hope to receive adequate representation of residents who lived proximate and non-proximate to the greenway. Proximate residents were considered residents who lived within ½ mile or less and non-proximate residents were considered residents who lived ½ to two miles from the greenway.

Past studies have also used two mile sampling zones to detect users of recreational facilities for physical activity (Diez Roux et al., 2007; Jilcott, Laraia, & Ammerman 2007, and

Sallis et al., 1990). Stratified random sampling was used to identify greater representation between proximate and non-proximate residents. Residents were organized into different sampling zones based on their household's proximity to the greenway. Every 0.25 miles from 0 - 2 miles, participants were randomly selected to participate in the study (e.g., 0 – 0.25 miles, 0.25 miles – 0.5 miles). Using street names, only proximate residents living on the southern side of the Tar River were identified as proximate since no ready access is available to the north side of the river. Half the participants who lived proximate to the greenway were selected for the study and the other half that lived non-proximate to the greenway were selected. Participants were identified and selected within each sampling zone by using a coded GIS database provided in partnership with the city planners of Greenville (see APPENDIX C). The GIS database presented a detailed list of 15,000 addresses of residents who lived within two miles or less to the South Tar River Greenway. Based on the list provided, participants were randomly selected within each sampling zone for the mailing portion of data collection.

Data Collection Procedures

To increase response rates specifically by mail, multiple contacts have been found to be more effective than any other technique (Dillman, 2000). Multiple contacts include cover letters, introductory letters enclosed with questionnaires, and follow-up reminders. In addition to multiple contacts, research indicates that endorsements from external parties who are considered credible will increase response rates (Rockford and Venable, 1995). In studying populations having access to the internet, having both mail and web questionnaires have been seen to be substantial in terms of increasing response rates. In populations having web access, the web questionnaire application has been comparable to mail questionnaires if the mail cover letter notifies respondents of web survey options (Kaplowitz, Hadlock, & Levine, 2004). Also,

providing at least a small amount of monetary incentives for mail questionnaires increases response rates. However, the marginal benefits diminish as the amount of incentives offered increases (Edwards, Cooper, Roberts, & Frost 2005).

In this study, only mail and door-to-door questionnaires were administered to respondents living within two miles or less of the South Tar River Greenway. This study did not use web questionnaires because the City of Greenville lacked access to personal email addresses for homeowners within two miles of the South Tar River Greenway. Therefore, the primary distribution technique was by U.S. mail. The other mode of distribution for data collection was door-to-door distribution in collaboration with FROGGS. Volunteers were sought using an email list of interested participants provided by FROGGS as well as East Carolina University's Volunteer and Service Learning Center. Door-to-door distribution of questionnaires took place in three-hour blocks over five weekends in the fall of 2010. These dates included, September 18, September 26, October 2, October 17, and October 24 (see APPENDIX D).

Houses on each volunteer's list were determined by the researcher. The general area to be surveyed was selected as a cluster by street name from the sampling zone. Within the named cluster, houses were then selected using systematic random sampling. The list of targeted addresses were then given to the volunteers. Volunteers were paired up and received instructions prior to going to selected addresses. During instruction, volunteers were given a schedule, script, and a spreadsheet from Microsoft Excel that showed the specified residential addresses (see APPENDIX D). During the door-the-door distribution, volunteers were encouraged to go to each listed house at least once and return at least once again if no one was home. If residents did not want to complete a questionnaire, then the volunteers marked those residents off the distribution list.

This study was endorsed by East Carolina University (ECU), Greenville Recreation and Parks Department (GRPD), and Friends of Greenville Greenways (FROGGS). GRPD provided monetary incentives by placing the respondents in a drawing to potentially win one of four items. These items included a one week pass to the Greenville Aquatics and Fitness Center, a one day shelter rental at a Greenville park, a round of golf for two at the Bradford Creek Public Golf course, or $10 worth of batting cage tokens at the department's *Sports Connection* facility.

In cooperation with GRPD, a four-page questionnaire was distributed by mail to a stratified random sample of residents living within pertinent sampling zones provided by the city of Greenville's city planners (see APPENDIX E). For this study, 1,011 questionnaires were distributed to this population. Using the modified Dillman method, there were two phases of follow up to promote resident participation in the study. In the initial mailing, the participants received the questionnaire packets with a Greenville Recreation and Parks Department cover letter included (see APPENDIX F). The questionnaire packets included a two-part questionnaire to complete and return through mail to the Department of Recreation and Leisure Studies (RCLS) at East Carolina University (ECU). Typically eight days after the initial mailing, postcards are supposed to be sent to respondents in order to promote completion of the questionnaires packets. However, postcards were not sent out until 16 days after the initial mailing due to delayed printing within the printing and graphics entity. A second round of questionnaires was sent to non-respondents eighteen days after the initial mailing. Finally, data collection was completed 40 days after the initial mailing and sent back to the Department of RCLS at ECU.

The expenses and efforts for this study were provided in partnership with ECU, GRPD, and FROGGS. Collating materials for mailing, data collection, and analysis was provided by

ECU. To lower costs on this project, the following financial expenses were provided in-kind by GRPD: resident database for sampling and GRPD letterhead envelopes. Other financial expenses provided by GRPD included the copying of cover letters and first and second round questionnaires.

Instrumentation

There were two parts to the questionnaire. The first part of the questionnaire consisted of questions of their greenway awareness, greenway usage, and mode of physical activity on the South Tar River Greenway. The residents were asked questions pertaining to their safety on the greenway. Additionally, residents were asked social support questions to see if others encouraged them to be physically active.

The second part of the questionnaire was a modified, short version of the International Physical Activity Questionnaire (IPAQ). The IPAQ short-version asks about time spent in physical activity within the last seven days. It requires the participants to understand the difference between vigorous intensity physical activity and moderate intensity physical activity**.** Definitions of these terms were provided in the questionnaire. Vigorous intensity physical activities are activities such as heavy lifting, aerobics, and fast bicycling. Moderate intensity physical activities are activities such as bicycling and tennis. Finally, the questionnaire asked about how much time was spent walking within the last seven days. In a sample of approximately 2,388 adults in the year 2000 in more than 14 countries, the IPAQ questionnaire produced a validity of 0.8 with Spearman's *p* clustered analysis. Criterion validity had a median *p* of about 0.30 which is comparable to most other self-report validation studies (Craig et al., 2003). The information for this study was obtained about the participants and their physical activity levels on the greenway by slightly modifying the IPAQ instrument. For example, the

IPAQ asks for the number of days, hours, and minutes the respondent was physically active. On this questionnaire, respondents were informed about where the greenway was located. They were asked if they used the greenway for physical activity and were assessed on their greenway-specific physical activity. The IPAQ short form was changed to specify greenway-specific physical activity. For example on the original IPAQ, it asks "During the past seven days, how much time was spent walking, performing moderate, and vigorous physical activity?" On the modified version, respondents were additionally asked, "During the past seven days, how much time was spent walking, performing moderate, and vigorous activity on the greenway?"

Additional contextual questions were included in the questionnaire. These questions included their awareness of the greenway, mode of physical activity, owning or renting their property, a student or non-student, gender, race/ethnicity, age, height and weight to measure body mass index (BMI), socio-economic status, marital status, highest level of education, physical disability, and did their doctor suggest they become more physically active (see APPENDIX E). These contextual variables were included based on their importance in previous research and for the funder's desire.

Contextual Variables

Awareness. Respondents were asked if they had heard of the South Tar River Greenway.

Mode of Activity. Respondents were asked an open-ended question of what type of physical activity they, their spouse, and/or children performed on the South Tar River Greenway.

Safety. Respondents were asked two questions about safety at the South Tar River Greenway. Safety question one (Safety Q1) addressed the following, "Do concerns about safety at the South Tar River Greenway reduce your greenway usage?" Safety question two

(Safety Q2) addressed the following, “Is there too much traffic along the streets to travel to the South Tar River Greenway?” These questions were taken from Kirkland et al. (2003).

Own/Rent. Respondents were asked whether they owned or rented their current home.

Student/Non-student. Respondents were asked whether or not they were a student or non-student.

Gender. Respondents were asked whether they were male or female.

Race/ethnicity. Respondents were asked whether they were Caucasian/white, African American/black, Asian, Hispanic/Non-white, Multi-racial/ethnic, or other.

Age. Respondents were asked to give their age.

Body Mass Index (BMI). BMI is defined as the “number calculated from a person's weight and height” (Centers of Disease Control, 2010). For this study, BMI was measured by asking the respondent their height in inches and their weight in pounds. Height was converted to m^2 and weight was converted to kg for appropriate units of a BMI measurement in $kg \cdot m^2$ units using Predictive Analytic Software statistics (PASW).

Socioeconomic status (SES). SES is defined as “a composite measure that typically incorporates economic status, measured by income; social status, measured by education; and work status, measured by education”. Often researchers use one of the indicators as a measure of SES (Dutton & Levine, 1989). For this study, SES was measured by asking the respondents what was their annual household income.

Marital Status. Marital status is the condition of being married or unmarried. For this study, marital status was measured by asking the respondents whether or not they were married/lived with a partner or single.

Educational Attainment (EA). EA refers to the highest degree of education an individual has completed**.** For this study, EA was measured by asking the respondents their highest level of education in category format duplicated from the U.S. Census 2010.

Physical disability. Respondents were asked whether or not they had a physical disability that prevented them from everyday functioning.

Doctor recommendation to increase physical activity. Respondents were asked whether or not their doctor suggested that they become more physically active.

Independent Variables

Proximity. Proximity is defined as "the closeness to parks for residents" (Mowen et al., 2007). For this study, proximity was considered those residents who lived ½ mile or less on the south side of the South Tar River Greenway. For this study, non-proximate residents were those who lived ½ mile to two miles away from the South Tar River Greenway. Proximity was measured using GIS data sets provided by a city of Greenville GIS Specialist (see APPENDIX C).

Social Support (SS). SS is defined as **"**the resources provided to a person by another person with the goal of enhancing well-being" (Gleeson-Kreig, 2008 p. 1038). More specifically, instrumental social support is defined as "the most concrete direct form of social support, encompassing help in the form of money, time, in-kind assistance, and other explicit interventions on the person's behalf (House, 1981). For this study, instrumental social support was measured by asking the respondents three questions. The first question asked, "Are you encouraged by family members to do physical activities and play sports?" The second question asked, "Have other family members done physical activity and played sports

with you?" The third question asked, "Have other family members done physical activity with you on the greenway?"

Dependent Variables

Vigorous Intensity Physical Activity (VPA). VPA is defined as activity that is done at 6.0 or more times the intensity of rest which includes activities such as running, fast biking, and heavy gardening" (Centers for Disease Control and Prevention, 2010). For this study, VPA was measured by asking two questions. The first question asked, "During the past seven days, how many total days did you do vigorous physical activities like heavy lifting, digging, aerobics, running, or fast bicycling?" The second question asked, "How many days was spent in VPA specifically on the South Tar River Greenway?"

Moderate Intensity Physical Activity (MPA). MPA is defined as 3.0 to 5.9 times the intensity of rest which includes activities such as slow biking and gardening" (Centers for Disease Control and Prevention, 2010). For this study, MPA was measured by asking two following questions. The first question asked, "During the past seven days, how many total days did you do moderate physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis?" The second question asked, "How many days were spent in MPA specifically on the South Tar River Greenway?"

Walking. For this study, walking was measured by asking two questions. The first question asked, "During the past seven days, how many total days did you walk for at least 10 minutes at a time?" The second question asked, "How many days were spent walking specifically on the South Tar River Greenway?"

Analysis

Data was entered into Predictive Analytic Software statistics (PASW) for analysis. For contextual variables, frequency statistics were run to determine characteristics of the population who were using and not using the South Tar River Greenway. A T-test analysis was run to compare perceived safety among proximate and non-proximate residents. For research question one, six T-test analyses were used to compare independent variables: proximate (0 – 0.5 miles) and non-proximate (0.5 - 2 miles) residents in relationship to dependent variables: total days walking, total days in MPA, total days in VPA, greenway-specific walking, greenway-specific MPA, and greenway-specific VPA. For research question two, correlation analyses were used to compare independent variable social support to dependent variables: total days walking, total days in MPA, total days in VPA, greenway-specific walking, greenway-specific MPA, and greenway-specific VPA. An additional frequency was run among the sample to determine the mean and standard deviation for each of the social support questions.

CHAPTER 4: RESULTS

The purpose of this study was to investigate whether living in close proximity to the South Tar River Greenway was associated with adult residents' physical activity on the greenway. This section presents descriptive statistics for contextual variables. Further analysis was conducted to describe respondents' (a) perception of safety on the greenway, (b) preferred mode of physical activity on the greenway, (d) proximity and residents' physical activity levels on the greenway, and (c) social support toward physical activity on the greenway. The primary purpose of this research was to examine the relationship between residents' proximity to greenways and those residents' physical activity levels. The second purpose of this study was to examine the relationship between social support and resident's physical activity levels. All results should be interpreted with caution because of the low number of respondents in relationship to the sample and population as a whole.

Characteristics of Respondents

For the mailing portion of the study, 74 out of 1,011 participants completed the questionnaire for a 7.32% response rate. For door-door administration, 105 participants completed the questionnaire. Data from a total of 179 respondents was collected and analyzed for this study. All respondents lived within an urban city in eastern North Carolina. A summary of these respondents' attitudes and characteristics are presented in Tables 1 and 2. As shown in Table 1, more proximate respondents were female (n=46) than male (n=30) while non-proximate respondents were balanced in gender. Most of the respondents were of white race (n=146) in both the proximate and non-proximate groups. A Chi-Square Analysis showed a significant difference in the ages of the respondents who lived either proximate or non-proximate to the greenway. For the total sample, most respondents were between 18-24 years old (n=54) while

more proximate respondents were between 18-24 years old (n=38) and more non-proximate respondents were greater than 60 years of age (n=23). A significant Chi-Square Analysis result was again observed in responses related to home ownership. More proximate respondents rented their property (n=58) and more non-proximate respondents owned their property (n=64). A significant relationship using Chi-Square analysis was observed between those respondents who were students or non-students compared to those who lived proximate and non-proximate to the greenway. More proximate respondents were students (n=46) and more non-proximate respondents were non-students (n=69).

Table 1

Characteristics of Respondents

	Total		Proximate		Non-proximate	
Category	(n)	%	(n)	%	(n)	%
Gender						
Male	79	45.4	30	39.5	47	49.0
Female	95	54.6	46	60.6	49	51.0
Race/ethnicity						
Caucasian/White	146	84.4	68	89.5	76	80.0
African American/Black	10	5.8	3	3.9	7	7.4
Asian	3	1.7	1	1.3	2	2.1
Hispanic/Non-white	5	2.9	1	1.3	4	4.2
Multi-racial/ethnic	8	4.6	3	3.9	5	5.3
Other	1	0.6	0	0.0	1	1.1
Age*						
18-24	54	32.3	38	49.4	16	18.2
25-34	37	22.2	18	23.4	18	20.5
35-44	14	8.4	5	6.5	9	10.3
45-59	31	18.6	9	11.7	22	25.0
>60	31	18.6	7	9.1	23	26.1
Own or rent*						
Own	83	48.0	19	24.7	64	66.7
Rent	90	52.0	58	75.3	32	33.3
Student or non-student*						
Student	72	41.6	46	59.7	25	26.6
Non-student	101	58.4	31	40.3	69	73.4

*Indicates a significant finding in observed versus expected values when comparing proximate and non-proximate residents using a Pearson Chi-Square analysis (2-sided).

As shown in Table 2, a significant difference was observed for socio-economic status between those who lived proximate and non-proximate to the greenway. Among proximate residents, more respondents reported that they earned less than $10,000 than any other income group (n=37). For the proximate group, more respondents reported earning less than $10,000 than any other group. In the non-proximate group, more respondents reported earning less than 10,000 dollars as well as 50,000-74,999 (n=13). However, the non-proximate group tended to report higher income compared to the proximate group. With regard to marital status, more people were single (n=90) than married or living with a partner (n=74). Proximate respondents tended to be single (n=48) whereas non-proximate respondents reported being married or living with a partner (n=48) more often. People were generally well educated and 160 respondents had some college education or more. A majority of both proximate respondents (n=73) and non-proximate respondents (n=85) had some college education or higher. With regard to body mass index (BMI), almost half of the respondents were in the normal range (n=71). In both the proximate and non-proximate groups, almost half the respondents had a normal range BMI while almost a third in both groups were considered overweight. The majority of respondents did not have a physical disability (n=152) and most respondents' doctors did not recommend physical activity for them (n=112).

Although, not shown in Tables 1 or 2, a majority of respondents who lived both proximate (n=61) and non-proximate to the South Tar River Greenway (n=68) were aware of the greenway. However, these groups appeared different in many ways. For example, almost two-thirds of the proximate respondents indicated that they used the greenway (n=51) while almost two-thirds of the non-proximate respondents had never used the greenway (n=61).

Table 2

Characteristics of Respondents

	Total		Proximate		Non-proximate	
Category	(n)	%	(n)	%	(n)	%
Socio-economic status*						
<10,000	37	25.5	24	34.8	13	17.3
10,000-14,999	13	9.0	11	15.9	2	2.7
15,000-24,999	15	10.3	8	11.6	7	9.3
25,000-34,999	13	9.0	6	8.7	7	9.3
35,000-49,999	19	13.1	9	13.0	10	13.3
50,000-74,999	16	11.0	3	4.3	13	17.3
75,000-99,999	14	9.7	3	4.3	11	14.7
>100,000	18	12.4	5	7.2	12	16.0
Marital status						
Married/living with a partner	74	43.5	25	33.8	48	51.1
Single	90	52.9	48	64.9	41	43.6
Widow/Widower	5	2.9	1	1.4	4	4.3
Divorced	1	0.6	0	0.0	1	1.1
Educational Attainment						
Less than high school graduate	5	2.8	1	1.3	4	4.1
High school graduate	11	6.3	3	3.9	8	8.2
Some college	61	34.7	32	41.6	28	28.9
Associate's degree	13	7.4	5	6.5	8	8.2
Bachelor's degree or higher	86	48.9	36	46.8	49	50.5
Body Mass Index (BMI)						
≤18.5	2	1.4	1	1.4	1	1.3
18.5 – 24.9	71	48.0	36	51.4	35	45.5
25.0 – 29.9	48	32.4	23	32.9	24	31.2
≥30.0	27	18.2	10	14.3	17	22.1
Physical disability						
Does have a physical disability	17	10.1	5	6.8	10	10.6
Does not have a physical disability	152	89.9	68	93.2	84	89.4
Doctor recommendation for PA						
Doctor does recommend PA	49	30.4	23	31.9	25	28.7
Doctor does not recommend PA	112	69.6	49	68.1	62	71.3

* Indicates a significant finding in observed versus expected values when comparing proximate and non-proximate residents using a Pearson Chi-Square analysis (2-sided).

Perceived Safety

Following conversations with officials who manage the greenway, two safety questions were included in the survey instrument. The two safety questions were organized in Likert scale format to indicate how strongly residents agreed or disagreed with the statements. Safety question one (Safety Q1) addressed the following, “Do concerns about safety at the South Tar River Greenway reduce your greenway usage?” Descriptive statistics showed that nearly half of the proximate respondents strongly disagreed (n= 28) while over one-third of non-proximate respondents strongly disagreed (n=25) with Safety Q1. For safety question two (Safety Q2), the respondents were asked, “Is there too much traffic along the streets to travel to the South Tar River Greenway?” Nearly two-thirds of the proximate respondents strongly disagreed with this statement (n=44) while nearly half of the non-proximate respondents disagreed (n=34) with Safety Q2. As shown in Table 3, a T-test analysis was run to compare the two safety questions in relationship to the variables proximate and non-proximate. The T-test analysis showed a significant difference between proximate and non-proximate responders on Safety Q2. Respondents who lived proximate to the greenway felt the space was safe while non-proximate respondents felt like the greenway was less safe.

Table 3

Summary of T-Tests Comparing Respondents' Perception of Safety

	Safety Q1		Safety Q2	
Variables Tested	Mean	SD	Mean	SD
Proximate	2.04	1.05	1.52*	0.82
Non-proximate	2.22	1.13	2.07*	1.19

*Indicates a significant finding with alpha set at .05 level (2-tailed)

Note: Safety Q1 was measured with the question, "Do concerns about safety at the South Tar River Greenway reduce my greenway use. Higher values indicate less safe environments?"

Safety Q2 was measured with the question, "Is there too much traffic along the streets to travel to the South Tar River Greenway?"

Mode of Physical Activity

Respondents were asked to record what type of physical activity they performed on the South Tar River Greenway by writing responses about their own activity, their spouses' activity, and their children's activity. Written responses were combined for each group and added into PASW statistics labeled as mode of physical activity on the greenway. Recorded modes of physical activity on the greenway among respondents included walking, jogging/running, biking, skateboarding, and other physical activity among the respondents. Walking was the most popular mode of physical activity on the greenway among the respondents (n=66), their spouses (n=27), and their children (n=12) as shown in Table 4. Biking was the second most popular mode of physical on the greenway among the respondents (n=40), their spouses (n=8), and their children (n=6).

Table 4

Preferred Mode of Physical Activity on the Greenway

	Myself		Spouse		Children	
Category	(n)	%	(n)	%	(n)	%
Walking	66	44.4	27	62.8	12	50.0
Jogging/Running	33	22.9	7	16.3	5	20.8
Biking	40	27.8	8	18.6	6	25.0
Skateboarding	3	2.1	0	0.0	1	4.2
Other	4	2.8	1	2.3	0	0.0

Research Question Testing

This section was designed to test the following research questions and the related hypotheses.

I. Is having an accessible greenway within ½ mile *proximity* of residence related to higher physical activity levels in those residents compared to non-proximate residents?

II. Is having *social support* related to higher physical activity levels in greenway proximate residents compared to non-proximate residents?

Hypotheses

H_a^1: Residents who live within one half mile of a greenway will report higher levels of physical activity than non-proximate residents.

H_a^2: Residents who exhibit higher levels of social support will report higher levels of physical activity on the greenway.

Proximity

To explore research question one, it was first necessary to modify the independent variable "proximity" into two groups based on their proximity to the greenway, proximate (0 - .5 miles) and non-proximate (0.5 - 2 miles). Once this was completed, this "proximity variable" was used as a grouping variable for an independent-samples T-test to compare dependent variable physical activity according to total days in vigorous physical activity (VPA), VPA days on greenway, total days in moderate physical activity (MPA), MPA days on greenway, total days walking, and walking days on the greenway (see Table 5). The results of these T-tests were used to observe any significant relationships by comparing the mean and standard deviations of the proximate and non-proximate groups to total physical activity intensity and physical activity intensity on the greenway.

As shown in Table 5, the independent-samples T- test did not show higher levels of physical activity among proximate residents in comparison to non-proximate residents. The finding did not support H_a^1. However, a significant relationship was shown between proximate to VPA days on greenway (0.77 days) and non-proximate to VPA days on the greenway (0.19 days) as set as significant at the .05 level (2-tailed). Further, the independent-samples T-test showed a significant relationship between proximate to walking days on greenway (2.09 days) and non-proximate to walking days on greenway (0.47 days). No other significant relationships were observed between the independent variables proximity and non-proximity compared to dependent variable physical activity.

Table 5

Summary of T-Tests Comparing Respondents' Days in Physical Activity

	Total VPA Days		VPA Days on Greenway		Total MPA Days		MPA Days on Greenway		Total Walking Days		Walking Days on Greenway	
Variables Tested	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Proximate	2.42	1.89	0.77*	1.28	2.34	2.05	0.52	1.15	4.75	2.11	1.63*	2.09
Non-proximate	1.88	2.04	0.19*	0.67	2.49	2.26	0.30	0.81	3.91	2.46	0.47*	1.24

*Indicates a significant finding with alpha set at .05 level (2-tailed)

Social Support

Respondents were asked three social support questions. Social Support question one (SS1) asked, "During a typical week, how often has a friend or member of your household encouraged you to do physical activities or play sports?" Social Support question two (SS2) asked, "During a typical week, how often has a friend or member of your household done physical activity or played sports with you?" Social Support question three (SS3) asked, "During a typical week, how often has a friend or member of your household done physical activity with you on the greenway?" Responses were based on one of five answer choices. Choices included none coded as 0; once, coded as 1; sometimes coded as 2; almost everyday coded as 3; and everyday coded as 4.

As shown in Tables 7, 8, and 9, the correlation analyses did not show higher levels of social support among those who exhibited higher levels of physical activity on the greenway. The finding did not support H_a^2. However, as shown in Table 6 (SS1), on average the respondents were encouraged to do physical activities or play sports by a friend or member of the household between once and sometimes each week. For SS2, on average the respondents' friends or members of the household did physical activity or played sports with them once. For SS3, on average the respondents did physical activity on the greenway with either a friend or member of the household less than once a week.

Table 6

Average Social Support Responses among the Sample

	SS1		SS2		SS3	
	Mean	SD	Mean	SD	Mean	SD
Sample	1.97	1.36	1.73	1.32	0.74	1.07

Note: Respondents were asked social support questions and answer choices ranged from none coded as 0, once coded as 1, sometimes coded as 2, almost everyday coded as 3, or everyday coded as 4.

To explore research question two, the three social support questions were compared at all physical activity intensities. Three social support items were entered as the independent variable social support (SS1, SS2, and SS3) and were compared to dependent variable physical activity. The correlation compared social support to total days in VPA, VPA days on greenway, total days in MPA, MPA days on greenway, total days walking, and walking days on the greenway using a correlation analysis test. A small but significant positive correlation was found between social

support question one (SS1) and physical activity. As shown in Table 7, a significant positive correlation was observed between SS1 and total VPA days (r = .235).

Table 7

Correlation between Social Support (SS1) and Days in Physical Activity

Variables Tested	(n)	Sig	r
SS1/Total VPA Days	160	.003	.235**
SS1/VPA Days on Greenway	136	.003	.235**
SS1/Total MPA Days	160	.338	.083
SS1/Total MPA Days on Greenway	125	.301	.082
SS1/Total Walking Days	163	.799	.023
SS1/Total Walking Days on Greenway	129	.054	.151

Note: SS1 was measured with the question, "During a typical week, how often has a friend or member of your household encouraged you to do physical activities or play sports?" Responses ranged from 0-4 with higher values indicating greater support.

**Correlation is significant at the 0.01 level (2-tailed)

*Correlation is significant at the 0.05 level (2-tailed)

A comparison of commonality between SS2 and physical activity indicated low but statistically significant positive correlations (see Table 8). Specifically, SS2 showed a low correlation between total VPA days and physical activity (r = .203). The lowest correlations were observed between SS2 and VPA days on greenway (r = .173), MPA days on greenway (r = .188), and total walking days (r = .157).

Table 8

Correlation between Social Support (SS2) and Days in Physical Activity

Variables Tested	(n)	Sig	r
SS2/Total VPA Days	161	.010	.203**
SS2/VPA Days on Greenway	137	.043	.173*
SS2/Total MPA Days	161	.159	.111
SS2/Total MPA Days on Greenway	126	.035	.188*
SS2/Total Walking Days	164	.044	.157*
SS2/Total Walking Days on Greenway	129	.274	.097

Note: SS2 was measured with the question, "During a typical week, how often has a friend or member of your household done a physical activity or played sports with you?" Responses ranged from 0-4 with higher values indicating greater support.

**Correlation is significant at the 0.01 level (2-tailed)

*Correlation is significant at the 0.05 level (2-tailed)

Larger significant positive correlations were observed between SS3 and physical activity. A positive correlation was observed for total VPA days (r = .338). However, the highest correlations were observed among the following: VPA days on greenway (r = .495), total MPA days on greenway (r = .450), and total walking days on greenway (r = .403).

Table 9

Correlation between Social Support (SS3) and Days in Physical Activity

Variables Tested	(n)	Sig	r
SS3/Total VPA Days	156	.000	.338**
SS3/VPA Days on Greenway	133	.000	.495**
SS3/Total MPA Days	155	.010	.208**
SS3/Total MPA Days on Greenway	123	.000	.450**
SS3/Total Walking Days	158	.196	.103
SS3/Total Walking Days on Greenway	126	.000	.403**

Note: SS3 was measured with the question, "During a typical week, how often has a friend or member of your household done a physical activity on the greenway?" Responses ranged from 0-4 with higher values indicating greater support.

**Correlation is significant at the 0.01 level (2-tailed)

*Correlation is significant at the 0.05 level (2-tailed)

CHAPTER 5: DISCUSSION

The primary purpose of this research was to examine the relationship between residents' proximity to greenways and those residents' physical activity levels. The second purpose of this study was to examine the relationship between social support and resident's physical activity levels on the greenway. Based on the results of this study, it can be inferred that people who live proximate (0 - 0.5 miles) to a greenway are more likely to use it than residents living farther from the greenway. However, it cannot be assumed that peoples' total or net physical activity will increase as a result of having a greenway in close proximity. Further, residents who had social support were more likely to do site-specific physical activity on the greenway when compared to net physical activity.

Summary of Results

This study yielded 179 usable surveys with a relatively high percentage of respondents who were adult (18-24) females of white race. Research has consistently shown that men report higher levels of physical activity compared to women (Hardman et al., 2003; Sallis et al., 2000). However, women have been shown to participate in more physical activity in site-specific locations such as parks when compared to men (Kaczynski et al., 2008). Previous research has shown mixed results in terms of parks and recreation usage among different racial and ethnic groups. In some studies, (Brownson et al., 2000; Furuseth et al., 1991) predominately white populations were the majority of park users. However, other research suggests that African Americans use urban parks and trails at a greater frequency than whites (Paxton, Sharpe, Granner, & Hutto, 2005; Shores & West, 2008; West, 1989).

Further, the respondents in this study generally made lower income earning less than $10,000 annually and had some college education. Previous research has shown that greenway

users are typically employed and have above average education and income (Furuseth et al., 1991; Lindsey et al., 2004). In one particular study, living in close proximity to a multi-use trail was associated with a college degree (Krizek & Johnson, 2006). In this study, it can be implied that more proximate residents were college students. More respondents in the current sample earned less than $10,000 and had not achieved higher levels of education. This could be attributed to the college population who responded in this study.

Key Findings: Perceived Safety and Mode of Physical Activity

Researchers have studied perceived safety to understand the importance of crime, traffic, and lighting toward greenway usage. Research on perceived safety has shown that women and elderly people tend to feel more vulnerable compared to men and adults (Foster et al., 2008). Further, ethnic minorities and lower socio-economic groups are more vulnerable to insecurities about safety (Covington & Taylor, 1991). For this study, a T-test analysis was conducted to compare the relationship between perceived safety and residential proximity. The quantitative data reflected little concern with perceived safety among respondents when asked about safety in their neighborhood and from traffic. However, additional qualitative data was gathered with the survey instrument. Although a full analysis is outside the scope of this paper, qualitative data suggest that respondents had issues with using the greenway at night. Respondents indicated that improving the lighting around the greenway was important for their usage. Street lighting encourages more intensive use of neighborhoods and streets after dark. In addition, good lighting has been shown to reduce crime and fear which increases pedestrian use and reduces the risk of a surprise attacks (Painter, 1996). However, it should be noted that the qualitative data observed was outside the scope of this study.

Researchers have also studied mode of physical activity to understand the importance of these variables toward greenway usage. Walking is the number one mode of physical activity (U.S. Department of Health and Human Services, 1996). Additionally, it is usually performed in neighborhoods and public open spaces (Giles-Corti et al., 2002). For this study, people were more likely to walk or bike in comparison to running and skateboarding for physical activity. Prior research has also shown that the frequency of biking and walking has also exceeded the proportion of runners and skateboarders specifically within multi-use trails (Lindsey et al., 2006).

Key Findings: Proximity and Physical Activity

For this study, there was no indication that the proximate residents had higher physical activity levels compared to non-proximate residents. Thus, H_a^1 was not supported.
This could mean that people who live proximate to the greenway supplement their physical activity toward greenway usage instead of using other recreational amenities. Since non-proximate residents live farther from the greenway, it is likely that they use other recreational amenities to be physically active. However, there still seems to be a connection between physical activity and greenway usage. Kaczynski and Henderson (2007) found 14 of 20 papers that included parks or open space reporting a positive association between proximity and physical activity levels. Proximity has been directly related to the frequency of visitation but not the duration of the park visits (Mowen et al., 2007). In the current study, it should be noted that days in physical activity and greenway physical activity were only measured and not the frequency of physical activity in minutes.

Based on the results of a T-test analysis, people were more likely to do vigorous physical activity (VPA) and walking on the greenway if they lived proximate to the greenway. VPA such

as running has shown a lower frequency of physical activity when compared to moderate physical activity (MPA) such as biking (Lindsey et al., 2006). However, walking is the number one mode of physical activity (U.S. Department of Health and Human Services, 1996). In regards to this study, people were more likely to walk or bike specifically on the greenway compared to other modes of physical activity. In regards to intensity, more people were more likely to report doing VPA compared to MPA. These differences between physical activity mode and intensity could imply that respondents did not understand the difference between VPA and MPA. For future research, it will be imperative that respondents are aware of the difference in intensity between VPA and MPA. For mail questionnaire sampling, it is important to note the difference between VPA and MPA by giving examples. In addition, giving metabolic equivalencies (METs) for both VPA and MPA would be a way for respondents to understand the differences and a way for them to respond more accurately. For door-to-door questionnaire sampling, it is also vital that administrators of the questionnaires mention the difference between the two intensities as well as give examples and MET values of the examples.

Key Findings: Social Support and Physical Activity

Social support has been related to physical activity across a variety of different populations using multiple measures (Hawley & Klauber, 1988; Steptoe et al., 1997). However, few investigations have examined the role of social support in contributing to physically active leisure in outdoor environments such as public parks or trails (Mowen et al., 2007). For this study, there was no indication that residents who exhibited higher levels of social support exhibited higher levels of physical activity on the greenway. In this case, H_a^2 was not supported. However, there were noticeable differences when comparing social support to days on the greenway among when specific activity intensities were examined.

Based on the results of a correlation analysis for this study, there is a relationship between social support and site-specific physical activity on the greenway. However, in this study we cannot assume that living in close proximity to a greenway will increase overall physical activity levels in those residents. Further, higher levels of social support do not exhibit higher levels of physical activity on the greenway. Based on this study, people who have social support and live proximate to a greenway are more likely to use that for physical activity compared to other recreational areas.

Implications for Practice

The results of this study suggest that having greenways located proximate (0 - 0.5 miles) to residences can encourage physical activities such as walking, biking, and running. In addition, if people living proximate to the greenway are aware of it, then perhaps they will be more likely to use it. Increasing awareness of the greenway could be accomplished through several marketing strategies. At the moment, the city of Greenville does not have signs notifying citizens where the greenway is located. Placing city signs along major streets and intersections could increase awareness of the greenway. Additionally, the creation of a city map illustrating where greenways are located could be another marketing strategy to increase awareness for the citizens.

In the current study, more greenway users were of lower income earning less than $10,000 annually. This could be important because greenway access could serve lower income citizens who lack resources for-profit venues to be active. City government and recreation managers should consider greenway development as a way to serve lower income residents. As for data on safety, most people felt safe around the greenway. Some residents suggested increased lighting around and along the greenway. City government and recreation managers

should consider increased lighting in neighborhoods around the greenway to encourage more greenway usage.

The data also suggest that respondents living proximate are more likely to do site-specific physical activity such as walking and VPA on the greenway. Therefore, if a greenway is available, then residents are more likely to use this for physical activity compared to other recreational areas. In addition, residents are more likely to do physical activity such as walking, biking, and VPA such as running on a greenway compared to other recreational areas available to them. This could be useful information in promoting walking and biking programs on greenways in this geographic area.

People were more likely to use the greenway at different physical activity intensities if they had social support. This can imply that if a person living in close proximity to a greenway has some type of social support such as a friend or family member, then this could be influential toward their greenway usage. Social support seems to be a factor in whether or not the residents use the greenway. The establishment of special programs geared toward increasing physical activity through walking and biking could be seen as a strategy to increase physical activity levels by the use of social support. A walking program could be created to initiate site-specific greenway usage for social support. Community walking programs have been used as a way to increase physical activity as well as promote trail and greenway use. In Pennsylvania, trail organizations have established partnerships in small urban, suburban, and rural municipalities in promoting walking and biking trails (Schasberger et al., 2009). Additional programs such as a National Greenway Biking Day could be seen as a strategy to promote bicycle use on the greenway. With the establishment of such programs, research studies could be created to

measure pre and post to determine whether or not these programs have increased physical activity levels among the residents on the greenway.

The Social-Ecological Model should be considered as a guiding framework for city government, urban planners, and parks and recreation professionals in organizing factors for physical activity and greenway usage. In this study, the intrapersonal level was addressed based on contextual variables. For this study, a majority of proximate greenway users were 18-24 year old students who rented and had an income of less than $10,000. The interpersonal level was addressed based on the importance of social support and greenway usage for physical activity. The institutional level was addressed by making recommendations for parks and recreation areas such as greenways to promote physical activity for proximate residents. The community level was addressed based on the importance of proximity and safety for greenway usage. Finally, the public policy level was addressed by encouraging the investment in signs and maps to promote greenway awareness and usage for existing greenways. Further, the promotion of more land development for greenway structures can also be seen as a public policy level issue.

Limitations

As noted in chapter one, this study should be taken with caution due to several limitations. This study had a low sample size (179 respondents). This low sample size could be due to a number of factors related to mailing and door-to-door administration of the questionnaires. Even though the modified Dillman method was utilized for maximizing mail response rates in this study, there was still a low response rate. According to Dillman (2000), self-administered mail surveys can suffer from a variety of errors, especially those associated with low response rates. Some contributors to a low mailing response for this study could be due to bad addresses from GIS data, lack of respondent interest, and little monetary incentive

provided to potential responders. First, the city planner provided GIS data from all city addresses including residential and commercial addresses within two miles of the South Tar River Greenway. It is possible that some GIS addresses were either commercial, homes with no vacancy, or property with no homes. Second, due to an overwhelming amount of mail being given to citizens, respondents could have simply disposed of their questionnaires on both occasions thinking that the mail was of little to no use. Third, even though respondents were notified that they would be entered into a drawing to win a gift prize, this could have been of little incentive to enforce the completion of the questionnaire. Studies have shown that small amounts of money with questionnaires can enforce monetary incentives (Edwards et al., 2005). Therefore, presenting money with the questionnaire could have been a better strategy to promote respondent completion of the questionnaires. For door-to-door surveying, it was a limitation that low-income areas were undersampled with respect to volunteer safety. Fourth, 41.6% of the samples were students who had access to a no-cost recreational facility. Therefore, this sample population could have disregarded the study questionnaire because of their free access to an indoor recreational facility which could have impacted the response rate.

Another limitation discovered after data analysis was the mixed results between mode of physical activity and physical activity intensity. The most prevalent modes of physical activity were walking and biking on the greenway. The most common form of physical activity intensity specifically on the greenway was both VPA and walking. These mixed results could be due to a lack of understanding of the differences between VPA and MPA among the respondents.

Implications for Research

Many implications for research are apparent. First, replicating this study in another city could be beneficial in determining if the study population attributed to the low sample size

specifically for the mailing portion. Also, results tended to be mixed in regards to perceived safety of the residents. This study did not present enough information about safety perceptions of people using the greenway. Future studies should consider using methodologies that measure the perception of safety among residents living close to greenways.

For this study, it is known that people tend to use the greenway more if they live in close proximity to it. However, there were no results reporting that their physical activity levels increased as a result of the greenway development. Future studies should compare net physical activity and site-specific physical activity on the greenway. This information would let researchers and practitioners know if greenway development is attributed to an overall increase in physical activity among residents living in close proximity to it.

There is a lack of research on social support in outdoor environments. Social support has been shown to outweigh the influence of environmental characteristics such as proximity variables (Mowen et al., 2007). For this study, social support seemed to be an influential factor in physical activity on the greenway. Future studies should observe social support's influence on outdoor environments such as greenways. In addition, creating methodologies to determine if social support is a causable factor in determining site-specific physical activity would be beneficial for researchers and practitioners as well.

Concluding Comments

For this particular study, the greenway served as a replacement for physical activity. However, the results from this study did not show higher levels of physical activity among residents living in close proximity to a greenway. Further, higher levels of physical activity were not shown as a result of social support near the greenway. It is important to note that the greenway served lower income populations for both the proximate and non-proximate users. It is

known that obesity rates and health care costs are at an all-time high in the United States (Finkelstein et al., 2009). Therefore, the development of greenways can be used as a strategy in promoting physical activity for lower income residents. Greenway development can further be used as a strategy in reducing the obesity rate and ultimately reducing health care costs.

Previous research on the measurement physical activity and proximity in park environments is well documented. This study was unique in that it was the first greenway study completed in eastern, North Carolina. Further, this study uniquely measured proximity in greenway environments. There is still a gap showing the importance of greenway development on physical activity. Further, this study investigated the relationship between social support and greenway usage. It is vital that researchers continue to study greenway developments' influence on physical activity whether it is through proximity, safety, social support, or other study variables. Understanding the connection between physical activity and greenways can provide future implication for greenway development. Research of this nature is helpful for researchers and practitioners proposing new development of greenways.

REFERENCES

Booth, K.M., Pinkston, M.M., & Carlos Poston, W.S. (2005). Obesity and the built environment. *Journal of the American Dietetic Association, 105,* S110-S117.

Booth, M., Owen, N., Bauman, A., Clavisi, O., & Leslie, E. (2000). Social-cognitive and perceived environment influences associated with physical activity in older Australians. *Preventive Medicine, 28,* 313-323.

Bronfenbrenner, U. (1977). Toward an experimental ecology of human development. *American Psychologist,* 513-531.

Brownson, R.C., Baker, E.A., Boyd, R.L., Caito, N.M., Duggan, K., Housemann, R.A., Kreuter, M.W., Motten, M.T., Pulley, C., Schmid, T.L., & Walton, D. (2004). A community-based approach to promoting walking in rural areas. *American Journal of Preventive Medicine, 27,* 28-34.

Brownson, R.C., Baker, E.A., Houseman, R.A., Brennan, L.K., & Bacak, S.J. (2001). Environmental and policy determinants of physical activity in the United States. *American Journal of Public Health, 91,* 1995-2003.

Brownson, R.C., Boehmer, T.K., & Luke. D.A. (2005). Declining rates of physical activity in the United States: What are the contributors? *Annual Review of Public Health, 26,* 421-443.

Brownson, R.C., Hoehneer, C.M., Day, K., Forsyth, A., & Sallis, J.F. (2009). Measuring the built environment for physical activity. *American Journal of Preventive Medicine, 36,* S99-123.

Brownson, R.C., Hosemann, R.A., Brown, D.R., Jackson-Thompson, J., King, A.C., Malone, B.R., & Sallis, J.F. (2000). Promoting physical activity in rural communities walking trail access, use, and effects. *American Journal of Preventive Medicine, 18,* 235-241.

Centers for Disease Control and Prevention (CDC). Retrieved April, 2010, from http://www.cdc.gov/physicalactivity/everyone/glossary/.

Centers for Disease Control and Prevention (CDC). *Behavioral Risk Factor Surveillance System Survey Data*. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2009.

Cicchetti, C., Seneca, J., & Davidson, P. (1969). *The Demand and Supply of Outdoor Recreation*. New Brunswick, NJ. Rutgers Bureau of Economic Research.

Courneya, J., & McAuley, E. (1995). Cognitive mediators of the social influence-exercise adherence relationship: A test of the theory of planned behavior. *Journal of Behavioral Medicine, 18,* 499-515.

Coutts, C. (2008). Greenway accessibility and physical-activity behavior. *Environment and Planning B: Planning and Design, 35,* 00-00.

Covington, J.M., Taylor, R.B. (1991). Fear of crime in urban residential neighborhoods: implications of between and within-neighborhood sources for current models. *Sociology Quarterly, 32,* 231.

Craig, C.L., Marshall, A.L., Sjostrom, M., Bauman, A.E., Booth, M.L. Ainsworth, B.E., Pratt, M., Ekelund, U., Ungve, A., Sallis, J.F. & Oja, P. (2003). International physical activity questionnaire: 12-county reliability and validity. *Medicine & Science in Sports & Exercise, 3508,* 1381-1395.

Diez Roux A.V., Evenson K.R., McGinn A.P., Brown, D.G., Moore, L., Brines, S., & Jacobs, Jr. D. (2007). Availability of recreational resources and physical activity in adults. *American Journal of Public Health, 97,* 493-499.

Dillman, D.A. (2000). *Mail and internet surveys: The tailored design method* (2nd ed). New York: John Wiley.

Dillman, D.A. (1991). The design and administration of mail surveys. *Annual Review of Sociology, 17,* 225-249.

Dutton, D.B., & Levine, S. (1989). Overview, methodogical critique, and reformulation. In J.P. Bunker, D.S. Gomby, & B.H. Kehrer (Eds.), *Pathways to Health* (pg. 29-69). Menlo Park, CA: The Henry J. Kaiser Family Foundation.

Edwards, P., Cooper, R., Roberts, I., & Frost, C. (2005). Meta-analysis of randomized trials of monetary incentives and response to mailed questionnaires. *Journal of Epidemiology Community Health, 59,* 987-999.

Evenson, K.R., Herring, A.H., & Huston, S.L. (2005). Evaluating change in physical activity with the building of a multi-use trail. *American Journal of Preventive Medicine, 28,* 177-185.

Ewing, R., Schmid, T., Killingsworth, R., Zlot, A., & Raudenbush, S. (2003). Relationship between urban sprawl and physical activity, obesity, and morbidity. *American Journal of Health Promotion, 18,* 47-56.

Finkelstein, E.A., Trogden, J.G., Cohen, J.W., & Dietz. W. (2009). Annual medical spending attributable to obesity: Payer and service specific estimates. *Health Affairs,* 822-831.

Fisher, K.J., Li, F.Z., Michael, Y., & Cleveland, M. (2004). Neighborhood-level influences on physical activity among older adults: A multilevel-analysis. *Journal of Aging and Physical Activity, 12,* 45-63.

Foster, S., & Giles-Corti, S. (2008). The built environment, neighborhood crime and constrained physical activity: An exploration of inconsistent findings. *Preventive Medicine, 47,* 241-251.

Frank, L.D., Anresen, M.A., & Schmid, T.L. (2004). Obesity relationships with community design, physical activity, and time spent in cars. *American Journal of Preventive Medicine, 27,* 87-96.

FROGGS Friends of Greenville Greenways. (2010). Retrieved September 1, 2010. http://www.froggs.org/

Furuseth, O., Altman, R. (1991). Who's on the greenway: Socioeconomic, demographic, and locational characteristics of greenway users. *Environmental Management, 15,* 329-336.

Giles-Corti, B., Broomhall, M.H., Knuiman, M., Collins, C., Douglas, K., Ng, K., Lange, A., & Donovan, R.J. (2005). Increasing walking: how important is distance to, attractiveness, and size of public open space. *American Journal of Preventive Medicine, 28,* 169-176.

Giles-Corti, B., Donovan, R.J., (2002). The relative influence of individual, social, and physical environmental determinants of physical activity. *Social Science and Medicine, 54,* 1793-1812.

Gleeson-Kreig, J. (2008). Social support and physical activity in type 2 diabetes: A social-ecologic approach. *The Diabetes Educator, 34,* 1037.

Gobster, P.H. (2005). Recreation and leisure research from an active living perspective: taking a second look at urban trail use data. *Leisure Sciences, 27,* 367-383.

Godbey, G. (2009). Outdoor recreation, health, and wellness. *Resources for the Future.*

Gold, S. (1980). *Recreation Planning and Design* (McGraw-Hill, New York).

Hardman, A.E., & Stensel, D.J. (2003). *Physical activity and health: The evidence explained.* London: Routledge.

Haskell, W.L., Lee, I., Pate, R.R., Powell, K.E., Blair, S.N., Franklin, B.A., Macera, C.A., Heath, G.W., Thompson, P.D., & Bauman, A. (2007). Physical activity and public health: update recommendation for adults from the American college of sports medicine. *Medicine & Science in Sports & Exercise, 116,* 1423-1434.

Hawley, P.J., & Klauber, M.R. (1988). Health practices and perceptions of social support in persons over age sixty. *Journal of Applied Gerontology. 7,* 205-230.

House, J.S. (1981). *Work, Stress and Social Support.* Reading MA: Addison Wesley.

Humpel, N., Owen, N., Leslie, E., Marshall, A., Bauman, A., & Sallis, J. (2004). Associations of location and perceived environmental attributes with walking in neighborhoods. *American Journal of Health Promotion, 18,* 239-242.

Isreal, B., & Schurman, S., 1990. Social support, control, and the stress process. *Health Behavior and Health Education: Theory Research and Practice.* K. Glanz, F. Lewis and B. Rimer. San Francisco, CA, Jossey-Bass Publishers. p. 187-215.

Jilcott S.B., Evenson K.R., Laraia B.A., & Ammerman, A.S. (2007). Association between physical activity and proximity to physical activity resources among low-income, midlife women. *Preventive Chronic Disease, 4,* A04.

Kaczynski, A.T., & Henderson, K.A. (2007). Environmental correlates of physical activity: A review of evidence about parks and recreation. *Leisure Sciences, 29,* 315-354.

Kaczynski, A.T., Potwarka, L.R., & Saelens, B.E. (2008). Association of park size, distance, and features with physical activity in neighborhood parks. *American Journal of Public Health, 98,* 1451-1456.

Kaplowitz, M.D., Hadlock, T.M., & Levine, R. (2004). A comparison of web and mail survey response rates. *Public Opinion Quarterly, 68,* 94-101.

King, A., Taylor, C., Haskell, W., & DeBusk, R. (1990). Identifying strategies for increasing employee physical activity levels: Findings from the Stanford/Lockheed exercise survey. *Health Education Quarterly, 17,* 269-285.

Kirkland, K.A., Porter, D.E., C.L., Neet, M.J., Williams, J.E., Sharpe, P.A., Neff, L.J., Kimsey, Jr, C.D., & Ainsworth, B.E. (2003). Environmental measures of physical activity supports: Perception versus reality. *American Journal of Preventive Medicine, 24,* 323-331.

Krenichyn, K. (2004). Women and physical activity in an urban park: Enrichment and support through an ethic of care. *Journal of Environmental Psychology, 24,* 117-130.

Krizek, K.J., & Johnson, P.J. (2006). Proximity to trails and retail: Effects on urban cycling and walking. *Journal of American Planning Association, 72,* 33-41.

Lee, B.K. (1999). The dynamic nature of emotions during a trail-based leisure experience: an application of affect control theory (ACT). Unpublished Doctoral Dissertation, Department of Recreation, Park and Tourism Sciences, Texas A&M University, College Station, TX.

Lindsey, G., Han, Y., Wilson, J., & Yang, J. (2006). Neighborhood correlates of urban trail use. *Journal of Physical Activity and Health, 1,* S139-S157.

Lindsey, D.B. & Nguyen, B.L. (2004). Use of greenway trails in Indiana. *Journal of Urban Planning and Development,* 213-217.

Little, C.E. (1990). Greenways for America. *John Hopkins University Press,* Baltimore, MD.

Mowen, A., Orsega-Smith, E., Payne, L., Ainsworth B., and Godbey, G. (2007). The role of park proximity and social support in shaping parks visitation, physical activity, and perceived health among older adults. *Journal of Physical Activity and Health, 4,* 167-179.

Ogden, C.L., Carroll. M.D., McDowell, M.A., & Flegal, K, M. (2007). Obesity among adults in the United States— no change since 2003–2004. NCHS data brief no 1. Hyattsville, MD: National Center for Health Statistics.

Owen, N., Humpel, N., Leslie, E., Bauman, A., & Sallis, J.F., (2004). Understanding environmental influences on walking: Review and research agenda. *American Journal of Preventive Medicine, 27,* 27-76.

Painter, K., (1996). The influence of street lighting improvements on crime, fear and pedestrian street use, after dark. *Landscape Urban Planning, 57,* 193-201.

Pate, R.R., O'Neill, J.R., & Lobelo, F. (2008). The evolving definition of ''sedentary.'' *Exercise Sport Science, 36*(4), 173-178.

Paxton, R.J., Sharpe, P.A., Granner, M.L., Hutto, B. (2005). Associations of sociodemographic and community environmental variables to use of public parks and trails for physical activity. *International Journal Health Promotion Education, 43,* 108-116.

Rockford, L., & Venable, C.F. (1995). Surveying a targeted population segment: The effects of endorsement on mail questionnaire response rate. *Journal of Marketing Theory and Practice, 3*(2), 86-97.

Roemmich, J. N., Epstein, J.H., Raja, S., Yin, L., Robinson, J., & Winiewicz, D. (2006). Association of access to parks and recreational facilities with the physical activity of children. *Preventive Medicine, 43,* 437-441.

Sallis J.F., Bauman A., & Pratt, M. (1998). Environmental and policy interventions to promote physical activity. *American Journal of Preventive Medicine, 15,* 379-397.

Sallis, J.F., Cervero, R.B., Ascher, W., Henderson, K.A., Kraft, M.K. & Kerr, J. (2006). An ecological approach for creating active living communities. *Annual Review Public Health,* 27, 297-322.

Sallis, J.F., Hovell, M.F., Hofstetter, C.R., Elder, J.P., Hackley, M., Caspersen, C.J., & Powell, K.E. (1990). Distance between homes and exercise facilities related to frequency of exercise among San Diego residents. (1990). *Public Health Rep, 105,* 179–85.

Sallis, J. F., Owen, N., & Fotheringham, M.J. (2000). Behavioral epidemiology: A systematic framework to classify phases of research on health promotion and disease prevention. *Annals of Behavioral Medicine, 22,* 294-298.

Schasberger, M.G., Hussa, C.S., Polgar, M.F., McMonagle, J.A., Burke, S.J., & Gegaris, A.J. (2009). Promoting and developing a trail network across suburban, rural, and urban communities. *American Journal of Preventive Medicine, 37,* S336-344.

Schilling, J.M., Giles-Corti., & Sallis, L.F. (2009). Connecting active living research and public policy: Transdiciplinary research and policy interventions to increase physical activity. *Journal of Public Health. 30,* S1-S15.

Searns, R. M. (1995). The evolution of greenways as an adaptive urban landscape form. *Landscape and Urban Planning,* 65-80.

Shores, K.A., & West, S.T. (2008). The relationship between built park environments and physical activity in four park locations. *J Public Health Management Practice, 14,* E9-E16.

Steptoe, A., Wardle, J., Fuller, R., Holte, A., Justo, J., Sanderman, R., & Wichstrom, L. (1997). Leisure-time physical exercise: Prevalence, attitudinal correlates, and behavioral correlates among young Europeans from 21 countries. *Preventive Medicine, 26,* 845-854.

Stokols, D. (1996) Translating social ecological theory into guidelines for health promotion. *American Journal of Health Promotion, 10,* 282-298.

U.S. Census Bureau, (2010). *Census Redistricting Data for Greenville, N.C.* (Public Law 94-171). Summary File, Tables P1, P2, P3, P4, H1. Retrieved March 31, 2011.

U.S. Census Bureau. (2000). *State & County Quickfacts: Pitt County, N.C.* Retrieved May 27, 2010, from http://quickfacts.census.gov.

U.S. Department of Health and Human Services. (2000). *Healthy People 2010: Understanding and Improving Health.* Washington, D.C: U.S. Government Printing Office.

U.S. Department of Health and Human Services. (1996). Physical activity and health: A report of the surgeon general. Atlanta, GA., U.S. Department of Health and Human Services: Centres for Disease Control and Prevention.

Warburton, Darren E.R., Nicol, C.W., & Bredin, Shannon S.D. (2006). Health benefits of physical activity: The evidence. *CMAJ, 174,* 801-809.

West, P.C. (1989). Urban region parks and black monitories: subculture, marginality, and interracial relations in park use in the Detroit metropolitan area. *Leisure Sciences, 11,* 11-28.

Wolter, S. & Lindsey, G. (2001). Summary report Indiana trails study. Eppley Institute for Parks and Public Lands, Indiana University, Bloomington, IN.

World Health Organization. (2005). *Preventing Chronic Diseases: A Vital Investment.* Geneva, Switzerland: World Health Organization.

APPENDIX A: PROPOSED COST OF STUDY

EXPENSES	COST	ECU	GRPD
Resident Database	In kind		In kind
GRPD Letterhead Envelopes	In kind		In kind
Business Reply Envelopes	$440	✓	
Copying of Cover Letters	# sent x 4¢ per page x # of pages 1000 x .04 x 1 = $40		✓
Copying of Questionnaires	# sent x 4¢ per page x # of pages 1000 x .04 x 4 = $160		✓
Copying of Postcards (Cardstock)	# sent x 4¢ per page x # of pages 1000 x .04 x 1 = $40	✓	
Copying of 2nd Round Questionnaires	# sent x 4¢ per page x # of pages 1000 x .04 x 4 = $160		✓
Collating Materials for Mailing	Provided by graduate student	✓	
Postage (Questionnaires) *Bulk rate for Postage	# sent x current postage x mailing 1000 x .28 x 1 = $280		✓
Postage (Postcards) *Bulk rate for Postage	# sent x current postage x mailing 1000 x .28 x 1= $280	✓	
Postage (2nd round Questionnaires) *Bulk rate for Postage	# sent x current postage x mailing 1000 x .28 x 1 = $280		✓
Questionnaire Incentives			In kind
Estimated Faculty Time Estimated Graduate Student Time	Hourly wage x estimated hours $30 x 83 hours= $2,490 $12 x 83 hours = $996	✓	
TOTAL	**$4,796**	**$4,246**	**$920**

APPENDIX B: ADAPTED SOCIAL-ECOLOGICAL MODEL OF ACTIVE LIVING

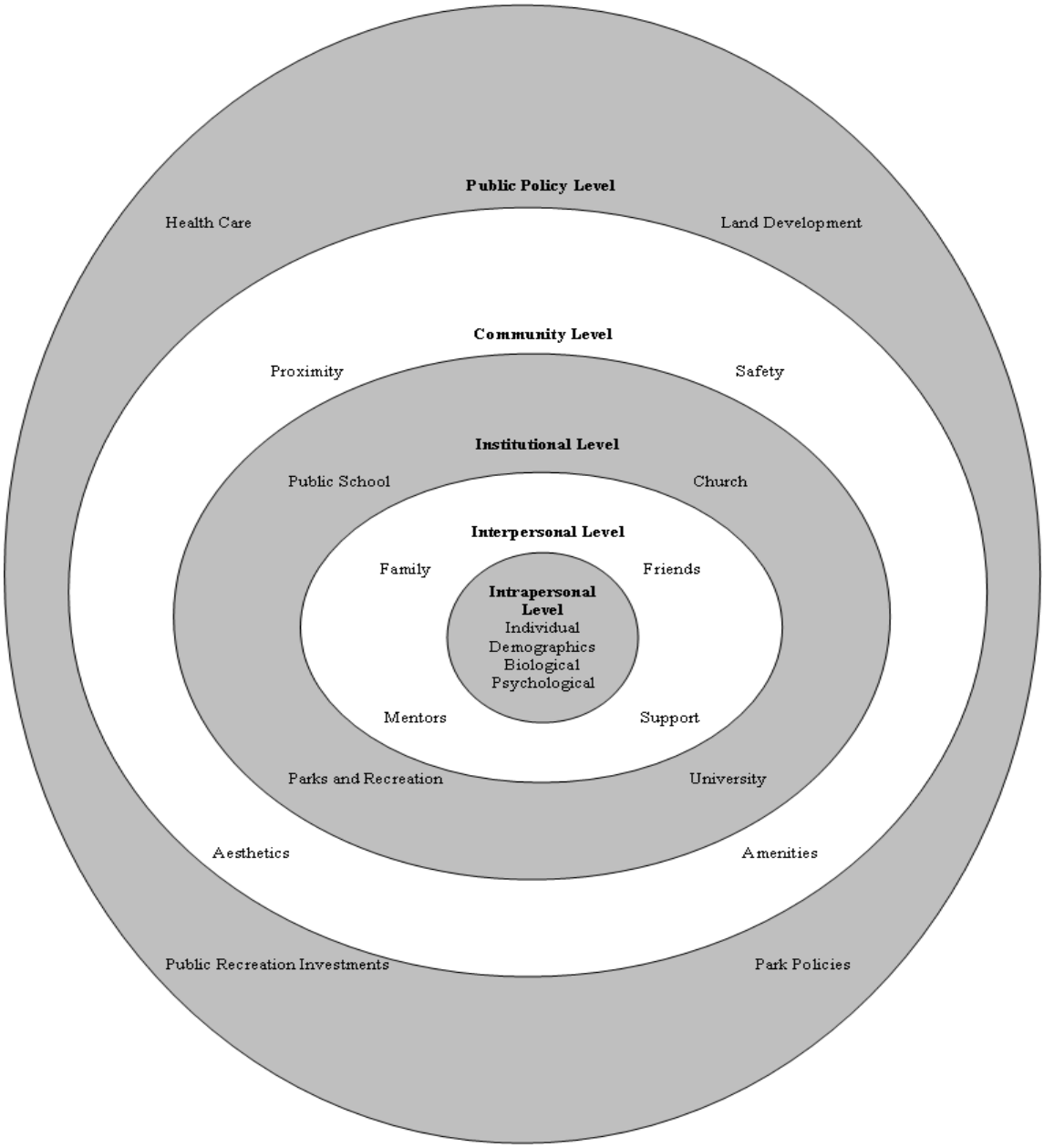
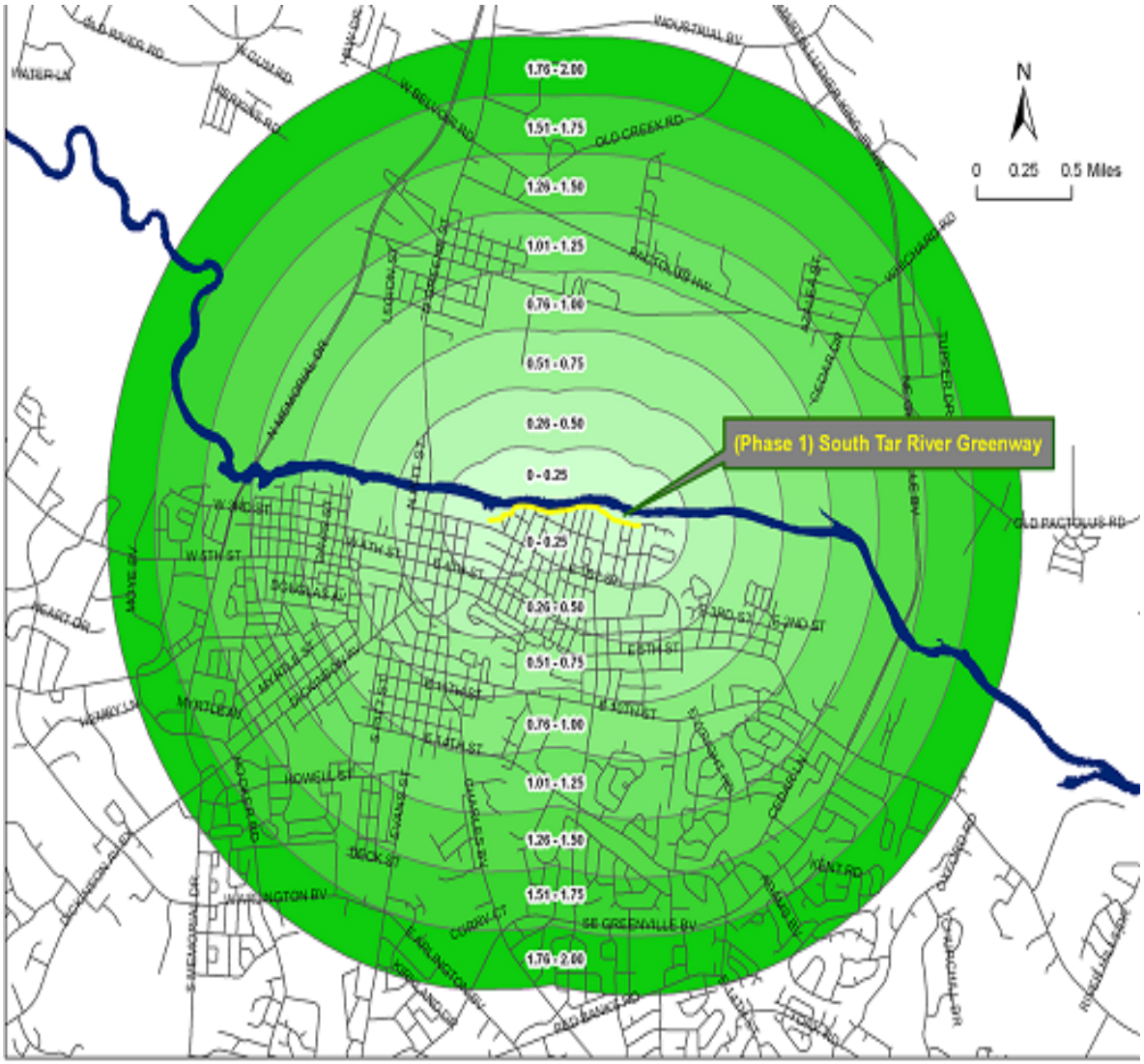


Figure 1. Adapted Social-Ecological Model of Active Living. Adapted from "An ecological approach for creating active living communities by Sallis et al. (2006). *Annual Review Public Health,* 27, p. 301.

APPENDIX C: SOUTH TAR RIVER GREENWAY SAMPLING ZONES



APPENDIX D: VOLUNTEER INFORMATION

****Volunteer Service Needed****

Name of the event: South Tar River Greenway Research Study

Dates needed for volunteers: 9/18/10, 9/26/10, 10/2/10, 10/17/10 and 10/24/10

Location of event: Volunteers will meet at FROGGS map located at the Greenville Town Commons Bridge and will be split up into partners.

Number of volunteers needed: Four groups of two for each specific date for a total of 24 volunteers with the exception of the rain date in which eight volunteers will also be needed.

Task volunteers will be performing: Volunteers will need to meet at arrival time in order to get instructions. Volunteers will be given local addresses and surveys for residents living two miles or less to the South Tar River Greenway. Within that block of time, volunteers will be responsible for pairing up with a partner and going to the listed addresses and asking the specific residents survey questions pertaining to a physical activity and demographic research study funded by East Carolina University, Greenville Recreation and Parks, and in affiliation with the FROGGS group. Volunteers will be given snacks and refreshments for their participation.

Time of arrival for volunteers: Saturday, 9/18/10 - 12:45 PM, Sunday, 9/26/10 - 12:45 PM, Saturday, 10/2/10 - 9:45 AM, Sunday, 10/17/10 – 12:45 PM, and Sunday, 10/24/10 – 12:45 PM

Time of departure for volunteers: Saturday, 9/18/10 - 4 PM, Sunday, 9/26/10 - 4 PM, Saturday, 10/2/10 - 1 PM, Sunday, 10/17/10 – 4 PM, and Sunday, 10/24/10 – 4 PM

Contact person: Chip Davis

Contact person' phone number or email address: 252-412-8887 (Cell) and davisc06@students.ecu.edu

Schedule of Volunteer Service for Greenway Study

Arrival Time: Arrive 15 minutes early. Volunteers will be given instructions for the day.

Volunteer Time: Volunteers will be walking door-to-door to appropriate addresses for a three hour time period. The goal is to obtain 30 surveys within the three hour time period. Therefore, try to stay no longer than 5-6 minutes within each household.

*If any questions arise, feel free to call Chip Davis at 252-412-8887 or Dr. Kindal Shores at 252-917-0434 on their cell phone.

*After three hours is complete, volunteers can make their way back to the Greenville Town Commons parking lot.

Departure Time: 5-15 minutes after the three hour period. Volunteers will hand in their surveys to either Chip Davis or Dr. Kindal Shores once returning.

Refreshments will be provided once returning.

Script for Door-to-Door Survey Volunteers

1) Hello, my name is (name) and I'm with East Carolina University and the Greenville Recreation and Parks Department. We are conducting an educational research project examining physical activity levels associated with usage on the South Tar River Greenway. May I take a minute to describe the study and invite you to participate? *(If yes, then continue, if no, say thank you for your time and continue to the next address).*

2) This study is focusing on your physical activity levels on and off the South Tar River Greenway. This greenway is approximately 1.3 miles located between the Greenville Town Commons and Greenville Dog Park (refer to the map below if needed). If you are not 18 years old, we ask that you give the survey to someone else in your household (age 18 or above) who is here. By completing this survey, you will be entered into a drawing with the possibility of winning a Greenville Recreation and Parks gift certificate. Survey results will help inform the development decisions and site management in your nearby parks and greenways.

3) The survey includes questions about your physical activity, safety, and demographics. Please be assured that your name does not appear anywhere on the survey – this survey is totally confidential. Therefore, we hope you will answer all of the questions, but you may skip any question you do not wish to answer. We would like to ask you the questions now and it should take between 5-6 minutes to complete. However, we will be happy to leave the survey here and pick up within the next hour if desired.

4) Begin asking the survey questions.

*If inclement weather develops, please return back to your car by the Greenville Town Commons as timely as possible or seek immediate shelter.

APPENDIX E: SURVEY INSTRUMENT

Thank you for taking the time to complete this survey! It should only take you 5-8 minutes to complete. Specifically, this study is focusing on your physical activity levels on and off the South Tar River Greenway. This greenway is approximately 1.3 miles located between the Greenville Town Common and Greenville Dog Park (refer to the map below). If you were out of town this past week, please give the survey to someone else in your household (age 18 or above) who was in town. By completing this survey, you will be entered into a drawing for one of four Greenville Recreation and Parks gift prizes. Survey results will help in the decision-making and site management for your nearby greenways.

Part One: In this section we ask about your knowledge of and use of the South Tar River Greenway.

Have you ever heard of the South Tar River Greenway located between the (Greenville Town Commons and Greenville Dog Park)? – **Mark one box**. □ Yes □ No

➡ If yes, do you ever use the South Tar River Greenway? □ Yes □ No

Have you ever used the South Tar River Greenway for physical activity? – **Mark one box**. □ Yes □ No

Who in your immediate family uses the greenway? – **Mark all that apply**.
□ Myself □ Spouse □ Children

If applicable, what type of physical activity are **you** doing on the South Tar River Greenway?

_____

_____

If applicable, what type of physical activity is your **spouse** doing on the South Tar River Greenway?

_____

_____

If applicable, what type of physical activity are your **children** doing on the South Tar River Greenway?

_____

_____

Please indicate how strongly you agree with each of the following statements:	**Strongly Disagree** **1**	**Somewhat Disagree** **2**	**Somewhat Agree** **3**	**Strongly Agree** **4**
Concerns about safety at the South Tar River Greenway reduce my greenway use.	O	O	O	O
There is too much traffic along the streets to travel to the South Tar River Greenway.	O	O	O	O

DURING A TYPICAL WEEK, how often has a friend or member of your household:

	None	Once	Sometimes	Almost everyday	Everyday
Encouraged you to do physical activities or play sports	□0	□1	□2	□3	□4
Done a physical activity or played sports **with you**?	□0	□1	□2	□3	□4
Done a physical activity **with you on the greenway?**	□0	□1	□2	□3	□4

Which friend(s) or member(s) of your family is/are helping you be physically active?

Part Two: In this section, we are interested in your general physical activity and the physical activity you do on the South Tar River Greenway.

Think about all the **vigorous** activities that you did in the **last 7 days**. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling?

_____ **days per week** _____ **days on South Tar River Greenway**

How much time did you usually spend doing **vigorous** physical activities such as running, or fast bicycling on one of those days?

_____ **hours per day** _____ **minutes per day** _____ **Don't know/Not sure**

How much total time did you spend doing vigorous physical activity on the Tar River Greenway?

_____ **hours per day** _____ **minutes per day**

Think about all the **moderate** activities that you did in the **last 7 days**. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

_____ **days per week** _____ **days on South Tar River Greenway**

How much time did you usually spend doing **moderate** physical activities on one of those days?

_____ **hours per day** _____ **minutes per day** _____ **Don't know/Not sure**

How much total time did you spend doing moderate physical activity such as fast- paced walking on the South Tar River Greenway?

_____ **hours per day** _____ **minutes per day**

Think about the time you spent **walking** in the **last 7 days**. This includes at work and at home, walking to travel from place to place, and any other walking that you might do solely for recreation, sport, exercise, or leisure.
During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time?

_____ **days per week** _____ **days on South Tar River Greenway**

How much time did you usually spend **walking** on one of those days?

_____ **hours per day** _____ **minutes per day** _____ **Don't know/Not sure**

How much total time did you spend walking on the South Tar River Greenway?

_____ **hours per day** _____ **minutes per day**

Do you currently own or rent this property? □Own □Rent

Describe your current status? □Student □Non-student

What is your gender? □Male □Female

What is your race/ethnicity?

□ Caucasian/White □ African American/ black □ Asian

□ Hispanic/Non-white □ Multi-racial/ethnic □ Other

What is your age? ____ What is your height? ____ft ____in What is your weight? ____lbs

Approximately, what is your household income per year?
□Less than $10,000 □$35,000-$49,999
□$10,000-$14,999 □$50,000-$74,999
□$15,000-$24,999 □$75,000-$99,999
□$25,000-$34,999 □$Greater than $100,000

Which of the following best describes you?
□Married/Living with a partner □Single

What is your highest level of education?
□Less than high school graduate □Some college □Bachelors' degree or higher
□High school graduate □Associate's degree

Do you have a physical disability? □Yes (please describe) _____ □No

Did your doctor suggest that you become more physically active? □Yes □No

Please provide any additional comments about the greenway regarding safety, access, or other issues for the Greenville Recreation and Parks Department.

_____

_____

_____

_____

_____

_____

Thank you for participating in the survey.

APPENDIX F: LETTER DISPURSED TO RESPONDENTS

September 22, 2010

Dear Resident of Greenville:

The City of Greenville is preparing to make extend the South Tar River Greenway, which is located in your area. To understand how these changes may impact you and your household, we are requesting your help!

We would like you to complete the enclosed questionnaire, which asks some simple demographic questions as well as questions on your physical activity levels and other issues. We have sent this survey to households in Greenville that are within two miles of the existing South Tar River Greenway. Your input will help us understand your current greenway use and how the greenway extension may impact your neighborhood.

The questionnaire should be completed by a member of your family who is 18 years of age or older. The survey can then be returned in the enclosed postage-paid envelope. Your input will be completely confidential. Participation is voluntary and participants will be entered into a drawing for one of the following items: a one week pass to the Greenville Aquatics and Fitness Center, a one day shelter rental at a departmental park, a round of golf for two at the Bradford Creek Public Golf Course, or $10 worth of batting cage tokens at the department's *Sports Connection*. Completing the questionnaire will only take a few minutes, and will allow you to have a say in recreation and community planning in Greenville. Of course, you may skip any question that makes you uncomfortable.

The information you provide will be very helpful to us as we plan recreation and park services and facilities for our residents. Your opinion counts!

Sincerely,

Gary Fenton

APPENDIX G: IRB APPROVAL FORM

See attached.

EAST CAROLINA UNIVERSITY
University & Medical Center Institutional Review Board Office
1L-09 Brody Medical Sciences Building• 600 Moye Boulevard • Greenville, NC 27834
Office 252-744-2914 • Fax 252-744-2284 • www.ecu.edu/irb

Date: September 23, 2010

Principal Investigator: Chip Davis
Dept./Ctr./Institute: 2404 Carol Belk Building
Mailstop or Address: ECU—Mailstop 540

RE: **Exempt Certification**
UMCIRB# **10-0466**
Funding Source: ECU/Greenville Recreation & Parks Dept., Greenville, NC

Title: "Leisure-Time Physical Activity Associated with Greenway Usage Among Proximate and Non-Proximate Residents"

Dear Chip Davis:

On 9.22.10, the University & Medical Center Institutional Review Board (UMCIRB) determined that your research meets ECU requirements and federal exemption criterion #2 which includes research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects and any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

It is your responsibility to ensure that this research is conducted in the manner reported in your Internal Processing Form and Protocol, as well as being consistent with the ethical principles of the Belmont Report and your profession.

This research study does not require any additional interaction with the UMCIRB unless there are proposed changes to this study. Any change, prior to implementing that change, must be submitted to the UMCIRB for review and approval. The UMCIRB will determine if the change impacts the eligibility of the research for exempt status. If more substantive review is required, you will be notified within five business days.

The UMCIRB Office will hold your exemption application for a period of five years from the date of this letter. If you wish to continue this protocol beyond this period, you will need to submit an Exemption Certification Request at least 30 days before the end of the five year period.

Sincerely,

Chairperson, University & Medical Center Institutional Review Board

Cc: Dr. Kindal Shores