Atlanta BeltLine Eastside Trail: Population Comparison Measuring Changes in Behavior Related to Health

Contract Research
Final Report
Sponsored by: Kaiser Permanente Georgia

December 31, 2012

Center for Quality Growth and Regional Development
Georgia Institute of Technology
College of Architecture
Center Director: Catherine L. Ross, Ph.D., Harry West Professor
760 Spring Street, Suite 213
Atlanta, GA 30308
P: 404.385.5133
F: 404.385.5127
E: cqgrd@coa.gatech.edu
W: www.cqgrd.gatech.edu

Principal Investigator:
Sarah M. Smith, Research Scientist II

Co-Principal Investigator:
Catherine L. Ross, Ph.D., Harry West Professor
Director of the Center for Quality Growth and Regional Development

Co-Investigator:
Michael Elliott, Ph.D.
Associate Director of the Center for Quality Growth and Regional Development

Research Assistants:
Alexandra Frackelton
Anna Harkness
Arthi Rao

“Atlanta BeltLine Eastside Trail: Population Comparison Measuring Changes in Behavior Related to Health” was created by the Georgia Institute of Technology’s Center for Quality Growth and Regional Development (CQGRD).

DISCLAIMER: The contents of this report reflect the views of the authors who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of Kaiser Permanente Georgia. This report does not constitute a standard, specification, or regulation.

Table of Contents

Table of Contents 4
List of Tables 5
List of Figures 5
1. Introduction 8
1.1 History of the Atlanta BeltLine and the Eastside Trail 8
1.2 Research Objectives and Methodology 12
1.3 Report Organization 14
2. Public Health and the BeltLine Eastside Trail 15
2.1 Connecting Public Health and the Built Environment 15
2.2 Physical Activity and Health 16
2.3 Trails and Health 18
2.4 Trail Safety and Security 20
2.5 Trail Accessibility 22
2.6 Commuting Patterns and Active Travel 23
2.7 Neighborhood Characteristics 25
2.8 Social Capital and Mental Health 26
2.9 Socioeconomic Status and Health 29
2.10 Special Populations and Physical Activity 31
3. Household Pre- and Post- Impact Health Behavior 33
3.1 Methodology 33
3.2 Target Populations 34
3.3 Household Sample Survey Results 34
4. Centers of Hope Pre- and Post-Impact Health Behavior 64
4.1 Methodology 64
4.2 Target Populations 65
4.3 Centers of Hope Families Survey Results Summary 65
4.4 Child Survey Results 67
4.4 Adult Survey Results 69
5. Conclusion 81
5.1 Residential Household Sample and Centers of Hope Survey Results Comparison 81
5.2 Analysis of Initial and Follow-up Survey Results 82
5.3 Recommendations and Conclusion 84
6. References 87

List of Tables

Table 1: Reported physical activity of all survey respondents 36
Table 2: Responses to "Have your family members/friends/doctor encouraged you to be more physically active?" stratified by respondents' level of physical activity. 40
Table 3: Responses to "In your neighborhood, how accessible are the following amenities?" 54
Table 4: Respondents' feelings of connectedness within their neighborhoods (initial survey) 56
Table 5: Respondents' feelings of connectedness within their neighborhoods (follow-up survey) 57
Table 6: Follow-up child survey activity days. 67
Table 7: Child survey, walking and physical activity habits 68
Table 8: Physical activity reported by adult Centers of Hope respondents (Initial survey) 70
Table 9: Respondents' perception of closeness and community within their neighborhoods 76
Table 10: Respondents' perceptions of the maintenance and safety of their neighborhood 77
Table 11: Centers of Hope respondents' satisfaction with access to neighborhood amenities 78

List of Figures

Figure 1: Overview of the Atlanta BeltLine. The Eastside Trail portion is highlighted in green. (www.beltline.org) 9
Figure 2: The BeltLine Eastside Trail, October 2012 (www.beltline.org) 10
Figure 3: Details of the Atlanta BeltLine Eastside Trail Corridor 11
Figure 4: Physical activity levels among all respondents 36
Figure 5: Differences in physical activity level between respondents who have or have not been on the trail. Top: Initial survey, Bottom: Follow-up survey. 37
Figure 6: Responses to "How many of your family members are physically active?" 38
Figure 7: Responses to "How many of your family members are physically active?" 39
Figure 8: Responses to "How many of your friends are physically active?" 39
Figure 9: Responses to "How many of your friends are physically active?" 40
Figure 10: Responses to "Have your family members/friends/doctor encouraged you to be more physically active?" 41
Figure 11: Share of respondents who have been on the gravel trail (left) or the new paved trail (right). 42
Figure 12: Responses to "How did you find out about the trail?" 43
Figure 13: Responses to "How often, on average, do you use the gravel trail?" 43
Figure 14: Responses to "What is your main activity (or activities) on the gravel trail?" 44
Figure 15: Responses to "Generally, when do you use the trail?" 45
Figure 16: Responses to "How much time do you generally spend on the trail each visit?" 45
Figure 17: Responses to "What do you consider your use of the trail to be for?" 46
Figure 18: Responses to "While using the trail, did you purchases any of the following items along the trail?" 46
Figure 19: Responses to "What is the most likely reason that you've never been on the gravel trail?" 47
Figure 20: Responses to "Do you anticipate using the Eastside Trail once it is paved/in the future?" 48
Figure 21: Responses to "What do you anticipate using the trail for once it is paved/in the future?" 49
Figure 22: Responses to "How would you rate the safety and security on the trail?" 50
Figure 23: Responses to "What portion of the trail do you use most often?" 51
Figure 24: Responses to "Which trail access point do you generally use when you visit the trail?" 51
Figure 25: Responses to "How do you commute to work?" 52

Figure 26: Initial survey neighborhood walking behavior. 53
Figure 27: Follow-up survey neighborhood walking behavior 53
Figure 28: Responses to "How satisfied are you overall with the services/amenities in your neighborhood?" 55
Figure 29: Responses to "How would you rate the maintenance of facilities and buildings in your neighborhood?" 58
Figure 30: "In your opinion, the safety and security in your neighborhood is ..." 58
Figure 31: Responses to "What is your race/ethnicity?" 59
Figure 32: Responses to "What is your household income?" from the initial (left) and follow-up (right) surveys. 60
Figure 33: Responses to "What is your level of education?" from the initial (left) and follow-up (right) surveys. 61
Figure 34: Household composition of initial survey respondents 61
Figure 35: Household composition of follow-up survey respondents. 62
Figure 36: Ages of initial (left) and follow-up survey respondents. 63
Figure 37: Gender of initial (left) and follow-up survey respondents. 63
Figure 38: Initial child survey activity levels, left, and initial child survey activity days, right. 67
Figure 39: Responses to "If you haven't been on the trail, why not?" and "Do you think you will go on the trail once it is paved?" 69
Figure 40: Ages of adult Centers of Hope survey respondents (Initial survey) 69
Figure 41: Physical activity scores for adult respondents (Initial survey) 70
Figure 42: Initial responses to "How many of your family members/friends are physically active?" 71
Figure 43: Responses to "Have your family members/friends/doctor encouraged you to be more physically active?" 71
Figure 44: Responses to "What is the most likely reason you have never been on the trail?" (left) and "Do you anticipate using the Eastside Trail once it is paved?" (right) 72
Figure 45: Responses to "What do you anticipate using the trail for (once it is paved)?" 73
Figure 46: Responses to "How did you find out about the trail?" 74
Figure 47: Responses to "How do you commute to work or school?" 74
Figure 48: Neighborhood walking behavior among adult initial Centers of Hope respondents. 75
Figure 49: Responses to "How often do you see neighbors (or people) you know when outside your residence?" 75
Figure 50: Responses to "How would you describe your street?" and "Does your residence have a front porch?" 77
Figure 51: Responses to "How satisfied are you overall with the services/amenities (listed above) in your neighborhood?" 78
Figure 52: Adult Centers of Hope respondents' race, income, and education levels 79
Figure 53: Responses to "Do you have children under the age of 18 living with you?" (left), "Are you a single parent?", and "Would you say that your child has a lot of friends in your neighborhood?" 80
Figure 54: Prior week stress levels of initial survey respondents. 80

1. Introduction

1.1 History of the Atlanta BeltLine and the Eastside Trail

The Atlanta BeltLine is one of the largest redevelopment projects currently underway in the United States. It represents an exciting new vision for the city of Atlanta and the Atlanta region. The project will ultimately include the transformation of a 22-mile mostly abandoned freight rail corridor to a new system of parks, trails, and transit. The construction of the BeltLine is creating greater opportunities for residents to have a higher quality healthier life through the creation of new greenspace, walkable neighborhoods, high-quality infill development, transit, and healthy communities.

The entire BeltLine loop lies between two and four miles from the city center, encircles the City's core, and will affect approximately 45 neighborhoods, touching all Council Districts in the City of Atlanta. This project will also ultimately result in improvements to 700 acres of existing parks as well as the creation of 1,300 acres of new greenspace and parks. The plans for the project also include 33 miles of new multi-use trails connecting 40 parks and a 22-mile loop of rail transit service. It is projected that the 6,545 acres of redevelopment (approximately 7% of the city's land area) will include thousands of new housing units, jobs, office and retail space. In addition, there will be sidewalk, streetscape, road, and intersection improvements constructed throughout the BeltLine area to link the parks, trails, transit, and redevelopment of the BeltLine to existing neighborhoods. Taken together, the BeltLine components are intended to create a continuous loop of urban regeneration around the core of the city. Linked by transit and greenspace, the BeltLine will connect people with places and with each other.

Construction has recently been completed on a 2.5 mile section of the BeltLine located in northeast Atlanta. This section, which is the focus of this research report, extends from Piedmont Park to Irwin Street and is one of the first sections to be developed as a multi-use trail. This section of the BeltLine, known as the Eastside Trail, will eventually include lighting, plantings, and other design elements and is intended for walking, bicycling, and other non-motorized movement. Figure 1 shows the overall 22-mile route of the BeltLine and highlights the Eastside Trail section.

Figure 1: Overview of the Atlanta BeltLine. The Eastside Trail portion is highlighted in green. (www.beltline.org)

Figure 2: The BeltLine Eastside Trail, October 2012 (www.beltline.org)

Work on the BeltLine Eastside Trail began on October 30, 2010 and was completed in October of 2012. Figure 2 illustrates the newly improved trail as it exists currently. Figure 3 shows details of the Eastside Trail corridor including adjacent roads and parks.

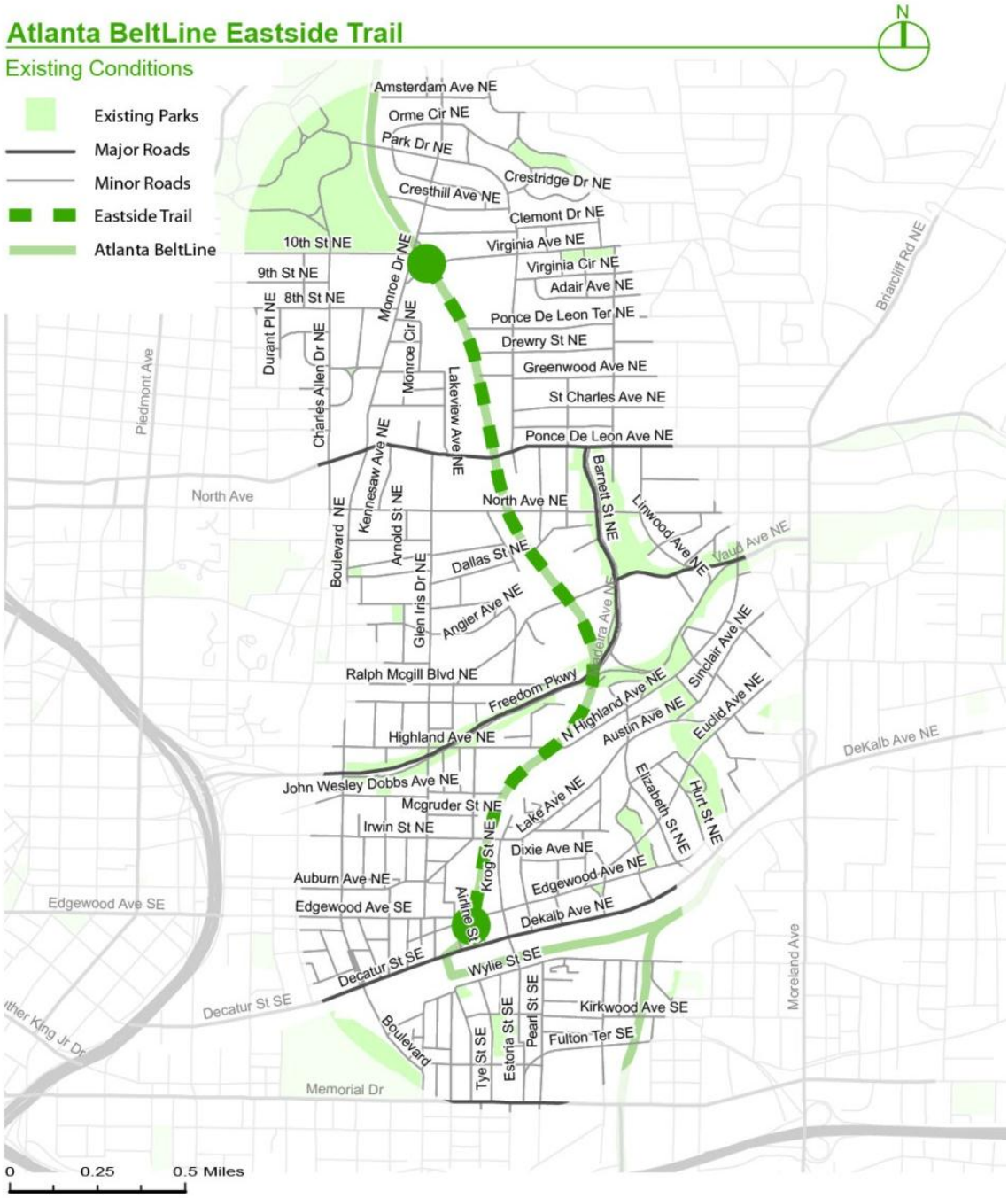


Figure 3: Details of the Atlanta BeltLine Eastside Trail Corridor

1.2 Research Objectives and Methodology

This research report examines how an external health determinant such as the construction of the BeltLine Eastside Trail can potentially shape individual behavior patterns in the population living along the corridor. The report also analyzes how this behavioral change can impact public health, specifically by providing an increased opportunity for physical activity, as well as how the creation of greenspace, which provides opportunities for social interaction, can improve mental health. The research does this by measuring the behavior of a sample of the population before and after construction of the trail. The research investigates whether the trail design, implementation, and associated activities increase physical activity for the surrounding population, improve access to destinations, and provide additional opportunities for active modes of travel.

Although several studies have established linkages between health and physical activity outcomes and built environment characteristics, research substantiating the health effects of specific built environment interventions is limited (Ogilvie et al., 2006). The research includes a literature review to establish the relationship between the built environment and health as well as to review previous research conducted on urban trail interventions which analyzed corresponding effects on behavior. The literature review also includes documentation of the historical and practical foundation of trail design and current trail design practices and assesses the built environment factors impacting trail usage, access, and safety, and correlations with physical activity and other health benefits.

The construction of the BeltLine Eastside Trail provides an unusual opportunity to study the health impacts of new opportunities for physical activity, using baseline and post-construction survey data. It is through “natural experiments” such as environmental interventions that research can investigate the relationships between health outcomes, built environment features, and neighborhood characteristics. Furthermore, the lessons learned in the development of the BeltLine Eastside Trail will inform new development and redevelopment throughout the city and region.

The Atlanta BeltLine Eastside Trail’s design also offers a unique opportunity to measure the effects of an urban multi-use trail on the behavior of the surrounding population. The trail provides new connectivity and access between established residential neighborhoods that historically have been

physically separated. The land uses surrounding the trail include both single-family and multi-family residential households as well as commercial and retail establishments, parks, and schools. The trail provides opportunities for active modes of travel between the households in these neighborhoods and nearby destinations by creating a direct connection between locations which are currently not easily accessed except through the use of an automobile.

The primary objective of this research project is to document and measure baseline conditions of physical activity and trail use prior to construction of the paved walking and cycling trail and to compare those conditions to what exists after the trail is complete. This data is used by the research team to understand and quantify potential changes in physical activity and access relative to development of the Atlanta BeltLine Eastside Trail.

This research utilized surveys of individuals living along the BeltLine corridor, who are most likely to be impacted by the construction of the trail. The study population includes a sample of households, as well as select children and families associated with three recreation centers located near the trail. For households in the BeltLine corridor, information was collected via two on-line surveys; the first, a pre-impact assessment, determined subjects' baseline conditions and physical activity levels prior to the completion of the trail, while the second, a post-impact assessment, assessed subjects' conditions following the opening of the newly-constructed trail. The study area population sample was drawn from a selection of the households located within a 0.5 mile buffer on either side of the trail. The distance of 0.5 miles from the trail for the study area corridor was selected as a reasonable distance that individuals would be likely to walk to reach the trail facility. Children and adults affiliated with three recreation centers located near the trail were also given pre-impact assessment surveys in person during an event held for these families. After trail construction, these same families were mailed follow-up surveys for the post-impact assessment phase.

CQGRD evaluated the changes in the behavior of these two population groups. The analysis presents a picture of the activity and related health benefits associated with the enhanced opportunity for physical activity and social interaction newly available after the construction of the trail. Specifically, it is expected that the trail design, implementation, and associated activities will increase physical activity for

adults and children, increase social capital through a higher level of community interactions, and improve access to destinations through active modes of travel. This research was conducted in compliance with the policies established by and with the approval of Georgia Institute of Technology's Institute Review Board (IRB) to ensure the protection of human subjects.

1.3 Report Organization

The report is organized as follows. Section 2 provides a review of the literature which illustrates the benefits of physical activity related to improving public health and the relationship of the built environment (specifically trails) to disease prevention. The effects of urban trails, such as the BeltLine Eastside Trail, with regards to these issues are described. Section 2 also includes current research on the health statistics of demographic groups that are of higher risk for certain health conditions due to low socio-economic status. These vulnerable population groups often are more likely to suffer from negative health impacts.

Section 3 defines the boundaries of the study area corridor from which the household population sample was drawn. Section 3 also includes the details of the methodology used for the data collection procedures, the subject populations included in the study, and the result of the analyses. Section 4 describes the results of the surveys conducted with the Centers of Hope families. This Section also includes the details of the methodology used for the data collection procedures, the subject population description, and the result of the analyses. Section 5 draws conclusions from the body of literature and synthesizes the results of the surveys and the opportunities and challenges presented by the existing conditions. This data then is also utilized to formulate recommendations.

2. Public Health and the BeltLine Eastside Trail

2.1 Connecting Public Health and the Built Environment

The World Health Organization defines health as "a state of complete physical, social and mental well-being, and not merely the absence of disease or infirmity." The 1986 Ottawa Charter for Health Promotion expands this definition to include the ability of an individual or group "to identify and to realize aspirations, to satisfy needs, and to change or cope with the environment." These definitions recognize that numerous factors influence the ability of an individual to be healthy, including health determinants associated with biological, social and economic, environmental, lifestyle, services, and policy factors. These definitions also clearly allow for the expansion of the idea of public health to include the impact of conditions beyond the behavior of the individual. Thus, many external factors—such as the environment where one lives, works, and goes to school; and the social and economic factors, policies, and services that shape the environment—affect an individual's ability to be healthy.

The built environment is comprised of the human-made surroundings that provide the setting for human activity. It is determined by land use and settlement patterns, transportation systems, protection of environmentally sensitive areas, and urban design. Land use patterns establish the proximity of different activity centers and spatially determine where various activities occur, including residential areas, commercial areas, community facilities, and areas preserved as open space, among others. Transportation systems connect the various land uses; the structure of the transportation system both enables and constrains the options available to individuals for travel between daily activities and destinations. Urban design policies influence the details of development patterns impacting buildings, open space, and transportation systems.

In recent years, research has indicated potential linkages between the characteristics of the built environment and human health outcomes, such as respiratory and cardiovascular health, fatal and non-fatal injuries, physical fitness, obesity, mental health, and social capital. Although causality is not conclusively proven, there is sufficient evidence linking elements of the built environment and health to warrant inclusion of health considerations in project and policy decisions. As such, there is reason to believe that the BeltLine Eastside Trail, which will directly affect households, businesses, schools, and

other community facilities along a 2.5 mile corridor, will play a role in the future health of those who live, work, play, and go to school nearby.

2.2 Physical Activity and Health

One aspect of overall health is physical health, which can be defined as fitness level, the presence or absence of disease or disease risk factors, the utility of body systems, and the body's exposure to abuses, such as stress, addictions, or radiation (Eberst, 1984). Historically, physical health had been equated with overall health, though it is now recognized that there are a variety of dimensions that determine overall well-being. Physical activity, the main contributor to an individual's fitness level, is an important component of the individual's physical health, as well as public health in general. Unfortunately, an increasing lack of physical activity (physical inactivity) is becoming a global trend.

Physical inactivity and elevated body mass index (BMI) are among the most pressing health concerns today. Thirty-four percent of Americans are obese, and more than two-thirds are overweight or obese. Obesity, defined as a BMI over 30, leads to elevated risk for heart disease, type 2 diabetes, cancer (including breast cancer and colon cancer), high blood pressure, stroke, liver disease, sleep disorders, arthritis, and infertility. Obese individuals are twice as likely to die prematurely as their non-obese counterparts. Sixteen percent of American children are obese, many of them already at risk for heart disease and type 2 diabetes (National Center for Chronic Disease Prevention, 2009). Physical inactivity is a primary factor in obesity, and it is thought to contribute to approximately 30% of all U.S. deaths. Physical inactivity is estimated to have cost the United States more than $250 billion in 2006 (Chenoweth & Leutzinger, 2006).

In response to these negative health statistics, increased focus on external changes to behavior have become a subject of study, such as the link between health and the built environment. Policies and programs that discourage the population from using active transportation modes to accomplish utilitarian trips has resulted in an increasing reliance on the exclusive use of individual automobiles for all trips and in missed opportunities to incorporate exercise as part of daily life. However, creating a built environment that is supportive of physical activity through infrastructure availability as well as land use policy that

connects households and destinations can encourage physical activity and potentially reduce some negative health conditions (Ross & Marcus, 2008).

The evidence suggests that individuals can accumulate health benefits through exercise that is as little as 10 minutes in duration. Thus, time spent traveling on foot (for at least 10 minutes) can increase physical health (Ewing & Kreutzer, 2006). According to the U.S. Department of Health and Human Services (DHHS), adults should get at least 30 minutes of moderate physical activity five times a week, and children should get at least 60 minutes of activity daily (Ewing & Kreutzer, 2006). Fifty-four percent of Atlanta Metropolitan residents do not meet the recommended guidelines for daily amounts of physical activity, and lack of physical activity contributes to the three leading causes of death in the metropolitan region, according to the National Center for Chronic Disease Prevention and Health Promotion (2008).

Regular physical activity is also beneficial to people of all ages and walks of life, having positive effects on health, longevity, and quality of life. It has been found to improve self-image, self-esteem, physical and mental wellness, and overall health. The benefits of regular physical activity extend to children as well as older and younger adults (Kaplan, 1995; Biddle, Gorely & Stensel, 2004; Sherman, D'Agostino, Cobb & Kammel, 1994; Humphrey, 2005). In fact, benefits of physical activity have been seen in all segments of the population including people with disabilities and chronic diseases (Humphrey, 2005). Participating in regular physical activity starting at an early age appears to have lifelong health benefits in terms of early muscle, bone, and joint development as well as weight control, high blood pressure prevention, and a reduction of feelings of depression and anxiety (Report to the President, 2000; Humphrey, 2005).

Walking has been shown to be the most accessible method of incorporating physical activity into daily activities. It is the easiest and most common type of daily physical activity and is available to the most number of people. Walking is confirmed to be a preferred form of physical activity by an overwhelming majority of study populations across different gender, age, and income groups. (Lee & Moudon, 2004). Four studies (Ball, Bauman, Leslie & Owen, 2001; Booth, Bauman, Owen & Gore, 1997; Giles-Corti & Donovan, 2002; Troped, Saunders, Reininger, Ureda & Thompson, 2001) report walking as the most frequently undertaken physical activity. These findings suggest that even small changes in the

amount of pedestrian activity in a community may decrease incidents of disease. The pedestrian amenities and infrastructure of a neighborhood can positively or negatively impact walking rates. Saelens, Sallis, Black and Chen (2003) found that people who live in walkable neighborhoods averaged an additional 30 minutes of walking for transportation each week and achieved more total physical activity.

2.3 Trails and Health

Trails are important places where physical activity occurs. The literature indicates that a relationship exists between the availability of parks and trails and the ability of the population to meet the U.S. Department of Health & Human Services recommendations for physical activity (As stated above, adults should get at least 30 minutes of moderate physical activity five times a week, and children should get at least 60 minutes of activity daily). A study by Huston, Evenson, et al. (2003) and colleagues found that trails were associated with a 51% increased chance of meeting the CDC/ACSM recommendations for physical activity, controlling for individual level factors. In addition, Brownson (1999) found a 55% increased chance of individuals meeting the recommendations if people had access to a walking/biking trail after controlling for demographic variables. A macro-level study modeling physical activity, overweight, and obesity within counties in Oregon using recreation supply and demand found that the prevalence of trails and outdoor recreation facilities was associated with higher rates of physical activity and decreases in overweight and obesity rates (Rosenberger, Bergerson & Kline, 2009).

Trail use is often related to trail accessibility and other aspects such as connectivity, continuity, length of routes, presence of bike lanes, and signage. Connectivity of bikeways is an important factor that influences their use. In Eugene, Oregon bike trip volume was found to increase where bikeways were connected (Nelson and Allen, 1997). In addition to the determinants of use based on the design of the built environment, presence of trails, and issues of access, there are determinants of use based upon the individual user.

In Arlington, MA, Troped, Saunders, et al. (2001) found that higher education and living in a mixed residential or commercial neighborhood were related to increased use of a local bike path. On the other hand, older individuals and women were less likely to use the bikeway. Another study in rural Missouri found that after walking paths were introduced, 55.2% of trail users increased the time they

spent walking (Brownson, Housemann et al., 2000; Brownson, Baker et al., 2001). The study also found that many people who were not previously walking for exercise reported they were now doing so and that others who were already active increased their amount of activity because of the trail. Interestingly, groups which are often considered 'hard to reach' were using the trails: women and individuals with less than a high school education increased their walking the most (Brownson, Housemann et al. 2000).

A Chicago study examined objective physical activity along a 1.2 mile trail in an urban area and found that 9% of trail users were engaging in vigorous physical activity (fast walking, running, roller skating), 65% were moderately active (walking, bicycling), and 26% were engaging in low levels of physical activity (standing, sitting). Individuals engaging in high levels of physical activity were more likely to be men between the ages of 18 and 34. They were also more likely to use the trails during the morning, on weekdays, and during bad weather. The only other group who used the trail despite bad weather was moderately active individuals walking dogs. Trail users in the Chicago study were also asked why they used the trails: 44% of users reported that pleasure or recreation was the most important reason, followed by 32% who said that it was health or physical training. Less than 10% of users reported social interaction, safety, scenery, or commuting as the reason for use. Respondents who reported health or physical training as the most important reason for using the trail used the trails more often and utilized the trails alone. Along with commuters, they used the trail for a shorter length of time, were less likely to drive to the trail, and tended to use the same trail. Health-motivated users reported safety as a major barrier, although this may have been due to using the trail in the early morning. People who used the trail for pleasure were more likely to travel more than 20 miles to use the trail (Gobster, 2005).

A recent study of environmental correlates of total trail use (in Dallas, Texas, Chicago, Illinois and Los Angeles, California) found that intrinsic motivation for physical activity, perceived safety and distance to the trail were the most significant predictors of trail usage, measured by total time on the trails (Wolch et al., 2010). On the neighborhood level, accessibility barriers to trail usage were found to be significant suppressors of trail usage. The study also found a link between perceived health of respondents and total time spent on trails, noting that few studies have explored this association.

In order to assess the health effects of trail interventions, several recent studies have conducted

pre- and post-intervention surveys to evaluate the relationships between the presence of multi-use trails and physical activity. A study of a North Carolina rails-to-trails conversion (involving a sample of 366 adults living within 2 miles of a trail segment) found that trail usage was not associated with increases in self-reported physical activity, absent any educational or promotional campaigns (Evenson, Herring & Huston, 2005). Additionally, a pre-post intervention study of a rail-trail in Western Sydney (involving a cohort of 450) found that after a promotional campaign, trail usage and trail awareness was greater for cyclists as well as males and individuals living closer to the trail (Merom, Bauman, Vita & Close, 2003). Additionally, bicycle count data indicated increases in trail usage at the beginning of the campaign, although the study noted the need for further analysis.

Further, research which reviewed case studies examining the health effects of transportation interventions of several kinds that could have either positive or negative impacts on health and active travel indicated that there is a need for "natural experiment" studies. This review also highlighted the methodological difficulties in establishing the significance of the relationship between transportation and health. Particularly, the study noted the need for an "overwhelmingly large" sample size in order to test the health effects of transportation interventions, as relevant studies have indicated population-level changes in active travel to be between 2 and 4 minutes on average for population level changes related to time spent engaging in active travel per day after transportation interventions. (Ogilvie et al., 2004).

2.4 Trail Safety and Security

The rate of intentional injuries – those due to crime and violence – is influenced by the built environment. These injuries occur at lower rates in communities with more trees, where neighbors are acquainted, where citizens informally patrol the street from windows and sidewalks, and individuals have access to public transit (Goodell & Williams, 2007). Tract-level studies have demonstrated disparities between indicators of physical and social disorder as well as health disparities between neighborhoods. Disadvantaged neighborhoods are often marked by concentrated poverty, low rates of homeownership and college education, and single-parent households. Neighborhood disadvantage and disorder can contribute to low health status by inhibiting physical activity via walking, and cause stress, which may increase vulnerability to infection and disease.

Social “disamenities” such as crime rates may also impact the uses of neighborhood physical activity sites. Addressing the paradox of higher obesity rates among black and Hispanic residents given greater park access in New York City, a study examined the prevalence of neighborhood “disamenities” and proximity to parks (Weiss et al., 2011). The study found that black and Hispanic residents have greater access to parks but are also exposed to greater “disamenities,” such as undesirable land uses, crime (measured by homicide rate), and traffic hazards. This study echoes a larger literature on the existence of crime and crime perception as a major deterrent to physical activity and health promotion (Foster & Giles-Corti, 2008; Harrison, Gemmel & Heller, 2007).

Barriers to trail usage can be analyzed to ascertain some of the determinants of use. Built environment barriers were noted in several studies. Troped, Saunders, et al. (2001) found that increases in self-reported and actual distance were related to decreased use of bikeways. There is an inverse relationship between perceived distance from the trail and the likelihood that trail was used—the greater the distance, the less likely the use of the trail. Not having to cross a busy street and not having to cross a steep hill (greater than 10% change in slope over 100 meters) were related to increased use of the Minuteman Bikeway in Boston.

Another potential barrier to use is lack of knowledge regarding the existence of trails. A study by Reed, Ainsworth, et al. (2004) in a rural southeastern community found that residents were only weakly aware of trails to which they were proximate. Thirty-three percent of people who knew about the trails reported using them. At the same time, knowledge about the benefits of trails appears to be widespread. One study found that 90% of adults in the U.S. were in favor of using local government funds to install jogging/bicycle trails and recreational facilities (Brownson, Baker et al. 2001).

Safety and fear of crime are often mentioned as barriers to trail development and use. A study by the Rails-to-Trails Conservancy (1998) examined both minor and more serious incidents on urban, suburban, and rural trails. They found that there were no burglaries in homes adjacent to the trails in urban areas and the rate was 0.01% for suburban rail-trails. While minor infractions (graffiti, littering, and damage to property) occur more frequently along urban trails than suburban or rural trails, severe crimes do not occur at high rates, making trails safer than other public spaces. The three-city study cited above

also found a significant relationship between perceived safety and accessibility and time spent using multi-use trails.

2.5 Trail Accessibility

A number of interventions focused on access have been used to reduce some of the barriers to trail use. In Minnesota for example, the Minnesota Comprehensive State Bicycle Plan is an attempt to increase pedestrian travel by recommending increased building of bikeways, expansion of education and safety programs, and recommending the hiring of a full-time bike coordinator. A survey subsequently found that adults in Minnesota bike twice the national average, with biking for transportation accounting for half of all of these miles (Barnes, 2004). Other examples of enhanced access interventions do not include the construction of additional trails.

The importance of encouraging trail usage is not only to promote awareness of alternative transportation methods to access work, play, or errands, but also to promote the health benefits of trail usage in terms of increased opportunities for physical activity. Research has been conducted to ascertain potential health benefits related to trail use. Vuori, Oja, et al. (1994) evaluated a trail use intervention in Finland. At the end of the 10-week intervention they found that physically active commuting to work (average of 1 hour per day for 10 weeks) increased VO2 max (maximum volume of oxygen consumed per kilogram of body weight per minute) by 4.5%. VO2 max is the maximum amount of oxygen in milliliters, one can use in one minute per kilogram of body weight. Those who are more fit have higher VO2 maximums and are able to exercise more intensely. Maximum treadmill times were increased by 10.3%, and HDL cholesterol (good cholesterol) by 5% (Vuori, Oja et al., 1994).

In addition to the evidence to suggest that the availability of trails and their promotion is related to increased physical activity and improved cardiovascular function, there is evidence of additional benefits. A study of trails users found that only a small minority (4%) of users were using the trail solely for exercise most users reported additional benefits including social, spiritual, physical, and time spent in nature (Bichis-Lupas & Moisey, 2001).

2.6 Commuting Patterns and Active Travel

An increase in the amount of daily physical activity could be achieved through the use of active transport for routine activities. Both walking and cycling can be done for multiple purposes including leisure, recreation, or exercise; for occupational purposes; and for basic transportation, including shopping or going to work (Sallis, Frank, Saelens & Kraft, 2004). *Active* (or non-motorized) *transportation* is a form of physical activity, and evidence suggests that the use of active transportation is related to transportation and land-use policy. A built environment that encourages integrating active transportation with other daily activities such as work, commuting and child care, may contribute to increased walking and cycling (Booth, Bauman, Owen & Gore, 1997). Conversely, ever increasing automobile dependence due to the characteristics of the built environment may have considerable negative implications for physical activity and health.

Studies which explored mode choice between motorized and non-motorized methods of transport showed that 40% of respondents considered the lack or poor condition of pedestrian and cycling routes as limiting their walking and cycling to work, and about 30% considered these activities as unsafe modes of transportation. Fear of accidents limited physically active commuting in 30% of all women and in 14% of all men. (Oja, Vuori & Paronen 1998).

Studies suggest that mode shifts to active transportation (walking and cycling) generate positive health outcomes through increased physical activity (Woodcock et al., 2009; de Hartog, Boogaard, Nijland & Hoek, 2010). A study in Copenhagen, Denmark found that bicycling to work (average cycling time to work was three hours per week) was associated with a 38% decreased risk of mortality after adjusting for leisure-time physical activity, body mass index (BMI), blood lipid levels, smoking, and blood pressure (Andersen, Schnorr, Schroll & Hein, 2000). Another study examined men between the ages of 50 and 59 and found that those who regularly spent more than 10 MET h/week (metabolic equivalent hours per week) in walking or cycling to work had a lower mean BMI (0.3kg/m^2), waist circumference (1 cm) and change in BMI over 5 years (0.06 kg/m^2) than those who did not expend energy getting to work (Wagner et al. 2001).

A review of evidence linking active commuting and cardiovascular disease demonstrated the

protective effect of active commuting, as active commuting was associated with an overall 11% reduction in cardiovascular risk (Hamer & Chida, 2008). In a study evaluating the effects of a work travel plan on reported commuting patterns, the number of respondents walking to work increased from 19% in 1998 to 30% in 2007. The majority of "usual" walkers and cyclists were estimated to meet greater than 80% of recommended physical activity levels, demonstrating possible health improvements associated with changing commuting patterns (Brockman & Fox, 2011). Some studies have found that active commuting (walking or cycling for transportation) is an effective method of achieving desired activity levels (USDHHS, 2008; Matthews et al., 2007; Andersen, Schnor, Schroll & Hein, 2000) and therefore even modest increases in physical activity have the potential to produce significant health benefits (Haskell, Lee, Pate, Powell, et al., 2007).

Strong evidence exists for the impact of infrastructure changes and promotional campaigns on active transportation (Ogilvie, Egan, Hamilton & Petticrew, 2004; Pucher, Dill & Handy, 2010; WHO-UNECE, 2009). In Germany, bicycle share of urban trips increased 50% from 1972 to 1995 with this increase largely due to public policies that increased the safety, speed, and convenience of cycling. This was accomplished by, in most cases, giving precedence to cyclists over cars. In addition amenities were added for bikers such as bike racks at transit stations, bike rental facilities, and an integrated signage system. Outreach activities included safety training for children as well as planning festivals and giving awards. Policies were implemented that made automobile use more expensive and inconvenient such as reducing speed limits for cars, eliminating all free parking in the city core and decreasing the number of parking spaces, and making some streets one-way for cars and two-way for cyclists (Pucher, 1997). The Oregon Department of Transportation (1995) stated that some of the benefits to cycling were economic, such as increased tourism from cyclists while others were more intangible such as increased quality of life, feelings of safety, sense of community, social interactions, and enhanced access for children and the elderly.

In addition, a study of pedestrian path choice suggested an association between a "good" pedestrian environment and the utility of walking and that the effect would justify policy intervention to alter the built environment to encourage walking (Guo, 2009). Many studies have examined the role of

built environment characteristics on mode choice and associated public health outcomes related to physical activity. The layout of cities and communities and their transportation infrastructure are important factors in determining whether people walk or drive as a means of transportation (Moudon, Hess, Snyder & Stanilov, 1998; Frank & Engelke 2001).

Pikora et al (2003) developed a framework that identifies four features of neighborhoods that are likely to be associated with people's walking and cycling: functional, safety, aesthetics and destinations. Research on the characteristics of walking behavior has shown that walking for recreation was associated with functional features of local environments whereas walking for transport was associated with destinations (Pikora et al., 2006).

However, not all studies have demonstrated a clear association between built environment characteristics and mode choices or physical activity outcomes. For example, studies of adult populations in Australia and Washington State found that built environment characteristics was not associated with BMI and did not find built environment characteristics predictive of walking for exercise (Christian, Giles-Corti, Knuiman, Timperio & Foster, 2011, Lovasi et al., 2008). A recent report by the Transportation Research Board/Institute of Medicine on physical activity and the built environment recognized that several factors such as land-use mix, accessibility, and transportation infrastructure had good support, although both panels concluded that the data were insufficient to determine how the built environment affects physical activity across population subgroups (Humphrey, 2005; CDC, 2006). The Task Force concluded that street-scale and community-scale design interventions were effective at increasing walking and cycling (CDC, 2006). The current discrepancies between research results in this area likely reflects differences in research design, specific built environment characteristics studied, and the difficulties in establishing causality or separating effects of different variables (Humphrey, 2005).

2.7 Neighborhood Characteristics

Reviewing the existing transportation literature, several studies have presented frameworks for attributes of neighborhoods and the built environment that encourage active commuting and physical activity. Greater land-use mixes, population and employment density, street connectivity and continuity of the bike and pedestrian network, are all believed to increase physical activity and contribute to positive

health outcomes, as are the presence of recreational facilities and parks (Ewing & Kreutzer, 2006).

Transportation mode choices related to active transportation reflects two fundamental aspects of land use: proximity, as determined by density of land uses and land use mix; and connectivity which is the ease of movement between origins and destinations within the existing street and sidewalk – pathway structure. Connectivity is also increased with the absence of barriers to walking or cycling, and multiple route options increase the viability of walking or cycling as a mode choice (Saelens, Sallis, Black & Chen, 2003). Studies repeatedly demonstrate that mixed land use diversity is the urban design variable most likely to affect the walkability of neighborhoods, primarily by influencing the accessibility and convenience of locations (Saelens, Sallis, Black & Chen, 2003, Giles-Corti & Donovan 2002, Handy & Clifton, 2001).

Studies have shown that the presence of greenery has been linked to lower crime rates and better mental health, air quality improvement, and micro-climate improvement. This can be particularly significant for vulnerable populations such as children and the elderly. For example, the availability of greenspace has been linked to decreased mortality in elderly individuals. Five-year survival rates for senior citizens improved when there was space for walking or parks and tree lined streets near their home (Takano, Watanabe & Nakamura, 2002).

Having natural environments nearby has been shown to enhance children's psychological health. Wells and Evans (2003) suggest that the presence of nearby nature in the window view and in the surrounding outdoor yard buffers the impact of life stress on rural children and enhances self-worth. The attenuation of attention deficit disorder (ADD) and attention deficit hyperactivity disorder (ADHD) symptoms has also been shown after contact with nature. In one study, parents were asked to rate after effects of several green outdoor and indoor activities (e.g. reading) for children with physician-diagnosed ADHD. Ratings showed that green outdoor activities reduced symptoms significantly more than built outdoor or indoor activities after controlling for activity type (Kuo & Taylor, 2004).

2.8 Social Capital and Mental Health

Another dimension of overall health and well-being is mental health. According to the 1999 Surgeon General's report, "*mental health* is a state of successful performance of mental function, resulting in productive activities, fulfilling relationships with other people, and the ability to adapt to

change and to cope with adversity" (Satcher, 1999). The World Health Organization has defined mental health as a "state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community" (WHO, 2004). In both of these definitions, mental health is not only the absence of mental illness, but the presence of a positive mental state (Keyes, 2007). Since regular physical activity reduces depression, improves mood, and enhances cognitive functioning (U.S. Department of Health and Human Services, 1996; World Health Organization, 2000), a potential increase in physical activity through trail construction holds potential for mental health benefits. Participating in regular physical activity starting at an early age appears to have lifelong health benefits in terms of preventing feelings of depression and anxiety (Report to the President, 2000; TRB, 2005).

Since mental health is closely associated with a healthy population, one method to describe and measure the mental health of the population is to measure the degree of social capital that exists in the population. Social capital can be defined as the collective value of a network—social, political, and economic—whose purpose is to inspire trust in and provide support for other members of that community (Dannenberg et al., 2003). Social capital has been linked to a variety of health outcomes, such as prolonged life expectancy and improved physical condition and mental health (Leyden, 2003). Social capital is also the degree to which people feel that they live in and belong to a socially cohesive local environment, and the range of activities and resources that emerge as a consequence of those ties. Social capital is built both formally, through participation in group activities, and informally, through casual association and encounters.

A study conducted by Roman & Moore (2004) found that the quantity of religious institutions and pro-social places (i.e. parks, schools, recreation centers) was correlated with trust, community participation and block satisfaction. In addition, the study found that the distance or accessibility to these institutions was associated with higher levels of social capital indicators (Roman & Moore 2004). This study indicates the importance of local, community institutions for the creation of social, healthy places.

The linkages between institution accessibility and community participation indicate the importance of the built environment for social capital. Research suggests that walkability, automobile dependence,

mix of land uses, density, size of place, traffic volume, homogeneity, and presence of public spaces all impact social capital through their ability to create or support opportunities for formal and informal interaction. Built environments that promote social interaction can produce mutually reinforcing effects on place attachment or "sense of place" and social capital (Wood & Giles-Corti, 2008; Waxman, 2003).

Automobile dependence, in particular for commuting long distances, has been correlated with decreased social capital (Ewing & Kreutzer, 2006). Robert Putnam found that each 10 minutes spent commuting translates directly into a 10% decrease in community involvement (Putnam, 2000). Traffic volume has been shown to affect people's sense of community; as traffic volumes increase, people's social capital decreases. In a study by Besser et al (2008), social capital was operationalized as travel purpose (socially-oriented trips). The study suggests that for every additional 10-minute increment in the categorical commute time variable, there is a corresponding increase in risk of no socially-oriented trips (increase in commute time negatively correlated with social capital). Similarly, research suggests that people residing on streets with light traffic volumes have larger social networks than those on streets with heavy volume (Lavin et al., 2006). The link between high traffic volume/speed and low social capital stems primarily from three causes: fear for personal safety, which limits walking and children playing outside; not wanting to walk in an unpleasant environment; the physical divide caused by the amount of traffic, its speed, and the width of the road (Lavin et al., 2006)

Several studies demonstrate the linkages between land-use mixing, access to amenities and social capital. In a study of physical activity, social capital and the built environment, social capital was associated with access to services (restaurants, bars, libraries and museums) and associated with lower pedestrian injury rates. However, social capital indicators were negatively associated with land use mixing and access to parks and transit (Wen & Zhang, 2009). A study of Australian suburban neighborhoods found that the number and quality of destinations was associated with social capital (Wood et al., 2008), while a study in Portland, Oregon (Lund, 2003) found that local retail access was positively associated with social capital indicators in inner-city (but not suburban) neighborhoods.

The decline of social capital has been attributed in part to a loss of public spaces. These public spaces, including sidewalks, parks, plazas, dog parks, community gardens, playgrounds, and even cafes,

bookstores, and hair salons provide spaces in which people can interact intentionally or accidentally, formally or informally. These moments of interaction, whether for the exchange of pleasantries or information, create and strengthen the social networking bonds of social capital and can have real and substantial positive health outcomes (Ewing & Kreutzer, 2006; Baum & Palmer, 2002; Bedimo-Rung, Mowen & Cohen, 2005; Leyden, 2003). In a study of parks, physical activity and social capital in New Orleans, parks with higher social capital were found to have more park users and more than four times the amount of physical activity than parks with lower social capital (Broyles, Mown, Theall, Gustat & Rung, 2011).

In addition, these opportunities for socializing in public spaces or neutral territories can help reduce feelings of prejudice and increase understanding of other cultures and races by enabling interaction amongst people of differing races, economic status, education levels, and ethnicities thereby building feelings of social capital (Lewis, 1996). Homogeneity in communities, particularly in terms of income and age, has been shown to reduce social capital, in particular political participation, which can have detrimental impacts on the well-being of that community (Ewing & Kreutzer, 2006). Examining recent literature, substantial linkages exist between indicators of social capital and a variety of associative variables relevant for urban design and health promotion. As numerous studies suggest, access to services and public spaces, pedestrian amenities and local institutions can affect residents' social capital and potentially affect selected health outcomes such as physical activity levels and described health status. However, social capital research is in its early stages, and further research is necessary to examine the effects of self-selection bias and establish causality among the associative variables determined to affect social capital.

2.9 Socioeconomic Status and Health

There is mounting evidence to support the assumption that poorer people have poorer health because they live in places that are unhealthy, although the relationship is complex (Baum & Palmer, 2002). For the purposes of this research, "vulnerable" populations are considered to include those with low socioeconomic status, people of color, female-headed households, low educational attainment, and persons with disabilities. Research often also includes children and the elderly as "dependent"

populations. There are recognized health disparities in vulnerable populations, such as higher rates of chronic disease, infant mortality, and certain cancers.

In a study of collective efficacy and built environment features, the presence of parks and neighborhood disadvantage were significant predictors of collective efficacy. One study indicated that residents of high poverty neighborhoods live on average eight years less than non-poverty neighborhoods (Bhatia, Rivard & Seto, 2006). Lack of access to employment, under-employment, or jobs which do not pay a living wage or provide sufficient benefits can contribute to stress, depression, malnourishment or obesity, homelessness, and many other negative outcomes. Doyle, Kavanagh, Metcalfe, and Lavin (2005) provided a comprehensive review on the impacts of employment, and by extension unemployment on health. According to their findings, unemployment is a stressful event and can have marked negative effects on one's health. These may include but are not limited to premature mortality; poverty due to long-term unemployment may also result in individuals having less healthy lifestyles and being exposed to more unhealthy environments; financial strains may contribute to one being more prone to depression; individuals might be more likely to undertake unhealthy practices such as drinking and smoke; and be at greater risk for coronary heart disease due to increased stress.

In addition, involuntary displacement and gentrification of vulnerable populations can also diminish social capital by removing people from their established social networks and support systems, which has physical and mental health implications (Bhatia et al., 2006). Neighborhood change, whether in terms of gentrification and displacement or increasing crime and deterioration, can be stressful for long-time residents who feel unable to control the events surrounding them which can have negative mental and physical health repercussions (Baum & Palmer, 2002).

Vulnerable populations, including individuals with low socioeconomic status, older adults and minorities, also often experience health disparities due to lack of access to health care, language barriers and built environment factors. Given these barriers to accessing traditional public health intervention strategies, studies have shown that community-based health promotion programs can be effective in improving health outcomes for vulnerable populations. For example, reviews of faith-based or church-based health programs have shown effectiveness in improving outcomes related to cardiovascular

disease (Peterson, Atwood & Yates, 2002), by increasing physical activity, reducing mental illness and improving diet (DeHaven, Hunter, Wilder, Walton & Berry, 2004). Studies suggest that the involvement of community and faith organizations has a greater potential of reaching underserved populations and utilizes social support systems to increase participation in public health programs. Additionally, the level of involvement of community or religious leaders, as well as the collaboration between community leaders and public health professionals, have contributed to positive outcomes within these programs.

2.10 Special Populations and Physical Activity

In addition, the physical context of the built environment may also encourage or discourage physical activity by age group. Research has found that some age groups, especially children and the elderly are differentially affected by aspects of urban form (Frank, Engelke & Schmid, 2003; Lockett, Willis & Edwards 2005; De Vries, Bakker, van Mechelen & Hopman-Rock, 2007). A study in the Netherlands demonstrated that the number of days youth (6-11 years) met physical activity recommendations increased with increased access to sports facilities, greenspace and residential areas with limited access to traffic; while parking spaces, intersections, and heavy bus and truck traffic were associated with less activity (De Vries et al., 2007). Traffic speed is the key determinant for pedestrian injury risk for children (Jacobsen et al., 2000). Traffic safety improvements in California resulted in a 65% increase in walking, and a 114% increase in biking to school among children (Staunton, Hubsmith & Kallins, 2003). One study also found that children living in neighborhoods built after 1969 were more likely to be obese than children living in pre-1969 neighborhoods, which may be associated with changes in land use patterns and built environment design (Spence, Cutumisu, Edwards & Evans, 2008).

Since many older adults cannot perform vigorous physical activities they typically walk for exercise (Feskanich, Willis & Colditz, 2002; Tudor-Locke, Jones, Myers, Paterson & Ecclestone, 2002). In a six-year longitudinal study, older adults who walked a mile at least once a week were significantly less likely to develop functional limitations (Miller, 2000; Feskanich et al., 2002). Walking also improves cardiovascular endurance, balance and flexibility (King et al., 1998). A study in Seattle found significant relationships between community form and level of activity among seniors (Frank et al., 2003). Seniors in Ottawa, Canada, reported that traffic hazards and fear of falling are barriers to walking. Respondents also

reported that they would be engaged in greater rates of walking if there were convenient routes and destinations, good public transportation, aesthetics, benches, and restrooms (Lockett, Willis et al. 2005). Walking as a form of regular physical activity is also important for older adults with disabilities as a means to maintain their functional abilities and independence (Miller et al., 2000; Dean & Shepherd, 1997; Brach et al., 2003) and to decrease the chance of increasing their disability (DiPietro, 1996; Ettinger et al., 1997; Spirduso & Cronin, 2001; Hillsdon, Foster & Thorogood 2005).

Neighborhood accessibility to physical activity sites such as trails and greenspace has been negatively associated with race, ethnicity and socioeconomic status (Powell, Slater & Chaloupka, 2004). However, it is important to distinguish accessibility to physical activity sites from increases in active behavior, as Hispanic neighborhoods were associated with more community physical activity sites but lower physical activity rates than non-Hispanic neighborhoods. A study of Latino trail users in Chicago (the Lincoln Park Trail System) found that many individuals visited trails on weekends for long periods of time, and that greenspace is used for cultural purposes (Cronan, Shinew & Stodolska, 2008). Survey results from this study found that the most popular reasons for visiting the trail system were reducing stress, and spending time outdoors and with friends/family. The study also noted that many Latino trail users did not participate in high amounts of physical activity, and recommended organizing family-oriented physical activity events to encourage physically active trail usage within Latino populations. These results indicate that trails and greenspace serving diverse population groups should be designed to incorporate their use preferences.

3. Household Pre- and Post- Impact Health Behavior

This research seeks to understand and quantify changes to access and in physical activity amongst residents who live proximate to the Eastside Trail, for the purpose of maximizing positive health outcomes resulting from the development of the trail. Specifically, it is expected that the trail design, implementation, and associated activities will increase physical activity for adults and children, increase social capital through a higher level of community interactions, and improve access to destinations through active modes of travel.

3.1 Methodology

The research team developed and administered survey instruments to a targeted sample of households located within the BeltLine Eastside Trail corridor. Household survey responses were collected on-line in December of 2011 before construction of the trail. Similar data was collected from the same sample of households in November of 2012 approximately one month after the trail was improved, paved, and opened to the public. It therefore measures only immediate-term effects of the newly opened trail. The follow-up survey was conducted via US mail and on-line responses. The research methods and approaches were also reviewed and approved by the Georgia Institute of Technology Institutional Review Board for the protection of human subjects in research.

The research methodology included contacting a random sample of households from a specific list of addresses. Approximately 6,000 residential parcels (potential households) are located within a half mile (0.5 mile) of the trail corridor. The addresses of these parcels were selected in a geographic information system from Fulton County Tax Assessor data using the 0.5 mile buffer function. These approximately 6,000 residential parcels were assigned a unique identification number. From this set of approximately 6,000 unique household parcels, the research team divided the parcels into ownership type. For this study, single-family and multi-family owner occupied household parcels were included as potential participants. The research team then generated a random sample of approximately 10% of the total number of parcels initially included in this set. After data review and clean-up, 501 households received a request to participate in the on-line survey. The research team then solicited participation in

the survey from this sample of households. The survey responses from the households were collected anonymously. The participants were also given a consent form, to explain the purpose of the study and to clarify the voluntary nature of the survey.

The individuals responding electronically via the on-line survey were introduced to the research study with an explanation of the purpose of the research, a description their rights as participants, and a consent agreement. This information was presented by the Georgia Tech researchers and signed by the research scientist leading this research project. The research team tracked the survey responses by address and provided a $20.00 gift card as compensation to the individuals who respond to the survey. The gift card was sent via US mail once the survey was completed. In late 2012, after completion of the trail, the research team followed up with the individuals who responded to the first survey. Participants were asked to complete a second survey at this time and received another $20.00 gift card via US mail if they participated.

Information was gathered on the baseline level of physical activity of the interviewees based on the standardized International Physical Activity Questionnaire (IPAQ) short form, which is an internationally recognized standard used to collect this type of information. The survey questions were also designed to gather information on other characteristics of the respondents including: residential locational data, commute mode and length, demographic data, usage of the existing temporary beltline trail, most frequently used trail access points, perceptions regarding safety and security along the trail, activity along the trail, and respondents' perceptions of the neighborhood in which they live. Results from the online survey of the residential population are analyzed in this section.

3.2 Target Populations

The study population included adult residents of the study area. The study team sought participation from both existing trail users and those who have not yet utilized the trail.

3.3 Household Sample Survey Results

Pre-Impact Assessment

For the Pre-impact Assessment, 123 completed, non-duplicate surveys were returned to the

study team. Of the respondents who returned the survey, 66 indicated that they had previously been on the unimproved gravel Eastside Trail, while 57 indicated that they had never been on the trail. Respondents who had previously visited the trail were also asked about their use of the trail, while respondents who had not used the trail were asked why they had not used the trail.

Post-Impact Assessment

Of the 123 households sent the post-construction survey, 91 surveys were returned. Of these, 76 had been on the newly constructed multi-use trail and 15 had not been on the trail.

Physical Activity and IPAQ Scores

The questions included in the on-line survey are based on the International Physical Activity Questionnaire (IPAQ), which is an internationally accepted method to collect data on health-related physical activity. The use of this form allows for standardization of this type of data so that results can be compared internationally over time.

The first set of questions on the survey, from the IPAQ Short Form, asked respondents for information about the frequency and duration of their vigorous, moderate, and walking activities during the past seven days, as well as the number of hours per day respondents typically spent sitting. These activities included both exercise and leisure activities as well as activities respondents engage in during daily life, such as housework, work-related physical activities, and transport-related physical activities.

The frequency of vigorous, moderate, and walking activities reported by respondents to the first and second surveys is shown below in Table 1. On average, respondents to the first survey participated in vigorous activities on 2.99 days during the previous week, moderate activities on 2.53 days, and walking on 4.11 days. In the second survey, activity levels remained similar, with 2.87 reported days of vigorous activity, 2.49 days of moderate activity, and 4.22 days of walking.

Table 1: Reported physical activity of all survey respondents

Days respondent participated in activity	Initial Survey			Follow-up Survey		
	Vigorous Activity	Moderate Activity	Walking	Vigorous Activity	Moderate Activity	Walking
1	19	20	9	13	15	6
2	17	29	12	22	22	10
3	25	23	20	11	18	10
4	17	10	18	14	7	12
5	19	4	13	10	5	6
6	7	8	5	5	2	9
7	5	8	35	5	7	28
No activity in last week	14	21	11	11	15	10
Average activity days	2.99	2.53	4.11	2.87	2.49	4.22

Respondents also reported the average minutes per day they engaged in each type of activity. Combined with frequency of participation, this information was used to calculate each respondent's physical activity level in metabolic equivalents (METs) during the past seven days. Based on METs, frequency, and duration of activity, respondents' physical activity levels were categorized as high, moderate, or low during the prior seven day period. IPAQ guidelines for data-processing were used for this categorization. Among all respondents to the first survey, 19% had low levels of physical activity; 36% had moderate levels of physical activity, and 45% had high levels of physical activity. In the follow-up survey, the share of the respondents with either low or high activity decreased slightly, with more respondents reporting moderate levels of activity (increase from 36% to 45%). See Figure 4, below.

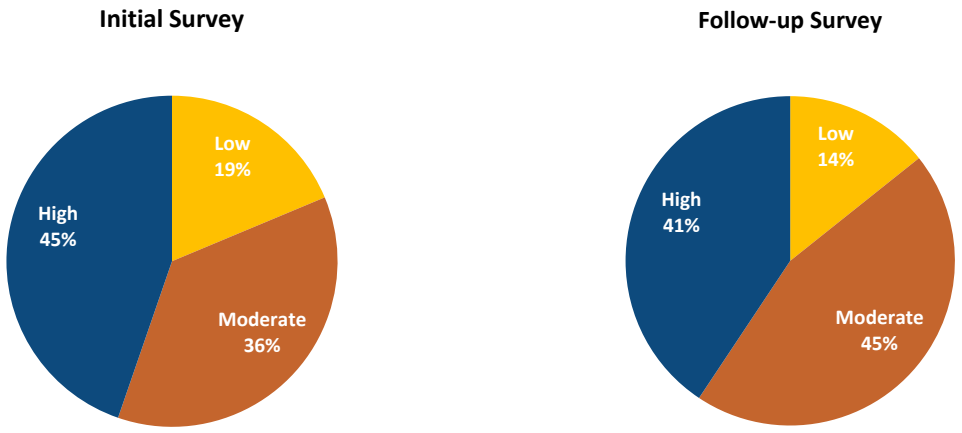


Figure 4: Physical activity levels among all respondents

The research team also compared the physical activity levels of initial and follow-up survey respondents who had previously used the Eastside Trail with those who had not, see Figure 4. Among initial survey respondents who had been on the gravel trail, more than half (53%) reported high levels of physical activity in the past seven days. Only 12% of these respondents had low levels of physical activity. In contrast, just 35% of respondents who have never been on the gravel trail reported high levels of physical activity, and 26% reported low levels of physical activity. This suggests that respondents who have used the gravel trail are more physically active, on average, than respondents who have never been on the gravel trail.

The same pattern was repeated in the follow-up survey. Among users of the paved trail, just 9% scored a low level of physical activity, compared to 40% of those who had never been on the trail. In addition, 42% of paved trail users had high levels of physical activity, compared to 33% of respondents who had not been on the paved trail.

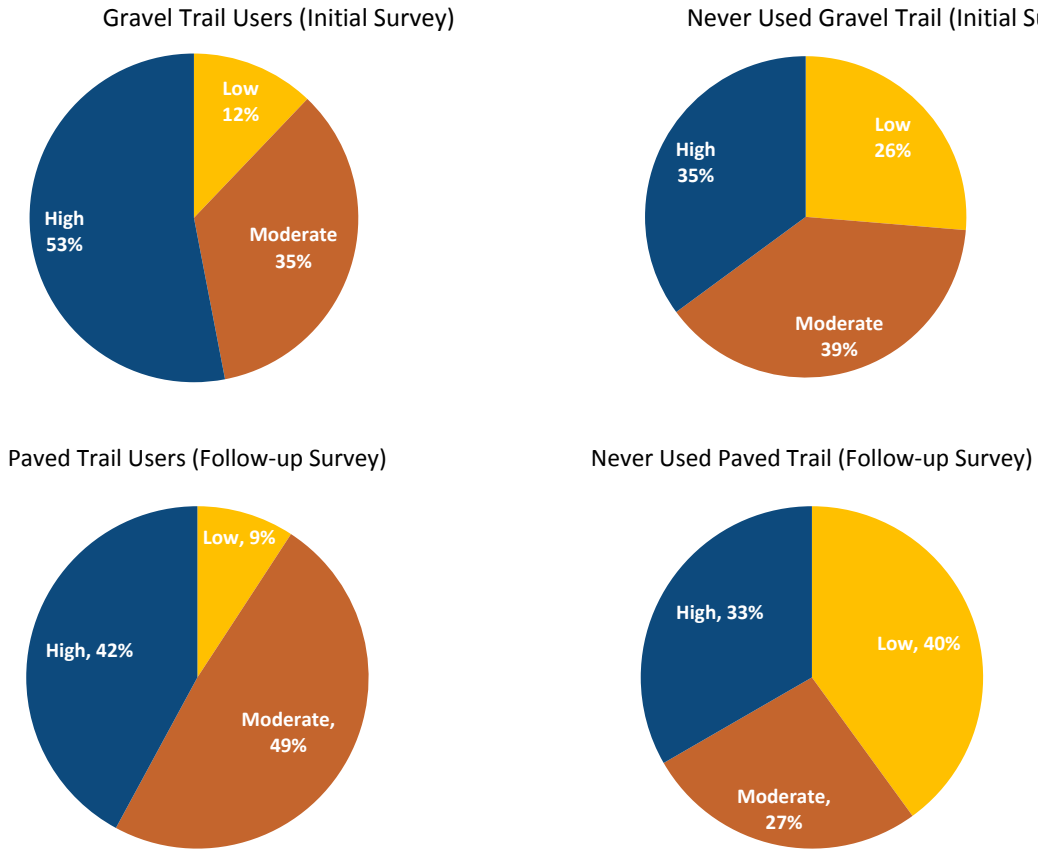


Figure 5: Differences in physical activity level between respondents who have or have not been on the trail.

Top: Initial survey, Bottom: Follow-up survey.

Respondents were asked about the physical activity levels of their friends and family. The majority of respondents to both the initial (69.7%) and follow-up survey (66.7%) indicated that "most" of their family members and friends were physically active. However, these results were stratified by the respondents' levels of physical activity. On the initial survey, 76.4% of respondents with a high level of physical activity responded that most of their family members were active, compared to 68.2% for respondents with a moderate level of physical activity and to 56.5% for respondents with a low level of physical activity. Additionally, while the majority of those with a low level of activity responded that most of their family members were active, 30.4% responded that none of their family members were physically active, compared to 1.8% of highly active respondents and 2.3% of moderately active respondents.

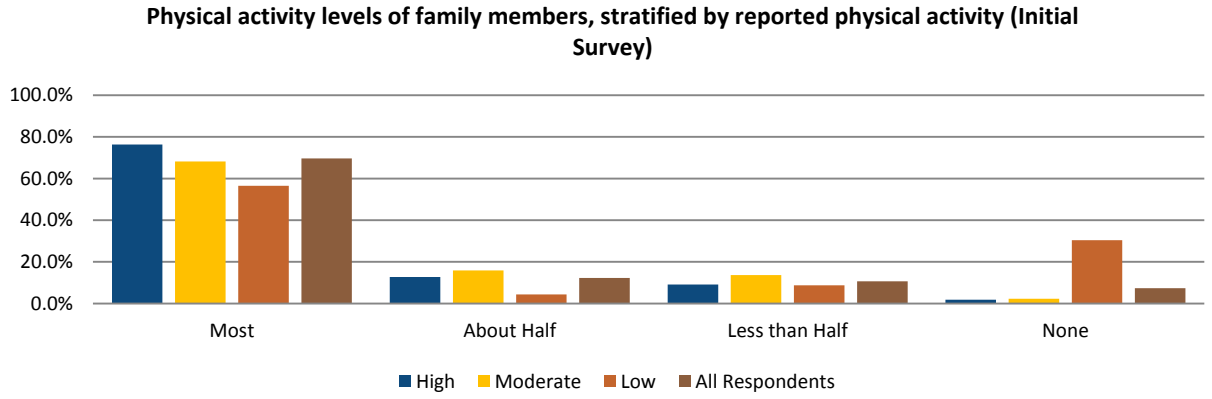


Figure 6: Responses to "How many of your family members are physically active?"

Among respondents to the second survey, the majority of respondents with a high or moderate level of physical activity reported that "most" of their family members are physically active, but just 38.5% of respondents with a low level of physical activity did so. Low-active respondents were much more likely than other respondents to report that their family members are less physically active. 30.8% reported that less than half of their family members are active and 15.4% that none are, compared to 5.4% of highly active and 2.5% of moderately active respondents for each category.

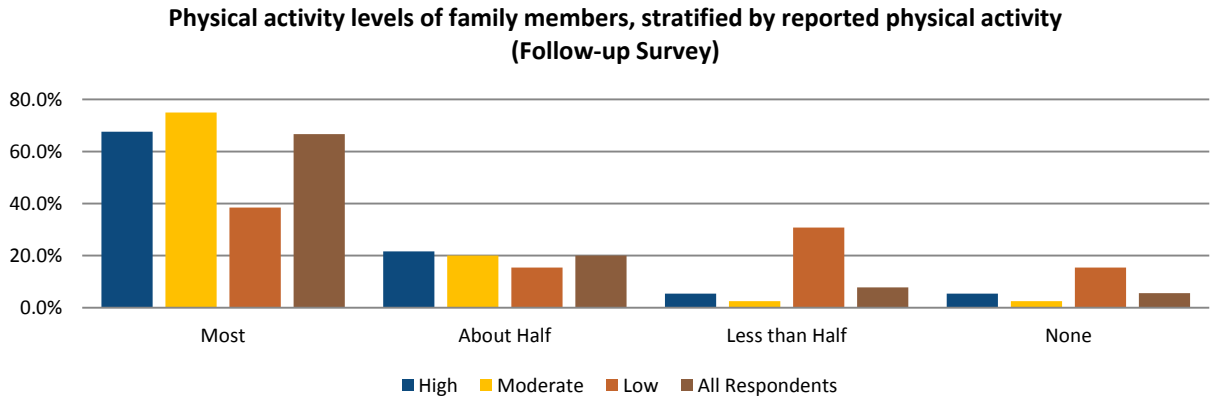


Figure 7: Responses to "How many of your family members are physically active?"

Results were similarly stratified when respondents were asked about their friends' level of physical activity. While 65.5% of highly active respondents stated that most of their friends were active, this declined to 57.8% for moderately active respondents and 56.5% for respondents with low activity levels. While no respondents indicated that none of their friends were physically active, more low active respondents stated that less than half of their friends were active. 21.7% of these respondents stated that less than half of their friends were active, compared to 5.5% of highly active respondents and 8.9% of moderately active respondents.

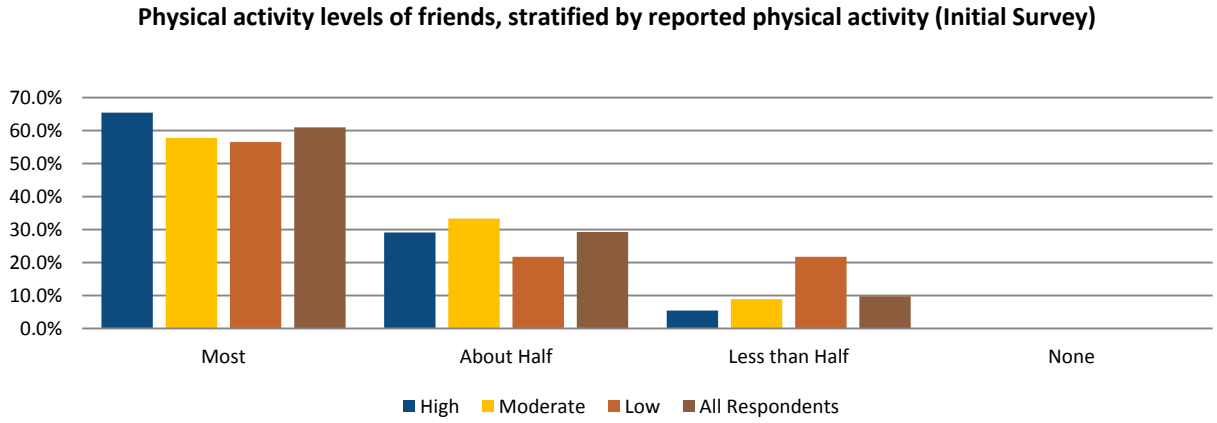


Figure 8: Responses to "How many of your friends are physically active?"

On the second survey, although a majority of all respondents, highly active respondents, and moderately active respondents reported that most of their friends are physically active, just 38.5% of low active respondents did so. However, low active respondents were more likely to report that about half of

their friends are physically active (53.8%) compared to 29.7% of highly active respondents, 25.0% of moderately active respondents, and 31.1% of respondents overall.

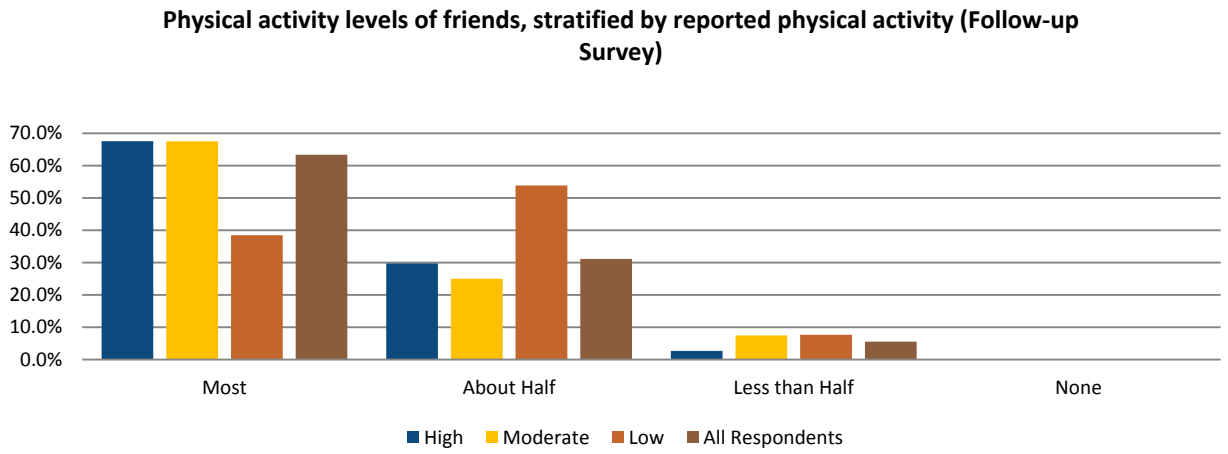


Figure 9: Responses to "How many of your friends are physically active?"

Stratification by activity level was also evident when respondents were asked if they had been encouraged to become more physically active by their family members, friends, or doctor. Overall, most respondents to both surveys indicated that they had not been encouraged to become more physically active (Figure 10).On the initial survey, while a majority of highly and moderately active respondents indicated that no one had encouraged them to become more active, the reverse was true for respondents with a low level of physical activity. Low active respondents indicated that 56.5% had been encouraged to become more active by family members, while 60.9% had been encouraged to do so by their doctor.

Table 2: Responses to "Have your family members/friends/doctor encouraged you to be more physically active?" stratified by respondents' level of physical activity.

		Initial Survey				Follow-up Survey			
		High	Moderate	Low	All	High	Moderate	Low	All
Family	Yes	40.0%	48.9%	56.5%	46.3%	25.0%	51.2%	38.5%	38.9%
	No	60.0%	51.1%	43.5%	53.7%	75.0%	48.8%	61.5%	61.1%
Friends	Yes	32.7%	42.2%	47.8%	39.0%	27.8%	41.5%	38.5%	35.6%
	No	67.3%	57.8%	52.2%	61.0%	72.2%	58.5%	61.5%	64.4%
Doctor	Yes	32.7%	37.8%	60.9%	39.8%	25.0%	36.6%	69.2%	36.7%
	No	67.3%	62.2%	39.1%	60.2%	75.0%	63.4%	30.8%	63.3%

On the follow-up survey, just one in four highly active respondents reported that they have been encouraged to increase their physical activity by either their family, friends, or doctor. Among moderately

active and inactive respondents, the share was slightly greater. A slight majority of moderately active respondents (51.2%) reported being encouraged to be more active by their family members. However, most of these respondents reported that they had not received such a suggestion from their friends or doctor. For inactive respondents, a majority reported that they have not been encouraged to be more active by either their friends or family. However, 69.2% of these respondents reported that they have been encouraged to be more active by their doctor.

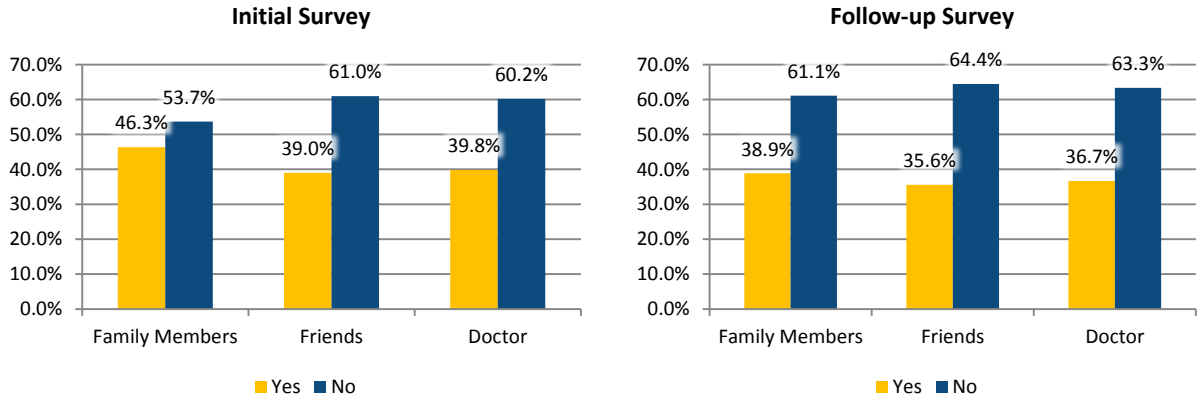


Figure 10: Responses to "Have your family members/friends/doctor encouraged you to be more physically active?"

Trail Use

Sixty-six respondents (54%) to the initial survey reported that they had previously used the gravel Eastside Trail, while 57 (46%) have never used the trail. The share of respondents who have been on the trail increased for the follow-up survey. Seventy-six respondents (84%) have used the paved Eastside Trail, while 15 respondents (16%) have not.

Figure 11: Share of respondents who have been on the gravel trail (left) or the new paved trail (right).

When asked how they first found out about the gravel Eastside Trail, 25.2% of respondents to the initial survey indicated that they did not know about it (Figure 12). This share decreased greatly for the second survey, with just 4.4% of respondents indicating that they did not know about the paved Eastside Trail. Of the remaining respondents, many respondents to both the initial survey (43.1%) and the follow-up survey (54.9%) had learned about the trail through word-of-mouth, while many others found out about the trail due to proximity: 30.1% of initial survey respondents and 48.4% of follow-up survey respondents indicated that they had driven, walked, or biked past the trail, while several of the 18.7% of respondents who selected "other" stated that they became aware of the trail because they live on or near it. The next most common way in which respondents found out about the trail is through the newspaper (19.5%), while small numbers learned about it through roadside signage (6.5%), from the Rails-to-Trails Conservancy (6.5%), or through the Atlanta Parks Department (0.8%).

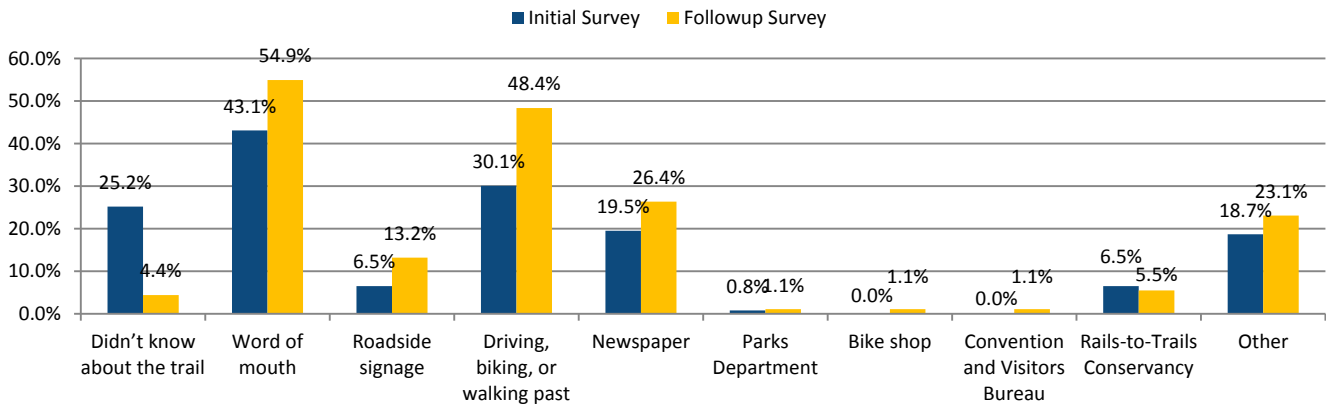


Figure 12: Responses to "How did you find out about the trail?"

When asked how often they used the gravel trail, 47% of respondents reported that they used the trail a few times a year. This share greatly decreased in the follow-up survey, with only 6.6% of respondents using the trail a few times a year. Of the remaining respondents, many used the trail a couple of times a month (15.2% in the initial survey, 22.4% in the follow-up survey) or had been on it once (19.7% in the initial survey and 15.8% in the follow-up survey). A large share of respondents in the follow-up survey (32.9%) used the trail 2 to 5 times per week, compared with just 3% of respondents reporting that they had used the trail several times a week during the initial survey.

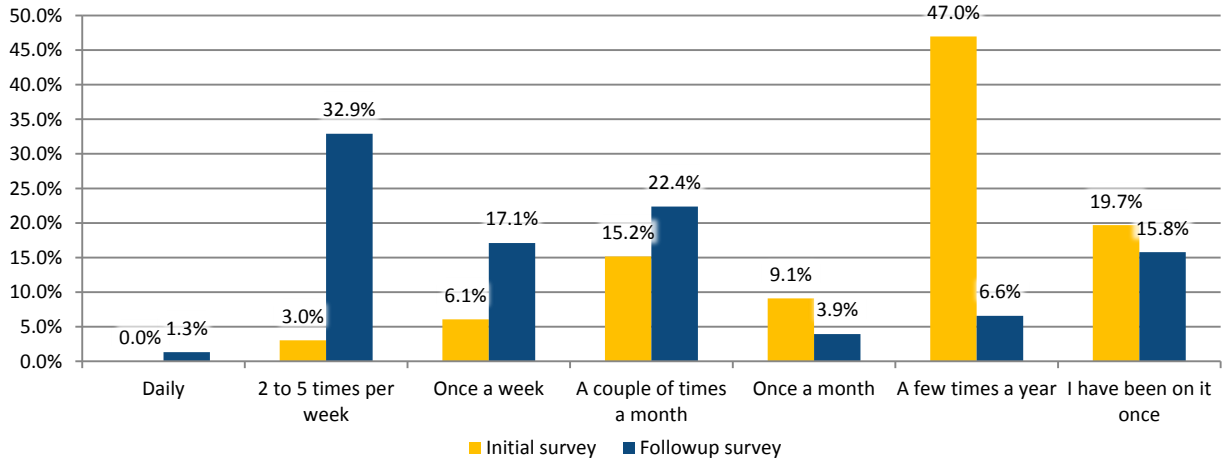


Figure 13: Responses to "How often, on average, do you use the gravel trail?"

Respondents reported that their primary activity or activities on the trail is walking or hiking, which 68.2% of respondents in the initial survey and 68.8% of respondents in the follow-up survey reported doing (Figure 14). Other activities, such as biking (24.2%), jogging or running (19.7%), and walking pets (16.7%) were commonly reported, though much less frequent than walking or hiking. In the follow-up survey, 37.5% of respondents reported biking, 26.3% reported jogging or running, and 16.7% of respondents reported walking pets. Just 1.5% of respondents in the initial survey and 2.5% of respondents in the follow-up survey reported engaging in other activities while on the trail.

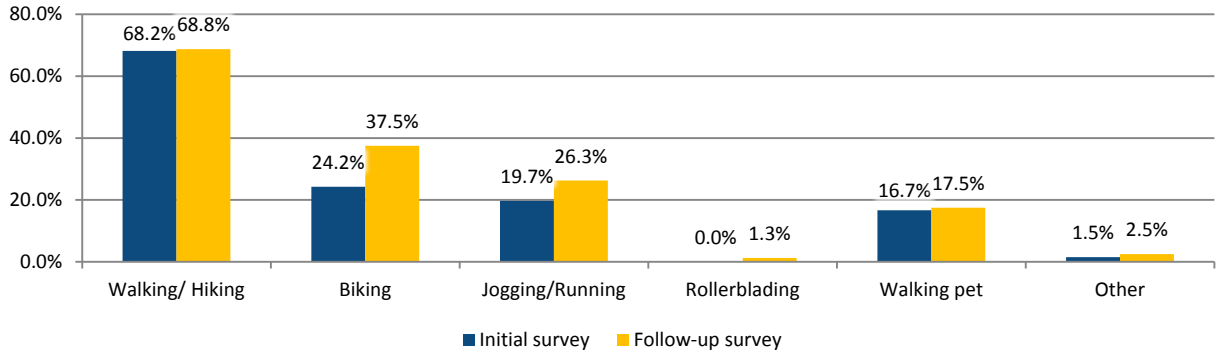


Figure 14: Responses to "What is your main activity (or activities) on the gravel trail?"

A majority of respondents (52%) reported that they use the trail primarily on weekends, although 45% reported that they are equally likely to use the trail on weekends as on weekdays (Figure 15). Only a few respondents (3%) reported that they primarily use the trail on weekdays. In the follow-up survey, a majority of respondents reported using the trail both on weekdays and weekends (56%), although the share of users on weekends had decreased (32% from 52%), while more respondents reported weekday visits (12%). The typical visit reported by 58% of respondents in the initial survey and 68% of respondents in the follow-up survey lasts between 30 minutes and one hour, while 15% of visits in the initial survey and 11% of visits in the follow-up are shorter than that. One-quarter of respondents in the initial survey and 21% of respondents in the follow-up survey reported a typical visit length between one and two hours, while 2% of respondents in the initial survey, and 0% of respondents in the follow-up reported that their typical visit last more than two hours.

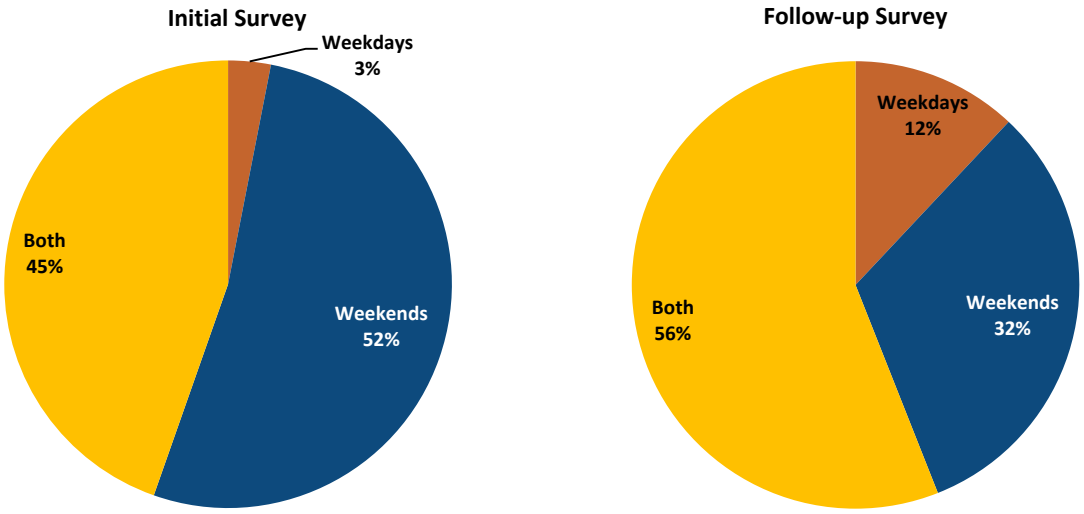


Figure 15: Responses to "Generally, when do you use the trail?"

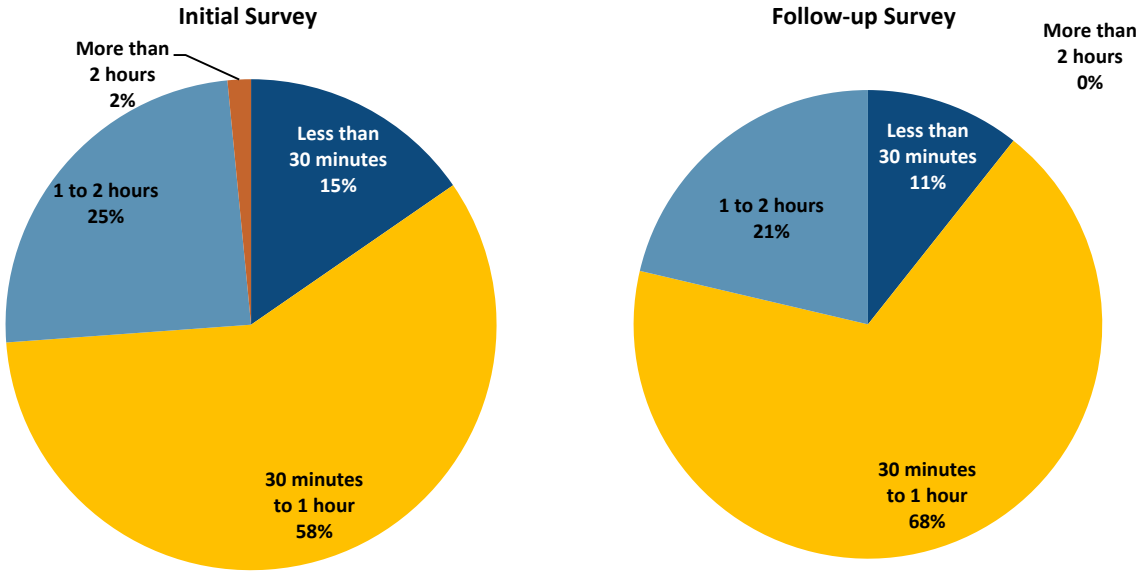


Figure 16: Responses to "How much time do you generally spend on the trail each visit?"

The primary reasons for using the trail as reported by respondents are recreation and general health and exercise, each of which was chosen by approximately four out of every five respondents (Figure 17). Similarly, in the follow-up survey, 81.3% reported using the trail for recreation and also for health and exercise. Respondents also reported some utilitarian uses of the trail: 31.8% in the initial survey and 43.8% in the follow-up survey reported having used the trail to travel to shops or restaurants, while 15.2% in the initial survey and 15.0% in the follow-up reported that they use the trail for fitness training purposes. A small number of respondents use the trail for travel to either school (4.5% in the

initial survey, 5.0% in the follow-up) or work (9.1% in the initial survey, 8.8% in the follow-up). In addition, 9.1% of respondents in the initial survey and 10.0% in the follow-up survey reported having other uses of the trail as well. These uses include traveling to friends' houses, between Atlanta neighborhoods, and to specific events, while one respondent reported using the trail "to enjoy an alternate view of Atlanta."

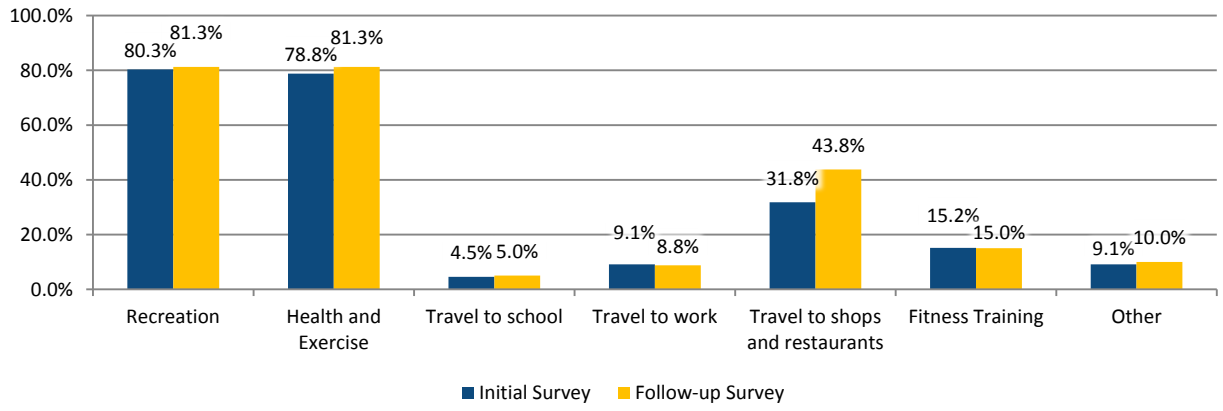


Figure 17: Responses to "What do you consider your use of the trail to be for?"

The majority of respondents (69.7% in the initial survey, 63.8% in the follow-up survey), reported that they have never purchased an item while using the trail. Among respondents who had made at least one purchase, the most frequently reported purchases included beverages (16.7% in the initial survey, 20% in the follow-up survey) and meals at a restaurant along the trail (13.6% in the initial survey, 18.8% in the follow-up survey). Few reported having purchased items such as snack food, sandwiches, or ice cream (Figure 18).

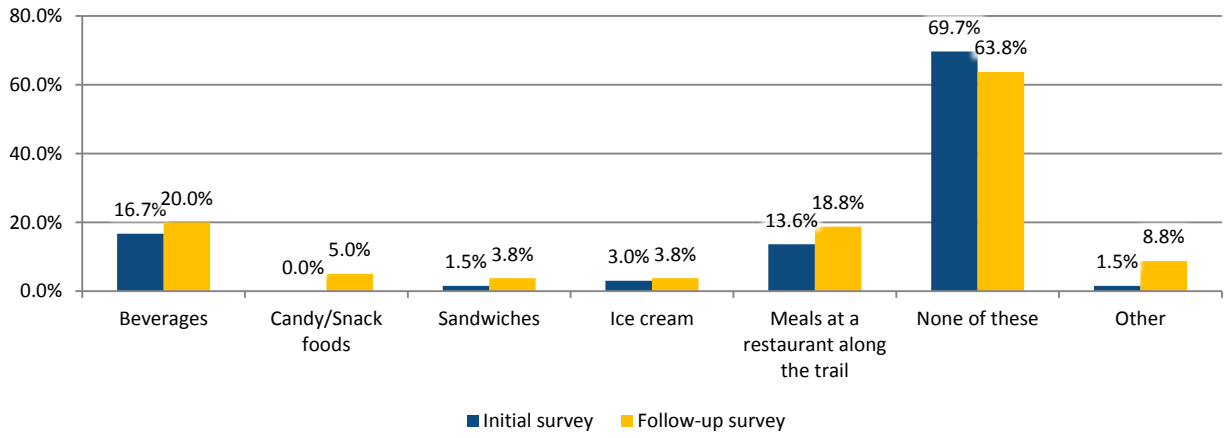


Figure 18: Responses to "While using the trail, did you purchases any of the following items along the trail?"

Fifty-seven respondents in the initial survey and 15 respondents in the follow-up survey indicated that they have never been on the gravel Eastside trail. These respondents were asked a series of questions regarding why they had never used the trail and whether or not they plan to use the trail in the future. Respondents were first asked for the most likely reason they have never used the trail (Figure 19). In the initial survey, 60% of respondents said that the primary reason they had not used the trail was that they had a lack of knowledge about the trail. The second most common response, given by 19% of respondents, was that they "exercise, but in other ways." In the follow-up survey, 40% of respondents stated that they have not used the trail for "other" reasons (including not knowing where to park, and not having time to visit yet). The second most common response, by 33% of respondents, was that they did not know about the trail, while 27% stated that they exercised in other ways.

In addition, a few respondents indicated that they had not used the trail due to safety concerns (7%), distance concerns (2%), or accessibility concerns (3%). In the follow-up survey, 0% of respondents stated that the trail was too far away, unsafe, or difficult to access. Among the 9% of respondents in the initial survey who indicated another reason for not using the trail, responses included the difficulty of using the trail with small children in a stroller; concerns about ongoing construction on the trail; and a lack of interest in using the trail. In addition, one respondent indicated that they intended to use the trail but have not yet done so.

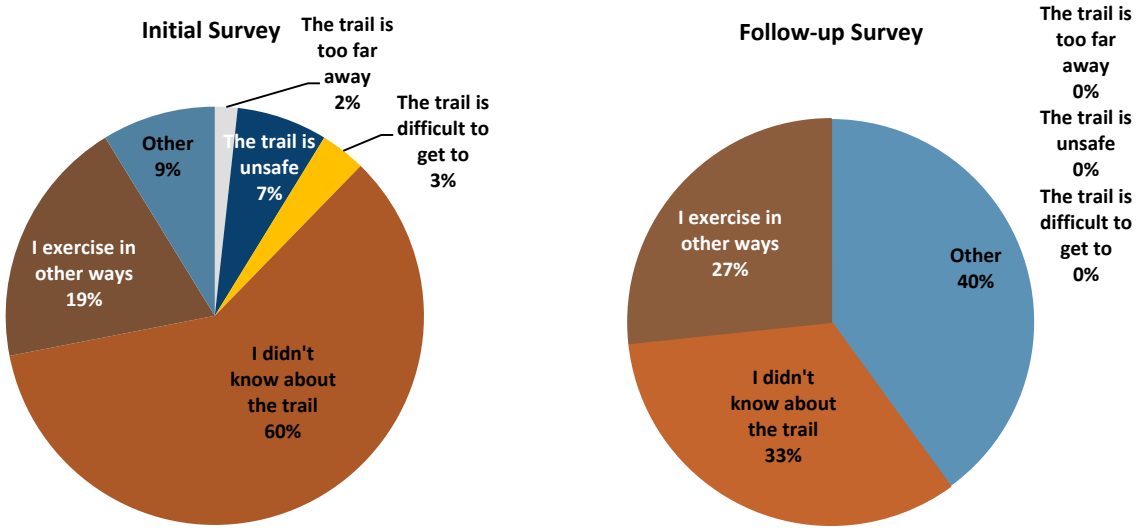


Figure 19: Responses to "What is the most likely reason that you've never been on the gravel trail?"

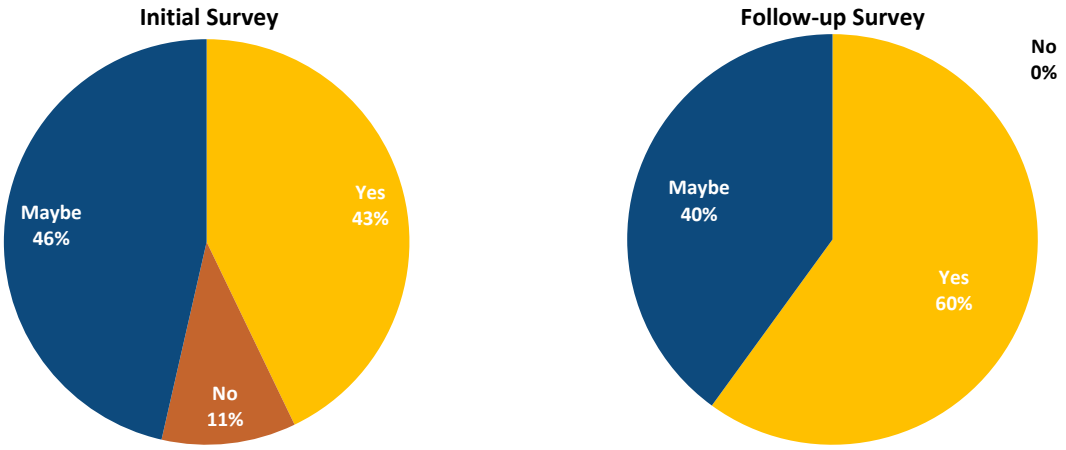


Figure 20: Responses to "Do you anticipate using the Eastside Trail once it is paved/in the future?"

Respondents were next asked whether they intended to use the trail in the future (Figure 20). Eighty-nine percent of respondents in the initial survey indicated that they will definitely or maybe use the trail once it is paved, while just 11% indicated that they do not plan to use the trail even after it is paved. In the follow-up survey, 60% of respondents indicated that they plan to use the trail, and 40% indicated that they will maybe use the trail once it is paved (0% indicated that they do not intend to use the trail in the future). The 50 respondents who answered that they would definitely or maybe use the trail in the future were asked for what purpose they thought they would use the trail. Respondents were able to select as many uses as they thought would apply (Figure 21). The most common anticipated use of the Eastside Trail was “Health and exercise”, which 78% of respondents in the initial survey and 73.3% in the follow-up survey selected. In addition to general health uses, 12% of respondents in the initial survey and 6.7% in the follow-up survey indicated that they would use the trail specifically for fitness training, such as training for a marathon or triathlon.

The second most common anticipated use of the trail was “Recreation” which was selected by 66% of respondents in the initial survey and 73.3% of respondents in the follow-up survey. Smaller numbers of respondents selected utilitarian uses of the trail, such as travel to shops and restaurants (30% in the initial survey, 20% in the follow-up survey) or travel to work (2% in the initial survey, 0% in the follow-up), and no respondents selected travel to school as an anticipated use of the trail. Six percent of respondents in the initial survey and 13.3% of respondents in the follow-up survey selected “Other”

anticipated uses of the trail, with specific examples including “easy walking,” “walking the dog” and “cycling.”

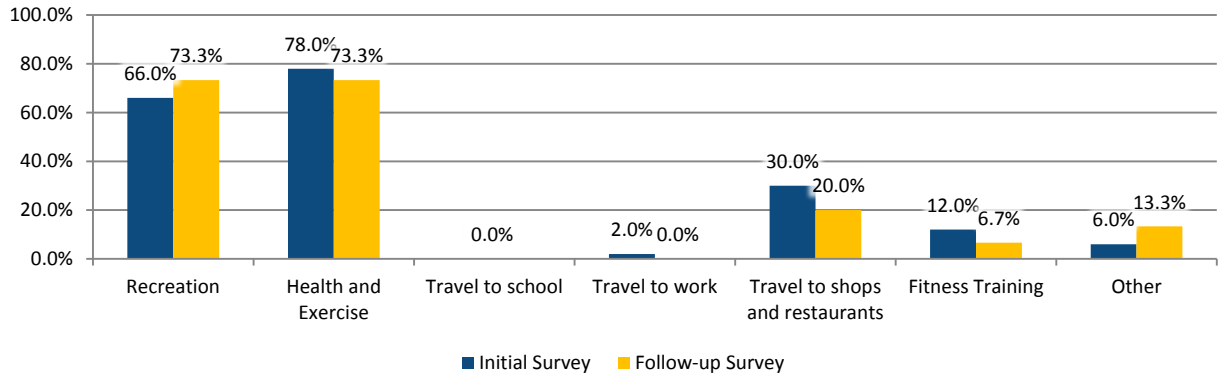


Figure 21: Responses to "What do you anticipate using the trail for once it is paved/in the future?”

Trail Safety & Security

Respondents were next asked to rate their perception of the safety and security of the trail. Most respondents in the initial survey rated the trail’s safety as fair (52%). 36% of respondents in the initial survey felt that the safety of the trail is either good or excellent, while 9% felt that it was poor. 3% of respondents in the initial survey did not know how they would rate the trail’s safety and security. In the follow-up survey, the majority of respondents (55%) rated the trail’s safety and security as good, and 15% rated it as excellent. Sixteen percent of respondents in the follow-up survey rated the safety and security as fair, 5% as poor and 9% reported that they did not know.

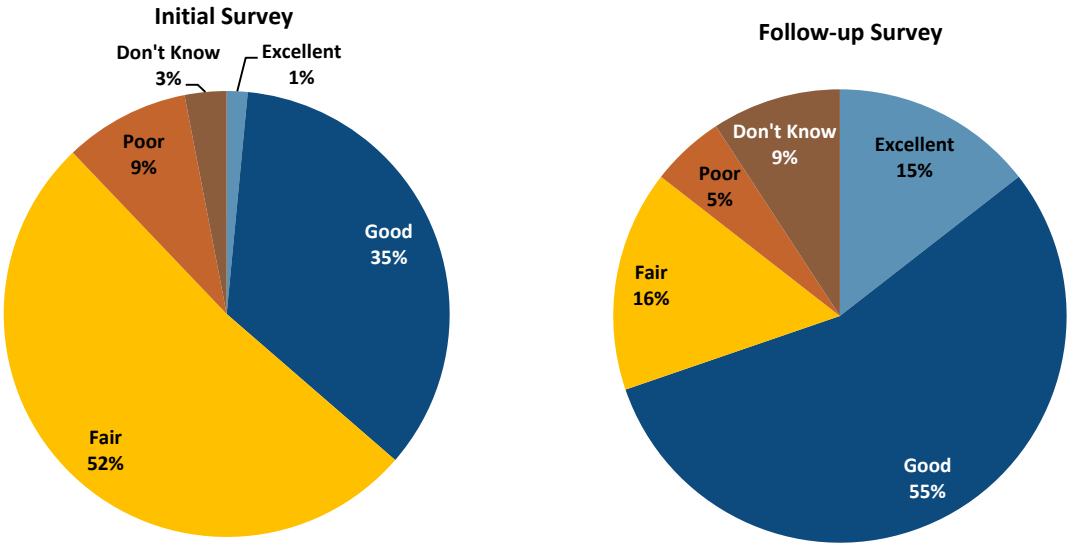


Figure 22: Responses to "How would you rate the safety and security on the trail?"

Trail Accessibility

Finally, respondents were asked which portions of the trail they use most often. In the initial survey and the follow-up survey, respondents reported using the southern two sections of the trail – from Ponce de Leon Avenue to Ralph McGill Boulevard, and from Ralph McGill to DeKalb Avenue – most often, with over half of respondents using each of these sections. However, more than a third of respondents in the initial survey and 50% of respondents in the follow-up survey reported using the northern section of the trail, from Monroe Drive to Ponce de Leon Avenue, as well.

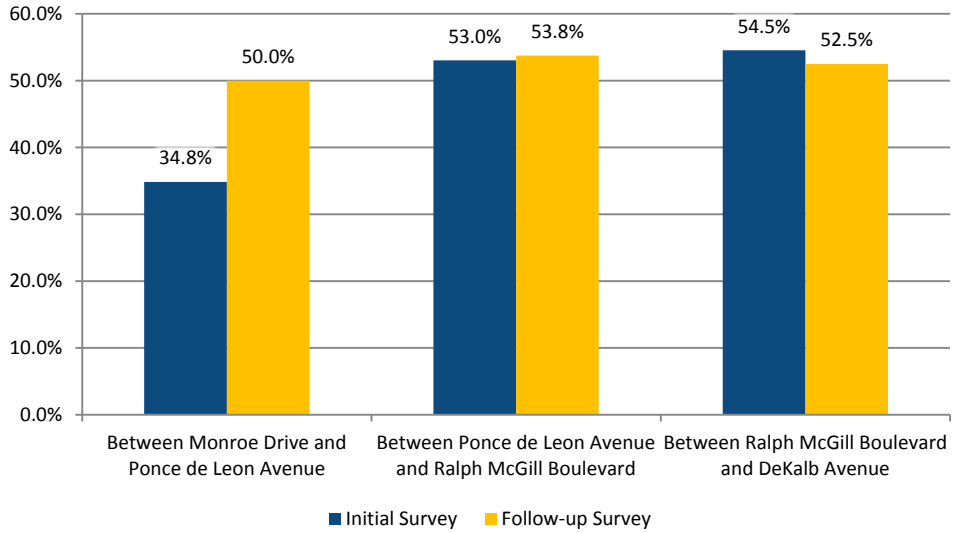


Figure 23: Responses to "What portion of the trail do you use most often?"

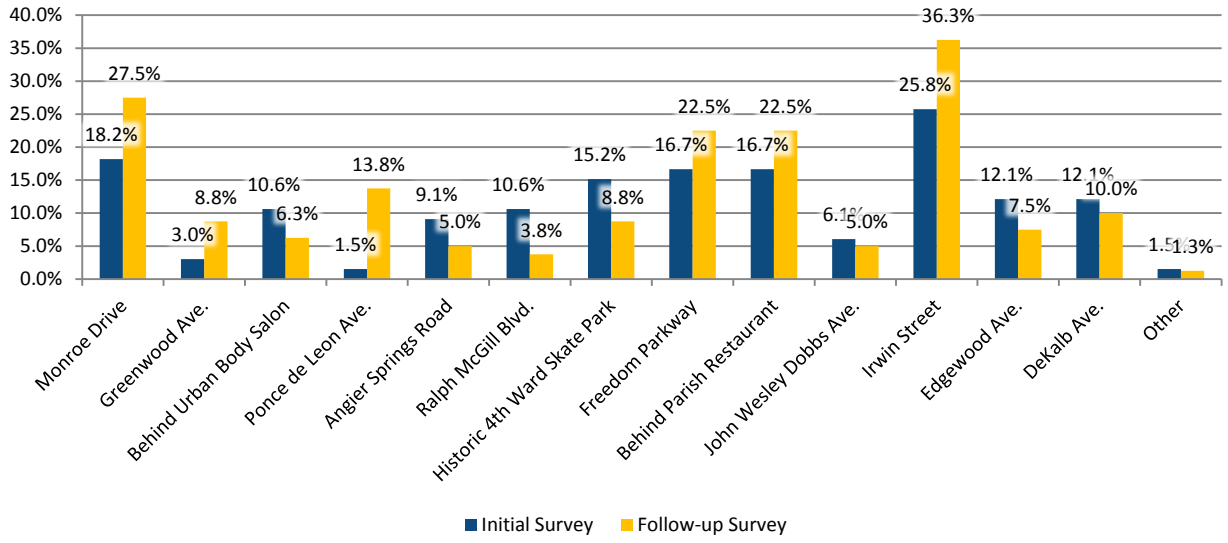


Figure 24: Responses to "Which trail access point do you generally use when you visit the trail?"

In addition, respondents recorded which access points they use to reach the trail. Almost 26% of respondents in the initial survey and 36.3% of respondents in the follow-up survey use the Irwin Street access point, while 18.2% of respondents in the initial survey and 27.5% of respondents in the follow-up survey access the trail at Monroe Drive, adjacent to Piedmont Park. Other frequently used access points in the initial survey include Freedom Parkway, the access point behind Parish Restaurant, and the Historic 4th Ward Skate Park, all of which are used by more than 15% of respondents. In the follow-up survey, over 20% of respondents used the access points at Freedom Parkway and behind Parish Restaurant, while 13.8% of respondents used the access point at Ponce de Leon Avenue (compared with only 1.5% in the initial survey).

Commuting Patterns

Respondents were asked what mode they use to commute to work. Respondents were allowed to select more than one mode if they use two or more modes in one commute trip, or if they commute by different modes on different days. Most respondents (78.8% in the initial survey and 73.6% in the follow-up survey) said that they commute to work by driving alone at least some of the time. However, 26.3% of

respondents in the initial survey and 24.2% in the follow-up survey telecommute (work from home) or do not work, while 7.6% of respondents in the initial survey and 9.9% in the follow-up survey walk, bike, or run as part of their commute. A small number of respondents carpool (1.7% in the initial survey, 1.1% in the follow-up) or ride MARTA rail (2.4% in the initial survey, 2.2% in the follow-up survey) as part of their commute. No respondents reported taking the bus as part of their commute.

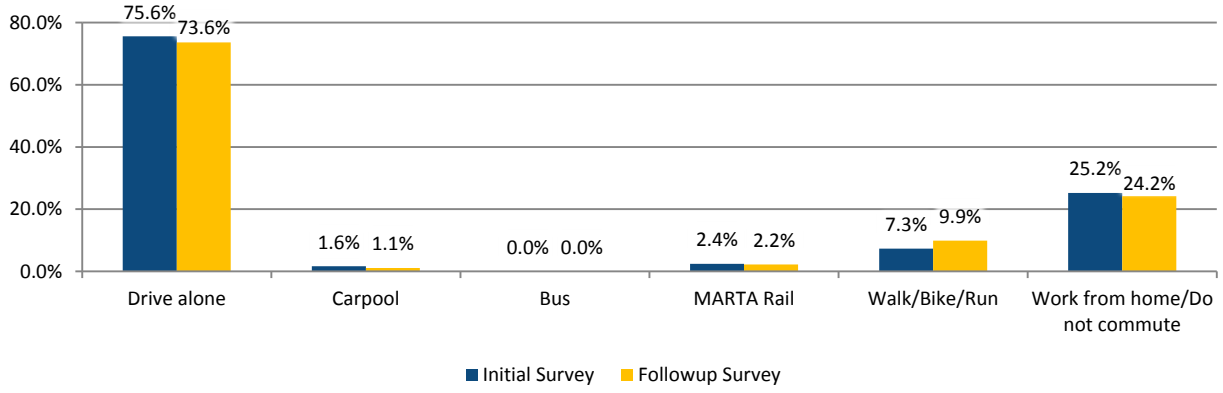


Figure 25: Responses to "How do you commute to work?"

Walking Behavior

After answering questions about their use or non-use of the trail, all survey respondents were asked a series of questions about their perception of their neighborhood. These questions were intended to understand survey respondents' use of and satisfaction with neighborhood facilities and the connectedness that survey respondents feel within their neighborhood. Respondents were first asked if they walk in their neighborhood. Almost all respondents, 94% in the initial survey and 98% in the follow-up survey, indicated that they do walk in their neighborhood. In the initial survey, the most common reason for walking trips was recreation (47%), while the follow-up survey respondents reported that exercise was the most common reason for walking (41%). The percentage of respondents who stated a utilitarian reason for walking trips increased from the initial survey (20%) to the follow-up survey (28%). Both sets of survey respondents indicated that a slight majority did not feel safe walking in their neighborhood after dark (51% in the initial survey and 52% in the follow-up survey).

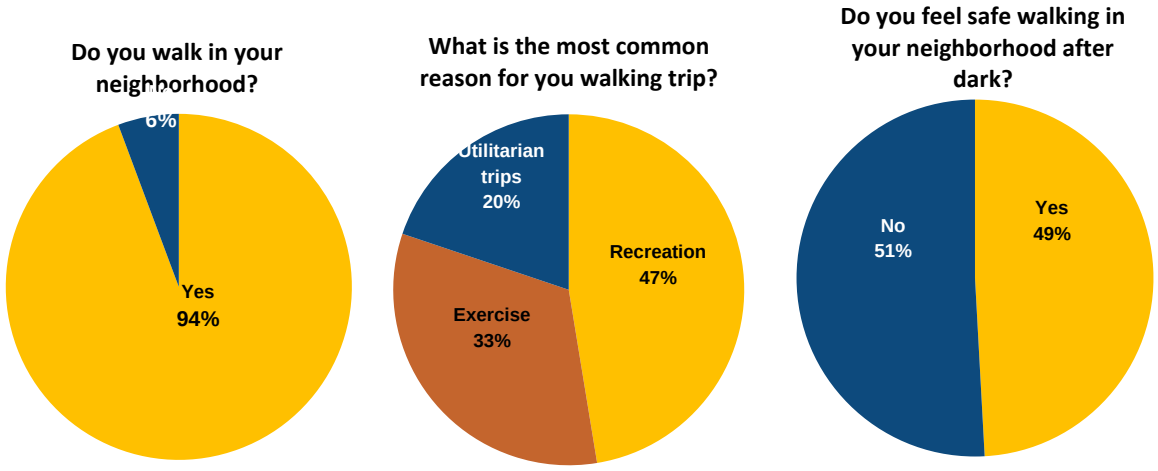


Figure 26: Initial survey neighborhood walking behavior.

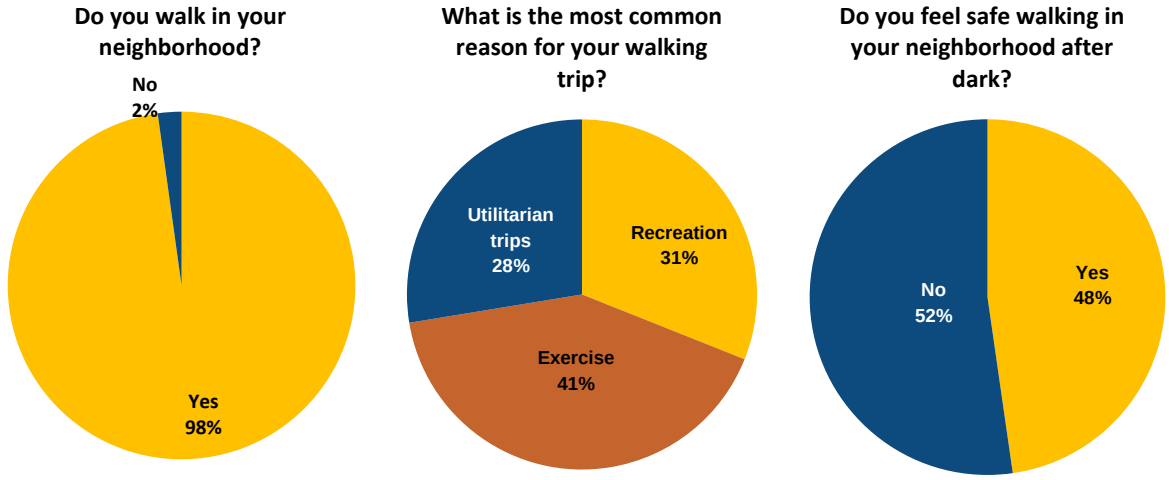


Figure 27: Follow-up survey neighborhood walking behavior.

Neighborhood Amenities

The last set of neighborhood questions asked respondents to rate the accessibility of services and amenities in their neighborhood. Most respondents felt that both parks (86.2% in the initial survey and 89% in the follow-up survey) and establishments such as restaurants and bars (86.2% in the initial survey and 92.3% in the follow-up survey) were very accessible in their neighborhood. However, the "very accessible" rating remained essentially flat for other amenities, such as retail (69.1% in the initial survey

and 68.1% in the follow-up survey) or social, religious, or educational institutions (59.2% in the initial survey, 60% in the follow-up survey). In particular, respondents felt that transit was less accessible relative to other amenities, with just 45.1% in the initial survey and 50% in the follow-up survey rating transit as “very” accessible, compared to a slim majority in the initial survey and 47.8% in the follow-up survey who rated it as “somewhat” accessible. However, very few respondents felt that any of these amenities were “not at all” accessible (see Table 3).

Table 3: Responses to "In your neighborhood, how accessible are the following amenities?"

	Initial Survey						Follow-up Survey					
	Very		Somewhat		Not at all		Very		Somewhat		Not at all	
In your neighborhood, how accessible are parks?	106	86.2%	15	12.2%	2	1.6%	81	89.0%	9	9.9%	1	1.1%
In your neighborhood, how accessible are restaurants/bars?	106	86.2%	16	13.0%	1	0.8%	84	92.3%	7	7.7%	0	0.0%
In your neighborhood, how accessible are retail locations?	85	69.1%	34	27.6%	4	3.3%	62	68.1%	29	31.9%	0	0.0%
In your neighborhood, how accessible are institutions?	71	59.2%	47	39.2%	2	1.7%	54	60.0%	35	38.9%	1	1.1%
In your neighborhood, how accessible is transit?	55	45.1%	62	50.8%	5	4.1%	45	50.0%	43	47.8%	2	2.2%

This is reflected in respondents’ overall rating of services and amenities in their neighborhood. The majority of respondents (52% in the initial survey and 56% in the follow-up survey) indicated that they are “very satisfied” with the services and amenities available to them, while an additional 44% in the initial survey and 42% in the follow-up survey stated that they are “somewhat satisfied”. Just 4% in the initial survey and 2% in the follow-up survey indicated that they are either “unsatisfied” or “extremely unsatisfied” with their neighborhood’s services and amenities.

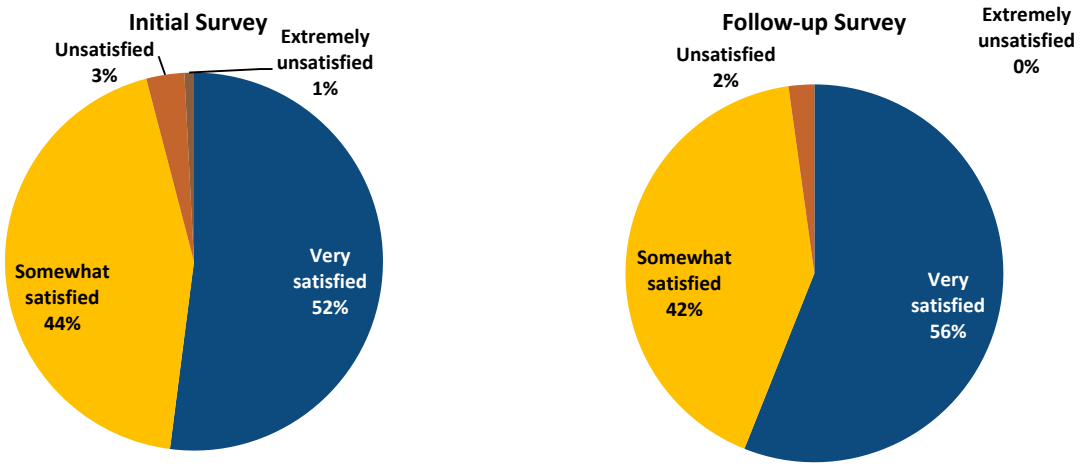


Figure 28: Responses to "How satisfied are you overall with the services/amenities in your neighborhood?"

Social Capital

Respondents were then asked a series of questions about their perception of the connectedness of their neighborhoods. Summarized in Table 4, respondents in the initial survey who had previously used the gravel Eastside Trail generally indicated a stronger perception of connectedness within their neighborhoods than respondents who had never been on the gravel trail. This pattern held for six of the seven questions asked in the initial survey. For the seventh question, “Can you count on other adults in the neighborhood to take action if they saw someone doing something wrong, like doing graffiti, littering or skipping school?”, the answers from both sets of respondents were similar, with 90.9% of previous trail-users and 89.3% of non-users answering “yes.”

Table 4: Respondents' feelings of connectedness within their neighborhoods (initial survey)

	All Respondents				Have Been on Trail				Never Been on Trail			
	Yes		No		Yes		No		Yes		No	
Do you know the names of your neighbors?	107	87.0%	16	13.0%	62	93.9%	4	6.1%	45	78.9%	12	21.1%
Would you say that people in this neighborhood generally know each other?	90	73.2%	33	26.8%	52	78.8%	14	21.2%	38	66.7%	19	33.3%
Do you and your neighbors ask each other for advice or do favors for one another?	84	68.3%	39	31.7%	52	78.8%	14	21.2%	32	56.1%	25	43.9%
Is this a close-knit neighborhood?	83	67.5%	40	32.5%	48	72.7%	18	27.3%	35	61.4%	22	38.6%
Can you count on other adults in the neighborhood to take action if they saw someone doing something wrong?	110	90.2%	12	9.8%	60	90.9%	6	9.1%	50	89.3%	6	10.7%
Is there someone in the neighborhood you could go to for help in an emergency?	108	88.5%	14	11.5%	61	92.4%	5	7.6%	47	83.9%	9	16.1%
In the past 12 months, have you participated in the activities of any community groups/organizations?	83	68.0%	40	32.8%	54	81.8%	12	18.2%	29	50.9%	28	49.1%

For three of the seven questions, answers from the two sets in the initial survey differed by between 8 and 12 percentage points. To the question, “Would you say that people in this neighborhood generally know each other?”, 78.8% of previous trail-users and 66.7% of non-users answered “yes.” To the question “Is this a close-knit neighborhood?”, 72.7% of trail-users and 61.4% of non-users said “yes”. Finally, to the question, “Is there someone in the neighborhood you could go to for help in an emergency?” 92.4% of previous trail-users said yes in the initial survey, compared to 83.9% of non-users.

In the follow-up survey summarized in Table 5, this pattern held for two of the seven questions, while many of the questions elicited similar responses. Particularly, respondents in the follow-up survey who had used the gravel trail were more likely to know the names of their neighbors, (90% compared with 66.7%) and were much more likely to have participated in community groups and organizations (65.8% compared with 26.7%). Additionally, a higher percentage of respondents who had been on the gravel trail reported asking neighbors for advice and favors (65%) than respondents who had never been on the trail

(60%) in the follow-up survey.

Table 5: Respondents' feelings of connectedness within their neighborhoods (follow-up survey)

	All Respondents				Have been on trail				Never been on trail			
	Yes		No		Yes		No		Yes		No	
Do you know the names of your neighbors?	78	85.7%	13	14.3%	68	90.0%	8	10.0%	10	66.7%	5	33.3%
Would you say that people in this neighborhood generally know each other?	72	79.1%	19	20.9%	60	78.8%	16	21.3%	12	80.0%	3	20.0%
Do you and your neighbors ask each other for advice or do favors for one another?	60	65.9%	31	34.1%	51	65.0%	25	35.0%	9	60.0%	6	40.0%
Is this a close-knit neighborhood?	55	60.4%	36	39.6%	46	60.0%	30	40.0%	9	60.0%	6	40.0%
Can you count on other adults in the neighborhood to take action if they saw someone doing something wrong?	81	89.0%	10	11.0%	64	86.1%	11	13.9%	13	86.7%	2	13.3%
Is there someone in the neighborhood you could go to for help in an emergency?	81	89.0%	10	11.0%	68	90.0%	8	10.0%	13	86.7%	2	13.3%
In the past 12 months, have you participated in the activities of any community groups/organizations?	55	61.1%	35	38.9%	51	65.8%	42	34.2%	4	26.7%	11	73.3%

Respondents were asked to rate the maintenance of facilities and buildings within their neighborhoods. The majority (69% in the initial survey and 65% in the follow-up survey) rated facility maintenance as “good” while 14% in the initial survey and 18% in the follow-up considered the facilities to be “excellent” and 15% in the initial survey and 16% in the follow-up survey considered them to be “fair”. Few respondents (2% in the initial survey, 1% in the follow-up survey) rated their neighborhood facilities’ maintenance to be “poor”. Respondents in the initial survey were less satisfied with the level of safety and security in their neighborhood. Just 2% of respondents in the initial survey rated this as “excellent”, while 49% rated it as “good”. Forty-three percent of respondents in the initial survey considered their neighborhood’s safety and security to be just “fair”.

However, very few respondents in the initial survey (6%) rated safety and security in their neighborhood as “poor”. In the follow-up survey, a majority (57%) of respondents reported safety and security in their neighborhood as “good,” and 33% rated safety as “fair.” 8% of respondents in the follow-

up survey reported their safety and security as “poor,” while 2% rated safety and security as “excellent.” In the initial survey, 61% of respondents said they live on a street which is busy, compared to 39% who live on a quiet street. In the initial survey 71% report that they have a front porch on their residence, while 29% have no porch. Similarly, 37% of respondents in the follow-up survey reported living on a quiet street, and 57% reported living on a busy street. In the follow-up survey, 64% reported having a front porch and 36% reported having no porch on their residence.

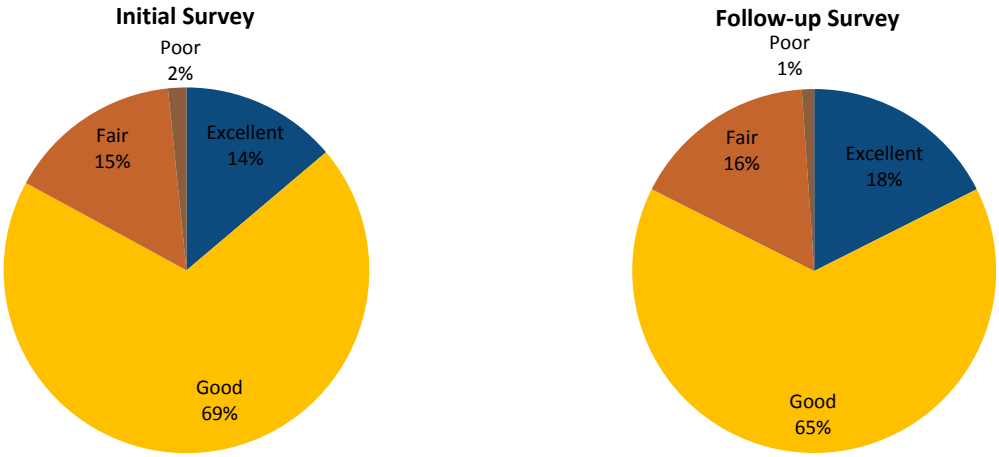


Figure 29: Responses to "How would you rate the maintenance of facilities and buildings in your neighborhood?"

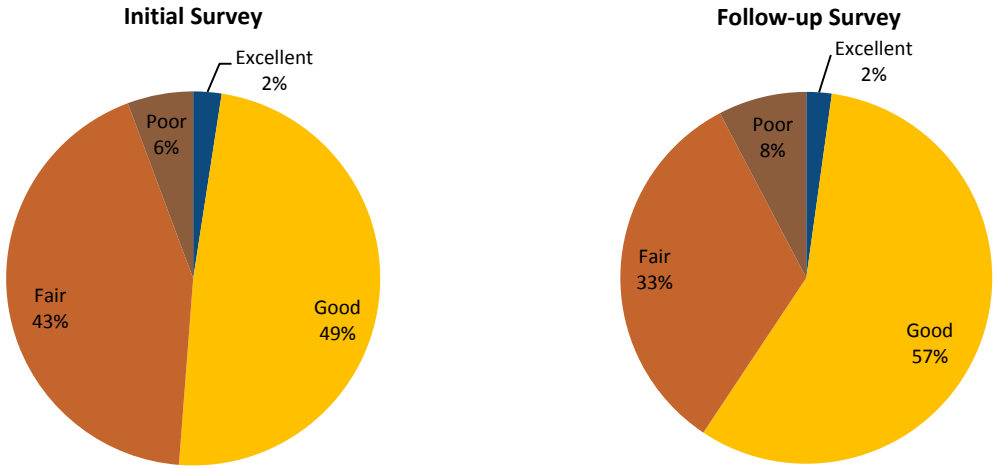


Figure 30: "In your opinion, the safety and security in your neighborhood is ..."

Demographic Information

The final set of questions asked respondents to describe themselves and their families.

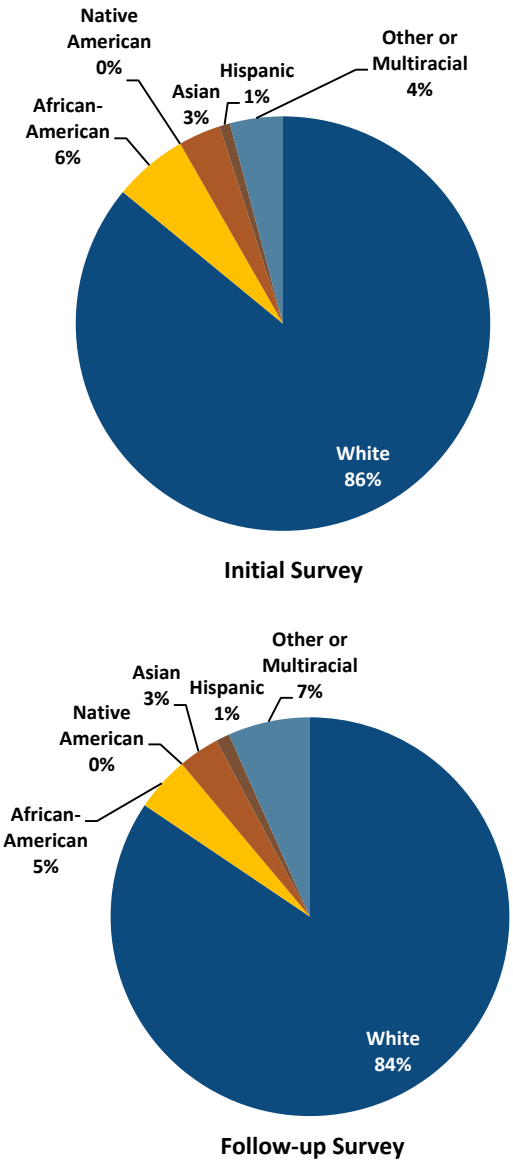


Figure 31: Responses to "What is your race/ethnicity?"

Household survey respondents tended to be white, affluent, and well-educated. Eighty-six percent of respondents to the first survey and 84% of respondents to the second survey reported their ethnicity as white. Six percent of first-survey respondents and 5% of second-survey respondents reported that they are African-American, and 3% of both surveys' respondents reported that they are Asian. Four percent of respondents to the first survey and 7% of respondents to the second survey stated that they are another race or they are two or more races. One percent of respondents to both surveys reported that they are Hispanic. No respondents were Native American.

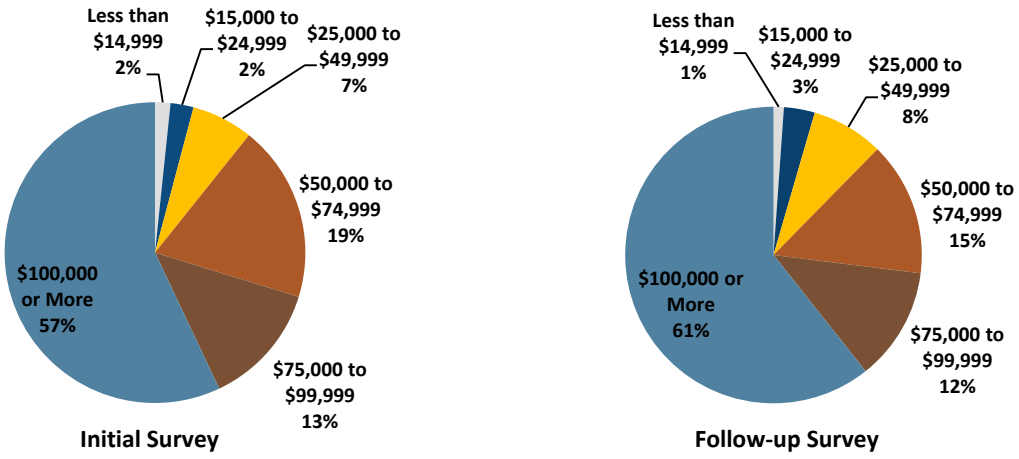


Figure 32: Responses to "What is your household income?" from the initial (left) and follow-up (right) surveys.

Most respondents to both surveys (57% in the initial survey; 61% in the follow-up survey) had a household income over $100,000 per year. Thirteen percent of respondents to the initial survey and 12% of respondents to the follow-up survey reported a household income between $75,000 and $99,999, and 19% of respondents to the first survey and 15% of respondents to the follow-up survey reported an income between $50,000 and $74,999. Eleven percent of respondents to the initial survey and 12% of follow-up survey respondents reported a household income below $50,000. Finally, 51% of respondents in the initial survey and 52% of respondents in the follow-up survey reported that they have at least some graduate education or a graduate degree, while a further 34% reported having a bachelor's degree in both surveys. Thirteen percent of respondents in the initial survey and 12% in the follow-up survey had some college or an associate's degree. Just 2% of respondents in both surveys had a high-school education or less.

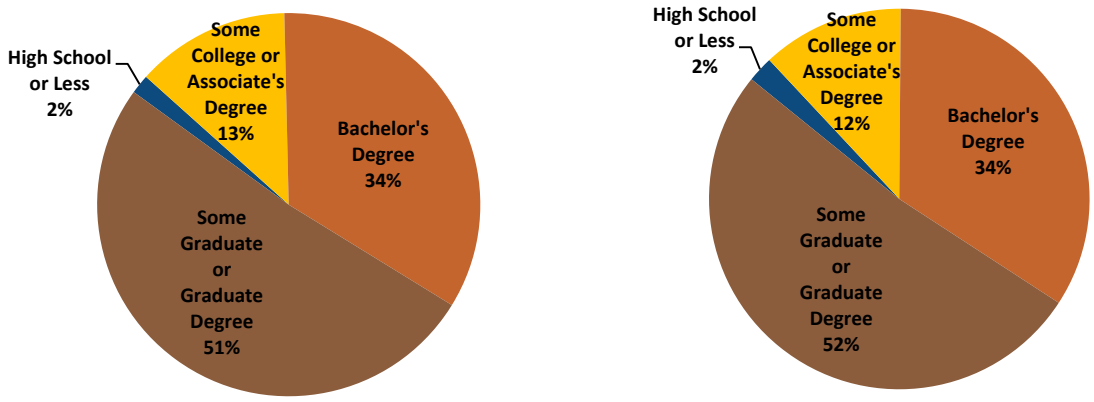


Figure 33: Responses to "What is your level of education?" from the initial (left) and follow-up (right) surveys.

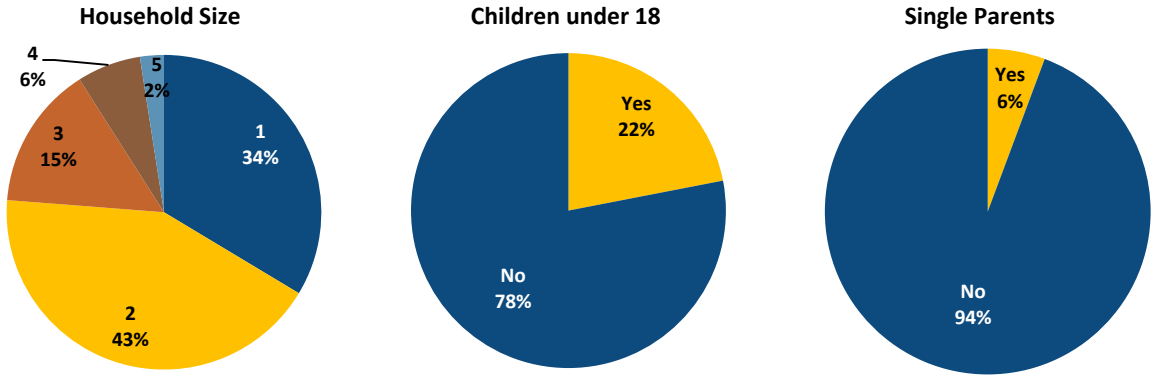


Figure 34: Household composition of initial survey respondents.

Respondents reported an average household size of 2.02 in the initial survey, and 2.01 in the follow-up survey. In the initial survey, 34% of respondents live in alone in their household, while 43% live with one other person. The remaining 23% of respondents in the initial survey live in a household with three or more people, with a maximum reported household size of five. In the follow-up survey, the largest share of respondents lived in households of four (27%) or five people (33%). Twenty percent of respondents in the follow-up survey reported a household of three people, while only 13% lived in a household of two people and 7% lived alone. The majority (78% in the initial survey, 79% in the follow-up survey) of households have no children under the age of 18, while 22% in the initial survey and 21% in the follow-up survey have at least one child. Among households with children, the average number of children per household is 1.41 in the initial survey and 1.36 in the follow-up survey, with each household

having between one and three children. Just 6% of respondents in the initial survey and 9% of respondents in the follow-up survey reported that they are a single parent.

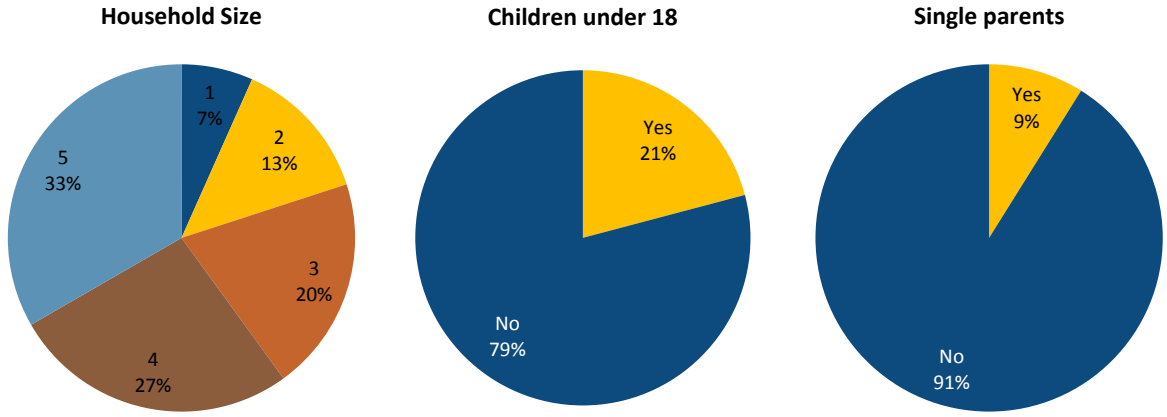


Figure 35: Household composition of follow-up survey respondents.

Respondents were asked to identify their age group, but not to specify their exact age. All respondents in the initial survey (and 99% of respondents in the follow-up survey) reported being over the age of 25. In the initial survey, 24% were between 26 and 35 years, while 39% were between 36 and 45. At the high end, 2% of respondents in the initial survey reported being between the ages of 66 and 75. In the follow-up survey, 23% were between 26 and 35 years, while 35% were between 36 and 45. 36% of respondents in the follow-up survey reported ages between 46 and 65, while 5% reported ages between 66 and 75. Finally, respondents were asked to report their gender. 46% of initial respondents and 44% of follow-up respondents were female, while 54% of initial respondents and 56% of follow-up respondents were male.

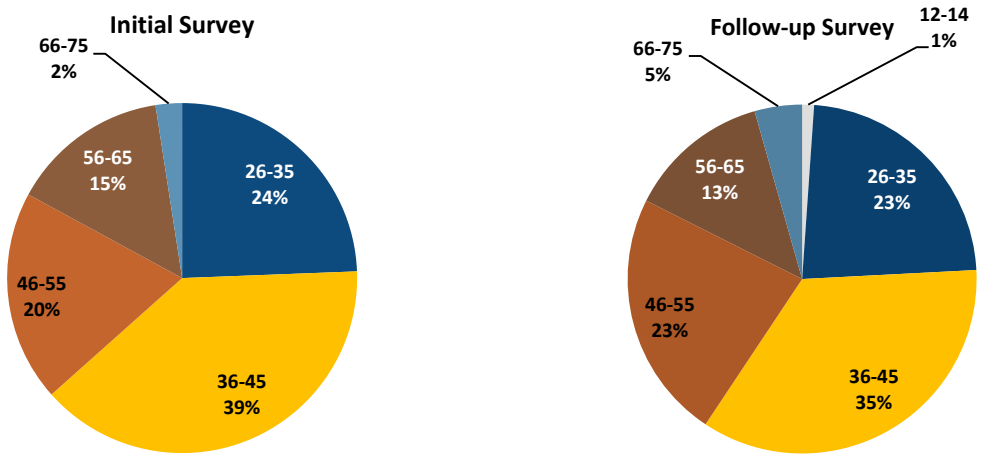


Figure 36: Ages of initial (left) and follow-up survey respondents.

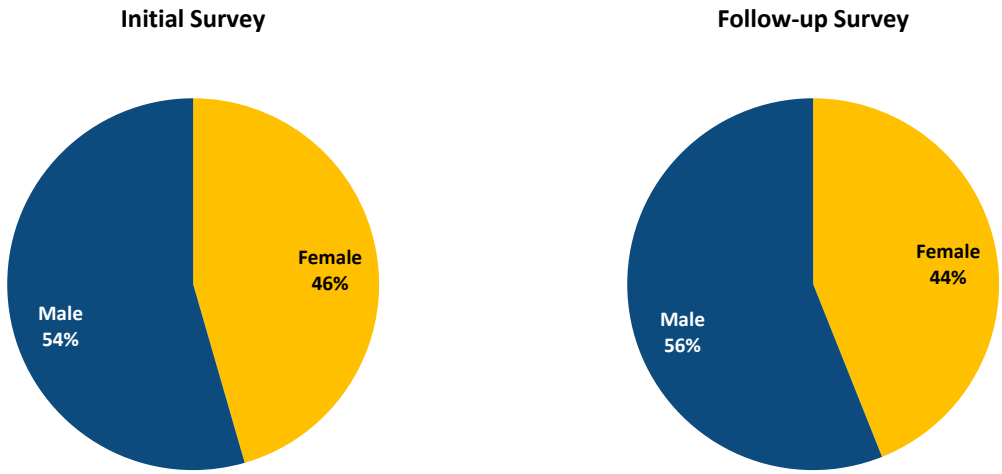


Figure 37: Gender of initial (left) and follow-up survey respondents.

4. Centers of Hope Pre- and Post-Impact Health Behavior

The research team also conducted a survey of a sample of families associated with three City of Atlanta Centers of Hope recreation facilities located near the trail corridor. This task also included the development and use of questionnaires to collect information from potential trail users regarding baseline demographics, physical activity levels, health characteristics, and social capital. The research team conducted two sets of surveys to establish baseline health behaviors for these families. The research methods and approaches were reviewed and approved by the Georgia Institute of Technology Institutional Review Board for the protection of human subjects in research.

4.1 Methodology

The Centers of Hope (COH) families were given the pre-impact survey in person at a day-long Build-a-Bike event held by Kaiser Permanente Georgia, the Atlanta Bureau of Cultural Affairs and the Atlanta BeltLine Partnership in November, 2011. The event was held at the Historic Fourth Ward Skate Park which is located adjacent to the Eastside Trail. Each family that participated received a $20 gift card at the event after completing the survey. Participant's signatures were collected on a consent form prior to administering the survey questions. The children included in the study were given a child assent form, to explain the purpose of the study and to clarify the voluntary nature of the survey. Parental permission was acquired prior to researchers collecting survey data from children under the age of 18. No data was collected from children without parental consent.

Two rounds of follow-up data collection attempts were made via US Mail with COH families after the trail was constructed. For the follow-up survey, families from the Centers of Hope who participated in the first survey received a packet in the mail in November of 2012. This packet contained a letter asking the families to participate in the second survey, included consent forms for adult respondents and for the parents of child respondents, an assent form for child respondents, and paper copies of the survey for each adult and child respondent. Each survey was labeled with the name of the respondent for whom it was intended. In addition, the packet contained a stamped envelope addressed to the research team in which to return completed surveys. All survey respondents received a second $20 gift card as

compensation for participating in the second round of surveys.

Information was gathered on the baseline level of physical activity of the interviewees based on the standardized International Physical Activity Questionnaire (IPAQ) short form, which is an internationally recognized standard used to collect this type of information. The survey questions for adults were also designed to gather information on other characteristics of the respondents including: residential locational data, commute mode and length, demographic data, usage of the existing temporary beltline trail, most frequently used trail access points, perceptions regarding safety and security along the trail, activity along the trail, and respondents' perceptions of the neighborhood in which they live. Child respondents were asked a shorter series of questions about their age, gender, and use and knowledge of the trail.

4.2 Target Populations

The study population included adults and children who are associated with three of the City of Atlanta's Centers of Hope recreation facilities. The study team sought participation from both existing trail users and those who have not yet utilized the trail.

4.3 Centers of Hope Families Survey Results Summary

Pre-Impact Assessment

Researchers conducted forty-five total in-person surveys at the Bike event sponsored by Kaiser Permanente. Of these surveys, forty-four individuals had never been on the unimproved BeltLine trail and 1 individual had been on the trail.

Eighteen families participated in the first round of surveys at the Kaiser bike event. One adult from each family as well as between one and three children completed the survey, for a total of eighteen adult and twenty-five child respondents. In addition, two children began but did not complete the survey. Because of the small sample size of this survey, raw numbers are reported.

Twenty-three of the children who completed the survey were between the ages of 7 and 11. In addition, two children between 12 and 14 completed the survey. The child respondents were fairly evenly split between male and female, with twelve girls and thirteen boys.

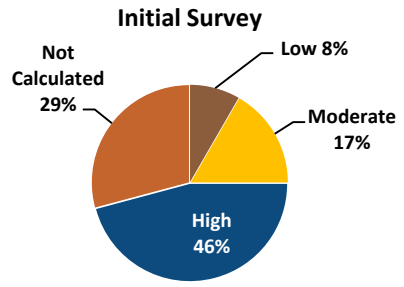
Post-Impact Assessment

For the follow-up survey, 5 households responded with a total of 13 surveys. Of those, 5 respondents were adults and 8 were children. Of these respondents, 3 of the adults had been on the trail and 2 of the children had been on the trail. Because of the small sample size of this survey, raw numbers are reported.

Physical Activity and IPAQ Scores

The children were asked about their physical activity in the seven days prior to answering the survey. Language from the IPAQ short form was simplified for the children so that it was easier to understand. Vigorous activity was described as activities such as “running, playing sports, riding your bicycle fast, or skateboarding” while moderate activities included “riding your bike slowly or jogging.” The children were asked both how many days they engaged in these types of activities, as well as how long they spent doing them on those days. These responses were used to calculate each child’s IPAQ activity level for children who gave information about all three types of activities. Children who answered “I don’t know” for one or more types of activity were excluded from this calculation.

4.4 Child Survey Results



	Vigorous	Moderate	Walking
1 day	0	1	0
2 days	3	3	1
3 days	1	2	2
4 days	1	2	1
5 days	10	5	6
6 days	2	0	1
7 days	5	3	8
0 days	0	4	0
I don't know	3	5	6

Figure 38: Initial child survey activity levels, left, and initial child survey activity days, right.

On both the initial and follow-up surveys, the child respondents reported being highly physically active. The vast majority of children reported at least two days with vigorous physical activity on both surveys (see Figure 38 for initial survey responses and Table 6 for follow-up survey responses). On the initial survey, 11 children reported a high level of physical activity as calculated from their IPAQ score, while on the follow-up survey, six of eight did, with the remaining follow-up survey respondent reporting a moderate level of physical activity. Two children on the initial survey had low levels of physical activity, while one child on the follow-up survey reported low levels.

Table 6: Follow-up child survey activity days.

	Vigorous	Moderate	Walking
1 day	0	0	0
2 days	1	1	0
3 days	1	2	2
4 days	0	0	3
5 days	0	1	2
6 days	1	2	1
7 days	4	0	0
0 days	1	2	0
I don't know	0	0	0

The children were next asked a series of questions about their walking and physical activity

habits. While most of the children reported walking around their neighborhood either on their own or accompanied by their parents, only two in the initial survey and one in the follow-up survey had previously walked from their house to the park at which the survey and bike event were held. However, most in the initial survey had walked to other parks or playgrounds from their house. In the follow-up survey, only one of eight had walked to other parks or playground. Twelve of the 25 in the initial survey and three of the eight in the follow-up survey reported walking to school. The majority of the children reported that they have both good places for active play and physical activity in their neighborhoods, as well as other children with whom to play.

Table 7: Child survey, walking and physical activity habits

	Initial Survey		Follow-up Survey	
	Yes	No	Yes	No
Do you ever walk from your house to [Historic Fourth Ward Park]?	2	23	1	7
Do you walk around your neighborhood?	23	2	4	4
Does your mom or dad walk around the neighborhood with you?	21	4	7	1
Do you walk to a park or playground from your house?	15	10	1	6
Do you ever walk to school?	12	13	3	5
Where you live, are there lots of good places to play and be active?	18	7	5	3
Where you live, are there are other kids around to play with?	18	7	6	2

None of the children reported having previously been on the gravel Eastside Trail. The survey concluded with a short series of questions asking about their knowledge of the trail and their plans to use it in the future. Most of the children indicated that they had not used the trail because they were not aware of it, while four said that it was too far away for them to use. The majority of the children said that they would definitely or maybe use the trail in the future.

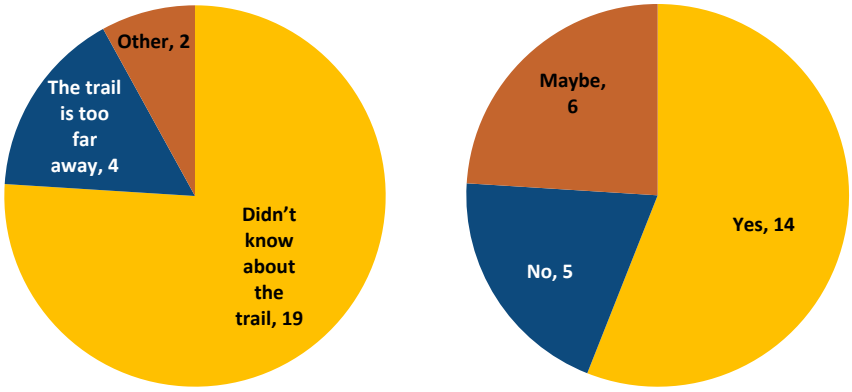


Figure 39: Responses to "If you haven't been on the trail, why not?" and "Do you think you will go on the trail once it is paved?"

In the follow-up survey, two of seven children reported having been on the gravel trail. Of the children who reported having been on the trail, the majority had used the trail on weekends or both weekdays and weekends and had used the trail either for 1-2 hours or 30 minutes to one hour. In the follow-up survey, the majority of respondents had used the trail for walking and biking or for fun/exercise and had not purchased anything. Of the six children who had not been on the trail before, two said that the trail was too far away (but may visit in the future), three did not know about the trail but would definitely visit in the future, and one said the trail was too far away but would definitely visit in the future.

4.4 Adult Survey Results

The parents of the previously described children also completed a similar survey. One adult from each family completed the survey, with a total of 18 respondents for the initial survey and five respondents for the follow-up survey. Of the first survey respondents, 12 were female and six were male. On the second survey, four respondents were female and one was male. The majority of Centers of Hope respondents were under 35, and no Centers of Hope adult respondents were older than 55. On the second survey, one respondent was between 46 and 55, two were between 36 and 45, and two were between 26 and 35.

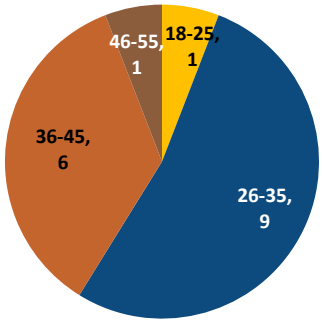


Figure 40: Ages of adult Centers of Hope survey respondents (Initial survey)

Respondents reported their frequency and duration of physical activity over the previous seven days. Most of the adults in the first survey reported being highly active, with fewer reporting being moderately or low active. Ten out of 18 adults were classified as highly active, while five were classified as moderately active and three were low active. In the follow-up survey, four of five respondents completed this section, and one reported high, two reported moderate, and one reported low activity.

	Vigorous	Moderate	Walking
1 day	2	0	0
2 days	2	4	1
3 days	0	4	2
4 days	1	1	1
5 days	5	3	4
6 days	0	0	0
7 days	2	2	8
0 days	6	4	1
Average	2.72	2.94	5.18

Table 8: Physical activity reported by adult Centers of Hope respondents (Initial survey)

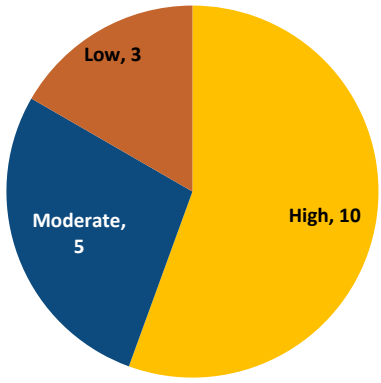


Figure 41: Physical activity scores for adult respondents (Initial survey)

Almost all respondents to the initial survey reported that at least half of the family members and friends are physically active. Eight respondents said that most of their family members are physically active, while seven said the same about their friends. Few reported that less than half or none of their family members and friends is active. Of the follow-up respondents, four reported that about half of their family members were physically active, while one reported that most of its family members were physically active. Three follow-up respondents reported that less than half of their friends were physically active, while one reported that about half of their friends were physically active and one respondent reported that most of their friends were physically active.

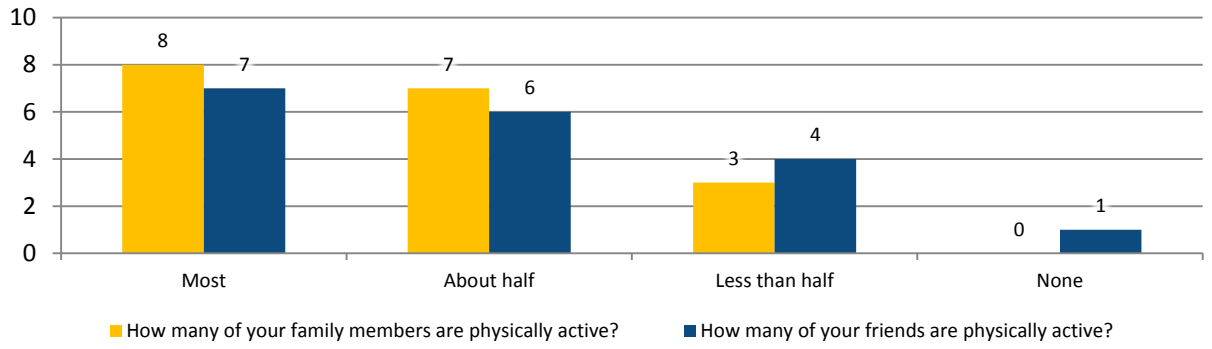


Figure 42: Initial responses to "How many of your family members/friends are physically active?"

Despite the high levels of physical activity generally reported, the majority of initial survey respondents said that they have been encouraged to become more physically active by family, friends, or their doctor. Fourteen have been urged to become more active by family, while 12 each have been urged to be more active by friends or their doctor. Among follow-up survey respondents, four had been encouraged to become more physically active by friends or family, while five respondents had not been encouraged to become more active by their doctor.

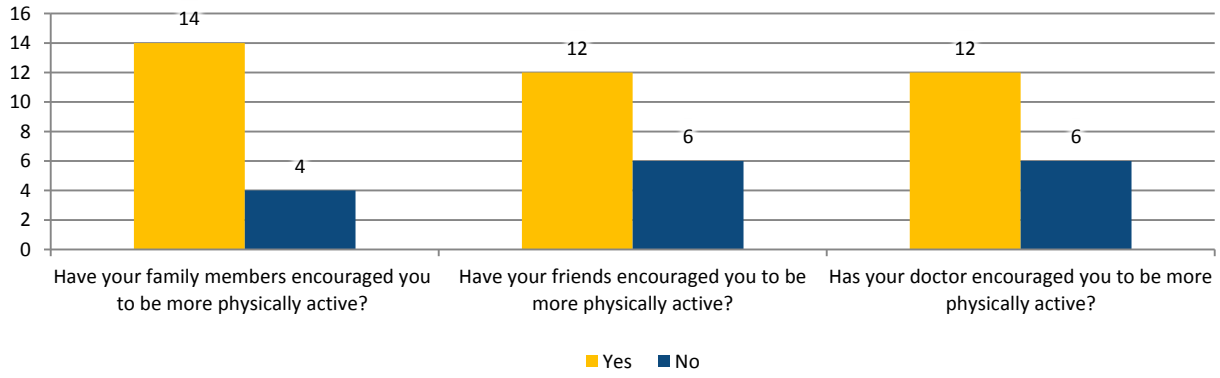


Figure 43: Responses to "Have your family members/friends/doctor encouraged you to be more physically active?"

Only a single adult in the initial survey reported having been on the gravel Eastside Trail. This respondent reported that they use the trail primarily for running or jogging and do so a couple of times per month, typically for less than thirty minutes per visit. The respondent typically accesses the trail at Ralph McGill Boulevard and uses the section between Ralph McGill and Ponce de Leon Avenue. They rate the safety of the trail as good. Among the follow-up survey respondents, three adults reported having been on

the gravel trail (two had not). Of the three who had been on the trail, two reported using the trail several times a week and the other used it daily. Three respondents reported using the trail for walking and hiking and using the trail both weekends and weekdays, while one respondent reported using the trail only on weekends. One respondent reported using the trail for visits between 30 minutes to one hour, one reported visits 1 to 2 hours long, and one reported visits less than 30 minutes; reported uses included recreation, health and exercise and travel to work. The three respondents reported safety on the trail as good or excellent. Follow-up respondents used the segments between Ralph McGill and Ponce de Leon, between Ponce de Leon and Monroe Drive and between Ralph McGill and DeKalb Avenue (utilized access points at Monroe Drive, Angier Springs and the Old Fourth Ward Skate Park).

The other respondents in the initial survey had never used the trail. The majority of these individuals reported that they did not know about the trail or that it is too far away to use (see Figure 44). However, after learning about the trail at the Kaiser Permanente Centers of Hope bike event and through the survey, the majority of respondents reported that they would definitely or maybe use the trail once it is completed. Only a single respondent indicated that they definitely would not use the trail. In the follow-up survey, two respondents have not used the trail and reported that they did not know about the trail or it was too far away. The two respondents reported that they would or might use the trail in the future for health and exercise as well as shopping.

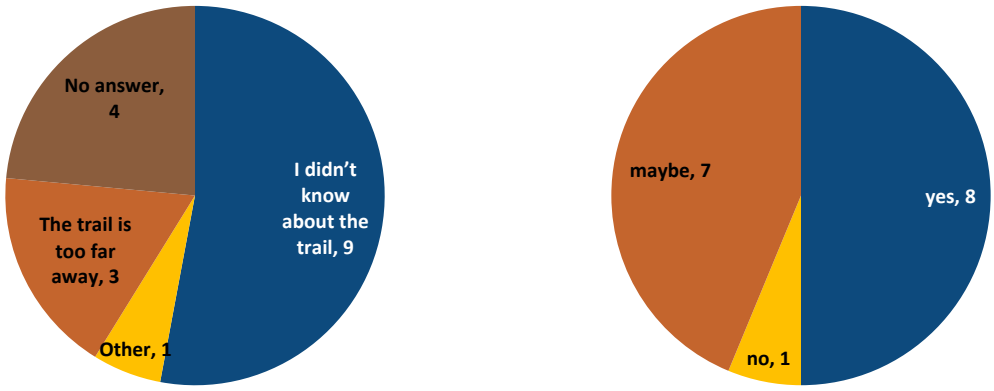


Figure 44: Responses to "What is the most likely reason you have never been on the trail?" (left) and "Do you anticipate using the Eastside Trail once it is paved?" (right)

The most commonly reported future use of the trail that respondents indicated was recreation, with seven responses, while five respondents reported that they would use the trail for health and exercise. Five respondents reported that they would use the trail for utilitarian purposes such as travel to school or work or to shopping.

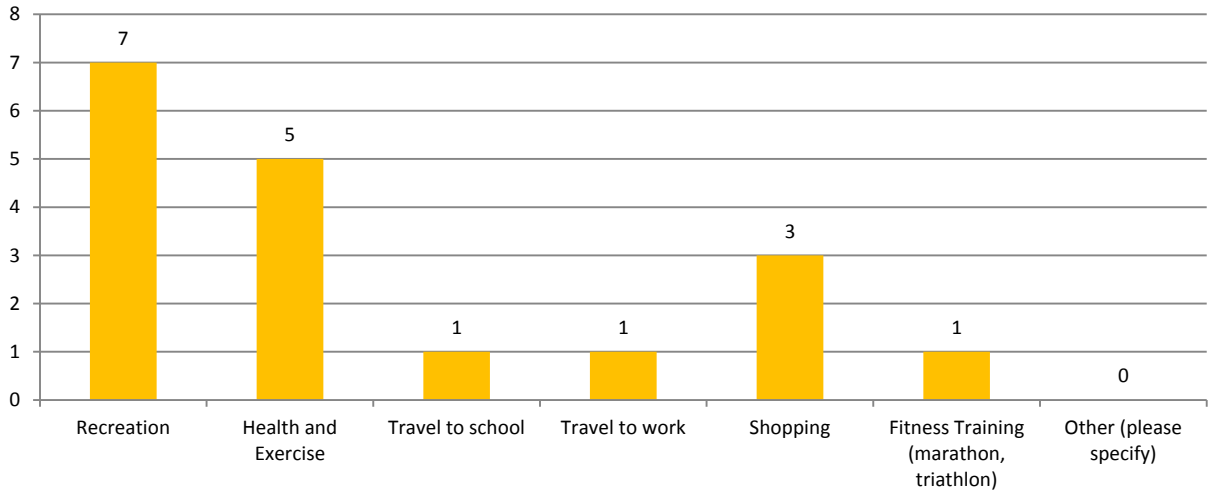


Figure 45: Responses to "What do you anticipate using the trail for (once it is paved)?"

Among respondents in the initial survey who had previously heard of the trail, three indicated that they had learned about it through word of mouth. Other respondents learned during the Kaiser Permanente Centers of Hope bike event, through roadside signage, by driving, biking or walking past, from the newspaper, or from the parks department, with one response each. Other ways in which respondents had heard about the trail included from television news and from Kaiser Permanente. Of the respondents in the follow-up survey, two had learned about the trail by driving past it, one had heard about it through the Kaiser bike event, one had heard about it through roadside signage, and one had heard about it in other ways (on the news).

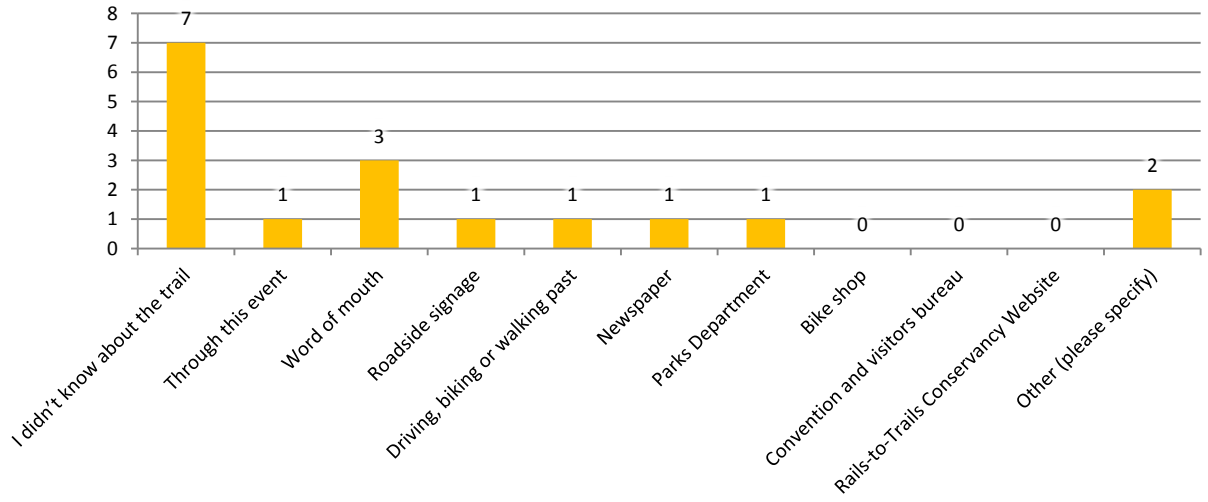


Figure 46: Responses to "How did you find out about the trail?"

Initial survey respondents were next asked about their commuting and walking patterns. Eight respondents stated that they usually drive a personal vehicle to work, including one respondent who rides in a carpool. Five said that they typically walk, bike, or run to work. Eight respondents use public transportation to commute to work, including four who take the bus and four who ride MARTA rail. One respondent indicated that they work from home or do not commute.

Among the follow-up survey respondents, three use a car or carpooled to work, two take MARTA rail, two take the MARTA bus and two walk, bike or run to work. Four out of five follow-up survey respondents do not primarily use a car to commute every day.

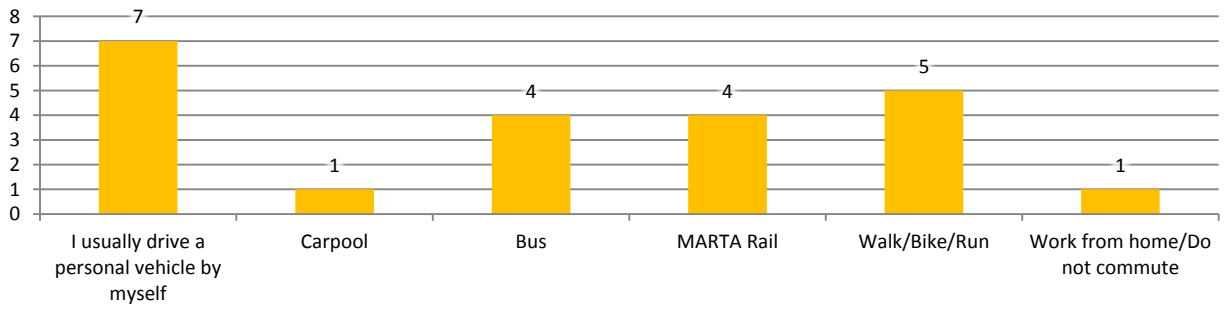


Figure 47: Responses to "How do you commute to work or school?"

The majority of initial survey respondents (fifteen out of eighteen) indicated that they walk in their

neighborhood. Asked to choose the most common reason the respondents walk, six said that they do so for exercise, four for utilitarian trips, and one for leisurely recreation. Three respondents said that they take walking trips for multiple purposes. Finally, the majority of respondents indicated that they feel safe walking in their neighborhood after dark, while five respondents do not feel safe.

All five follow-up survey respondents reported that they walk in their neighborhood. Four said that their primary reason for doing so was utilitarian trips, while one said that they do so for exercise. Two said that they feel safe walking in their neighborhood after dark, while three do not feel safe.

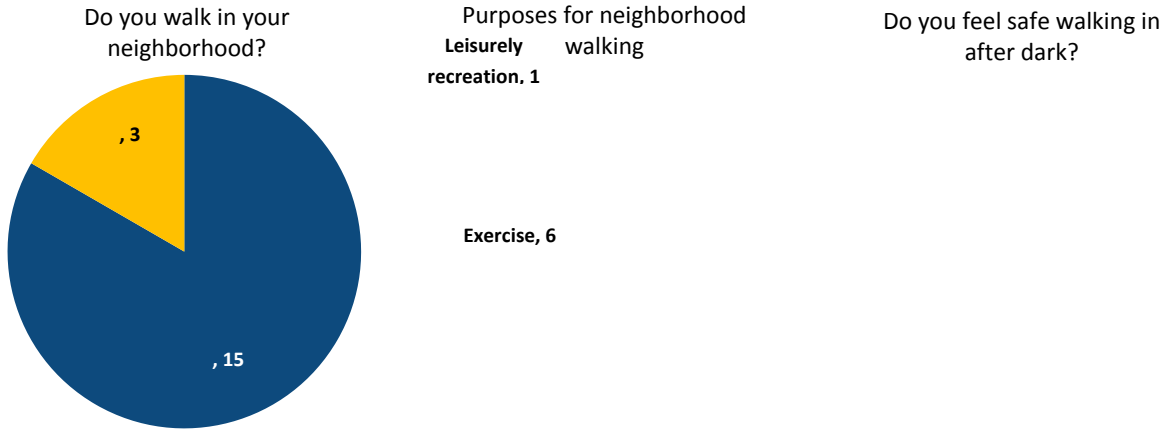


Figure 48: Neighborhood walking behavior among adult initial Centers of Hope respondents.

Initial survey respondents next answered a series of questions about their perceptions of their neighborhood, its amenities, and their sense of community within their neighborhood. The majority of respondents indicated that they see neighbors whom they know in their neighborhood often or occasionally. In addition, sixteen of eighteen respondents know their neighbors' names, and fifteen of eighteen agree that people in their neighborhood generally know each other. These responses suggest that the respondents general feel a familiarity and sense of community within their neighborhood.

Further responses continue to support this conclusion. Ten of fifteen respondents consider their neighborhood to be "close-knit" and twelve of eighteen frequently see the children of their neighborhood playing together. Respondents also indicated that

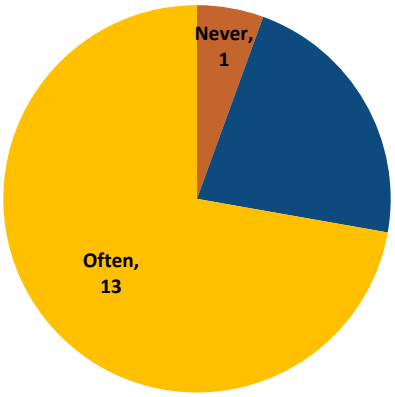


Figure 49: Responses to "How often do you see neighbors (or people) you know when outside your residence?"

they feel that they can count on the support and assistance of their neighbors. Ten of seventeen agreed that they can count on adults in their neighborhood to take action if they saw someone doing something wrong, while fifteen of eighteen could identify one or more people in their neighborhood whom they could turn to for help in an emergency. Among those who could identify at least one such person, respondents identified an average of 4.3 people whom they could ask for help.

Among the follow-up survey respondents, two answered "Yes" that they can count on other adults in the neighborhood to take action, and an average of three people stated that there was someone in the neighborhood that they could go to in case of an emergency. Five follow-up survey respondents stated that people in their neighborhood generally know one another and that children frequently play together in their neighborhood.

Table 9: Respondents' perception of closeness and community within their neighborhoods

	Initial Survey		Follow-up Survey	
	Yes	No	Yes	No
Do you know the names of your neighbors?	16	2	3	2
Would you say that people in your neighborhood generally know each other?	15	3	5	0
Do you and your neighbors ask each other for advice or do favors for one another?	13	5	3	2
Is your neighborhood a close-knit neighborhood?	10	6	3	2
Do children in your neighborhood play together frequently?	12	6	4	1
Can you count on other adults in the neighborhood to take action if they saw someone doing something wrong?	10	7	2	3
Is there someone in the neighborhood you could go to for help in an emergency?	15	3	3	2
In the past 12 months, have you participated in the activities of any community groups/organizations?	9	9	2	3

Respondents were also asked to describe their perception of the facilities and amenities available in their neighborhood. Twelve of seventeen initial survey respondents to the initial survey consider the maintenance of their neighborhood's facilities to be good, while eleven of eighteen feel that their neighborhood provides good safety and security. Among follow-up survey respondents, results were mixed as to the maintenance of buildings in their neighborhood, while three out of five rated neighborhood safety and security as "excellent" or "good."

Table 10: Respondents' perceptions of the maintenance and safety of their neighborhood

	Initial Survey				Follow-up Survey			
	Excellent	**Good**	**Fair**	**Poor**	**Excellent**	**Good**	**Fair**	**Poor**
How would you rate the maintenance of facilities and buildings in your neighborhood?	1	12	3	1	1	1	2	1
In your opinion, the safety and security in your neighborhood is:	2	11	3	2	2	1	2	0

Most initial survey respondents, eleven of seventeen, described the street they live on as busy, and fourteen of eighteen said that their residence has a front porch. Among follow-up survey respondents, three out of four lived on a busy street, and two out of four respondents lived in a building with a front porch. These responses are comparable to the responses given by respondents to the initial household sample survey. However, regarding other amenities, the Centers of Hope respondents had less positive perceptions of access than the household sample respondents. While household sample respondents are overwhelmingly “very” satisfied with the accessibility of parks, restaurants/bars, and retail, the Centers of Hope respondents are more split between “very” and “somewhat” satisfied. Centers of Hope respondents expressed greater satisfaction with the availability of institutions and transit, with 13 of eighteen initial survey respondents stating that they are “very” satisfied (only 1 of five follow-up respondents stated that they were “very satisfied” with the accessibility of institutions, and two of five rated themselves as “very satisfied” with transit access).

Figure 50: Responses to "How would you describe your street?" and "Does your residence have a front porch?"

As with the household respondents, few Centers of Hope respondents expressed that they are "not at all" satisfied with the accessibility of amenities, suggesting that at baseline, amenities are available which mostly meet the needs of residents. This is supported by respondents' assessment of the overall accessibility of amenities in their neighborhood. While initial survey respondents are split between "very satisfied" (9 respondents) and "somewhat satisfied" (7 respondents), no respondents indicated that they are "unsatisfied" or "extremely unsatisfied." Among follow-up respondents, two were "very satisfied" with the access to amenities, three were "somewhat satisfied" and no respondents indicated that they were "unsatisfied" or "extremely unsatisfied."

Table 11: Centers of Hope respondents' satisfaction with access to neighborhood amenities

	Initial Survey			Follow-up Survey		
	Very	Somewhat	Not at all	Very	Somewhat	Not at all
In your neighborhood, how accessible are parks?	9	8	0	1	4	0
In your neighborhood, how accessible are restaurants/bars?	10	7	1	1	3	1
In your neighborhood, how accessible are retail locations (grocery stores/other shops)?	8	10	0	1	4	0
In your neighborhood, how accessible are institutions (social/religious/schools)?	13	4	1	1	4	0
In your neighborhood, how accessible is transit?	13	3	2	2	3	0

Figure 51: Responses to "How satisfied are you overall with the services/amenities (listed above) in your neighborhood?"

Finally, the Centers of Hope respondents answered a series of questions about their background.

The majority of initial survey respondents are African-American (14), with a small number of Hispanic and multi-racial respondents. Among follow-up survey respondents, four were African-American and one was Hispanic. This is in contrast to the household sample respondents, of whom a large majority were white. In addition, Centers of Hope respondents have lower incomes than household respondents. A majority of household respondents reported incomes of over $100,000 annually, while no Centers of Hope respondents reported an income over $75,000. Most Centers of Hope respondents reported incomes under $25,000, with six initial survey respondents reporting that they earn less than $14,999 and six earning between $15,000 and $24,999. Finally, seven Centers of Hope initial survey respondents have a high school education or less, six have some college or an Associate's degree, and four respondents have at least a Bachelor's degree. Among follow-up survey respondents, two have high school education or less, one has a bachelor's degree, and two have some college or an associate's degree.

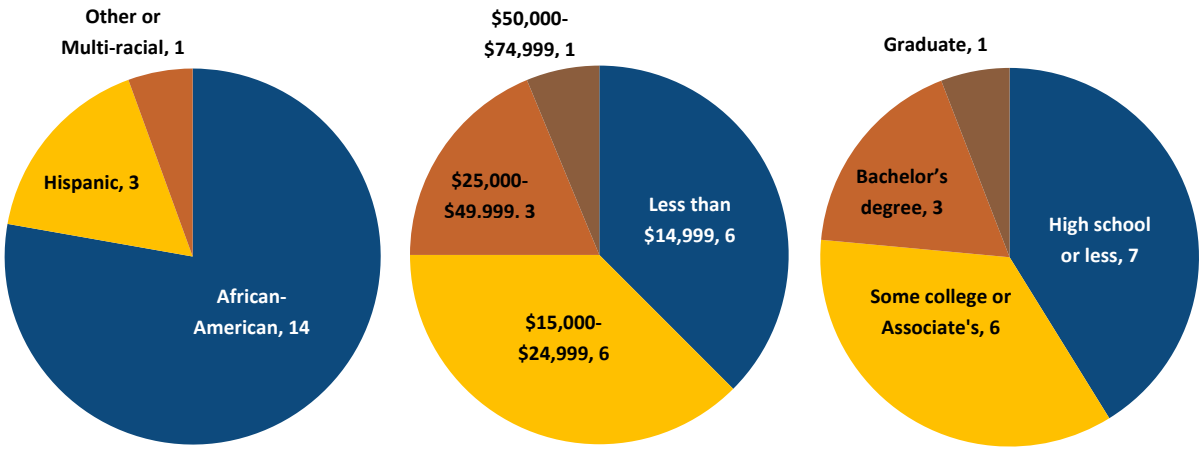


Figure 52: Adult Centers of Hope respondents' race, income, and education levels

Given the nature of the Centers of Hope event, not surprisingly seventeen of eighteen initial survey respondents reported that they have children under 18 living with them, including nine who identified themselves as a single parent. Among follow-up survey respondents, all five have children under 18 living with them, while two out of five identified themselves as a single parent. Centers of Hope respondents reported larger family sizes than household sample respondents. While household sample respondents reported an average of 2.1 people in their families, Centers of Hope respondents reported an average of 4.5 people among initial survey respondents and 3.5 people among follow-up survey

respondents. This includes an average of 3.3 children in the initial survey and 3.4 children in the follow-up survey, compared to 1.4 children in household sample families with children. Among respondents with children, about half said that their child had many friends in the neighborhood.

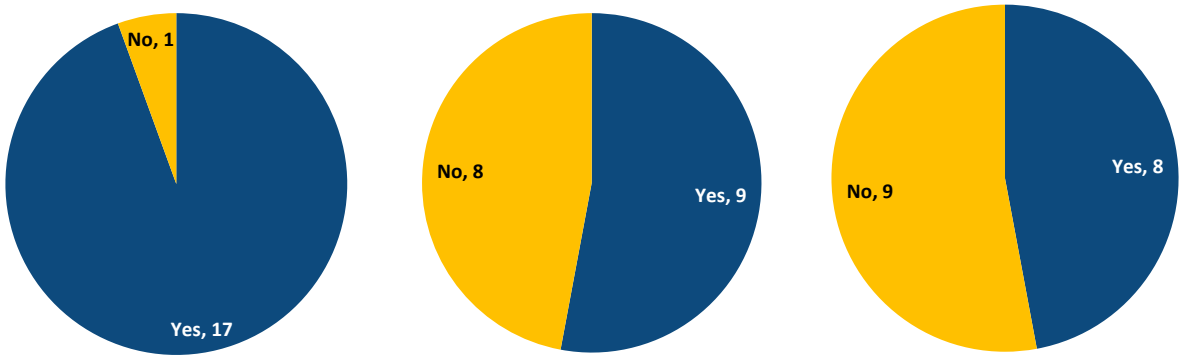


Figure 53: Responses to "Do you have children under the age of 18 living with you?" (left), "Are you a single parent?", and "Would you say that your child has a lot of friends in your neighborhood?"

The last question was asked only of Centers of Hope survey respondents, and pertained to the stress faced by these respondents in the week previous to taking the survey. In the initial survey, eight respondents reported that their week had been low or moderate to low stress, while seven reported that it had been moderate to high or high stress. On the follow-up survey, three of the five respondents reported a low stress week, one reported a high stress week and one reported a moderate to low stress week.

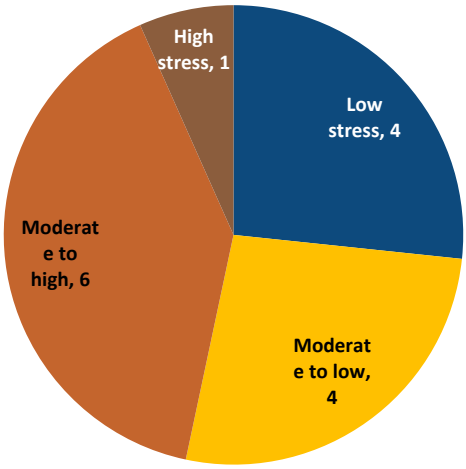


Figure 54: Prior week stress levels of initial survey respondents.

5. Conclusion

5.1 Residential Household Sample and Centers of Hope Survey Results Comparison

When surveyed about physical activity behavior, Centers of Hope respondents reported walking more than household sample respondents (walked on 5.18 vs. 4.11 days in last seven). Most respondents in both samples reported having moderate or high activity levels. Survey results indicate that Centers of Hope respondents were more likely to commute by public transit than the household sample (2.4% households commuted by MARTA rail compared to 44% of Centers of Hope adults commuting by bus or rail). None of the household respondents commuted by bus. Additionally, Centers of Hope respondents were less likely to know about or have used the gravel trail. Only one Centers of Hope respondent in the initial survey and three out of five respondents in the follow-up survey had used the gravel trail, compared with 50% of the household survey in the initial sample and 84% in the follow-up household survey.

Across both survey samples, most respondents reported satisfaction with the quality and accessibility of amenities in their neighborhood. However, Centers of Hope respondents were found to be less satisfied with their access to these amenities than the household sample. When surveyed about neighborhood characteristics, a majority of Centers of Hope respondents reported that they live on busy streets, and a majority in both samples reported having a front porch. Respondents in both samples reported high levels of social capital – indicating that they feel that they know and can count on neighbors.

The two survey samples demonstrated substantial differences in demographic and household characteristics. The Centers of Hope sample was generally younger, lower income and had larger family sizes (4.5 persons compared with 2.1 persons in the household survey) and more children than the household sample. Individuals in the Centers of Hope sample were also more likely to be people of color, and were majority African-American (compared with majority white for the household survey sample). A major difference in the survey design between the two samples populations was the inclusion of children in the Centers of Hope sample. The children associated with the Centers of Hope tended not to know

about the gravel trail, and none of these children had been on the trail in the initial survey.

5.2 Analysis of Initial and Follow-up Survey Results

After initial analysis of pre-intervention and post-intervention survey data, the research team compared results between the initial and follow-up household surveys. Researchers conducted further analysis in order to determine if changes between pre-intervention and post-intervention responses were statistically significant. Due to the small sample size of the Centers of Hope surveys, detailed analysis was conducted only for the household pre- and post-survey data.

Household respondents who have used the gravel or paved trail report higher levels of physical activity than respondents who have never been on the trail. This is true in both the initial and follow-up surveys. The majority of household sample respondents in the follow-up survey indicated that they had learned about the trail by word of mouth, and many indicated that they had learned about it through proximity, such as driving past or living near it. Use of the Eastside Trail increased greatly between the first and second survey – from 54% of respondents to 84%. By the second survey, only 15 households had not used the paved trail (compared with 37 households at the time of the first survey). Based on a difference of means test, the change in number of households using the trail from the baseline to the follow-up survey was found to be statistically significant (at $p = .0001$). The number of household sample respondents who did not know about the Eastside Trail decreased from one in four at baseline to one in 25 after the follow-up survey.

Residents who have high levels of physical activity tend to be more likely to report that their friends and family members are active as well. Physical activity levels did not appear to change much between the initial and follow-up surveys. Of the 37 respondents who completed both surveys and had not used the gravel trail in the first survey, 26 (about 70%) had used the paved trail upon completion of the follow-up survey. Of these households who began using the paved trail, 50% increased the number days that they walked for at least ten minutes, compared with 40.6% overall.

Although not statistically significant, moderate physical activity levels increased from the first to the second survey, and increased more for households who began using the gravel trail (a difference of average increase 5 minutes per week to 36 minutes per week). However, physical activity levels

decreased between the two surveys for households who had not used the gravel trail (reported in both surveys). This may suggest differences in activity levels between households who began using the trail and households who had not used the trail by the completion of the follow-up survey. Given the small sub-sample of households who had not used the trail reported in the follow-up survey, a larger survey sample size overall may lead to results of greater statistical significance. These patterns may indicate a modest physical activity increase and health benefits for respondents who began using the paved gravel trail after the initial survey. Results do clearly indicate that the majority of households within the sample were using the trail by the time of the follow-up survey, and many experienced increased physical activity and potentially health benefits from their trail usage.

At baseline, survey results suggest that neighborhood amenities are already available which mostly meet the needs of residents. However, many household residents are not completely satsified with their ability to access amenities such as transit and social/religious/educational institutions, which is true for both the initial and follow-up survey. Several Centers of Hope respondents were only somewhat satisfied by their access to retail/shopping. However, the relatively low percentage of respondents that used the trail for commuting purposes and for utilitarian trips indicates a potential opportunity to attract more walking/biking trips for transportation purposes, despite the relatively "good" accessibility to amenities reported by respondents within their neighborhoods.

Respondents to the Centers of Hope survey were more representative of vulnerable populations with many more minority, low income, and less educated respondents. Centers of Hope respondents also had more children/larger families, whereas the household survey respondents were older. Although the Centers of Hope survey was structured to capture responses of lower-income families with children, the household survey sample is likely higher-income due to the fact that single family, owner-occupied households could be higher-income overall.

The literature indicates that safety and public perception of safety and security is a major deterrent to physical activity. Therefore trail safety and perception of safety by the public is necessary to achieve the maximum potential health benefits of the trail. Survey results indicate that public perception of safety and security is already improving, with 55% of follow-up household survey respondents rating

safety as “good” compared with only 35% in the initial household survey. Based on a difference of means test, the change in number of households rating safety and security as “good” or “excellent,” between the baseline and follow-up survey, was found to be statistically significant (at p = .0001). These results may indicate that perceptions of safety and security improved after the trail usage increased overall and the trail was paved and opened to the public.

5.3 Recommendations and Conclusion

The objective of this research was to compare changes in the physical activity level of the population in the study area along the BeltLine Eastside Trail before and after construction of the paved, multi-use trail. A secondary objective was to gather current socio-demographic data for the study area population.

The presence of vulnerable populations in the study area represents both a challenge and an opportunity. These groups typically suffer higher rates of negative health impacts, yet are least likely to be aware of the existence of the trail or the potential health benefits of trail usage. Additionally, research indicates that vulnerable populations are likely to obtain the greatest health benefits from increased access to trails and greenspace. It is recommended that trail outreach efforts specifically target these individuals for increased trail usage. The large variation in socio-economic conditions of the residents along the trail coupled with targeted outreach for vulnerable populations would assist the groups with highest risk, that are least likely to be aware of trail, to utilize the trail in an equitable manner. Programs to engage these individuals could include educational efforts such as a bike safety courses or general education on the benefits of physical activity through trail usage. Additionally, survey results and prior research indicate that family-oriented programs and activities may be more effective in engaging vulnerable populations such as those represented by the Centers of Hope sample. Additionally, some studies indicate that trail programs to engage diverse groups may be more successful if they consider the different needs and uses for public open space, such as family and cultural gathering spaces, in addition to hiking and walking trails.

Certain design elements have been shown to greatly increase trail use. These elements shown to encourage trail use include: bike racks, clear and consistent signage, and bike rental opportunities.

Survey results suggest that access could be improved at many access points to the Eastside Trail (as large percentages of respondents utilized the same access points). Implementing a general educational program advertising the health benefits of trail usage, particularly highlighting aspects less commonly known, such as positive mental health, and the health benefits associated with spending time viewing nature, is recommended.

The household survey results show significant increases in trail usage and self-reported evaluation of trail safety and security after construction of the BeltLine Eastside Trail improvements. From the changes in trail use and activity levels in the study population, the researchers found increases in trail usage between the initial survey on the gravel trail and the follow-up survey after the Eastside Trail had been paved. Additionally, physical activity patterns among those respondents who had begun using the gravel trail indicate potential health benefits of trail construction and increased accessibility to the trail.

Research demonstrates that many chronic diseases can be prevented or controlled by increasing physical activity levels. Based on survey results, it is likely that increasing trail usage may further spur a virtuous cycle of trail usage, health benefits and improved perceived safety. Physical activity promotion has become an important part of the discussion on health and the built environment. Therefore, policies, programs, and projects, such as the Eastside Trail, that promote active modes of travel and daily physical activity through walking and cycling, could potentially help to prevent or reduce the occurrence of certain diseases. Active transportation is a pathway to increased physical activity levels and is an added protection against a variety of chronic diseases. The Eastside Trail will promote methods of activity which are the most common and accessible means of incorporating physical activity into daily life.

However, persistent population differences in the outcomes and efficacy of policy interventions to promote physical activity demonstrate the necessity to consider the diverging needs of various populations in any policy intervention and communication of interventions applied to the urban form. More research is needed to further examine the dynamics between built environment features, transportation and health promotion, especially given the methodological challenges underlying this type of research. Recent studies testing the public health effects of trail interventions have demonstrated the challenge in obtaining statistically significant increases in physical activity as a result of interventions (Evenson,

Herring & Huston, 2005; Merom, Bauman, Vita & Close, 2003). These studies indicate the need for a very large sample size in order to reduce the effects of "noise" in the data and the great degree of individual variability. Additional analysis utilizing stratified sub-samples within this dataset would provide an opportunity to further explore the relationships between self-reported built environment and neighborhood characteristics, trail usage and activity patterns.

Given the results of this study, the evidence is sufficient to begin considering policy interventions to promote behaviors such as active transportation to achieve desired positive health outcomes. As demonstrated by this assessment of health impacts during the implementation of the Eastside Trail, the BeltLine Trail provides rich opportunities to study the effectiveness of policy and project interventions. As trail usage increases along the Eastside Trail due to access improvements and as other trail segments are constructed, there may be future opportunities to continue to build the evidence base for the health benefits of multi-use trail implementation.

Additionally, since the household data was collected approximately one month after the trail was improved, paved, and opened to the public, it measures only immediate-term effects of the newly opened trail. Usage of the trail and the impact of the trail on resident health could potentially change over time, as the trail becomes further integrated into the neighborhood and its residents' consciousness and could be the subject of future study.

6. References

Andersen, L. B., Schnorr, P., Schroll, M., & Hein, H. O. (2000). All-cause mortality associated with physical activity during leisure time, work, sports, and cycling to work. *Arch Intern Med, 160*(11), 1621-1628.

Ball, K., Bauman, A., Leslie, E & Owen, N. (2001). Perceived environmental aesthetics and convenience and company are associated with walking for exercise among Australian adults. *Preventive Medicine, 33* (5), 434-440.

Barnes, G. (2004). The Benefits of Bicycling in Minnesota. St. Paul, Minnesota, Minnesota Department of Transportation, Research Services Section.

Baum, F., & Palmer, C. (2002). 'Opportunity structures': urban landscape, social capital and health promotion in Australia. *Health Promot Int, 17*(4), 351-361.

Bedimo-Rung, A. L., Mowen, A. J., & Cohen, D. A. (2005). The significance of parks to physical activity and public health: A conceptual model. *American Journal of Preventive Medicine, 28*(2, Supplement 2), 159-168.

Besser, L. M., Marcus, M., & Frumkin, H. (2008). Commute time and social capital in the U.S. *American Journal of Preventive Medicine, 34*(3), 207-211.

Bhatia, R., Rivard, T. & Seto, E. (2006). Oak to Ninth Avenue Health Impact Assessment: Public review draft. Accessed from http://ehs.sph.berkeley.edu/hia/.

Bichis-Lupas, M. & Moisey, R. N. (2001). A benefit segmentation of rail-trail users: Implications for marketing by local communities. *Journal of Park and Recreation Administration, 19*(3), 78-102.

Biddle, S., Gorely, T. & Stensel, D. J. (2004). Health-enhancing physical activity and sedentary behavior in children and adolescents. *Journal of Sports Sciences 22* (8), 679-701.

Booth, M.L., Bauman, A., Owen, N. & Gore, C. J. (1997). Physical activity preferences, preferred sources of assistance, and perceived barriers to increased activity among physically inactive Australians. *Preventive Medicine, 26* (1), 131-137.

Brach, J. S., FitzGerald, S., Newman, A. B., Kelsey, S., Kuller, L., VanSwearingen, J. M., & Kriska, A. M. (2003). Physical activity and functional status in community-dwelling older women: A 14-year prospective study. *Arch Intern Med, 163*(21), 2565-2571.

Brockman, R., & Fox, K. R. (2011). Physical activity by stealth? The potential health benefits of a workplace transport plan. *Public Health, 125*(4), 210-216.

Brownson, R. C. (1999). Promoting and evaluating walking trails in rural Missouri. Saint Louis University School of Public Health.

Brownson, R. C., Baker, E. A., Housemann, R. A., Brennan, L. K., & Bacak, S. J. (2001). Environmental and Policy Determinants of Physical Activity in the United States. *Am J Public Health, 91*(12),

1995-2003.

Brownson, R. C., Housemann, 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*(3), 235-241.

Broyles, S. T., Mowen, A. J., Theall, K. P., Gustat, J., & Rung, A. L. (2011). Integrating social capital into a park-use and active-living framework. *American Journal of Preventive Medicine, 40*(5), 522-529.

Centers for Disease Control and Prevention. (2004). *The burden of chronic diseases and their risk factors: national and state perspectives*. Atlanta: U.S. Department of Health and Human Services.

Chenoweth D. & Leutzinger, J. (2006). The economic cost of physical inactivity and excess weight in American adults. *Journal of Physical Activity and Health 3,* 148-63.

Christian, H., Giles-Corti, B., Knuiman, M., Timperio, A., & Foster, S. (2011). The influence of the built environment, social environment and health behaviors on body mass index. Results from RESIDE. *Preventive Medicine, 53*(1-2), 57-60.

Cronan, M. K., Shinew, K. J. & Stodolska, M. (2008). Trail use among Latinos: Recognizing diverse uses among a specific population. *Journal of Park and Recreation Administration 26* (1), 62-86.

Dannenberg, A. L., Jackson, R. J., Frumkin, H., Schieber, R. A., Pratt, M., Kochtitzky, C., & Tilson, H. H. (2003). The impact of community design and land-use choices on public health: A scientific research agenda. *Am J Public Health, 93*(9), 1500-1508.

Dean, C. M. & Shepherd, R. B. (1997). Task-related training improves performance of seated reaching tasks after stroke: A randomized controlled trial. *Stroke, 28*, 722-728.

De Hartog, J. J., Boogaard, H., Nijland, H., & Hoek, G. (2010). Do the health benefits of cycling outweigh the risks? *Epidemiology, 22*(1), S76-S77.

DeHaven, M., Hunter, I., Wilder, L., Walton, J. & Berry, J. (2004). Health programs in faith-based organizations: Are they effective? *American Journal of Public Health 94* (6), 1030-1036.

De Vries, S. I, Bakker, I., Van Machelen, W. & Hopman-Rock, M. (2007). Determinants of activity-friendly neighborhoods for children: Results from the SPACE study. *American Journal of Health Promotion, 21* (4 Suppl), 312-316.

De Vries, S., Verheij, R. A., Groenewegen, P. P. & Spreeuwenberg, P. (2003). Natural environments-healthy environments? An exploratory analysis of the relationship between greenspace and health. *Environ Plan A, 35*, 1717–1732.

DiPietro, L. (1996). The epidemiology of physical activity and physical function in older people. *Medicine & Science in Sports & Exercise, 28* (5), 596-600.

Doyle C., Kavanagh P., Metcalfe O., and Lavin T. (2005). Health Impacts of Employment a Review. *Institute of Public Health in Ireland.* Accessed from: http://www.publichealth.ie/sites/default/files/documents/files/IPH_Employment_Health_24pp.pdf

Eberst, R. M. (1984). Defining health: A multidimensional model. *Journal of School Health, 54*(3), 99-104.

Ettinger, W. H., Burns, R., Messier, S. P., Applegate, W., Rejeski, W. J., Morgan, T.,. . . Craven, T. (1997). A randomized trial comparing aerobic exercise and resistance exercise with a health education program in older adults with knee osteoarthritis. *JAMA: The Journal of the American Medical Association, 277*(1), 25-31.

Evenson, K., Herring, A., & Huston, S. Evaluating change in physical activity with the building of a multi-use trail. *American Journal of Preventive Medicine 28* (suppl 2), 177-185.

Ewing, R. & Kreutzer, R. (2006). *Understanding the relationship between public health and the built environment: A report prepared for the LEED-HD Core Committee, US Green Building Council.* Accessed from http://www.usgbc.org/ShowFile.aspx?DocumentID=3901.

Feskanich, D., Willett, W. & Colditz, G. (2002). Walking and leisure-time activity and risk of hip fracture in postmenopausal women. *Journal of the American Medical Association, 288* (18), 2300-2306.

Foster, S., & Giles-Corti, B. (2008). The built environment, neighborhood crime and constrained physical activity: An exploration of inconsistent findings. *Preventive Medicine, 47*(3), 241-251.

Frank, L. D., Engelke, P. O. & Schmid, T. L. (2001). *Health and community design: The impact of the built environment on physical activity*. Washington, DC: Island Press.

Giles-Corti, B.& Donovan, R.J. (2002). Socioeconomic status differences in recreational physical activity levels and real and perceived access to a supportive physical environment. *Preventive Medicine, 35* (6), 601-611.

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*(5), 367-383.

Goodell, S., Williams, S. H. (2007). The built environment and physical activity: What is the relationship? *The Synthesis Project, Policy Brief No. 11*. Princeton: The Robert Wood Johnson Foundation.

Guo, Z. (2009). Does the pedestrian environment affect the utility of walking? A case of path choice in downtown Boston. *Transportation Research Part D: Transport and Environment, 14* (5), 343-352.

Hamer, M. & Chida, Y. (2008). Active commuting and cardiovascular risk: A meta-analytic review. *Preventive Medicine, 46*(1), 9-13.

Handy, S. L. & Clifton, K. J. (2001). Local shopping as a strategy for reducing automobile travel. *Transportation, 28* (4), 317-346.

Harrison, R. A., Gemmell, I., & Heller, R. F. (2007). The population effect of crime and neighbourhood on physical activity: an analysis of 15 461 adults. *Journal of Epidemiology and Community Health, 61*(1), 34-39.

Haskell, W.L., Lee, I.M, Pate R.R., Powell, K.E., Blair, S.N., Franklin, B.A., Macera, C.A.. . Bauman, A. (2007). Physical activity and public health. *Circulation, 116*(9), 1081-1093.

Hess, P. M., Moudon, A. V., Snyder, M. C. & Stanilov, K. (1997). Site design and pedestrian travel. *Transportation Research Record, 16749*, 9-19.

Hillsdon, M., Foster, C., & Thorogood, M. (2005). Interventions for promoting physical activity. [Meta-Analysis Review]. *Cochrane Database Syst Rev* (1), CD003180.

Humphrey, N. P. (2005). *Does the built environment influence physical activity? Examining the evidence. Special Report 282*. Washington, D.C.:Transportation Research Board and Institute of Medicine of the National Academies.

Huston, S., Evenson, K., Bors, P. & Gizlice, Z. (2003). Neighborhood environment, access to places for activity, and leisure-time physical activity in a diverse North Carolina population. *American Journal of Health Promotion, 18* (1), 58–69.

Jacobsen, P., Anderson, C. L., Winn, D. G., Moffat, J., Agran, P. F. & Sarkar, S. (2000). Child pedestrian injuries on residential streets: Implications for traffic engineering. *ITE Journal*, 71-75.

Kaplan, S. (1995). The restorative benefits of nature: Toward an integrative framework. *Journal of Environmental Psychology, 15*, 169-182.

Keyes, C. L. M. (2007). Promoting and protecting mental health as flourishing: A complementary strategy for improving national mental health. *American Psychologist, 62*(2), 95-108.

King, A. C., Sallis, J. F., Dunn, A. L., Simons-Morton, D. G., Albright, C. A., Cohen, S.,. . . Group, F. T. A. C. T. R. (1998). Overview of the Activity Counseling Trial (ACT) intervention for promoting physical activity in primary health care settings. *Medicine & Science in Sports & Exercise, 30* (7), 10.

Kuo, F. E., & Faber Taylor, A. (2004). A potential natural treatment for Attention-Deficit/Hyperactivity Disorder: Evidence From a National Study. *Am J Public Health, 94*(9), 1580-1586.

Lavin, T., C. Higgins, O. Metcalfe, & Jordan, A. (2006). *Health impacts of the built environment: A review*. Dublin: Institute of Public Health in Ireland.

Lee, C., & Moudon, A. V. (2004). Physical activity and environment research in the health field: Implications for urban and transportation planning practice and research. *Journal of Planning Literature, 19*(2), 147-181.

Lewis, C. A. (1996). *Green nature/human nature;The meaning of plants in our lives*. Urbana, IL: University of Illinois Press.

Leyden, K. M. (2003). Social capital and the built environment: The importance of walkable neighborhoods. *Am J Public Health, 93*(9), 1546-1551.

Lockett, D., Willis, A., Edwards, N. (2005). Through seniors' eyes: An exploratory qualitative study to identify environmental barriers to and facilitators of walking. *Canadian Journal of Nursing Research, 37* (3), 48-65.

Lovasi, G., Moudon, A., Pearson, A., Hurvitz, P., Larson, E., Siscovick, D.,. . . Psaty, B. (2008). Using built environment characteristics to predict walking for exercise. *International Journal of Health Geographics, 7*(1), 10.

Lund, H. (2003). Testing the claims of New Urbanism: Local access, pedestrian travel, and neighboring behaviors. *Journal of the American Planning Association, 69*(4), 414-429.

Matthews, C. E., Jurj, A. L., Shu, X.-o., Li, H.-L., Yang, G., Li, Q.,. . . Zheng, W. (2007). Influence of exercise, walking, cycling, and overall nonexercise physical activity on mortality in Chinese women. *American Journal of Epidemiology, 165*(12), 1343-1350.

Merom, D., Bauman, A., Vita, P. & Close, G. (2003). An environmental intervention to promote walking and cycling—the impact of a newly constructed rail trail in western Sydney. *Preventive Medicine 36*, 235-242.

Miller, M. E., Rejeski, W. J., Reboussin, B. A., Ten Have, T. R. & Ettinger, W. H. (2000). Physical activity, functional limitations and disability in older adults. *Journal of the American Geriatrics Society, 48* (10), 1264-1272.

Moudon, A. V., & Hess, P. M. (2000). Suburban Clusters. *Journal of the American Planning Association, 66*(3), 243-264.

Moudon A.V., & Hess P.M., Snyder, M.C., Stanilov, K. (1998). Site Design effects on pedestrian travel behavior in medium-density environments. *Transportation Research Record; 1578:48-55*

National Center for Chronic Disease Prevention and Health Promotion. (2008). SMART: BRFSS city and county data 2009: Atlanta-Sandy Springs-Marietta, GA Metropolitan Statistical Area. *Behavioral Risk Factor Surveillance System*. Accessed from http://apps.nccd.cdc.gov/BRFSSSMART/MMSARiskChart.asp?yr=2009&MMSA=5&cat=OB&qkey=4409&grp=0

National Center for Chronic Disease Prevention and Health Promotion. (2009). *The power of prevention: Chronic disease. . . the public health challenge of the 21st century*. Atlanta: Centers for Disease Control and Prevention.

Nelson, A. C. & D. Allen (1997). If you build them, commuters will use them: Association between bicycle facilities and bicycle commuting. *Transportation Research Record 1578*, 79-83.

Ogilvie, D., Egan, M., Hamilton, V. & Petticrew, M. (2004). Promoting walking and cycling as an alternative to using cars: systematic review. *British Medical Journal, 329*, 763-766.

Ogilvie, D., Mitchell, R., Mutrie, N., Petticrew, M., & Platt, S. (2006). Evaluating health effects of transport interventions: Methodologic case study. *American Journal of Preventive Medicine 31* (2), 118-126.

Oja, P., Vuori, I. & Paronen, O. (1998). Daily walking and cycling to work: their utility as health-enhancing physical activity. *Patient Education and Counseling, 33* (1), 87-94.

Oregon Department of Transportation (1995). Oregon bicycle and pedestrian plan. Accessed from http://www.oregon.gov/ODOT/HWY/BIKEPED/docs/or_bicycle_ped_plan.pdf.

Peterson, J., Atwood, J. & Yates, B. (2002). Key elements for church-based health promotion programs: Outcome-based literature review. *Public Health Nursing 19* (6), 401-411.

Pikora, T., Giles-Corti, B., Bull, F., Jamrozik, K., & Donovan, R. (2003). Developing a framework for assessment of the environmental determinants of walking and cycling. *Social Science & Medicine, 56*(8), 1693-1703.

Pikora, T. J., Giles-Corti, B., Knuiman, M. W., Bull, F. C., Jamrozik, K., & Donovan, R. J. (2006). Neighborhoods environmental factors correlated with walking near home: Using SPACES. *Medicine & Science in Sports & Exercise, 38* (4), 708-714.

Powell, L., Slater, S., Chaloupka, F. (2004). The relationship between community physical activity settings and race, ethnicity and socioeconomic status. *Evidence-Based Preventive Medicine 1* (2), 135-144.

Pucher, J. (1997). Bicycling boom in Germany: a revival engineered by public policy. *Transportation Quarterly, 51*(4), 31-46.

Pucher, J., Dill, J., & Handy, S. (2010). Infrastructure, programs, and policies to increase bicycling: an international review. *Preventive Medicine, 50*, 106-125.

Putnam, R.D. (2000). *Bowling alone: The collapse and revival of American community.* New York: Simon & Schuster.

Rails-to-Trails Conservancy (2000). Rails-with-trails: design, management and operating characteristics of 61 trails along active railroads. Washington, DC: Rails-to-Trails Conservancy, November 2000.

Reed, J. A., Ainsworth, B. E., Wilson, D. K., Mixon, G., & Cook, A. (2004). Awareness and use of community walking trails. *Preventive Medicine, 39*(5), 903-908.

Report to the President. (2000.) *Promoting better health for young people through physical activity and sports: a report to the President from the Secretary of Health and Human Services and the Secretary of Education.* Silver Spring, MD: Department of Health and Human Services, Department of Education.

Roman, C. & Moore, G. (2004). Measuring local institutions and organizations: The role of community institutional capacity in social capital. Accessed from http://www.urban.org/UploadedPDF/410998_Local_Institutions.pdf.

Ross, C. L., & Marcus, M. (2008). Roadways and Health: Making the Case for Collaboration. In S. Malekafzali (Ed.), *Healthy, Equitable Transportation Policy: Recommendations & Research* (pp. 79-95): PolicyLink.

Rosenberger, R. S., Bergerson, T. R. & Kline, J. D. (2009). Macro-linkages between health and outdoor recreation: The role of parks and recreation providers. *Journal of Park and Recreation Administration 27* (3), 8-20.

Saelens, B. E., Sallis, J. F., Black, J. B., & Chen, D. (2003). Neighborhood-based differences in physical activity: an environment scale evaluation. *Am J Public Health, 93*(9), 1552-1558.

Sallis, J. F., Frank, L. D. Saelens, B. E. & Kraft, M. K. (2004). Active transportation and physical activity: Opportunities for collaboration on transportation and public health research. *Transportation Research Part A, 38*, 249-268.

Satcher, D. (1999). Mental health: A report of the Surgeon General--Executive summary. *Professional Psychology: Research and Practice, 31*(1), 5-13.

Sherman, S. E., D'Agostino, R. B., Cobb, J. L., & Kannel, W. B. (1994). Physical activity and mortality in women in the Framingham Heart Study. *American Heart Journal, 128*(5), 879-884.

Spence, J. C., Cutumisu, N., Edwards, J. O. Y., & Evans, J. (2008). Influence of neighbourhood design and access to facilities on overweight among preschool children. *International Journal of Pediatric Obesity, 3*(2), 109-116.

Spirduso, W. W. & Cronin, D. L. (2001). Exercise dose-response effects on quality of life and independent living in older adults. *Medicine & Science in Sports & Exercise, 33* (6), 598-608.

Staunton, C. E., Hubsmith, D., & Kallins, W. (2003). Promoting safe walking and biking to school: The Marin County success story. *American Journal of Public Health, 93*, 1431-1434.

Takano, T., Nakamura, K., & Watanabe, M. (2002). Urban residential environments and senior citizens' longevity in megacity areas: the importance of walkable green spaces. *Journal of Epidemiology and Community Health, 56*(12), 913-918.

Transportation Research Board (TRB) (2005). Does the Built Environment Influence Physical Activity? Examining the Evidence. Special Report 282. Washington D.C., Transportation Research Board and Institute of Medicine of the National Academies.

Troped, P.J., Saunders, R. P., Reininger, B., Ureda, J. R, & Thompson, S. J. (2002). Associations between self-reported and objective physical environmental factors and use of a community rail-trail. *Preventive Medicine, 32* (2), 191-200.

Tudor-Locke C., Jones R., Myers A.M., Paterson, D.H., & Ecclestone, N.A. (2002). Contribution of structured exercise class participation and informal walking for exercise to daily physical activity in community-dwelling older adults. *Research Quarterly for Exercise and Sports Sep;73(3):*350-356.

US Department of Health and Human Services (1996). Physical Activity and Health: A report of the Surgeon General. Centers for Disease Control and Prevention, Atlanta, GA, 1996. Available at http://www.cdc.gov/nccdphp/sgr/sgr.htm. Accessed 15 May 2006.

US Department of Health and Human Services (2001). Overweight and obesity: At a glance. *Office of the Surgeon General.* Accessed from http://www.surgeongeneral.gov/topics/obesity/calltoaction/fact_glance.htm

US DHHS. (2008). *Physical activity guidelines advisory committee report*. Washington, DC: US Department of Health and Human Services, Physical Activity Guidelines Advisory Committee.

Vuori, I. M., Oja, P., & Paronen, O. (1994). Physically active commuting to work--testing its potential for exercise promotion. *Medicine and science in sports and exercise, 26*(7), 844-850.

Wagner, A., Simon, C., Ducimetière, P., Montaye, M., Bongard, V., Yarnell, J.,. . . Arveiler, D. (2001). Leisure-time physical activity and regular walking or cycling to work are associated with adiposity and 5 year weight gain in middle-aged men: the PRIME Study. *International Journal Of Obesity And Related Metabolic Disorders: Journal Of The International Association For The Study Of Obesity, 25*(7), 940-948.

Waxman, L. (2003). Place experiences: The built environment as social capital. *Journal of Cultural Research in Art Education, 21*,19.

Weiss, C., Purciel, M., Bader, M., Quinn, J., Lovasi, G., Neckerman, K. & Rundle, A. (2011). Reconsidering access: Park facilities and neighborhood disamenities in New York City. *Journal of Urban Health 88* (2), 297-310.

Wells, N. M., & Evans, G. W. (2003). Nearby nature. *Environment and Behavior, 35*(3), 311-330.

Wen, M., & Zhang, X. (2009). Contextual Effects of Built and Social Environments of Urban Neighborhoods on Exercise: A Multilevel Study in Chicago. *American Journal of Health Promotion, 23*(4), 247-254.

Wood, L., & Giles-Corti, B. (2008). Is there a place for social capital in the psychology of health and place? *Journal of Environmental Psychology, 28*(2), 154-163.

Wood, L., Shannon, T., Bulsara, M., Pikora, T., McCormack, G., & Giles-Corti, B. (2008). The anatomy of the safe and social suburb: An exploratory study of the built environment, social capital and residents' perceptions of safety. *Health & Place, 14*(1), 15-31.

Woodcock, J., Edwards, P., Tonne, C., Armstrong, B. G., Ashiru, O., Banister, D.,. . . Roberts, I. (2009). Public health benefits of strategies to reduce greenhouse-gas emissions: urban land transport. *The Lancet, 374* (9705), 1930-1943.

World Health Organization (2000). Transport, environment, and health. Dora C. and Phillips M., eds.

WHO Regional Publications, European Series, No. 89.

World Health Organization. (2004). *A global strategy for diet, physical activity, and health*. Geneva: World Health Organization.

WHO. (2004). Promoting mental health: Concepts, emerging evidence, practice. Geneva: World Health Organization.

WHO. (2009). Global health risks: mortality and burden of disease attributable to selected major risks. Accessed from http://www.who.int/healthinfo/global_burden_disease/global_health_risks/en/index.html2009.

WHO-UNECE. (2009). Transport health and environment pan-European programme (the PEP) Toolbox. Accessed from http://www.healthytransport.com/2009.

Wolch, J.R., Tatalovich, Z., Spruijt-Metz, D., Byrne, J. Jerrett, M., Chih-Ping, C., …Reynolds, K. (2010). Proximity and perceived safety as determinants of urban trail use: findings from a three-city study. *Environment and Planning A*, 42, 57-79.