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# Trends in Bicycling Attitudes, Knowledge and Behavior at an Urban University

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# Trends in Bicycling Attitudes, Knowledge and Behavior at an Urban University

By

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# ABSTRACT

**BACKGROUND:** Active transportation, such as using a bicycle to get one from one place to another, has definite benefits over driving or some other form of travel that requires less exertion; the most obvious of these is that it helps a person meet the daily recommendations for physical activity. College campuses tend to have higher rates of bicycle-commuters than non-campus environments, although Georgia State University faces unique barriers to bicycling due to its downtown location. In 2009, a cross-sectional study was conducted to assess bicycling attitudes, knowledge, and behaviors. In the two years that followed, a faculty-student collaborative known as GSU Bikes implemented efforts to try to increase bicycling on campus. Campus bicycle count data between the two years showed positive increases. In 2011, the study was repeated to examine if bicycling attitudes, knowledge, and behavior had changed since 2009.

**METHODS:** 211 Georgia State University undergraduate and graduate students were surveyed in Fall 2011. The data they provided were then analyzed and compared to the 2009 bicycle data using independent-samples *t*-tests and a chi-square analysis to identify significant differences between the two data sets.

**RESULTS:** Few significant differences between the two sets of data were identified. Participants in 2011 had significantly higher agreement that they could locate information regarding bicycle safety and repairs, as well as reported a significantly greater likelihood of bicycling to campus if educational programs to, from, and around the GSU campus were implemented. Written feedback suggested that fear of collisions was still a major barrier; many students suggested a campus bicycle-share program and more information disseminated to students about bicycling to campus.

**DISCUSSION:** The results from this study demonstrate that efforts aimed at encouraging students to bicycle to campus, between the 2009 and 2011 data collections, may not have been as effective as they were intended. Bicycle promotion that reaches a greater number of Georgia State University students is suggested. Because of the method of data sampling in this study, the data analyzed may not be truly representative of the Georgia State University population. In the future, an improved survey that is disseminated electronically may result in a larger sample size, increasing statistical validity and ability to generalize findings.

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# Chapter I
# INTRODUCTION

## 1.1 Background

Active transportation, also referred to as "non-motorized transport", refers to a self-propelled activity in which the means of travel utilizes human power, rather than relying on a machine, like a motor vehicle (Sallis, Frank, Saelens, & Kraft, 2004). When researchers look at active transportation, they are often referring to active commuting through walking or bicycling. Walking or using a bicycle to get one from one place to another has definite benefits over driving or some other form of travel that requires less exertion; the most obvious of these is that it helps a person meet the daily recommendations for physical activity.

Physical activity is an integral part of health; it helps provide primary and secondary prevention against chronic diseases, supports better mental health, and increases life expectancy (Warburton, Nicol, & Bredin, 2006). Current recommendations for adults are to engage in at least 150 minutes of moderate-intensity exercise per week, in sessions of at least 10 minutes at a time; ideally, both aerobic and muscle-strengthening exercises will be incorporated for maximum benefits (USDHHS, 2008). According to the Centers for Disease Control and Prevention, however, eighty percent of Americans ages 18 and over do not meet the overall recommendations for physical activity; when aerobic exercise is taken into account by itself, less than half (46.9%) meet the recommendations (CDC, 2010).

Those who engage in active transportation, however, are more likely to engage in the recommended amount of physical activity; those who bicycle as a means of commuting are even more likely to experience the benefits of physical

activity than those who walk, due to the higher aerobic intensity (Moudon et al., 2005). One of the most important factors in health promotion is not only knowing which populations are at-risk, but knowing at what age and under what circumstances people may be most receptive to education and health-related interventions. College is a particularly crucial time, as some students may be living on their own for the first time and are learning how to develop healthy or unhealthy habits (Paffenbarger, Hyde, Wing, & Hsieh, 1986).

College campuses, in general, tend to have more people who commute by bicycle than non-university settings; a traditional, enclosed campus may have slower speeds and better equipment to support bicyclists because college students are also less likely than other populations to have access to a personal vehicle (Zhou, 2012). For more "open" college campuses, however, the challenges for active transportation by means of bicycle can be prevalent and somewhat difficult to overcome, particularly if the campus is in an urban area near high-speed, high-volume streets. In 2009, several of these barriers, as well as student resistance to bicycling, were identified in a survey regarding bicycling attitudes and behaviors (Pope, 2009). The survey revealed that only 11.1% of participants identified themselves as "bicyclists," and many cited concerns, such as fear of riding alongside Atlanta traffic, as reasons for not bicycling.

## 1.2 Purpose of Study

Since Fall 2009, Georgia State University has engaged in an activity referred to as "Bike Counts" in which volunteers stand at specified intersections on campus and count the number of bicyclists who pass through over a designated period of time. The data collected over a two-year period was encouraging, as depicted in Figure 1:

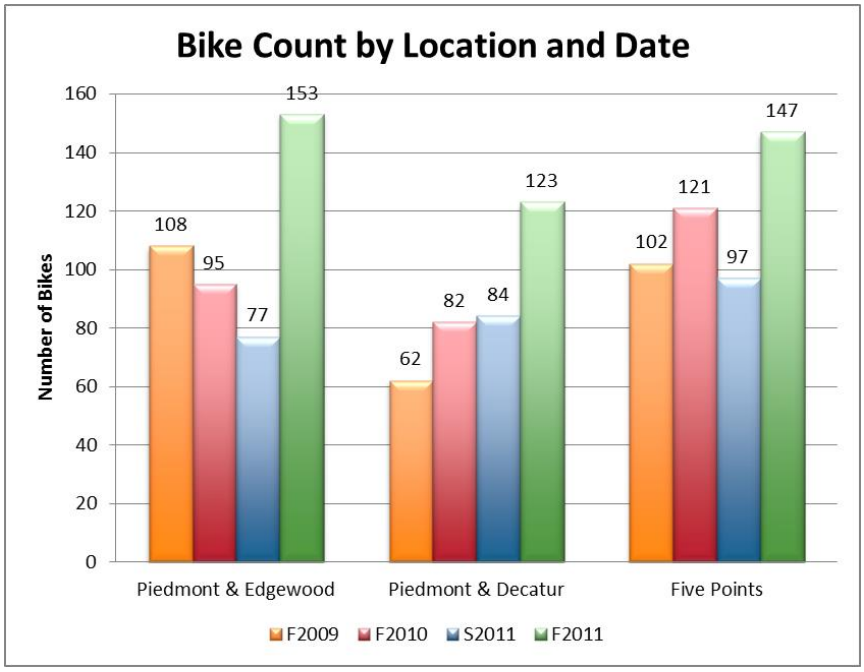


*Figure 1.* Bike Counts data 2009-2011.

After the findings in Pope's 2009 study had been established, several promotional efforts at Georgia State University occurred to help encourage students to try bicycle-commuting. A faculty-student collaborative known as "GSU Bikes" began working with other bicycle organizations around Atlanta to provide information and support to bicyclists. This collaborative also helped set up a bicycle-share program through GSU's Recreation Center. Other factors, like increasing fuel

prices and the opening of a new freshman dormitory, may also have encouraged students to drive less and be more likely attempt to commute to campus by means of bicycle.

The purpose of the current study is to assess what changes in attitudes, knowledge, and behavior have occurred since data were initially collected. Additionally, this study aims to utilize differences found between the two time periods to formulate suggestions for future promotional efforts and research.

# Chapter II
# REVIEW OF THE LITERATURE

## 2.1 Bicycling Trends and Barriers in the United States

The United States is largely a motor vehicle-dependent nation, with only an estimated two percent of all trips made using a bicycle (Pucher et al., 2011). One of the most commonly cited reasons for using a car rather than a bicycle is safety; fear of being hit by a car while bicycling deters many people from attempting to bicycle-commute (Parkin, Ryley, & Jones, 2007). This concern is not without merit. In a country that has so few bicycle-commuters, many drivers are unaware as to how to share the road with bicyclists, and some are unaware that bicyclists have the same rights to the roads as motorists. This lack of awareness and breaking of road laws on both sides contributes to hundreds of fatalities and tens of thousands of injuries per year from bicycle/car collisions (National Highway Traffic Administration, 2010). While this is a tiny fraction of the number of fatalities and injuries from all motor vehicle collisions, the perceived vulnerability of being on a bicycle, coupled with the decreased likelihood of the bicyclist's surviving a collision, does substantiate some skeptics' fears (Larouche & Abbott, 2012).

Many people see bicycling as an inconvenience instead of a positive mode of transportation, particularly when they already live in an area that caters to car commuters (Pucher, Komanoff, & Schimek, 1999). Increases in commute time when using a bicycle rather than a car and long distances between home and work or school are common reasons for not bicycle-commuting (Parkin, Ryley, & Jones, 2007).

Additionally, concerns about inclement weather and personal hygiene, particularly during warmer months, are common deterrents (Tin Tin, et al., 2010).

For those who may enjoy bicycling recreationally in parks and on trails, but are not apt to do so for utilitarian purposes, lack of appropriate infrastructure is often a major reason (Xing, Handy, & Mokhtarian, 2010). If, for example, one was interested in bicycling to work, but the only available route was a high-speed, multi-lane arterial road, where the destination had no available bicycle parking, the individual's cost-benefit analysis of doing so may favor the option of using a car (Hoedl, Titze, & Oja, 2010).

Bicycling for transportation tends to be more prevalent among college students than non-students, due to the expense of owning a car, parking on campus, and the possibility of living on or near campus. One study found that roughly half of its students engaged in some kind of active transportation regularly (Shannon, Giles-Corti, Pikora, Bulsara, Shilton, & Bull, 2006). The location and environment of the university, however, has a great deal to do with its students using a bicycle for transportation (Matthews, 2012). Enclosed campuses, in which most of the streets do not include "through" traffic from non-students, tend to have higher rates of students' bicycling for transportation than open campuses, where nearby streets have higher volumes of non-university-related traffic (Titze, Stronegger, Janschitz, & Oja, 2007). Barriers for college students when it comes to bicycling for transportation are similar to that of the general population; fears of collisions and bike theft, as well as concerns about personal hygiene, are common obstacles (Stinson & Bhat, 2004). Distance from campus is a prominent factor, along with overall convenience and ease with

which one can park his or her bicycle on campus and get to class on time (Matthews, 2012). Additionally, if one attends a university that has a high perceived crime rate, women especially are more likely to feel vulnerable on a bicycle, rather than in a car (Reed & Ainsworth, 2007).

## 2.2 Effective Promotional Efforts to Increase Bicycling for Transportation

Despite the barriers to bicycling, active transportation is a common contemporary topic among health researchers because of its implications for physical and environmental health. Several studies have been published looking at different forms of promotion and changes to the built environment to assess which have been the most effective. The following have been shown to have positive effects in increasing bicycling for transportation:

- On-road Bicycle Lanes
- Off-street Paths
- Speed Limits
- Facility Maintenance
- Bicycle Parking
- Bicycle Racks on Public Transit
- Shower Facilities
- Bicycle Traffic Phases
- Education/Training
- Safety in Numbers
- Bike-sharing Programs
- Bike-to-Work Days
- Ciclovias

***Physical Environment:***

On-road bicycle lanes: Bicycle lanes are separate lanes for bicyclists to share the road with motor vehicle drivers. They can either be "protected," meaning they have a physical barrier between the bicyclist and the driver, or the delineation may just be apparent through a white stripe on the road that separates the two lanes. Although the former are typically preferred by bicyclists because they feel less vulnerable from collisions, the latter are much more common because the expense is far less. Roads with bicycle lanes have been shown to positively correlate with the presence of bicycle-commuters (Parkin et al., 2008; Dill & Carr, 2003). Additionally, roads that have new bicycle lanes installed have typically seen an increase in bicycle-commuters as well (Barnes et al., 2006).

Off-street paths: These paved paths are physically separated from traffic and often have two lanes. Findings have been somewhat conflicting with experienced bicyclists in terms of whether or not off-street paths are preferred over on-road lanes, usually depending on whether or not taking an off-street path adds a substantial commute time (Dill, 2009). Women, however, have shown significant preference for the off-street path over the on-road lane (although they prefer both over no infrastructure); this method may be useful in narrowing the gender discrepancy in bicycling (Garrard, Rose, & Lo, 2008).

Speed Limits: Reducing the maximum speed that a vehicle is allowed to travel in a given area has been shown to increase both bicycling behaviors and feelings of safety while bicycling (Bauman, Rissel, Garrard, Ker, Speidel, & Fishman, 2008).

Facility Maintenance: The quality of the pavement on a road has been associated with the number of bicycle-commuters. In one study in London, the number of bicyclists doubled after the road was resurfaced (Transport for London, 2004). Another study in the United States showed that the smoothness of the pavement, as well as regular maintenance on removal of debris, was a strong predictor as to whether or not bicyclists used that particular road (Landis, Vattikuti, & Brannick, 1997).

Bicycle Parking: Having safe, secure, convenient bicycle parking available at one's destination has been shown to significantly increase the likelihood of bicycling for transportation. In order for bicycle parking to be considered adequate, the facilities need to be in well-lit, open areas (as opposed to behind a building, in which bicycle theft may be more plausible), as well as placed in locations where they can serve the most bicyclists; one study that looked at the effects of implementing safe and secure bicycle parking at common destinations estimated a total round-trip reduction of 27 minutes in commute time (Hunt & Abraham, 2007).

Bicycle Racks on Public Transit: Because many people do live farther from their workplace or university than they would like to bicycle, a viable alternative is using public transit for part of the commute. To do so, however, it is necessary that buses

and trains are equipped to transport bicycle; putting bicycle racks on buses has been shown to be a worthwhile investment, as the revenue it brings in from the additional bus riders surpasses the cost of installation (Hagelin, 2005). The Transportation Research Board (2005) has reported that bicycle facilities on public transit are being used more and more frequently.

Shower Facilities: Although evaluative literature on the impact of having shower facilities available is sparse, because personal hygiene is such a common theme among non-bicyclists, the estimated effect of being able to shower at one's destination is substantial, particularly if the destination is a professional environment (Wardman, Tight, & Page, 2007).

Bicycle Phases (Traffic Signals): These traffic signals provide a separate phase for bicyclists to be able to cross intersections without riding alongside motor vehicle traffic. One study in California showed that, in the thirty-five months that followed the installation of these traffic signals, there were no bicycle-motor vehicle collisions, compared with ten collisions in the thirty-five months that preceded installation (Korve & Niemeier, 2002).

***Programs, Promotion, and Education:***

Education and Training: Although there have been few published studies regarding evaluations of education and promotion of bicycling, there is evidence that these programs have can have a positive effect, especially when used in conjunction with

other efforts, such as implementation of bicycle-related infrastructure. An evaluation of a program in Sydney, Australia, showed that over half of participants were bicycling more often sixty days after the completion of an educational program that taught defensive bicycling (Telfer, Rissel, Bindon, & Bosch, 2006). Typically, in order for bicycling promotion to be effective (as is the case with many forms of health promotion), those who are on the receiving end of the promotional efforts need to have access to a physically supportive environment (Carnell, 2000).

Safety in Numbers: Although it probably comes as no surprise, greater numbers of bicyclists present in a given area tends to make people more comfortable with the idea of bicycling themselves. In fact, one study showed that bicycle fatalities actually increased after the implementation of a mandatory helmet law because the institution of the law deterred many people from bicycling. Despite the protective factors associated with wearing a helmet, the dramatic decrease in the number of bicyclists led to lower expectation on the drivers' part of needing to be cautious of bicyclists; this lack of preparation led to more bicycle-motor vehicle collisions (Robinson, 2005).

Bike-Sharing Programs: These programs allow users to check out bicycles short-term and return them to designated spots throughout the city or university. They are usually operated with a membership system that allows the person to unlock a bicycle from its location using a card or code. Implementation of bicycle-sharing programs has shown positive effects, in the fact that usage of the system generally increases

over time (Romero, 2008; Nadal, 2007). Although it is a correlation and not causation, bicycle counts have been reported to increase dramatically after a bicycle-sharing program has been instated (Bonnette, 2007).

Bike-to-Work Days: These events may take place over the course of a day, week, or designated month, in which cities or programs encourage non-bicyclists to attempt bicycling to work or school. There has been evidence that these programs increase bicycling among those who had never bicycle-commuted before after the program has concluded (League of American Bicyclists, 2008). One such program in Australia showed that about a quarter of first-time commuters were still bicycling to work five months later (Rose & Marfurt, 2007).

Ciclovias: Begun in Bogota, Colombia, ciclovias are events in which roads that are normally used for motor vehicle traffic are temporarily closed for bicyclists, pedestrians, and other people on non-motorized transport to use. Associations between the presence of ciclovias and utilitarian bicycle-riding are difficult to make because, while there is a correlation between recreational riding on ciclovias and presence of utilitarian riding during other times, it is hard to establish a causal link. Nevertheless, the use of Bogota's bicycle-share has significantly increased as the popularity of the ciclovia has increased, and it is reasonable to expect that bicycle-friendly events may encourage people to attempt bicycling at other times (Parra, Gomez, Pratt, Sarmiento, Mosquera, & Triche, 2007; Torres, Sarmiento, Stauber, Zarama, 2013).

***Bicycle-Friendly Universities:***

In addition to what has already been discussed, there are reputable criteria for whether or not universities are considered "bicycle-friendly." The League of American Bicyclists is an organization that seeks to promote cycling for recreation, fitness, and transportation among all fronts, but has a special set of guidelines against which they judge universities throughout the nation as being bike-friendly or not. The honor (whose categories include platinum, silver, bronze, and honorable mentions) is considerable, particularly when it comes to applying for grants from outside institutions.

In order to be considered a bicycle-friendly university, LAB judges universities on five specific criteria, referred to as the "5 E's": Engineering (referring to items such as infrastructure and campus bicycle plans); Education (campus resources and programs for bicyclists); Encouragement (university promotion of bicycling and incentives for doing so); Enforcement (cooperation of campus police in taking traffic violations seriously); and Evaluation and Planning (program monitoring for future improvements of current efforts).

Currently, the League of American Bicyclists has a list of forty-four universities that meet the bicycle-friendly criteria, two of which (Emory University and Georgia Institute of Technology) are in Atlanta, Georgia (bikeleague.org). Descriptions of the specific programs and goals of five awarded universities are outlined below:

Stanford University (Platinum Award): Stanford has a full-service Campus Bike Shop in which students can rent and purchase bicycles; repairs are offered at low-cost, with free advice to the owners if they wish to fix the bikes themselves. While a bicycle is in the repair shop, loaner bikes are available. The Campus Bike Shop works in conjunction with Stanford's Transportation Demand Management Department and Commute Club, two organizations dedicated to promote bicycling on campus. In addition to 13,000 bike rack spaces, the campus also offers bike lockers, clothing lockers, and showers to make the commute as comfortable as possible for everyone. The Commute Club and Bike Shop review bicycle count data every year to ensure that the number of facilities available is adequate to serve the increasing number of bike commuters. They have two Dero bike stands installed. The Commute Club offers "clean air cash" (whether this "cash" is for bicycle-related purposes or can be used for anything is not clear) to its members to further incentivize bike-commuting (campusbikeshop.com).

Portland State University (Silver Award): PSU's claim-to-fame is its campus Bike Hub, a 2000-square-foot bicycle repair shop staffed by two full-time employees and six student employees. While the bike shop repairs student bicycles, their aim is to help students learn how to care for and fix their own bikes; one-on-one instruction, in addition to group workshops, are available. In addition to 1700 regular bike-parking spaces, PSU constructed two bicycle garages that are secured through student-ID access; each garage has the capacity for about 80 bicycles. Campus bicycle promotion includes bike challenges each Spring, similar to Atlanta's bike-to-work

challenge, in which participants log away their miles spent commuting by bicycle and have the chance to compete for prizes (pdx.edu)

Georgia Institute of Technology (Silver Award): GA Tech has several campus programs dedicated to increasing the number of bike commuters on campus, one of which is Starter Bikes, a program in which volunteers refurbish donated bikes into inexpensive ($50-$150) but safe modes of transportation for students. Their Bicycle Infrastructure Improvement Committee is comprised of students and staff members and is responsible for evaluating and improving on-campus bicycle facilities, as well as securing funding for sustainable-transportation activities and equipment. GA Tech also participates in ViaCycle, a campus bike-share program in which students can reserve a bike by phone or iPhone application, which then unlocks the bike from its rack; the bike can then be dropped off at another ViaCycle campus location for convenience. Last year, the student government funded over $25,000 for new bike racks and bike lanes, which in turn inspired the university's President to allocate another $40,000 for marking low-speed lanes on campus with sharrows. Finally, to improve security, the university embarked on a focused effort to encourage students to abandon chain locks for more reliable U-locks, which dropped bike theft a dramatic sixty percent (bike.gatech.edu).

University of Kentucky (Bronze Award): UK currently has about 3000 bicycle parking spaces. They offer students a chance to register their bikes with the university so that, in the event that a bicycle is stolen, it can be reported and possibly

recovered if it reappears on campus. In June 2012, UK installed four Dero fix-it stations to assist students in bicycle repairs. In addition to the do-it-yourself stations, they have a mobile repair station that is set up on campus every week for a couple of hours for students to bring their bikes for free repairs. Their Bicycle Advisory Committee also recently published a manual on safest bicycle practices and tips for novice riders, as well as updating their campus map to show the safest bicycle routes and locations of the Dero stands and bike parking. Students are encouraged to fill out request forms if they feel that the university is in need of improved facilities, such as a greater number of bicycle racks. Their Office of Sustainability works closely with the student organization, Wildcat Wheels, to promote bicycle commuting to campus (uky.edu).

North Carolina State University (Bronze Award): NCSU recently invested $50,000 in a firm to devise a campus bicycle plan to improve their already bike-friendly community; over half the students at NCSU bike or walk to campus, mostly due to housing being in such close proximity. Incentives are available for those who choose alternate modes of transportation over driving, including single-use inclement weather permits, an Emergency Ride Home service in the event that one's bike has a mechanical issue rendering it inoperable, and clothing lockers. There are a multitude of shower facilities on campus in various locations. Their campus bicycle program, Wolfwheels, offers bicycle rentals for one day up to a full semester (nscu.edu).

## 2.3 Findings of 2009 Study

In Fall 2009, surveys assessing bicycling attitudes, knowledge, and behavior were distributed to 314 Georgia State University Students (Pope, 2010). For the most part, the purpose of this study was to assess overall bicycling trends, but also to examine differences in attitudes and knowledge between bicyclists and non-bicyclists. Eleven percent of this sample identified as bicyclists, over half of which reported using a bicycle for transportation to campus. In terms of gender differences, males were six times more likely to be bicyclists than females. Not surprisingly, those who identified as bicyclists were significantly more likely to agree that bicycling was a pleasant experience and that the distance was reasonable for bicycling to campus. Additionally, those who agreed that public transportation was within a reasonable distance were significantly more likely to be bicyclists. The majority of bicyclists and about half of non-bicyclists agreed that better safety and security for bicycle parking, as well as a campus bicycle shop available for minor repairs, would make it more likely that they would bicycle to campus. Those who perceived having social support for bicycling (in terms of having friends who bicycled and peers who thought bicycling was "cool") were significantly more likely to bicycle for transportation.

Pope suggested that because roughly 20% of students were living on campus at the time of the survey distribution, distance may be a significant barrier in bicycling to GSU. An on-campus bicycle-share program was proposed as a measure that may serve as beneficial for those who wish to bicycle around GSU while attending classes during the day but are not interested in bringing a bicycle from home.

Because social support was such a strong predictor of bicycling, it was also suggested that future programs that promote bicycling take into consideration little amount of social interaction that non-bicyclists have with bicyclists. In other words, having programs available that can include both novices and more experienced bicyclists may help non-bicyclists feel more comfortable and supported in beginning to bicycle for transportation.

Although the qualitative feedback provided at the end of the survey was not specifically addressed within the 2009 study, safety was mentioned several times, in terms of theft and fear of crashes. Overall, suggestions for long-term improvements, based on student responses as well as previous research, included changes to the built environment, as bicycle lanes and traffic control devices, as well as educational efforts that promote defensive bicycling in a safe environment.

## 2.4 Bike Promotion at Georgia State University

In 2009, a faculty-student organization named GSU Bikes was created to help promote bicycling on campus. GSU Bikes collaborated with similar organizations, such as Atlanta Bicycle Coalition, to help provide resources to make bicycling to campus and around Atlanta safer for students. The organization also helped facilitate a bike-share program in 2010 through Touch the Earth, a part of the Student Recreation Center that handles off-campus sports and activities. Through the bike-share, students are able to rent a bicycle for two days at a time, free of charge. Touch the Earth also began providing minor repairs to students' personal bicycles.

Additionally, GSU Bikes aimed to spread awareness of bicycling for transportation and bringing bicyclists together by hosting meet-and-greets, designing a website that included a mapping tool that showed the locations of bike racks/parking on campus, and hosting a contest for a student-designed bike rack. Finally, in Fall 2009, GSU Bikes and other campus bicycle advocates began conducting "Bike Counts" on campus at three different intersections, in which the number of cyclists, as well as cycling behavior (riding with/against traffic, wearing a helmet, etc.) are recorded over a two-hour period. Counts have been repeated every semester since then to track the number of bicyclists present on campus during a given period.

# Chapter III
# METHODS AND PROCEDURES

## 3.1 Research Design

The current study employed a cross-sectional design using surveys, which is often used for descriptive statistics in which no variables are manipulated by the researcher. The survey, proposed methodology, and all involved researchers were approved by the Institutional Review Board at Georgia State University prior to survey distribution. Because this study was developed to examine differences between the 2009 and 2011 data sets, researchers sought to make the procedures as similar as possible to those used in 2009.

## 3.2 Subjects

A select number of professors were asked to volunteer their classes for participation in this study. 211 Georgia State University undergraduate and graduate students (65.9% female, 34.1% male) were recruited through random cluster sampling for data collection. Participants completed the survey at the beginning or end of their class period at the discretion of the professor. All students were given a brief overview of the study's purpose and given two copies of an informed consent (See Appendix A); one copy was signed and returned to the researcher, while the other was provided for the participants' records. There was no debriefing after the surveys were completed and returned because no deception was used; however, all participants were provided with the researchers' names and contact information, in the event that he or she would like a copy of the results once the data had been analyzed.

## 3.3 Instrument

The survey given to participants in this sample was originally developed for the purpose of the 2009 study (see Appendix B). A questionnaire created by Titze (2007) was utilized and adapted for Georgia State University's physical and population characteristics. The survey includes fifty-four items that assess access to a bicycle, frequency of bicycle use, and attitudes toward and knowledge of bicycling. Thirty of these items fell under one of five categories: Functionality, which refers to perceptions of the campus environment (including built environment, air quality, concerns about weather, etc.); GSU Campus, which refers to bike-related facilities on campus; Social Environment, which refers to social support for bicycling and perceptions of bicycling among peers; Neighborhood, which refers to attitudes and perceptions of bicycling where one lives; and Bike Support, which assessed whether or not participants would be more likely to bicycle if certain changes in the environment were made. The questions in these five categories utilized a four-point Likert scale for responses, ranging from "Strongly Agree" to "Strongly Disagree." The twenty-four remaining items included questions about access to bicycles, frequency of bicycling and other modes of transportation (such as public transit, walking, driving a personal vehicle, etc.), exercise frequency, and demographic data regarding age, gender, major, and class ranking. Questions about physical activity and general health were adapted from the 2009 Behavioral Risk Factor Surveillance Survey Questionnaire (cdc.gov). Finally, participants were given an opportunity to provide written feedback and suggestions.

## 3.4 Data Analysis

Survey data was initially entered into Epi Info 3.5.4, a program provided by the CDC that allows users to create electronic forms that are identical to surveys used for the ease of data entry. Surveys and informed consents were numbered to ensure that there was a signed consent form present for every survey that would be included in the analysis. Data was then transferred into SPSS 18.0 for statistical analysis. Those who were not marked as having signed an informed consent were excluded from analysis. Researchers were unaware ahead of time, with the 2011 sample, if any of the participants were cyclists, so participants who had been specifically recruited in 2009 because they were cyclists were also excluded to make the two data sets as uniform as possible. After the data for these surveys had been eliminated, the 2009 set included information for 299 participants.

In order to examine differences between the 2009 and 2011 samples, independent samples *t*-tests were run between individual items as well as the five categories. For the Likert-scale items, "Strongly Disagree" was assigned as '1'; "Somewhat Disagree" was assigned as '2'; "Somewhat Agree" was assigned as '3'; and "Strongly Agree" was assigned as '4'. The response "I don't know" was not included in the analysis and did not affect the mean. To further assess differences in the two samples, the Likert-scale items were then recoded again into dichotomous variables; "Strongly Disagree" and "Somewhat Disagree" were combined and labeled as simply "Disagree" while "Strongly Agree" and "Somewhat Agree" were combined and labeled as "Agree". Chi-square analyses were run again between the individual

questions, as well as between the five categories to assess differences in overall agreement/disagreement that the *t*-test might not have detected.

Additionally, a separate *t*-test analysis was done for those who reported living in zip codes that were within a ten-mile radius of Georgia State University's campus. Distance of zip codes to GSU's mailing address (30 Courtland Street SE, Atlanta, GA 30303) was calculated using Google Maps. Full mailing addresses were utilized to calculate distance when participants provided them.

A Cronbach's *alpha* reliability analysis was run on Likert-scale items grouped by category. Even though the reliability had been run in 2009, because some responses were excluded from the 2009 data, Cronbach's *alpha* was produced for both 2009 and 2011 data sets.

Finally, qualitative feedback that was provided at the end of the survey was not statistically analyzed, but all comments were read and informally tallied by category of suggestion (for example, "better infrastructure," "safer bike routes," etc.) to assess which suggestions seemed to be the most common.

# CHAPTER IV
# RESULTS

## 4.1 2011 Sample Characteristics

Surveys were administered from October 26, 2011 to November 8, 2011. The participants' ages ranged from 18-66 years, with a mean of 23.73 years. A total number of 211 surveys were included in the 2011 data set after nine surveys had been excluded for not having signed a consent form. The most frequently reported length of time at Georgia State University was "less than one semester," as was the case with the 2009 data. Overall, participants reported good health: the average for "general health" was 3.8, which is between "Good", which was coded as '3', and "Very Good", which was coded as '4'. The average number of days of poor health for the previous thirty days was 2.23, although this number reflects only 159 people who answered the question; the other 54 either left it blank or were not sure. 82% of respondents reported having exercised at least once in the last thirty days, with the average number of days being 3.35.

| | 2009 (N=299) | 2011 (N=211) |
|---|---|---|
| Gender: | | |
| Female | 188 (62.8%) | 139 (65.9%) |
| Male | 111 (37.2%) | 72 (34.1%) |
| Mean Age | 22.26 years | 23.73 years |
| Health Status (1=poor; 4=excellent) | 3.89 | 3.80 |
| Mean # of days of poor health in last 30 days | 2.32 | 2.23 |
| Number and percentage of participants reporting exercising in last 30 days | 236 (79%) | 173 (82%) |
| Mean # of days participants exercised in last 7 days | 3.38 | 3.35 |

Table 1. Demographic and health information for respective samples.

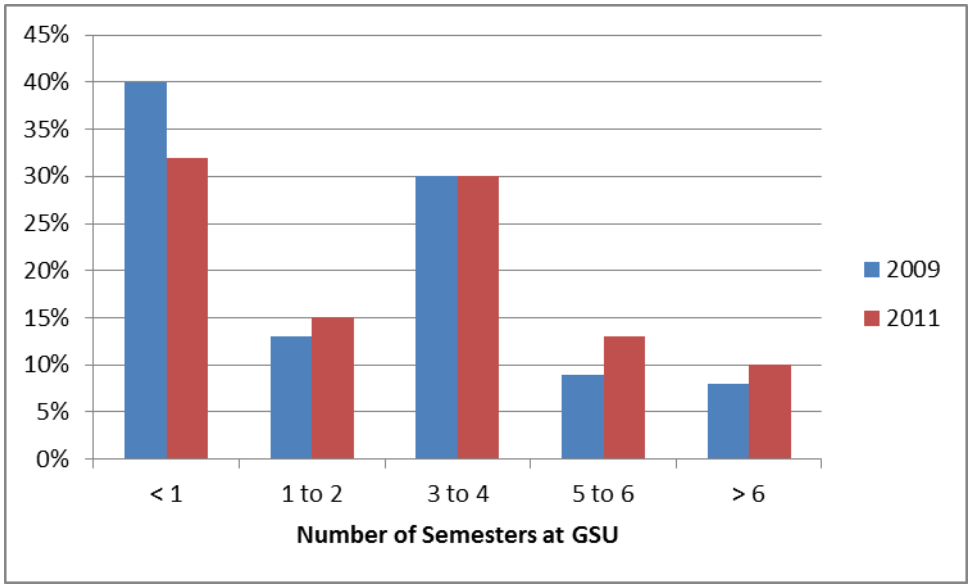

Figure 2. Percentage of responses for number of semesters participants had attended GSU.

Ninety-eight participants (46.4%) reported having access to a bicycle. Fifty-six (26.5%) participants reported riding a bicycle for fun within the last semester, and twenty-four (11.4%) reported riding a bicycle for transport. Eleven participants (5%) reported using a bicycle for transportation to campus within the past semester. The average number of days that a participant who had reported using a bicycle for transportation to campus had ridden to GSU in the past seven days was 1.36. This is slightly lower than the average number of days in 2009, which was 1.65, although the difference is not statistically significant (see Table 2).

Regarding modes of transportation in general, using a car was the most common form, with 69.2% of respondents reporting driving "all of the time" or "some of the time." The least common was riding a motorcycle, although bicycling came in at second-to-last with 8.1% reporting using a bike at least some of the time. Figure 3 shows the percentage of participants in 2009 and 2011 who reported using a

mode of transportation at least some of the time (some participants marked "some of the time" for more than one mode of transportation, so the percentages for all modes will add up to greater than one-hundred percent).

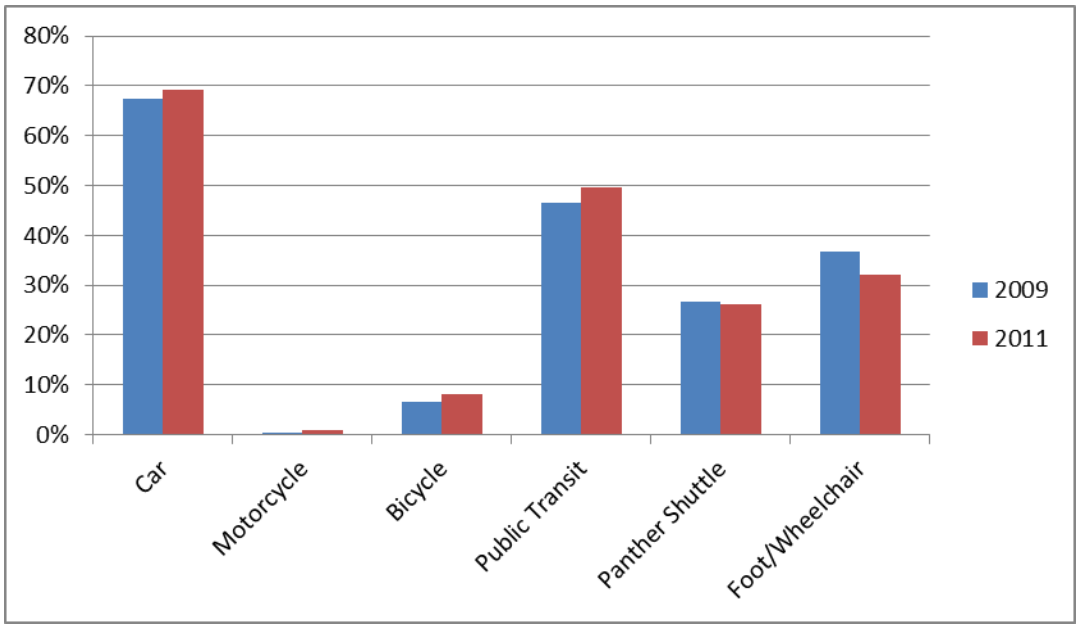

Figure 3. Percentage of participants in 2009 and 2011 reporting mode at least "some of the time."

## 4.2 Comparison of 2009 and 2011 Data Sets

Independent-samples *t*-tests detected no significant differences between the two years for general health, the number of days within the past month that participants had experienced poor health, the number of participants who reported having exercised within the last thirty days, or average number of days one had exercised in the previous week.

Chi-square analyses found no differences for having access to a bicycle or any bicycling behaviors. Independent samples *t*-tests detected no significant differences in the number of days that people had bicycled to campus in the last seven days or the average bicycle-commute time to campus.

| | Year | N | Chi-square (p-value) |
|---|---|---|---|
| Has access to bicycle | 2009<br>2011 | 139 (47.4%)<br>98 (46.7%) | .03 (.86) |
| Bicycled for fun in last semester | 2009<br>2011 | 54 (18.0%)<br>45 (21.3%) | 1.18 (.27) |
| Bicycled for transport in last semester | 2009<br>2011 | 31 (10.4%)<br>21 (10.0%) | .03 (.87) |
| Bicycled to/from/around GSU in last semester | 2009<br>2011 | 17 (5.7%)<br>11 (5.2%) | .00 (.96) |

*Table 2.* Number of participants within each sample who answered "yes" to bicycling behavior questions.

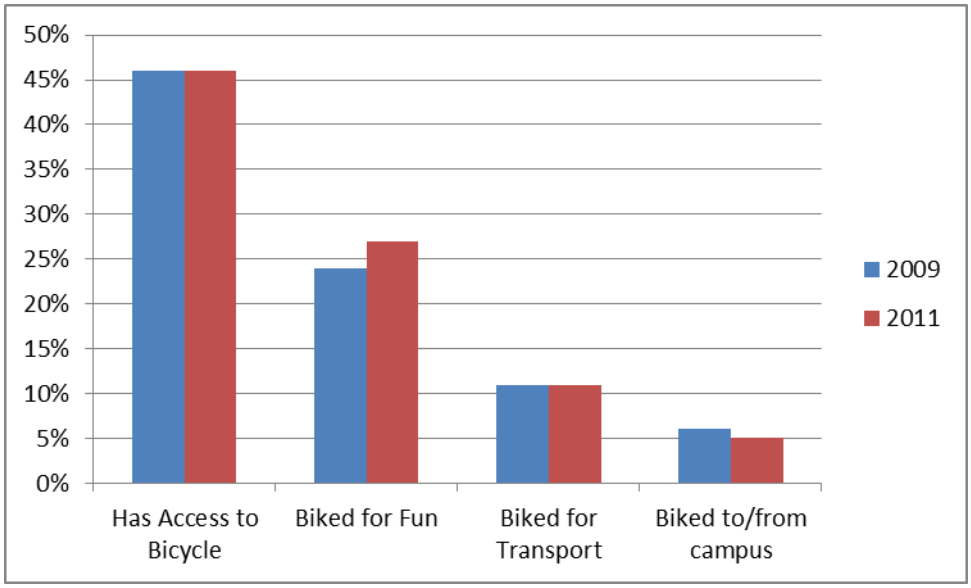


*Figure 4.* Percentages of 2009 and 2011 samples that answered "yes" to bicycling behavior questions

| | Year | N | Mean | Sig. ($p$<.05) |
|---|---|---|---|---|
| No. of days bicycled to GSU in last week | 2009<br>2011 | 17<br>11 | 1.65<br>1.36 | .69 |
| Avg. bicycling commute time (minutes) | 2009<br>2011 | 17<br>11 | 25.31<br>39.30 | .10 |

*Table 3.* Number of participants within each sample who bicycled to campus during previous week and their average commuting time.

With initial *t*-tests between categories of questions (see Table 5 for a list of items and their respective categories), no significant differences were found, as shown below in Table 4.

| | *t* | Mean Difference* | Std. Error Difference | Significance ($p<.05$) |
|---|---|---|---|---|
| Functionality | 0.99 | 0.76 | 0.78 | 0.33 |
| GSU Campus | 0.61 | -0.44 | 0.72 | 0.54 |
| Social Environment | 0.40 | 0.05 | 0.12 | 0.69 |
| Neighborhood | 0.43 | -0.03 | 0.08 | 0.67 |
| Bike Support | 0.40 | 0.04 | 0.11 | 0.69 |

*Table 4.* Initial *t*-test results for categories of Likert-scale items.
*Positive mean difference represents higher mean in the 2011 sample.

Analyses of individual questions yielded few significant differences; however, two items had significantly higher agreement in 2011 than 2009 (see Table 5 for a comparative list of all questions):

- "I can find information about bicycling such as safety, repairs, properly securing, and parking."
- "Educational programs about bicycling to, from, and around the GSU campus would make it more likely that I would bicycle to, from, and around the GSU campus."

| | 2009 (N,Mean[i]) | 2011 (N, Mean) | Sig. (*p<.05)* |
|---|---|---|---|
| **Functionality, Safety, and Aesthetics:** | | | |
| *On the Way to GSU and Back…* | | | |
| Route is hilly* | 257, 2.94 | 182, 2.92 | 0.78 |
| Distance is reasonable | 288, 2.53 | 200, 2.40 | 0.28 |
| Unsafe motor vehicle traffic* | 281, 3.30 | 199, 3.33 | 0.70 |
| Unsafe roadway conditions* | 268, 3.13 | 195, 3.01 | 0.16 |
| Detours are necessary* | 246, 3.13 | 166, 3.19 | 0.52 |
| Low pollution level | 242, 3.00 | 171, 3.04 | 0.63 |
| Interesting features | 285, 2.56 | 199, 2.42 | 0.10 |
| High noise level* | 282, 3.18 | 203, 3.23 | 0.50 |
| Bicycling is pleasant | 251, 2.16 | 179, 2.32 | 0.09 |
| Vacant buildings* | 243, 2.68 | 175, 2.63 | 0.59 |
| Unpleasant weather* | 282, 2.96 | 188, 2.85 | 0.17 |
| **GSU Campus:** | | | |
| *On the GSU Campus…* | | | |
| Enough bike racks | 192, 2.27 | 115, 2.30 | 0.79 |
| Convenient bike racks | 193, 2.52 | 118, 2.59 | 0.47 |
| Easy to find bike racks | 205, 2.38 | 124, 2.42 | 0.70 |
| Bike might be stolen on campus* | 224, 1.93 | 146, 1.97 | 0.68 |
| I know where to find bike info** | 189, 2.24 | 125, 2.47 | 0.05 |
| I know where to find a bike repair shop | 180, 2.24 | 116, 2.24 | 0.15 |
| **Social Environment:** | | | |
| GSU friends ride bicycles | 250, 1.94 | 174, 1.87 | 0.48 |
| Bicycling is cool among friends | 194, 2.42 | 122, 2.42 | 0.99 |
| Awareness of bicycle organization | 253, 1.94 | 167, 1.89 | 0.69 |
| Can obtain info on bike routes | 253, 1.93 | 161, 1.95 | 0.88 |
| **Neighborhood:** | | | |
| *Where I Currently Live:* | | | |
| Public transit within biking distance | 278, 2.94 | 187, 2.76 | 0.14 |
| Good neighborhood for riding | 281, 2.96 | 195, 2.81 | 0.12 |
| Bike might be stolen outside residence* | 287, 2.12 | 197, 2.28 | 0.14 |
| **Future Support:** | | | |
| More bike racks | 247, 3.04 | 170, 2.97 | 0.47 |
| Educational Programs** | 253, 2.49 | 179, 2.70 | 0.04 |
| Info on bike routes | 265, 3.00 | 183, 3.06 | 0.58 |
| Repair facility | 253, 2.95 | 180, 3.01 | 0.59 |
| Safer Bicycle Parking | 264, 3.26 | 182, 3.20 | 0.85 |
| Bike-Share Program | 264, 3.19 | 180, 3.29 | 0.29 |

*Table 5*. Response rate and means for individual items
*Item reverse-coded to favor bicycling
**Significant at the $p<.05$ level
[i]Means ranged from 1 to 4, with 4 indicating highest agreement

Likert-scale items were aggregated and transformed into dichotomous variables (either "Agree" or "Disagree"). Only those responses that were coded as "Strongly Disagree", "Slightly Disagree", "Slightly Agree" and "Strongly Agree" were used for dichotomous data; those that had responded "I don't know" were excluded from analysis.

A chi-square analysis was run between categories of questions and individual questions once responses were dichotomized to examine differences in overall agreement, between the two data sets, that the *t*-test might not have detected. No significant differences were detected between the two data sets for categories of questions. Regarding individual questions, support for future educational programs was significant, as was the item regarding aesthetics to and from campus ("…there are lots of trees, gardens, parks, or interesting features"), which had significantly less agreement in 2011 than 2009.

| | N | Chi-square (p-value) |
|---|---|---|
| Interesting Features | | 4.07 (.01) |
| 2009 | 285 | |
| 2011 | 199 | |
| Future Ed. Programs | | 7.80 (.04) |
| 2009 | 253 | |
| 2011 | 179 | |

*Table 6.* Significant chi-square results for dichotomous items.

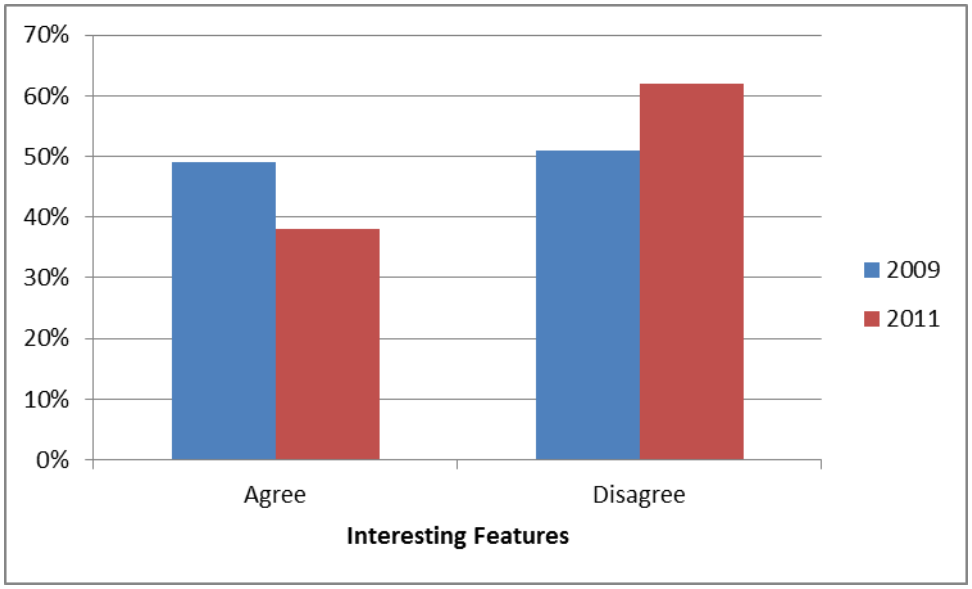


*Figure 5.* Percentages of agree/disagree responses for "Interesting Features" item for each data set

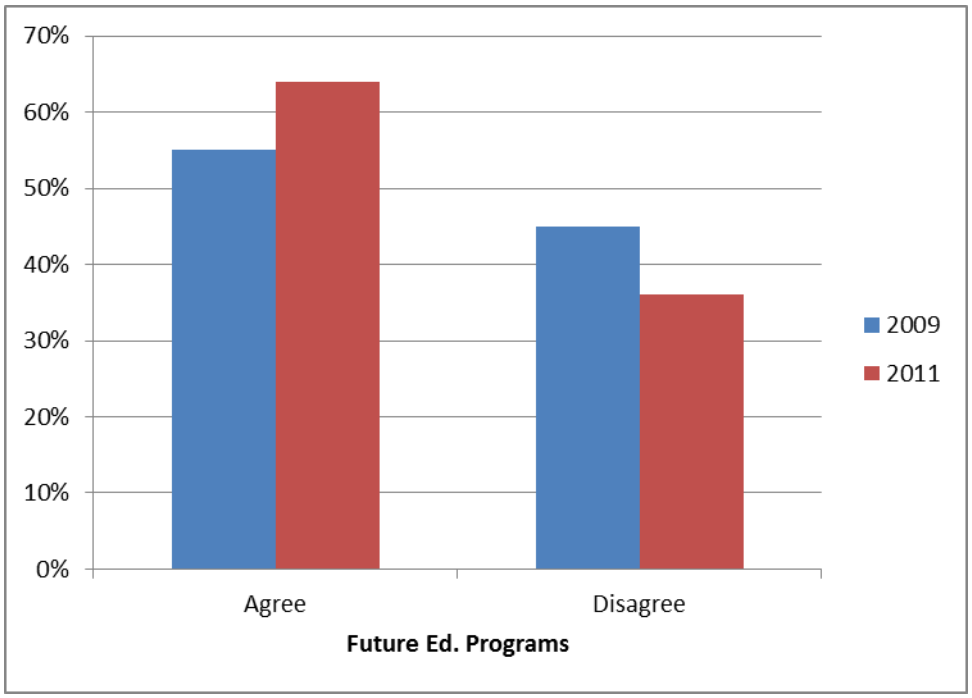


*Figure 6.* Percentages of agree/disagree responses for "Future Ed. Programs" item for each data set

Participants who had provided home addresses and/or zip codes that were within a ten-mile radius of campus (2009: N=159; 2011: N=96) were analyzed separately to assess whether or not those who lived within a closer proximity to GSU reported different attitudes, knowledge, or behavior since 2009. Independent *t*-tests

detected no significant differences in modes of transportation, access to bicycles, frequency of bicycling for fun, frequency of bicycling for transport, frequency of bicycling to campus, the average number of days within the past week that participants bicycled to campus, or the average number of minutes that it would take for participants to bicycle to campus.

| | Year | N | Chi-square (p-value) |
|---|---|---|---|
| Has access to bicycle | 2009<br>2011 | 72 (45.9%)<br>38 (39.6%) | .96 (.33) |
| Bicycled for fun in last semester | 2009<br>2011 | 32 (20.1%)<br>19 (20.0%) | .31 (.58) |
| Bicycled for transport in last semester | 2009<br>2011 | 22 (13.8%)<br>14 (14.6%) | .45 (.50) |
| Bicycled to/from/around GSU in last semester | 2009<br>2011 | 14 (8.8%)<br>10 (10.4%) | .23 (.63) |

*Table 7.* Number of participants within each sample who answered "yes" to bicycling behavior questions and live within 10 miles of campus.

| | Year | N | Mean | Sig. ($p<.05$) |
|---|---|---|---|---|
| No. of days bicycled to GSU in last week | 2009<br>2011 | 10<br>9 | 2.11<br>2.00 | .56 |
| Avg. bicycling-commute time (minutes) | 2009<br>2011 | 10<br>9 | 26.11<br>44.13 | .06 |

*Table 8.* Average commuting time and number of participants within each sample who live within 10 miles of campus and bicycled to campus during previous week.

No significant differences were found between the two years for categories of questions (Functionality, GSU Campus, Social Environment, Neighborhood, and Future Support) for those who lived within ten miles of campus. The 2011 sample reported significantly higher agreement for knowledge of where to obtain information about bicycling such as safety, repairs, properly securing and parking, as well as the statement, "Bicycling is a pleasant experience" (see Table 9). Support for future

educational programs was not significantly different between the two groups, nor were any of the other items.

| | *t* | Mean Difference* | Std. Error Difference | Sig. ($p<.05$) |
|---|---|---|---|---|
| Bicycle Info | 2.00 | .33 | .17 | .05 |
| Pleasant Experience | 2.13 | .26 | .13 | .03 |

*Table 9.* Significant *t*-test results for participants living within ten miles of campus.
*Positive mean difference represents higher mean in the 2011 sample.

Some participants provided responses to open-ended questions that requested "other comments." The most common complaint was fear of being hit by a car (18 comments). A suggestion that followed closely behind was disseminating more information to students to encourage them to bicycle and create strength in numbers by bicycling together (17 comments). Recommendation of a bike-share program at Georgia State University (15 comments) and better infrastructure and creation of bike lanes/paths (11 comments) were common suggestions as well. Living too far from campus to bicycle-commute (11 comments) and requests for an increased number and security of bicycle racks on campus were also mentioned several times (10 comments). Examples of the feedback that was provided are depicted in Table 10. These suggestions and concerns are similar to those given in 2009, although living too far from campus to bicycle-commute was the greatest barrier with the 2009 sample.

| | Example Student Responses |
|---|---|
| 2009 | • "I would love to bicycle more but my commute is 90 minutes."<br>• "Make bicycle routes that keep students separate from cars."<br>• "Have bicycles you can rent." |
| 2011 | • "It would be nice to be able to rent out bicycles and bicycle locks."<br>• "I would only ride a bicycle in an area with no motor vehicle traffic."<br>• "Biking is not feasible because I live 20 miles from campus." |

*Table 10.* Examples of qualitative feedback.

## 4.3 Reliability of Survey Items

Cronbach's *alpha* was established for each of the categories of Likert-scale items (Functionality, GSU Campus, Social Environment, Neighborhood, and Bike Support). A reliability analysis is conducted to assess whether or not people, overall, answered similar questions with similar responses. Generally, one seeks an *alpha* (depicted $\alpha$) of at least .7 in order for the reliability of the items to be considered acceptable (Kline, 1999).

As indicated in Table 11, the reliability is nearly sufficient in almost all categories; the Functionality category is borderline with an *alpha* of .66 and .64. The only category that showed very poor reliability was Neighborhood, which had a very poor internal consistency, as indicated by the *alpha* of .07 and .20.

| | 2009 | 2011 |
|---|---|---|
| | α | |
| **Functionality:**<br>The route is hilly<br>The distance is reasonable for riding a bicycle<br>The motor vehicle traffic on some streets makes the route unsafe for bicyclists<br>The roadway conditions on some streets make the route unsafe for bicyclists<br>I would have to take detours from the most direct route in order to use bike paths, bike lanes, or streets more suited for bicycles<br>The pollution is low<br>There are lots of trees, gardens, parks, or interesting features<br>The noise level is high<br>Bicycling is a pleasant experience<br>There are many vacant houses, buildings, or other properties<br>The weather often makes bicycling difficult or unpleasant | .66 | .64 |
| **GSU Campus:**<br>There are enough parking racks for bicycles<br>Bicycle racks are found in convenient locations<br>Bicycle racks are easy to find<br>My bicycle might be stolen even if properly secured<br>I can find information about bicycling such as safety, repairs, properly securing, and parking<br>I can find a place to help repair my bicycle if needed | .70 | .76 |
| **Social Environment:**<br>My GSU friends ride bicycles<br>Bicycling for transportation is considered cool<br>I know the name of at least one bicycle organization in Atlanta<br>I know where to get information about bicycle routes around Atlanta | .77 | .75 |
| **Neighborhood:**<br>There is a bus stop or train station with a reasonable bicycling distance<br>Is a good neighborhood for riding a bicycle<br>I would not leave my bicycle outside my residence because of the chance it might be stolen | .07 | .20 |
| **Bike Support:**<br>Bicycle racks on campus that allow parking in locations that are more convenient to the places I go on campus<br>Educational programs about bicycling to, from, and around the GSU campus<br>Information about routes for bicycling to, from and around the GSU campus<br>A facility on the GSU campus to get help with minor bicycle repairs<br>Better safety and security for bicycle parking and storage areas on the GSU campus<br>Bicycles available to use by students, staff, or faculty at little or no cost | .92 | .93 |

*Table 11.* Reliability analysis.

# CHAPTER V
# DISCUSSION AND CONCLUSION

## 5.1 Discussion of Research Findings

Although some changes have occurred over the two years between periods of data collection, the two samples were fairly similar in their responses about their bicycling perceptions and behaviors. There were no significant differences in the number of students who bicycled to campus, even when those who lived farther than ten miles from GSU were excluded. The similarities between the two sets for quantitative analyses and written feedback that was obtained suggest that the pro-bicycling strides made between 2009 and 2011 were insufficient to change bicycling behavior among students and encourage bicycling for transportation.

Regardless, the results from the data analysis yielded some important findings. First, the original analysis showed that 2011 participants reported higher agreement about their ability to find information about bicycling. As described in Chapter II, students and faculty formed a bicycle club called "GSU Bikes" in 2009, which worked in conjunction with organizations like Atlanta Bicycle Coalition to promote bicycling on campus. One of the aims was to make it more feasible for students to obtain information about bicycling routes, secure bicycle parking, suggested streets for safer bicycling, and tactics for defensive bicycling to minimize risk of collisions. The fact that the 2011 sample reported what could be considered increased self-efficacy when it comes to finding this information suggests that the presence of a club advocating bicycling on campus may have had a positive effect.

Second, the 2011 sample reported significantly higher agreement that future educational programs about bicycling to campus would increase likelihood of

bicycling to campus. The Transtheoretical Model of Change describes five stages of behavior change (Prochaska, Wright, &Velicer, 2008) with the first two being pre-contemplation (no intention of changing) and contemplation (thinking of making a behavior change but not yet committed to doing so). Figure 3 depicts an example of the stages of change.

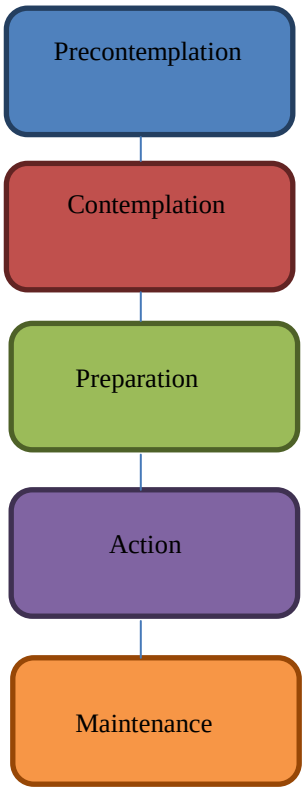


*Figure 7.* Transtheorectical Model of Behavior Change.

The presence of GSU Bikes on campus, along with environmental and economic changes that occurred over the two year period, may have created changes in attitudes towards bicycling that are more reflective of the "contemplation" stage than in 2009. On the other hand, these results also suggest that educational programs at Georgia State University that *have* occurred since 2009 to promote bicycling were not strong enough interventions, perhaps through lack of advertising, to produced their intended effects.

The issue with promotional efforts needing to reach a wider audience is further supplemented by the number of written comments advocating for a bike-share program, which Georgia State University implemented in 2009. Students may rent bicycles for two days at a time free-of-charge. If Georgia State's bike-share program were more intensely promoted, respondents may have reported more frequent bicycle-commuting.

Because both survey questions that were found significant in the original analysis were also statistically significant in at least one of the two additional analyses, these two variables ought to be taken into consideration when developing future promotional efforts. It is not empirically sound to assert that reported increases in knowledge of where to obtain bicycle information are a direct result of efforts made by GSU Bikes because data about sources of exposure to bicycle promotion were not obtained. However, the student-led organization, which has since been chartered as Panther Bikes, may help increase the number of bicycle-commuters on campus by attempting to reach a wider audience when publicizing the availability of existing campus bicycle facilities, as well as upcoming bicycle-education programs.

Because safety is a strong concern, expanding programs to beyond the classroom in the form of group rides led by an experienced instructor may be effective in helping those who are not comfortable riding a bicycle by themselves for the first time. Research has shown that people are more likely to exercise when they witness others around them engaging in exercise (Brownson, Baker, Housemann, Brennan, & Bacak, 2001; Giles-Corti & Donovan, 2002). Creating an event that may encourage people to try bicycling may encourage others and have a snowball effect in

increasing campus bicycle-commuting. It is reasonable to think that the more bicyclists that are present, the greater need and influence there will be for better infrastructure to protect bicyclists from collisions, which would serve a longitudinal plan for tackling safety concerns. Research conducted elsewhere shows that promotional efforts are most effective when coupled with additions of bicycle-friendly infrastructure (Carnell, 2000). As is evident from the descriptions of Bicycle-Friendly Universities outlined in Chapter II, the BFU designation is typically awarded to universities that promote bicycling through programs and have physical environments that are bicycle-friendly. In addition to aiming for a wider audience with bicycle-promoting efforts, better built environment conditions at GSU would be an effective way to encourage people to bicycle-commute.

## 5.2 Limitations and Recommendations for Future Research

A possible limitation of this study may be the instrument itself. Overall, reliability for the categories of Likert-scale items was mostly satisfactory, though "Functionality" was borderline. The category that showed a considerable lack of internal consistency was "Neighborhood", which consists of items #45-47:

**Where I currently live:**
45. There is a reasonable bus stop or train station within a reasonable bicycling distance.
46. Is a good neighborhood for riding a bicycle.
47. I would not leave my bicycle outside my residence because of the chance it might be stolen.

The statement "Where I currently live is a good neighborhood for riding a bicycle," is somewhat vague, and it would be beneficial to know more about the reasons that some respondents disagree with it: Is it a bad neighborhood for bicycling

due to fear of crime, lack of infrastructure, or both? In order to increase reliability in the future, additional items need to be included in the Neighborhood category.

Another limitation between the two data sets regarding the survey may have been the response "I don't know." When the data was originally collected and analyzed in 2009, Pope transformed the variable "I don't know" into a neutral category, and these responses were included in analysis. However, the response was excluded for the purposes of this study because there was a lack of agreement among the 2011 researchers that "I don't know" could be assumed to be neutral, especially because the option was provided on the far right of the other response options, rather than in the middle of the Likert scale, as one may expect of a neutral response (see below for clarification).

| **On the way to GSU and back…** | **Strongly disagree** | **Somewhat disagree** | **Somewhat agree** | **Strongly agree** | **I don't know** |
|---|---|---|---|---|---|
| the route is hilly. | ☐$_1$ | ☐$_2$ | ☐$_3$ | ☐$_4$ | ☐$_{77}$ |

*Figure 8.* Example of survey question and response options.

Future research may benefit from including "Neutral" and "I don't know" options in order to make better assumptions about the nature of the participants' responses.

Finally, participants of the 2009 and 2011 surveys may not be representative of Georgia State University students because both samples were obtained using non-randomized, convenience sampling. Figure 1 showed increases in the number of bicyclists counted on campus from 2009 to 2011, but the responses in these surveys regarding bicycling behavior do not reflect the increase. Although information from people who do not bicycle for various reasons is useful, it would also be useful to have feedback from more bicyclists to understand challenges, as well as positive

aspects, of bicycle-commuting (such as saving on fuel costs, benefits of physical exercise, etc.). More data collected from those who are bicycle-commuters will help develop future promotional efforts and highlight barriers to bicycling.

One reason that the bicycle counts data and the data obtained from these surveys do not reflect each other may be that many people who participated in the survey lived a considerable distance from campus. Many participants (2009: 53%; 2011: 45%) lived farther than ten miles from campus; distance was mentioned repeatedly in written feedback as a substantial barrier to bicycling to GSU. Future research would benefit from a larger sample size to increase the likelihood that more bicyclists, as well as more people living closer to campus, would be included, thereby increasing statistical reliability and ability to generalize findings. Additionally, the fact that modes of transportation did not significantly change between 2009 and 2011 may be attributable to a large number of respondents not living close enough to campus to consider bicycling or walking, making their personal vehicles a more likely option. Including more participants in the analysis would help establish whether such trends were consistent and statistically valid. In the future, researchers might administer the surveys electronically to make it available to a more representative sample. Because the information has implications for GSU's transportation plan and assessing the needs and characteristics of its students, it is in the university's best interests to support future efforts both conceptually and with resources. Departments such as the Office of Institutional Effectiveness may be appropriate collaborators.

## 5.3 Conclusion

This study was conducted to examine changes in trends of attitudes, knowledge, and behavior regarding bicycling over a two-year period. Although some significant results were found, the two samples provided relatively similar responses to the survey questions. Although the United States is largely considered a car-dependent country, active transportation is an effective way to improve physical, mental, social, and environmental health. Even though most students reported using a car to commute rather than active transportation, numerical data as well as written comments in these surveys suggest that students are open to the idea if education, resources, and infrastructure improve. There may be an increase in the number of bicyclists on campus, as well as more positive attitudes and greater knowledge of bicycling for transportation, if this information is utilized to develop future bicycle-friendly programs on campus. A good follow-up to doing so would be distributing a survey at regular intervals to larger samples to assess changes in trends over time.

References

Baltes, M.R. (2005). Integration of Bicycles and Transit (Vol. 62). Transportation Research Board.

Barnes, G., Thompson, K., & Krizek, K. (2006, January). A longitudinal analysis of the effect of bicycle facilities on commute mode share. In *85th Annual Meeting of the Transportation Research Board. Transportation Research Board,Washington, DC.*

Bauman, A., Rissel, C., Garrard, J., Ker, I., Speidel, R., & Fishman, E. (2008). *Cycling:Getting Australia Moving: Barriers, Facilitators and Interventions to Get More Australians Physically Active through Cycling.* Department of Health and Ageing.

Bonnette, B. (2007). The Implementation of a Public-Use Bicycle Program in Philadelphia.

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. *Journal Information*, *91*(12).

Carnall, D. (2000). Cycling and health promotion: A safer, slower urban road environment is the key. *BMJ: British Medical Journal*, *320*(7239), 888.

Centers for Disease Control and Prevention. "Fast Stats: Exercise or Physical Activity." Retrieved from http://www.cdc.gov/nchs/fastats/exercise.htm

Centers for Disease Control and Prevention. "2011 BRFSS Questionnaire: English Version." Retrieved from http://www.cdc.gov/brfss/questionnaires.htm

Dill, J. & Carr, T. (2003). Bicycle commuting and facilities in major U.S. cities: If you build them, commuters will use them. *Transportation Research Record, 2031*, 9-17.

Dill, J. (2009). Bicycling for transportation and health: the role of infrastructure. *Journal of Public Health Policy*, S95-S110.

Garrard, J., Rose, G., & Lo, S. K. (2008). Promoting transportation cycling for women: the role of bicycle infrastructure. *Preventive medicine, 46*(1), 55-59.

Georgia Institute of Technology. "Bike GT." Available from http://bike.gatech.edu

Giles-Corti, B., & Donovan, R. J. (2002). The relative influence of individual, social and physical environment determinants of physical activity. *Social science & medicine, 54*(12), 1793-1812.

Hagelin, C. A. (2005). *A return on investment analysis of bikes-on-bus programs* (No. NCTR 576-05).

Hoedl, S., Titze, S., & Oja, P. (2010). The bikeability and walkability evaluation table: Reliability and application. *American Journal of Preventive Medicine, 39*(5), 457-459.

Hunt, J. D., & Abraham, J. E. (2007). Influences on bicycle use. *Transportation, 34*(4), 453-470.

Jargowsky, P. A., & Park, Y. (2009). Cause or consequence? Suburbanization and crime in US metropolitan areas. *Crime & Delinquency, 55*(1), 28-50.

Korve, M. J., & Niemeier, D. A. (2002). Benefit-cost analysis of added bicycle phase at existing signalized intersection. *Journal of transportation engineering,*

*128*(1), 40-48.

LAB, 2008. Bike to work events in selected US cities. League of American Bicyclists. Washington, DC.

Landis, B.W. Vattikuti, V.R. & Brannick, M.T. (1997). Real-time human perceptions: toward a bicycle level of service. *Transportation Research Record: Journal of the Transportation Research Board, 1578*(1), 119-126.

Larouche, R. & Abbott, R. (2012). Promoting car safety behaviours should not stigmatise cycling as an alternative mode of transportation. *Australian and New Zealand Journal of Public Health*, *26*(2), 193-194.

League of American Bicyclists. Multiple sub-sites within the main website. Available from http://www.bikeleague.org/

Matthews, S. (2012). How space and place influence transportation trends at Humboldt State University. *The California Geographer*, 1.

Moudon, A. V., Lee, C., Cheadle, A. D., Collier, C. W., Johnson, D., Schmid, T. L., & Weather, R. D. (2005). Cycling and the built environment, a US perspective. *Transportation Research Part D: Transport and Environment*, *10*(3), 245-261.

Nadal, L. (2007). Bike sharing sweeps Paris off its feet. *Sustainable transport*, (19).

National Highway Traffic Safety Administration (2010). "Traffic Safety Facts: Highlights of 2009 Motor Vehicle Crashes." Available from http://www nrd.nhtsa.dot.gov/Pubs/811363.pdf.

North Carolina State University. "Campus Bicycle and Pedestrian Plan." Available

from
http://www2.acs.ncsu.edu/trans/planning/NCSU%20Campus%20Bicycle%20an
http://www2.acs.ncsu.edu/trans/planning/NCSU%20Campus%20Bicycle%20an%20Pedestrian%20Plan%20FINAL%20REPORT.pdf

Paffenbarger Jr, R. S., Hyde, R., Wing, A. L., & Hsieh, C. C. (1986). Physical activity, all-cause mortality, and longevity of college alumni. *New England Journal of Medicine*, *314*(10), 605-613.

Parkin, J., Ryley, T., & Jones, T. (2007). Barriers to cycling: an exploration of quantitative analyses. *Cycling and society*, 67-82.

Parkin, J., Wardman, M., & Page, M. (2008). Estimation of the determinants of bicycle mode share for the journey to work using census data. *Transportation*, *35*(1), 93-109.

Parra, D., Gomez, L., Pratt, M., Sarmiento, O. L., Mosquera, J., & Triche, E. (2007). Policy and built environment changes in Bogotá and their importance in health promotion. *Indoor and Built Environment*, *16*(4), 344-348.

Pope, N.B. (2010). An examination of the socio-demographic characteristics and perceptions of cycling among students at Georgia State University. *Public Health Theses*, 89.

Portland State University. "Campus Bicycle Plan." Available from
http://www.pdx.edu/sites/www.pdx.edu.planning
sustainability/files/PortlandStateUniversity_BicycleTransportationPlan_March211_ScreenRes.pdf

Prochaska, J.O., Wright, J. A., & Velicer, W.F. (2008). Evaluating Theories of Health Behavior Change: A hierarchy of Criteria Applied to the Transtheoretical Model. Applied Psychology, 57(4), 561-588.

Pucher, J., Komanoff, C., & Schimek, P. (1999). Bicycling renaissance in North America?: Recent trends and alternative policies to promote bicycling. *Transportation Research Part A: Policy and Practice*, *33*(7), 625-654.

Pucher, et al. (2011). Walking and cycling in the United States, 2001-2009: Evidence from the National Household Travel Surveys. *American Journal of Public Health,101*(1), 310.

Reed, J. & Ainsworth, B. (2007). Perceptions of environmental supports on the physical activity behaviors of university men and women: A preliminary investigation. *Journal of American College Health*, *6*(52), 199-204.

Robinson, D. L. (2005). Safety in numbers in Australia: more walkers and bicyclists, safer walking and bicycling. *Health promotion journal of Australia*, *16*(1), 47 51.

Romero, C. (2008). Spicycles in Barcelona. PowerPoint Presentation by City of Barcelona at the Spicycles Conference, Bucharest. *Romania, December*.

Rose, G., & Marfurt, H. (2007). Travel behaviour change impacts of a major ride to work day event. *Transportation Research Part A: Policy and Practice*, *41*(4), 351-364.

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: Policy and Practice*,

*38*(4), 249-268.

Shannon, T., Giles-Corti, B., Pikora, T., Bulsara, M., Shilton, T., & Bull, F. (2006). Active commuting in a university setting: Assessing commuting habits and potential for modal change. Transport Policy, 13(3), 240-253.

Stanford University. "Campus Bike Shop." Available from http://www.campusbikeshop.com

Stinson, M. A., & Bhat, C. R. (2004). Frequency of bicycle commuting: internet based survey analysis. *Transportation Research Record: Journal of the Transportation Research Board*, *1878*(1), 122-130.

Telfer, B., Rissel, C., Bindon, J., & Bosch, T. (2006). Encouraging cycling through a pilot cycling proficiency training program among adults in central Sydney. *Journal of Science and Medicine in Sport*, *9*(1), 151-156.

Tin Tin, S., Woodward, A. Thornley, S., Langley, J., Rodgers, A., & Ameratunga, S. (2010). Cyclists' attitudes toward policies encouraging bicycle travel: findings from the Taupo Bicycle Study in New Zealand. *Health Promotion International, 25*(1), 54-62.

Titze, S., Stronegger, W. J., Janschitz, S., & Oja, P. (2007). Environmental, social, and personal correlates of cycling for transportation in a student population. *Journal of physical activity & health*, *4*(1), 66.

Torres, A., Sarmiento, O. L., Stauber, C., & Zarama, R. (2013). The Ciclovia and Cicloruta Programs: Promising Interventions to Promote Physical Activity and Social Capital in Bogota, Colombia. *American journal of public health*, *103*(2), e23-e30.

Transport for London (2004). Business case for cycling in London. *Transport for Londo  Street Management*. Available at http://www.tfl.gov.uk/assets/downloads/businessandpartners/cycling-action plan.pdf

United States Department of Health and Human Services (2008). *2008 Physical Activity Guidelines for Americans.* Retrieved from http://www.health.gov/paguidelines/guidelines/default.aspx#toc.

University of Kentucky. "University of Kentucky Parking & Transportation Services." Available from http://www.uky.edu/pts/

Warburton, D. E., Nicol, C. W., & Bredin, S. S. (2006). Health benefits of physical activity: the evidence. *Canadian medical association journal*, *174*(6), 801 809.

Wardman, M., Tight, M., & Page, M. (2007). Factors influencing the propensity to cycle to work. *Transportation Research Part A: Policy and Practice*, *41*(4), 339-350.

Xing, Y., Handy, S. L., & Mokhtarian, P. L. (2010). Factors associated with proportions and miles of bicycling for transportation and recreation in six small US cities. *Transportation research part D: transport and environment*, *15*(2), 73-81.

Zhou, J. (2012). Sustainable commute in a car-dominant city: Factors affecting alternative mode choices among university students. *Transportation Research Part A: Policy and Practice*, *46*(7), 1013-1029.

# APPENDIX A

Georgia State University
Institute of Public Health

Informed Consent
Title: Bicycling for transportation at GSU
Investigators: John Steward (Principal), Christine Stauber, Student: Lindsey Martin

## I. Purpose

You are invited to participate in a research study. The purpose of the study is to investigate barriers to bicycling for transportation at GSU. You are invited to participate because you are a student at GSU. A total of 250 participants will be recruited for this study. Participation will require 15 minutes of your time

*Background*
As you may know, there are an increasing number of students living on and around the GSU campus. Efforts are being made around the campus to improve safety and promote multiple transportation options to, from, and around the campus. We, researchers from the GSU Institute of Public Health, GSU Recreational Services, and the Atlanta Bicycle Coalition, are interested in understanding more about the use of bicycles for transportation at GSU. To gather knowledge about bicycling to campus, we are conducting a survey and want to get your input. With this information we hope to understand and improve opportunities for bicycling on the GSU campus. We hope to recruit approximately 250 people to participate in this survey.

## II. Procedures

If you decide to participate, you will fill in this paper survey today and give us your responses. Your decision to take part in this project is completely up to you. If at any time during the project you decide that you no longer want to take part, you are free to do so. If you do not wish to participate in the study but would like more information about bicycling to campus, we will be happy to provide information.

## III. Risks

In this study, you will not have any more risks than you would in a normal day of life.

## IV. Benefits

Participation in this study may not benefit you personally. However, you will have an opportunity to share your opinions on how to improve bicycling at GSU. Overall, we hope to gain information about barriers to bicycling for transportation at GSU to reduce barriers, enhance facilities at GSU and encourage more bicycling for transportation.

## V. Voluntary Participation and Withdrawal

Participation in research is voluntary. You do not have to be in this study. If you decide to be in the study and change your mind, you have the right to drop out at any time. You may

decide not to answer any or all questions or stop participating at any time. Whatever you decide, you will not be penalized in any way.

## VI. Confidentiality

We will keep your records private to the extent allowed by law. John Steward and the research team will have access to the information you provide. Information may also be shared with those who make sure the study is done correctly, like the GSU Institutional Review Board, the Office for Human Research Protection (OHRP). We will use a unique identifier (numeric code) rather than your name on study records. The information you provide will be kept in a locked cabinet and on password- and firewall-protected computers. In addition, any information you provide about your address will be kept separately from any personal identity information and used only for the purposes of determining distances between residences and GSU. All potential identifying information will be kept separately from the questionnaire in a locked cabinet and in separate computer files with limited access to protect privacy. Your name, address, or email address will not appear when we present this study or publish its results. The findings will be summarized and reported in group form only. You will not be identified personally. Addresses and numeric codes will be destroyed after the research has been completed and published.

## VII. Contact Persons

Contact John Steward at 404-413-1137 or jsteward@gsu.edu if you have questions about this study. If you have questions or concerns about your rights as a participant in this research study, you may contact Susan Vogtner in the Office of Research Integrity at 404-413-3513 or svogtner1@gsu.edu.

## VIII. Copy of Consent Form to Subject

We will give you a copy of this consent form to keep.

If you are willing to participate in this research, please print your name, sign, and date the form.

_____

_____ _____

Participant Name Signature

Date

____John A. Steward _____

_____ _____

Principal Investigator Signature

Date

**APPENDIX B**

# IRB No. H10127

## Bicycling for Transportation at GSU

## About you

**1. Gender**
female ☐1
male ☐2

**2. In what year were you born? _____**

**3. What is your major?_____, or check if undeclared or uncertain ☐**
**4. When do you anticipate graduating? (Semester and year)_____**

**5. How many semesters have you been at Georgia State?**
less than 1 semester ☐
1-2 semesters ☐
3-4 semesters ☐
5-6 semesters ☐
longer than 6 semesters ☐

6. **Would you say that in general your health is**
Excellent ☐
Very good ☐
Good ☐
Fair ☐
Poor ☐

7. **Thinking about your physical health, which includes physical illness and injury, for**
**how many days during the past 30 days was your physical health *not good*?**

____ Number of days, *or*

☐ Check if not known

# Proceed to the next page

8. **During the past month, other than your regular job, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking *for exercise*?**

Yes ☐1
No ☐2 ⟶ ***If no, continue to question 10; do not answer Question 9.***

9. **During the past 7 days**, how many days did you participate in physical activities or exercises in which your heart rate and breathing was above normal for more than 10 minutes?

____ number of days, *or*

☐ Check if not known

**What forms of transportation do you use for getting to and from GSU? This includes between campus and your residence and work; however, *do not include* trips between classroom buildings or from an on-campus parking lot. Please provide the *best answer* for each question.**

| | | All of the time | Some of the time | None of the time |
|---|---|---|---|---|
| 10 | I drive myself or ride in a motor vehicle (car, SUV, truck, or van). | ☐1 | ☐2 | ☐3 |
| 11 | I ride a motorcycle/scooter. | ☐1 | ☐2 | ☐3 |
| 12 | I ride a bicycle. | ☐1 | ☐2 | ☐3 |
| 13 | I use public transportation (MARTA or other government system). | ☐1 | ☐2 | ☐3 |
| 14 | I take the GSU Panther Shuttle Bus from an outlying (off-campus) parking lot. | ☐1 | ☐2 | ☐3 |
| 15 | I go on foot or by wheelchair/power chair. | ☐1 | ☐2 | ☐3 |

**16. Do you have a permanent physical condition that prevents you from bicycling?**
Yes ☐1 ⟶ ***If yes, continue to question 23; do not answer questions 17-22.***
No ☐2

# Proceed to the next page

**17. Do you have access to a bicycle to use for transportation at the present time (even if you are not currently using it for transportation)?**

Yes, I own or can borrow a bicycle to use. ☐1

No, I have no bicycle available to use. ☐2

**18. Since the beginning of the current semester, did you bicycle *for fun or recreation* at least once?**

Yes ☐1

No ☐2

**19. Since the beginning of the current semester, did you bicycle at least once *for transportation to a location anywhere*?**

Yes ☐1

No ☐2 → *If no, skip to question 23; do not answer questions 20-22.*

## Bicycling for Transportation to GSU

**20. Since the beginning of the current semester, have you used a bicycle for transportation to, from, or around the GSU campus at least once?**

Yes ☐1

No ☐2 → ***If no, skip to question 23; do not answer questions 21 and 22.***

**21. During the *last 7 calendar days*, how many days did you bicycle for transportation to, from, or around the GSU campus?**

_____ days

**22. On the days that you did bicycle for transportation, what is the average amount of time that you spent bicycling for transportation to, from, or around the GSU campus?**

____ total minutes in the average day, *or*

☐ Check if not known

# Proceed to the next page

**ALL ANSWER** the following questions 23 through 52 by ***thinking about making your typical commute using a bicycle, along your actual or possible route, or using it on campus for transportation. Provide your best answer even though you may not currently bicycle***. Exclude freeways from your consideration as commuting routes. Select the *best answer for each question.*

## *Functionality, Safety, and Aesthetics*

| | **On the way to my GSU destination and back …** | **Strongly disagree** | **Somewhat disagree** | **Somewhat agree** | **Strongly agree** | **I don't know** |
|---|---|---|---|---|---|---|
| **23** | the route is hilly. | ☐1 | ☐2 | ☐3 | ☐4 | ☐77 |
| **24** | the distance is reasonable for riding a bicycle. | ☐1 | ☐2 | ☐3 | ☐4 | ☐77 |
| **25** | the **motor vehicle traffic** (speed, type, or volume) on some streets makes the route unsafe for bicyclists. | ☐1 | ☐2 | ☐3 | ☐4 | ☐77 |
| **26** | the **roadway conditions** (markings, signals, width, lighting, etc.) on some streets make the route unsafe for bicyclists. | ☐1 | ☐2 | ☐3 | ☐4 | ☐77 |
| **27** | I would have to take detours from the most direct route in order to use bike paths, bike lanes, or streets more suited for bicycles. | ☐1 | ☐2 | ☐3 | ☐4 | ☐77 |

| | **On the way to my GSU destination and back …** | **Strongly disagree** | **Somewhat disagree** | **Somewhat agree** | **Strongly agree** | **I don't know** |
|---|---|---|---|---|---|---|
| **28** | the pollution level is low. | ☐1 | ☐2 | ☐3 | ☐4 | ☐77 |
| **29** | there are lots of trees, gardens, parks, or interesting features. | ☐1 | ☐2 | ☐3 | ☐4 | ☐77 |
| **30** | the noise level is high. | ☐1 | ☐2 | ☐3 | ☐4 | ☐7 |
| **31** | bicycling is a pleasant experience. | ☐1 | ☐2 | ☐3 | ☐4 | ☐77 |
| **32** | there are many houses, buildings or other properties in disrepair or vacant. | ☐1 | ☐2 | ☐3 | ☐4 | ☐77 |
| **33** | the weather (temperature, humidity, storms, etc.) often makes bicycling difficult or unpleasant. | ☐1 | ☐2 | ☐3 | ☐4 | ☐77 |

### *On the GSU Campus*

| | On the GSU campus… | Strongly disagree | Some what disagree | Some what agree | Strongly agree | I don't know |
|---|---|---|---|---|---|---|
| **34** | there are enough parking racks for bicycles. | ☐1 | ☐2 | ☐3 | ☐4 | ☐77 |
| **35** | bicycle racks are found in convenient locations. | ☐1 | ☐2 | ☐3 | ☐4 | ☐77 |
| **36** | bicycle racks are easy to find. | ☐1 | ☐2 | ☐3 | ☐4 | ☐77 |
| **37** | my bicycle might be stolen even if properly secured. | ☐1 | ☐2 | ☐3 | ☐4 | ☐77 |
| **38** | I can find information about bicycling such as safety, repairs, properly securing, and parking. | ☐1 | ☐2 | ☐3 | ☐4 | ☐77 |
| **39** | I can find a place to help repair my bicycle if needed. | ☐1 | ☐2 | ☐3 | ☐4 | ☐77 |
| **40** | I can find a convenient place to shower and change clothing after bicycling when needed. | ☐1 | ☐2 | ☐3 | ☐4 | ☐77 |

### *Social environment at GSU*

| | | Strongly disagree | Some what disagree | Some what agree | Strongly agree | I don't know |
|---|---|---|---|---|---|---|
| **41** | My GSU friends ride bicycles. | ☐1 | ☐2 | ☐3 | ☐4 | ☐77 |
| **42** | Bicycling for transportation is considered cool among my friends. | ☐1 | ☐2 | ☐3 | ☐4 | ☐77 |
| **43** | I know the name of at least one bicycle organization in Atlanta. | ☐1 | ☐2 | ☐3 | ☐4 | ☐77 |
| **44** | I know where to get information about bicycle routes around Atlanta. | ☐1 | ☐2 | ☐3 | ☐4 | ☐77 |

### *Neighborhood*

| | Where I currently live… | Strongly disagree | Some what disagree | Some what agree | Strongly agree | I don't know |
|---|---|---|---|---|---|---|
| **45** | there is a bus stop or train station within a reasonable bicycling distance. | ☐1 | ☐2 | ☐3 | ☐4 | ☐77 |
| **46** | is a good neighborhood for riding a bicycle. | ☐1 | ☐2 | ☐3 | ☐4 | ☐77 |
| **47** | I **would not** leave my bicycle outside my residence because of the chance it might be stolen. | ☐1 | ☐2 | ☐3 | ☐4 | ☐77 |

## *Support For Bicycling*

| | Which of the following would make it more likely that you would bicycle for transportation to, from, or around GSU? | Strongly disagree | Some what disagree | Some what agree | Strongly agree | I don't know |
|---|---|---|---|---|---|---|
| **48** | Bicycle racks on campus that allow parking in locations that are more convenient to the places I go on campus. | ☐1 | ☐2 | ☐3 | ☐4 | ☐77 |
| **49** | Educational programs (courses, web-based learning, etc.) about bicycling to, from, and around the GSU campus. | ☐1 | ☐2 | ☐3 | ☐4 | ☐77 |
| **50** | Information about routes for bicycling to, from, and around the GSU campus. | ☐1 | ☐2 | ☐3 | ☐4 | ☐77 |
| **51** | A facility on the GSU campus to get help with minor bicycle repairs. | ☐1 | ☐2 | ☐3 | ☐4 | ☐77 |
| **52** | Better safety and security for bicycle parking and storage areas on the GSU campus. | ☐1 | ☐2 | ☐3 | ☐4 | ☐77 |
| **53** | Bicycles available to use by students, staff, or faculty at little or no cost. | ☐1 | ☐2 | ☐3 | ☐4 | ☐77 |

**55. Please provide the address where you usually live during the week or the name of the Georgia State University housing facility. (This information will only be used to map commuting and will not be used for mailing or personal identification).**

Street and number_____ ZIP Code _____ , *OR*

If you live in GSU housing, please provide the name of the facility_____

**56. Please provide comments or ideas about what could be done to promote bicycling at Georgia State or about the survey.**

_____
_____
_____
_____
_____
_____
_____

**End of the questionnaire – Thank you very much for your response!**