Predicting Bicycle Ownership and Usage Among University Campus Residents

by

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A REPORT

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Abstract

Concerns about climate change, environmental impacts and resources needed for transportation infrastructure, require new and different approaches to planning, designing, and operating transportation solutions on a global scale. College campuses are prime locations to focus on various methods of sustainable transportation, specifically walking and bicycling and the related infrastructures needed for these systems. The necessary infrastructures for these modes of transportation are different than the conventional road system utilized by automobiles. As a result, cities, planners, campuses, and the individuals who will be traveling must understand why changes to transportation infrastructures are important. This may require a mindset change before it becomes incorporated in their everyday lives. Universities can play a large role in this by offering increased infrastructure for bicycling.

This paper examines the travel behaviors of students that live on campus at Kansas State University Campus in Manhattan and examines their bicycle ownership and usage habits, through the use of a survey. The survey results suggest that the Jardine Apartments is the area most used for bicycle travel. The survey provides the most perceived prevalent impediments to cycling more often as well as the top elements the University could utilize to promote cycling. This report conducted three binomial logistic regression models to predict bicycle ownership and usage. It was found that being male, residing in the Jardine Apartments, and having a high bicycle comfort level are all important factors.

Table of Contents

List of Figures

List of Tables

Acknowledgements

Chapter 1 - Introduction

1.1 – Background

While we have come a long way in becoming more eco-friendly, few Americans choose to bicycle as a form of transportation. Less than 1% of trips are done by bicycle. This presents university campuses with unique opportunities to intervene and promote cycling. Depending on the infrastructure that is available, this will more than likely determine the type of transportation that people will take. If bicycle infrastructure is laid out and constructed in a manner that is beneficial to the users, then more people will bicycle. The University can also present bicycling as a mode of transportation and not just as a recreational activity. Bicycling as transportation probably has not always been an option for people in their hometowns. Now that they live on campus, they will be within bicycling distance of their classes. There are many good reasons that Kansas State University could use to encourage more cycling. It causes virtually no noise or air pollution and consumes far less non-renewable resources than any motorized transport mode. The only energy cycling requires is provided directly by the traveler, and the very use of that energy offers valuable cardiovascular exercise (Pucher & Buehler, 2008). This promotes a more sustainable and healthier campus.

Kansas State University has tried to make bicycle transportation a readily available option to all students that live on campus in a variety of ways. This has been accomplished by constructing bicycle-only paths, by constructing the pedestrian mall on 17th St. and Mid Campus Drive that is open to pedestrians and cyclists but closes to daily vehicular traffic, and by partnering with Green Apple Bikes to bring free bicycles for anyone to use on campus. With all of these options for students to ride bicycles on campus, there are many who still choose not to

ride at all or only ride at certain times. This project addresses ways in which bicycle infrastructure can be improved upon and/or added to on the Kansas State University campus. In addition the survey results show different aspects of why students that live on campus choose to own a bicycle and if they then choose to ride that bike. The boundaries of this project are the Kansas State Main Campus, located in Manhattan, Kansas, focusing on those students that live in campus housing, the three dorm complexes and the Jardine Apartments. This project is relevant to regional and community planning because making areas more pedestrian-accessible, in this case more bike friendly, is continuing to be an important concept and common theme that many planners and landscape architects work towards (Balsas, 2003; Horacek et al., 2012; Kaplan, 2015).

1.2 – Research Question

To address the unique opportunities of bicycling on campus, using Kansas State University as the study site, this study examines the following research question:

- What determines bicycle ownership and use amongst university campus residents?

1.3 – Sub Research Questions

This study breaks the above research question down further into three specific sub-questions.

- What factors affect students bringing a bicycle to campus?

- What factors affect students biking on campus?

- Can infrastructure elements make a difference to bicycle ownership and use on campus?

Chapter 2 - Background and Literature Review

Planners have a unique opportunity to provide access to bicycle infrastructure without destroying certain campus qualities (Balsas, 2003). There is a wide range of literature that analyzes the different aspects of a bike-able community, from the facilitators and barriers of biking, to traffic rules and safety, and to the lack of data on bicycle infrastructure (Hess & Peterson, 2015; Kaplan, 2015; Kumar, 2013; Ransdell, Mason, Wuerzer, & Leung, 2013; Schoner & Levinson, 2014; Sharpe et al., 2011). In order for a college campus to be "bike-able," it needs more than basic roadway infrastructure. It needs more specialized infrastructure, such as bicycle racks and bicycle paths, before people will partake in cycling as a form of exercise or transportation. While there are some literature pieces on cycling in a university setting (Balsas, 2003; Barks, 2011; Bonham & Koth, 2010; Kumar, 2013; Shannon et al., 2006) the majority of bicycle research available is focused on the infrastructure in cities.

2.1 – Bicycling on Campuses

This beginning section will be the basis for why bicycling planning and the promotion of bicycle usage on campuses is a good idea. It will be split up into the benefits that the universities receive and thus why they should expend their time and money into its development; and the benefits that the students receive. Universities are realizing that providing parking spaces on campus is expensive and takes up valuable campus land. Increasing infrastructure for bicycle usage is much cheaper than creating additional parking for cars (Fields, 2006). Money is one of the top factors that influence the choices that universities make. Deciding if a new building should be constructed or if that space is needed for additional parking lots, or parking structures, is a big financial decision that must be made. Another aspect that is important to consider is

what makes a campus bicycle friendly. An environment that is considered bicycle friendly is a place where people feel safe and comfortable riding their bikes for fun, fitness, and transportation (League of American Bicyclists, 2003). Many students will ride their bicycles from the on-campus dorms to the buildings on campus to go to class. It is essential to understand the benefits that promoting bicycling on campuses brings to both the university and the students. When a campus creates a sustainable community, it encourages the use of walking or bicycling to get to and from school, work, or daily errands. Many universities overlook the potential that they can have on the student population by not only impacting their travel behaviors in the present, but also the transportation habits that students can develop in the long term (Balsas, 2003; Fields, 2006).

While universities have their own incentives and benefits to offer cycling as a form of transportation, there is an added effect to those using this method of transportation. The users, most likely college students, will receive benefits in the forms of a healthier lifestyle, decreased amount of money spent on gas, and reduced parking costs (Balsas, 2003; Fields, 2006). Additionally, by encouraging bicycle transportation, perhaps more people will bicycle and this exercise will be a personal benefit to them and can help save on potential health care costs in the future (Fields, 2006). Ultimately, a university campus has the potential to be the most influential place a student might encounter bicycling as a form of transportation.

2.2 – Bicycle Infrastructure

There is a lack of data on bicycle infrastructure in many cities because bicycle infrastructure does not have the same data standards as roads do, and thus many cities and communities lack data to successfully analyze bicycle infrastructure (Callister & Lowry, 2013; Kaplan, 2015; Ransdell et al., 2013; Schoner & Levinson, 2014). More people would bike if the

infrastructure that was deemed necessary, such as separate bike lanes and bicycle signage were in place (Hess & Peterson, 2015; Schoner & Levinson, 2014). Furthermore, staying active and avoiding a sedentary lifestyle is beneficial for overall health of individuals and for the public health. Bicycling has been recognized as a beneficial form of exercise as well as a non-weight bearing exercise and with the correct infrastructure, bicycling can meet the recommendation for daily physical activity (Huy et al., 2008; Kimura & Silva, 2009; Lovretic et al., 2013; WHO/FIMS Committee, 1995).

Almost every bicycle study is conducted with the thought of the bicycle to be in movement, meaning the subject is riding the bicycle as either transportation or exercise. Bicycles at rest were "perceived as threatened or threatening, risky or at-risk; affected by theft, vandalism, the weather, official and familial disapproval" (Aldred & Jungnickel, 2013). Understanding the correct ways to house bicycles once they have arrived at their end destination is important for these reasons.

One way to increase bicycle ridership in a region is by increasing the amount of bicycle infrastructure in the area. All campuses can encourage cycling; they just need to be careful to take the approach that best suits its geography, student body, and mission. The League of American Bicyclists assists communities (campuses), in defining what their specific region can do to increase growth of the bicycling community (Blumenstyk, 2010).

2.3 – Facilitators and Barriers

The majority of bicycle use surveys center around what are either the reasons to bike or not to bike, called in many sources the facilitators and the barriers (Kaplan, 2015; Ransdell et al., 2013; Stinson & Bhat, 2003). The most important factor to consider is the bicycle safety that

riders experience while cycling. A big deterrent for commuting to work for many is travel time

and distance. There are many other deterrents that stop people from using a bicycle, such as

dangerous conditions, physical exertion, terrain, and adverse weather conditions. (Stinson &

Bhat, 2003) The majority of barriers involve the lack of having a bicycle or bicycle

infrastructure. Additionally, distance and time play a large role in the decision to ride a bicycle.

Contrasting these are the facilitators that increase the likelihood that one would ride a bicycle,

which commonly relate to access of a bicycle and the various pieces of bicycle infrastructure

(Ransdell et al., 2013). Each individual will experience different barriers and facilitators towards

bicycling and these will vary depending on the region.

2.4 – Type of Cyclist

The comfort level of a bicycler on a street will be one of the biggest indicators of the

likelihood one has towards deciding to bicycle. Geller (2006) describes four general categories

of transportation cyclists:

- A Rider – Strong & Fearless, will ride regardless of roadway condition.

- B Rider – Enthused & Confident – attracted to cycling and is comfortable

  sharing the roadway with automotive traffic, but prefers to do so operating

  their own facilities.

- C Rider – Interested but Concerned – curious about bicycling and like riding a

  bicycle, but are afraid to ride, specifically around automotive traffic.

- D Rider – No Way No How – currently not interested in bicycling at all.

B and C Riders are those that would be considered likely to have their opinion on

bicycling more often changed the most by changes in infrastructure, while A and D Riders will

not change their travel behaviors at all, either always choosing to ride or never choosing to ride.

Figure 2.1 Type of Cyclist

Four Types of Transportation Cyclists in Portland
By Proportion of Population

Interested but Concerned 60%

No Way No How 33%

Strong & Fearless <1%

Enthused & Confident 7%
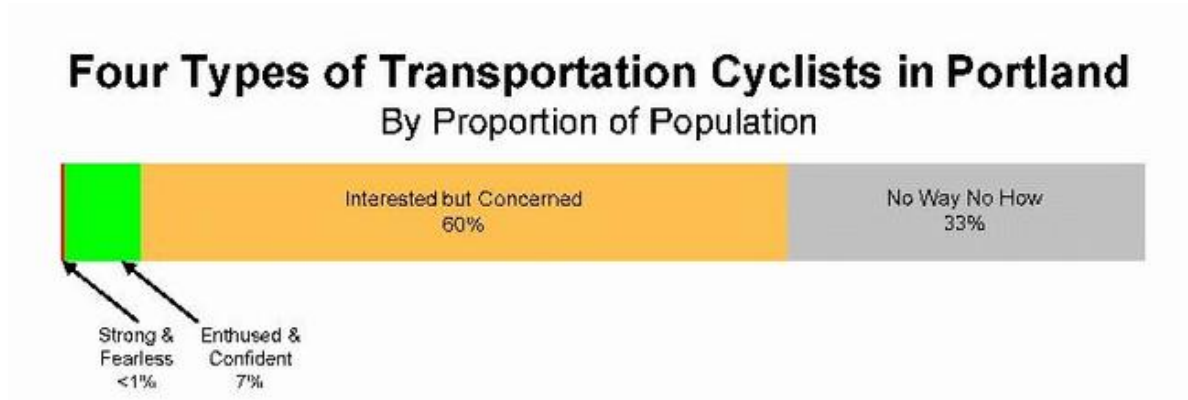
2.6– Summary

The literature summarized in this chapter displays a gap in the level of information for the topic of bicycle infrastructure in many cities and campuses, as the majority of previous data was relative to automobile infrastructures. Bicycling and sustainable transportation are both recent trends that cities are incorporating in their planning, but many of these solutions will take time to achieve. Current literature outlines many different types of facilitators and barriers towards bicycling, but most are directed towards cities and not university campuses. This study introduces the specific facilitators and barriers that students encounter in their daily lives. Few studies have been performed on evaluating the bicycle ownership and usage rates of university campuses. This study intends to provide this information for a specific campus.

Chapter 3 - Methodology

3.1 – Research Topic

This research attempts to understand the relationship between the attitudes and behaviors of cyclists and non-bikers, bike owners and bike users, while traveling on the Kansas State University Campus. This research will also analyze in depth the bicycle ownership and usage among undergraduate students that live on campus at Kansas State University.

3.2 – Study Site

The site for this research is the Kansas State University campus, in Manhattan, Kansas. As of the 2010 United States Census, there were 52,281 people residing in the city of Manhattan, with 23,779 students enrolled at Kansas State University in Fall 2016 (U.S. Census Bureau, 2010; Kansas State University, 2017). Manhattan has a distinct college town atmosphere.

Figure 3.1 Map of the Kansas State University Campus - 2017 (image by author)

Kansas State University
Campus Map - 2017

Legend

■ Jardine Apartments
■ Kramer Complex
■ Derby Complex
■ Strong Complex
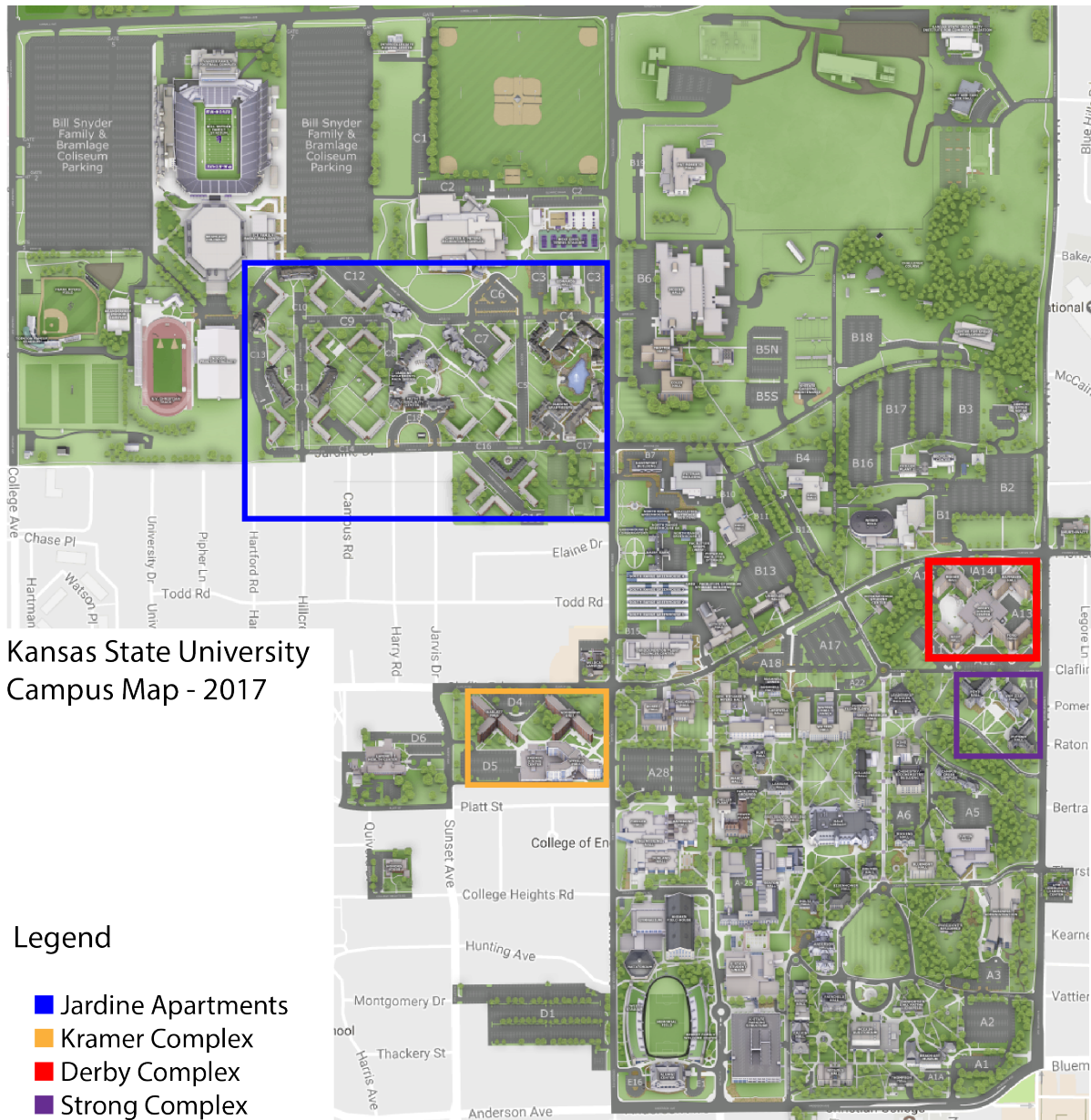
3.2 – Target Population

The target population for this study was both undergraduate and graduate students living in the different campus housing options that could utilize the bike infrastructure on campus. The survey participants live in the campus housing areas of: the Derby Dorm Complex (to the north

east), the Kramer Dorm Complex (to the west), the Strong Dorm Complex (to the east), and the Jardine Apartments (to the north west) (see Figure 3.1).

3.3 – Data Collection

The data for this research were collected through an online survey. The survey was designed by the author along with colleagues and consisted of sections on travel behaviors, including parking, ATA bus transit, and bicycling. An incentive in the form of a drawing for an iPad Air and multiple FitBit fitness bands was offered. The sampling frame for the entire survey consisted of ~20,000 Kansas State University students, faculty, and staff. For the questions regarding bicycle transportation, only those who have access to a bicycle were asked those specific questions. The sampling selection of the entire campus allowed for each living facility to be equally represented. The bicycling section had questions detailing different bicycling habits and thoughts on various bicycle infrastructure pieces. The results of the survey show the opinions of the students of Kansas State University on what types of bicycle infrastructure could be enhanced/increased in the future.

While the majority of questions throughout the survey were multiple choice, there were a few that asked the survey participants to rank their top choices from a list of options. This would be used to gauge what different aspects of bicycling are most important to the students on campus. There were also questions that utilized the slider aspect of the survey questionnaire to measure on a scale the limitations of bicycling in many different aspects and their satisfaction levels of certain infrastructure pieces already on campus.

In addition to providing detailed descriptive statistics on bicycle owners and users, this data provided information to formulate three different models. The models predicted bicycle

ownership, bicycle usage, and the impact infrastructure has on usage. Each model builds off the prior one, using the same variables but adding in new ones to predict ownership, usage, and infrastructure impact.

3.4 – Data Analysis

The next segment of this paper focuses on the results of the survey, including descriptive statistics, and three different binomial logistic regression models to predict bicycle ownership and usage rates among KSU students living on campus.

Chapter 4 - Results

4.1 – Survey Analysis

The campus wide survey received 2,892 responses for an approximate 15% response rate. For the purpose of this study only those who responded to living on campus were selected, a total of 709 survey responses.

4.2 – Basic Demographic Analysis

The most basic breakdown to be considered is the gender of the students that live on campus who have access to a bicycle. This is an important consideration due to the various factors that can effect the decision to cycle or not, i.e. safety, time constraints, etc. Almost three-fifths (59%) of respondents are female and 41% are male (Figure 4.1).

Figure 4.1 Respondents' Gender
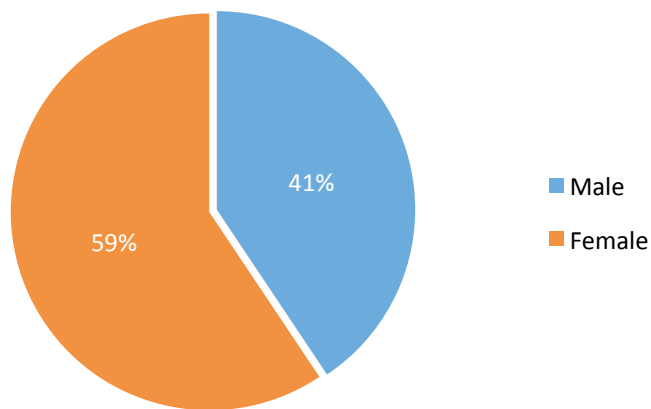
Next to be considered is the country that this population is from. The results of this could prove interesting because there may be different travel behaviors customary for people born outside of the United States. 14% of the respondents claimed to be born outside of the United States so this may have an impact on their decisions towards bicycling (see Figure 4.2).

Figure 4.2 Respondents' Birth Country
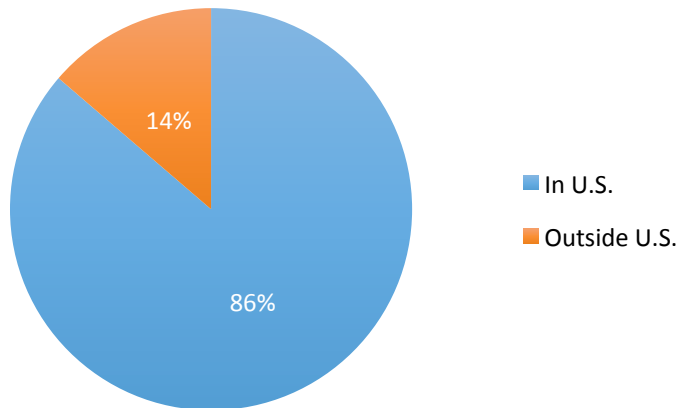
As you can see in Figure 4.3, those that always or usually have a car available to them account for 78% of those living on campus with a bike available to them as well. This will clearly have an impact on their bicycle usage if the majority of students could choose to drive instead.

Figure 4.3 Car Availability
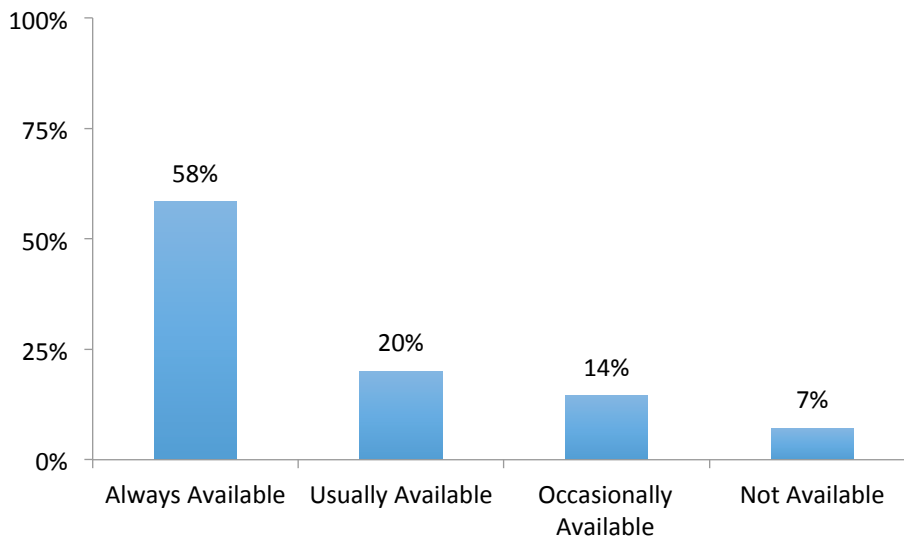
A further breakdown of where the respondents were living on campus was made (Table 4.1). The results were spread apart fairly evenly from the various on campus locations, with the exception of the Strong Complex because of the smaller sample size. There were more

respondents from the Kramer Complex than there were from the Derby Complex, which is a bit

unusual since there are more students that live in the latter.

Students that live in Jardine have an average age of 25.48 while Kramer was 20.07,

Derby was 19.79, and Strong was 20.10 (Table 4.1). The correlation between age and the

amount of semesters spent at Kansas State University fits directly for those living in the Jardine

Apartments. They have spent an average of 5.4 semesters, nearly doubling the next highest of

3.4 in the Strong Complex. While the difference in age between Strong, Kramer and Derby was

only 0.31 years, the difference in the amount of semesters between the same three locations was

0.94, which is a much bigger difference (Table 4.1). With the combination of age and the

amount of semesters at Kansas State University, there might be a correlation in the decision

making of students whether to bike or not. Another factor that is important to consider for these

different on campus locations is the distance to get to campus. Derby, Kramer, and Strong are all

located on campus, while the Jardine Apartments are located north west of the majority of the

buildings and the perception of distance and actual longer distance may play in to choosing to

bicycle rather than walk (see Figure 3.1).

Table 4.1 On Campus Location Analysis

On Campus Location	Respondents	Average Age	# Of Semesters
Jardine Apartments	26.52%	25.48	5.40
Derby Complex	27.93%	19.79	2.52
Kramer Complex	34.27%	20.07	2.93
Strong Complex	11.28%	20.10	3.46

Survey respondents were asked a question about how often they traveled to and from

campus from their residence, along with trips throughout campus, and what form of

transportation they utilized. Figure 4.4 shows the reported amount of bicycle usage for these

types of trips. These results are very interesting and may speak to the different mindsets of those

living in the dorms compared to the apartments. The students that live in the Jardine Apartments

(14.68%) more than doubled the bicycle usage than the next closest dorm complex of Kramer

(7.22%). There are a number of factors that could play in to this. The two biggest factors might

be the age of the students and the distance that must be traveled.

Figure 4.4 Bicycle Use Reported by On Campus Location
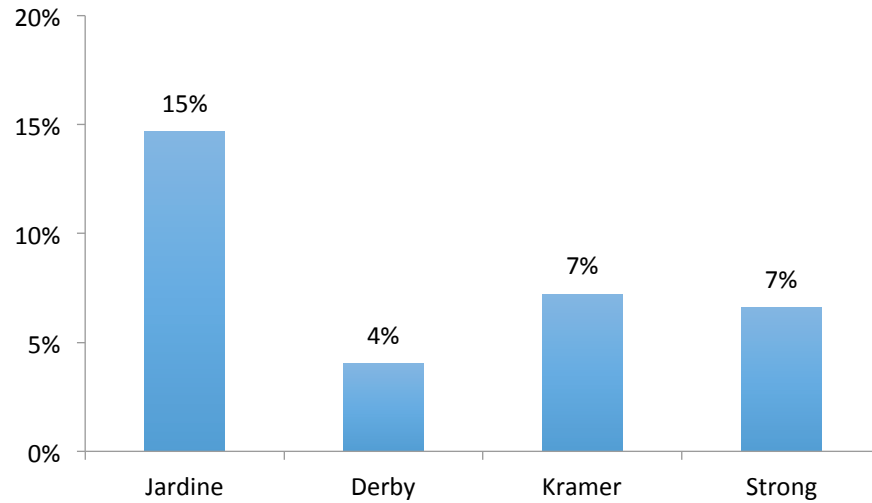
4.3 – Bicycle Usage Analysis

Another area that will be looked at is the different uses for bicycles on campus and the

different behaviors that students tend to show. The most basic variable to look at for this is the

different reasons that students say that they actually use their bicycle. Almost half of the results

(45%) returned as transportation. The next highest result with 29% of the results was for

exercise or fitness, 17% said that they used their bicycle for pleasure, and only 9% said that they

would go on bicycle rides to enjoy nature (Figure 4.5). While almost half of the trips were made

with the end destination in mind, such as a specific hall on campus, it is still important to look at

the near one-third (29%) of the results where exercise was the focus. These trips most likely

start and end in the same location, so the infrastructure needed for exercise and transportation differ.

Figure 4.5 Reasons to Bicycle
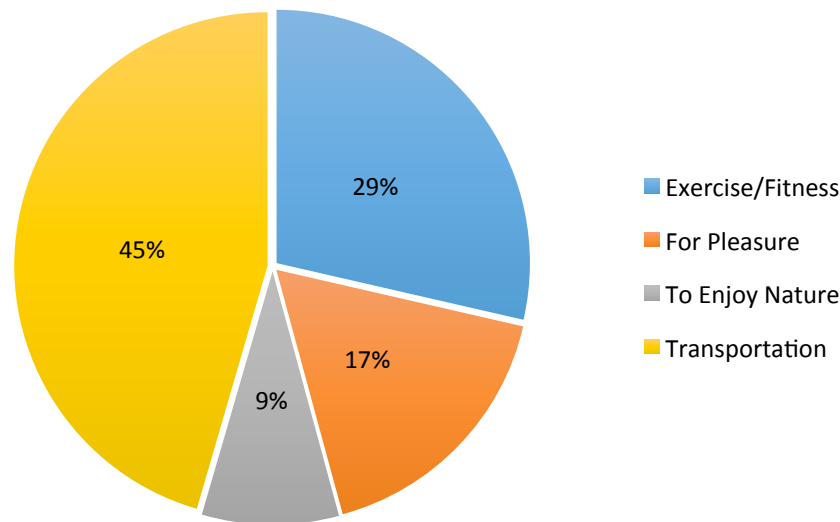
Other behaviors that can be examined are if the students are bicycling during the night or only during daylight hours. A large difference between female and male ridership is the amount of students that said they also ride their bicycle at night. Nearly three-fourths (71%) of women say that they do not make trips at night while their male counterpart is nearly split half and half, with 56% of the men saying that they do not ride at night (Figure 4.7). This may be because women do not feel the need to bicycle at night or the trips they are making are no longer necessary with a bicycle, but it also may be an attribute to their comfortability of riding at night, due to concerns of safety. Unless otherwise planned, bicycle trips are usually made alone and not in groups. Some women may not feel comfortable riding at night in the dark and may choose

to walk in groups together instead. While this is only speculation, the large difference between

the female and male populations is quite intriguing.

Figure 4.6 Bicycle Usage at Night
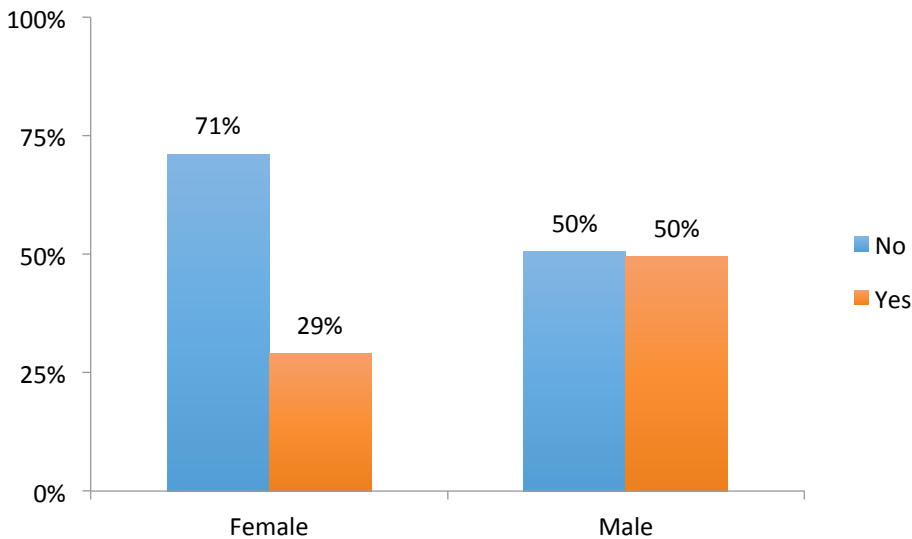
As reviewed in the Type of Cyclist section in the literature review, there are four

categories of riders. When trying to plan and build infrastructure for bicyclists, the 'Strong and

Fearless' group and the 'No Way No How' group are not closely examined because no matter

the amount of infrastructure improvements made, these people will either always choose to ride

or always choose not to. The middle two groups, the 'Enthused and Confident' group and the

'Interested but Concerned' group, are what draws more bicycle ridership. Luckily the majority

of students on campus fall into these two groups (Figure 4.9). Over 61% of female students fall

into the 'Enthused and Confident' group meaning nearly two thirds of all women would bicycle

more often given certain improvements. 41% and 38% of males fall into the 'Enthused and

Confident' and 'Interested but Concerned' groups respectively, so while there is not a huge

difference between the two, there are still nearly four-fifths of all males that bicycle on campus

willing to bicycle more often. This is great news for Kansas State University if it has an interest in attempting to reach the bicycle community and increase the corresponding infrastructure.

Figure 4.7 Bicycle Comfort Level
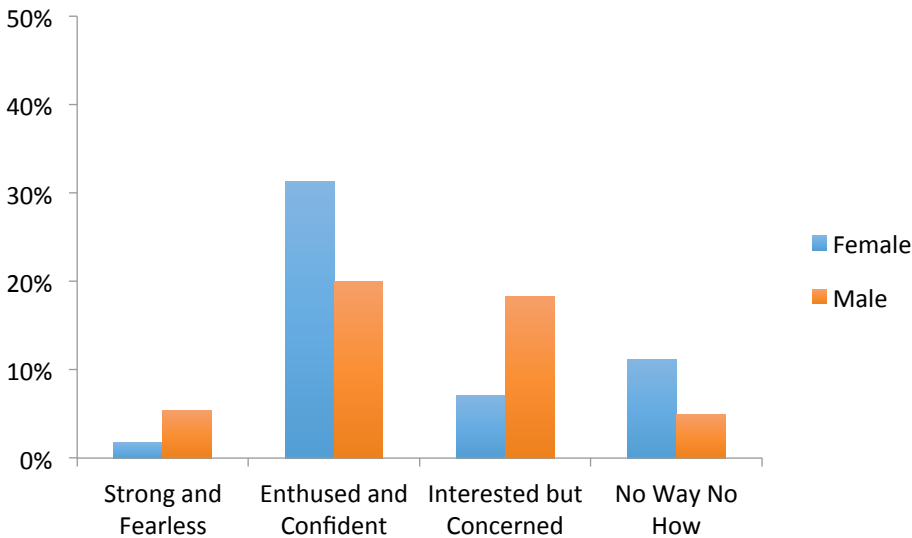
4.4 – Infrastructure Analysis

When examining on campus usage, it is also important to consider the many different infrastructure elements. Kansas State University campus has made many great strides to try to accommodate more bicycle use by placing bicycle racks near buildings, placing DIY bicycle repair stations throughout campus, and partnering with Green Apple Bikes so that students can ride a bicycle for free without actually having to own a personal bicycle. While the campus has placed these throughout campus in locations they deem fit, it is important to analyze the satisfaction levels that the users have of them (Figure 4.10). The result that was overwhelmingly negative was the availability of Green Apple Bikes. While this service was placed on campus to provide an opportunity for students to use free bicycles, it is not serving the vast majority of students. The location and availability of bicycle racks on campus is right down the middle, with more students being somewhat satisfied than not. Overall, this intrastructure type could be improved with more data, but is currently serving its purpose. Finally, while the majority of

students reported being somewhat satisfied with the availability of the DIY bicycle repair stations, the not satisfied group follows closely behind. This could be improved by placing more of the repair stations throughout campus, especially right next to the dorms, where the majority of students will be.

Figure 4.8 Satisfaction Level with Infrastructure Elements
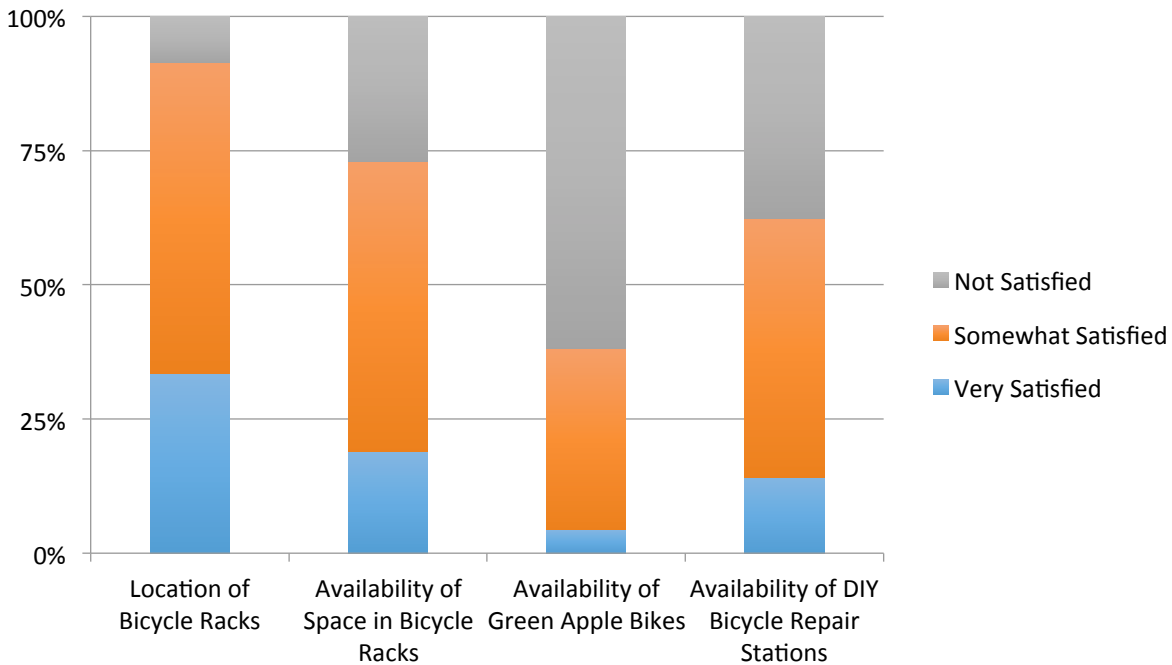
The survey asked students two questions to rank from one to three the top impediments that discourage them from bicycling more often and the infrastructure elements that would encourage more bicycle use. The first question regarding the top impediments, whether they were ranked first, second, or third, were compiled in Table (4.2) below. These results are the most interesting from the author's view and hopefully to the Kansas State University, because they show what exactly are keeping students from bicycling more often. The top four impediments listed feature two that the University can correct and two that are determined by the location. The University cannot do anything about the current terrain and without demolishing and constructing new dorms, students will have to deal with the time and distance required to get

to class. Removing motor vehicles from campus would reduce the amount of conflicts that occur

on campus and increase the personal safety of bicyclists. A good sign for the campus is that the

lack of interest in biking is in the bottom three for the impediments. Since the Kansas State

University campus is such an aesthetically pleasing location, unattractive surroundings ranked

the lowest.

Table 4.2 Top Impediments to Bicycling More Often

Top Impediments to Bicycling More Often	% Of Respondents
Conflicts with Motor Vehicles	17.06%
Concern for Personal Safety	11.45%
Time/Distance To Get To Destination	10.19%
Terrain (steep hills)	9.59%
Lack of Paths/Connections	9.56%
Hazardous Conditions (darkness, debris in path, path conditions)	8.60%
Difficult Intersections	8.07%
Conflicts with Pedestrians	8.03%
Physical Exertion	6.34%
No Interest	5.54%
Lack of End-of-Trip Facilities (lockers/showers/bike parking)	4.68%
Unattractive Surroundings	0.90%

The second question that the survey asked students to rank from one to three were the top

infrastructure elements that would encourage more bicycle use (Table 4.3). For roads that motor

vehicles are inevitably going to be on for the foreseeable future, namely the roads encompassing

the entire campus; creating new off-street, multi-use paths or more bike lanes on streets are what

most students would like to see happen. From a policy standpoint, slowing down traffic would

be a much cheaper option rather than construction and would very possibly have the same

results, but only 2% of the respondents chose this option.

Table 4.3 Top Elements to Encourage More Bicycle Use

Element to Encourage More Bicycle Use	% Of Respondents
New off-street, multi-use paths	18.92%
More streets striped with bike lanes	17.57%
Better links to or between routes/lanes/trails	13.71%
Wider outside lanes on roadways	13.34%
Construct more roadway shoulders	8.70%
More bicycle racks at destination	8.67%
More streets signed as bicycle routes	7.80%
Provide showers and lockers on campus	4.23%
Education on bicycle safety and how to ride a bicycle effectively	3.16%
Slow down traffic	2.22%
Better maps	1.68%

4.5 – Predicting Ownership Model

Three different binomial logistic regression models were created to test the different variables that have an impact on bicycle ownership and bicycle usage. They also were created to find relationships and correlations between sets of variables. The survey included information on the gender of the participants, place of residence, age, nativity, number of semesters at KSU, college associated at KSU, car availability, and if they had a license or not. These independent variables, the predictors, were included in the original model and were tested for statistical significance. For example, the location of where students lived on campus was tested by including all four of the possible on campus locations and running the model to see if any showed up as statistically significant. The first model looked at what factors affect students owning a bicycle while living on campus. The variables that were shown as statistically significant throughout can be seen in Table (4.4). For this model, the dependent variable is the availability of bicycles to students given that their availability to a bicycle is usually available or always available.

The odds ratio (OR) is a measure of association between an exposure and an outcome. An odds ratio of exactly 1 means that exposure to property A does not affect the odds of property B. An odds ratio of more than 1 means that there is a higher odds of property B happening with exposure to property A, while less than 1 is associated with lower odds. The estimate is the coefficient for the independent variable, meaning if the independent variable is increased by one unit, the dependent variable will increase by that amount. The standard error is the estimated standard deviation or measure of variability in the sampling distribution, calculated by dividing the standard deviation by the square root of the sample size. Finally, how much an independent variable impacts the dependent variable is shown in the probability value (Pr(>|z|) and significance columns. The more asterisks mean the independent variable is a more precise estimator of the dependent variable.

Table 4.4 Predicting Ownership Model

Category	Variable	Data Type	Impact	(OR)	Estimate	Std. Error	Pr(>|z|)	Significance
Dependent	Bicycle Availability	Ordinal						
Independent								
Demographics	Sex (Male)	Interval	Positive	1.67	0.51	0.17	0.002378	**
Environment	Place of Residence (Jardine)	Nominal	Positive	1.93	0.66	0.19	0.000451	***
	Driver's License	Nominal	Negative	0.49	-0.72	0.36	0.044281	*

These variables indicate that someone who lives in the Jardine Apartments is 92.9% more likely to own a bicycle than the other on campus locations and someone who is male is 66.7% more likely to own a bicycle than a female. Additionally, someone who has a driver's license is about half (48.6%) as likely to own a bicycle. Using the predict feature in RStudio resulted in an accuracy of

69.4%. This shows the accuracy of this particular logistic regression to predict the probability to own a bicycle given all of these variables are true.

4.6 – Predicting Usage Model

The second model will look at what factors affect bicycle usage for those that live on campus. In addition to keeping the same demographic and environmental independent variables, new attitudinal variables will be introduced (Table 4.5). Two different independent variables were considered for this model, the days that people reported using a bicycle and the bike mode share. Ultimately, the bike mode share was chosen because it yielded the best results. The bike mode share variable is the respondents who chose bicycling at least 20% of their trips. After running the model with every variable included, those variables without statistical significance were dropped from the model. This process was continued until each independent variable left in the model had statistical significance towards the dependent variable.

Table 4.5 Predicting Usage Model

Category	Variable	Data Type	Impact	OR	Estimate	Std. Error	Pr(>|z|)	Significance
Dependent	Bike Mode Share	Interval						
Independent								
Demographics	Age	Interval	Negative	0.910	-0.09	0.04	0.03424	**
	Sex (Male)	Nominal	Positive	1.899	0.64	0.26	0.01416	***
	Nativity (Outside of the US)	Nominal	Positive	3.166	1.15	0.42	0.00547	***
Environmental	Place of Residence (Jardine)	Nominal	Positive	2.146	0.76	0.34	0.02515	*
Attitudinal	Bicycling Comfort Level	Ordinal	Positive	6.03	1.80	0.28	2.13e-10	***

These variables indicate that someone is 503% more likely to use their bicycle if they responded to being 'Enthused and Confident' or 'Strong and Fearless' on the bicycle and 216.6% more likely to use the bicycle if someone is born outside of the United States. Also, they are 114.6% more likely to use the bicycle if they live in the Jardine Apartments compared to the other on campus locations, and if they are male they are 89.9% more likely than if female. Interestingly, although very slight, the older one gets, the less likely they are to use the bicycle by 9%. This model increases to an accuracy of 87.7% to predict the usage of a bicycle when combining these additional variables to the model.

4.7 – Infrastructure Impact Model

The third and final model will look at whether bicycle infrastructure plays a role in impacting the choice to own and/or ride a bicycle. This model was created to show how infrastructure perception affects bicycling usage. The same dependent variable as the predicting usage model was chosen, their bike mode share of bicycling at least 20% of their trips. This model tested the same demographic, environmental, and attitudinal variables as the prior two models. Infrastructure variables that were considered were satisfaction levels of certain infrastructure pieces on campus, the perceived impediments to bicycling, and the perceived enhancements to infrastructure that can be made with the variables that were statistically significant remaining (Table 4.6). Many of the infrastructure variables added did not have any statistical significance towards predicting bicycle usage, but the ones that did proved to be the biggest predictors out of all three models.

Table 4.6 Infrastructure Impact Model

Category	Variable	Data Type	Impact	OR	Estimate	Std. Error	Pr (>|z|)	Significance
Dependent	Bike Mode Share	Interval						
Independent								
Demographics	Sex (Male)	Nominal	Positive	1.705	0.53	0.29	0.062156	.
Environmental	Place of Residence (Jardine)	Nominal	Positive	1.961	0.67	0.28	0.016195	*
	Availability of a Car	Nominal	Negative	0.397	-0.93	0.31	0.003164	**
Attitudinal	Bicycling Comfort Level	Nominal	Positive	2.154	0.77	0.32	0.015075	*
Infrastructure	Satisfaction – Location of Bicycling Racks (Not Satisfied)	Ordinal	Positive	2.592	0.95	0.46	0.038292	*
	Satisfaction – Availability of Green Apple Bikes (Not Satisfied)	Ordinal	Positive	13.443	2.60	0.42	6.86e-10	***
	Satisfaction – Availability of Green Apple Bikes (Somewhat Satisfied)	Ordinal	Positive	8.807	2.18	0.47	3.95e-06	***
	Impediments – Hazardous Conditions	Nominal	Positive	3.152	1.15	0.32	0.000334	***

A common theme is the model resulting in more positive impacts than negative ones. Those who responded to the availability of the Green Apple Bikes with "not satisfied" are significantly more likely to use a bicycle, most likely their personal one, by 1244.3%. Comparatively, those who responded to the availability of the Green Apple Bikes with "somewhat satisfied" are also more likely to ride their bicycles, by 780.7%. The biggest reasoning to both of these is students who are more likely to bicycle will already own a personal bicycle and will not need to rely on Green Apple Bikes. Students who picked 'Hazardous Conditions' in their top three impediments are 215.2% more likely to ride their bicycle than someone who did not choose that answer, possibly choosing this answer because they notice the hazardous conditions while bicycling. Those who chose "not satisfied" with the location of bicycling racks on campus resulted in students bicycling 159.2% more and when they are 'Enthused and Confident' or ' Strong and Fearless' they

bicycle 115.4% more than the bottom two categories, a probability of about a third of the previous model. Two consistent variables are that living in the Jardine Apartments increases the likelihood to bicycle by 96.1% and if the student is male rather than female it increases by 70.5%. The only negative impact to predicting bicycle usage in this model is if students will usually and/or always have access to a motor vehicle, which decreases the likelihood to bicycle by 60.3%. When including the infrastructure elements, this model's accuracy increases by just fewer than 2% to a predictability accuracy of bicycle usage to 89.4%.

Chapter 5 - Conclusions

5.1 – Key Findings

There are two different sets of key findings for this report, one based on the descriptive statistics and another based on the three different models. Key findings for the descriptive statistics indicate that, perhaps most importantly, there are a substantial amount of students that are willing to use bicycles as a form of transportation on the Kansas State University campus. Additionally, while there was bicycle ridership from all of the different on campus housing options, the Jardine Apartments utilized the bicycle as an option far more often than the other dorms. This is interesting, since time and distance to get to their destination was in the top three for impediments to bicycle more often, even though dorms are all well within a mile away from the furthest hall on campus.

Key findings for the models indicate the overall prediction of a student on the Kansas State University campus to own a bicycle and then to use that bicycle. The infrastructure model indicated that with more bicycle infrastructure in place, specifically the kind that students are asking for, more people would be willing to bike on campus. Whether it is to get to class, to travel to the union or the dining centers to eat lunch, or any other reason to bicycle on campus, the same type of infrastructure will be necessary for the students.

Ultimately, this study produced subtle results, such as the differences in perception of various bicycle habits between the male and female students on campus. This study shows the different aspects that would encourage more bicycle ownership and use, especially with the opportunity that Green Apple Bikes has and the gap that it currently has. The results for satisfaction level for this certain amenity to students are overwhelmingly "not satisfied" and if corrected, this could present an opportunity for students to use a bicycle more often without

actually having to own one. Students who are male are much more likely to bicycle than their female counterparts, while students who live in the Jardine Apartments are also more likely to bicycle. This could be for several reasons. For example, students who live in these apartments are typically older and have spent more time at the university and are likely more familiar with the campus.

5.2 – Limitations

The largest obstacle facing this research was completing and distributing such a large and comprehensive survey in a timely manner. The idea of being able to finish this survey and distribute it in the fall semester was quickly dismissed and was subsequently pushed to the spring semester. Given the information that was desire to be obtained from this survey meant waiting until the weather warmed up meant pushing distributing the survey even later in the semester. As a result, students were invited to take the survey the week prior to Spring Break, which may have had implications on the level of willingness to take the survey.

A direct limitation of this was the amount of time to calculate the results. Given more time, other statistical models could have been calculated. Looking at the travel diary results would also have been another analysis that would have added to the depth of the overall analysis.

5.3 – Future Studies

Future studies should include looking at the entire student population, instead of just the students that live on campus by a more geospatial analysis. Using the travel diary results and mapping the bicycle travel behavior of all students, as well as breaking it down to just those living on campus, would provide spatial data for where students are using their bicycles. While

the results from this survey would be able to support many other types of studies, conducting another survey each year would capture the differences in travel behavior and habits of the graduating and incoming students at the university. For this survey, the bicycle related questions were only asked to those who had access to a bicycle and that lived on campus. To capture the entire campuses bicycle behaviors, future surveys will need to open these types of questions to a bigger sample size.

5.4 - Conclusions

While this study may have had opportunities to reach a larger respondent size, it proves that the majority of students that live on campus bicycle some or at least would be willing to bicycle more. Despite infrastructure that may not be at the ideal quality level that many people look for, students still bicycle on them. However, this does not mean that the Kansas State University and the planners in the city of Manhattan should just stay stagnant with this current level. The results of this study indicate the different infrastructure elements that students would most like to see added to campus. As the demand for parking increases on the Kansas State campus, looking at different methods to increase bicycle use may be a possible solution.

Since the survey was distributed to all students at the Kansas State University, an equal opportunity to weigh in on different travel behaviors was presented. The results were more often expected than unexpected. The survey results confirmed the assumption that bicycle use is a fairly common form of transportation for students on campus. It was also expected that walking would be the most common form of transportation that students used to get around on a day-to-day basis. The most surprising outcomes of this survey is how many students said that they say

that their bicycle comfort level fall into the 'Enthused and Confident' and 'Interested but Concerned' groups.

The City of Manhattan and Kansas State University are both making great strides more recently to increase bicycle ridership quality. Within the last five years, both have applied for and received bronze-level on the Bicycle Friendly scale. However, bronze should not be the end goal to have. There is a large amount of potential improvements that could be made to the infrastructure, both on campus as well as getting to campus, to increase bicycle use and the level of bicycle friendliness. The university can potentially promote bicycle transportation in a great light, but may need to revisit the policies that they are implementing on campus.

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Appendix A - Glossary

- Access
- Barriers
- Bicycle at Rest
- Bicycle Commuting
- Bicycle Signage
- Bike Friendly Campus
- Bike (Multi-Use) Lanes
- Exercise
- Facilitators
- Public Health
- Sustainable Transportation
- Traffic Rules
- Transportation
- Type A, B, C, D Rider

Appendix B - KSU Bike Rules

I. Introduction
A. The University Bicycle Program
Information about the Kansas State University bicycle program may be obtained during working hours from KSU Parking Services, 1 KSU Parking Garage, 532-PARK (7275), a department of the Division of Human Resources, Kansas State University. After hours, information may be obtained from the University Police, Edwards Hall (532-6412).

II. Regulations
A. General Regulations
1. **Bicycle Permit:** All bicycles parked on campus shall have a KSU bicycle permit displayed on the bicycle. A ticket will be issued to bikes without permits. Bicycle permits may be obtained at no cost from Parking Services in Edwards Hall. After working hours, permits may be obtained from campus police in Edwards Hall. The bicycle permit shall be attached to the center post of the bicycle frame, below the seat post, and be totally visible. Counterfeiting, altering, defacing, or transferring the permit to another bicycle or person and/or giving false information on application or in hearing is a violation of these regulations.

2. **Bicyclist Responsibilities:** The person to whom the bicycle permit is registered is the one responsible for any violation of bicycle parking regulations. Moving violations will be assessed to the individual operating the bicycle.

3. **Authorities:** Every person operating a bicycle on University property is subject to these Bicycle Regulations and must obey all Police Officers and Parking Services Personnel.

B. Moving Regulations
1. **Bicycle Access:** Riding a bicycle on University lawns or planted areas is prohibited. Riding a bicycle on University walkways, Monday through Friday from 7:30 A.M. to 5:30 PM. is prohibited except where indicated otherwise on Bike Map (see centerfold) or on weekends, holidays or school breaks.

2. **Reasonable Operation:** No person operating a bicycle on University property including exclusive use bikeways and shared pedestrian walkways, shall exceed the maximum speed that is reasonable and prudent with respect to visibility, local traffic, weather, and surface conditions that exist at the time, or that endangers the safety of any person or property. The Kansas State University Police Department Bicycle Patrol is exempt from these regulations while performing official duties.

3. **Pedestrian Right-Of-Way:** Bicyclists shall yield the right-of-way to pedestrians on all shared use walkways.

4. **Traffic Laws:** Bicyclists shall be subject to all vehicular laws including parking and traffic control mechanisms, signs and traffic lights unless there is specific signage or rules to the contrary that is applicable to bicycles.

C. Parking Regulations
1. **Bike Racks:** All bicycles shall be parked only in an approved bike rack. Bike rack locations are indicated on the Bike Map (see centerfold).

2. **Parking Violations:** Parking outside of any approved bicycle rack including:
   a. Parking on or locked to trees, plants, or other living objects, railings, fences, posts, signs, fire hydrants, gas pumps, trash receptacles.
   b. Parking in or on any service drive, building entrance, driveway, bikeway, rail, or stairway.

2. **Field Impoundment:** A bicycle is field impounded when it is locked by University personnel in the location it was found. Removal of the impounded bicycle or securing mechanism by unauthorized personnel is against the law. Criminal charges may be filed. Bicycles field impounded longer than two days may be transport impounded.

3. **Transport Impoundment:** A bicycle is transport impounded when it is removed from its location, its lock cut if necessary, and stored by the University Police. Storage charges will begin fourteen (14) calendar days of the date of the ticket. If the bike owner does not recover the bike after a period of 60 days, the bike becomes the property of KSU Parking Services and may be sold at public auction as provided in K.S.A. 22-2512 Annotated.

E. Use of Fees
Fees collected from the enforcement of this regulation will be used to purchase additional bicycle racks, improve bicycle lanes, and/or enhance the campus bicycle program.

IV. Supplemental Information
A. Granting Authority–Kansas State University
By the authority vested in the Kansas Board of Regents through the provisions of Kansas Statutes Annotated 74-3209—74-3216, regulations pertaining to the operation and parking of bicycles are hereby established and set forth.

B. Scope of Regulations
These bicycle regulations are issued supplemental to all applicable state laws. These regulations apply to all persons operating bicycles on the University campus, except Certified Police Bicycle Officers in the performance of their official duties. These regulations are in effect at all times, including holiday, weekend and break periods.

C. Approval of and/or Revisions To Regulations
These regulations are approved by the KSU Council on Parking Operations. This council is a joint organization of students, faculty, and staff. Inquiries may be made to the KSU Council on Parking Operations, Kansas State University, Manhattan, c/o Parking Services, 1 KSU Parking Garage. The University reserves the right to change these regulations as necessary.

D. City/State Laws
City of Manhattan and State of Kansas laws will apply to you when you ride on city streets and bikeways. Consult the Manhattan Revised Code for complete information on City bicycle laws. Two important State Laws are summarized below:

1. A front white light is mandatory between sunset and sunrise shall be visible from 500 feet. The bicycle shall also have a red reflector mounted on the rear of the bicycle that is visible from a distance of 100 to 600 feet to the rear when exposed to the head lamps of a motor vehicle. Leg lights or rim mounted red lights do not meet these requirements-, however, they are encouraged as a supplement.

2. Stop signs and stop light devices must be observed.

3. Bicyclists must dismount in crosswalks.

E. University Liability
The University assumes no duty for the care of protection of bicycles or their contents while the bicycle is on property owned, leased, or otherwise controlled by the University.

III. Fines or Impoundment
A. Fine Assessment
Violation of any bicycle and/or traffic regulations may result in the assessment of fines, impounding of the bicycle and/or filing of criminal charges.

B. Fine Payment
1. **Payment/Appeal:** Any person receiving a KSU bicycle citation shall submit fine payment or submit an appeal to Parking Services, Edwards Hall or deposit payment in yellow misuse fees boxes. If a bicycle is ticketed for a violation and is found not to have a valid registration, the owner of the bicycle shall register the bicycle at that time. Additional fines and charges must be paid when applicable; or

2. **Appeal:** The ticket may be appealed.
   a. Appeals must be filed by the owner of the bicycle, before 14 calendar days after the date of issuance of the citation.
   b. Appeal must be in writing on the prescribed form from Parking Services.
   c. Appeals will be handled in accordance with the KSU Parking Citations Appeals Board (PCAB).
   d. Initiation of an appeal stays the penalty until a ruling is made by PCAB.
   e. Tickets may be appealed only once. Decisions of PCAB on any violation is final. Paid tickets may not be appealed.

3. **Nonpayment:** Nonpayment of fines may result in loss of parking privileges, transport impoundment, and/or administrative action. Fines are delinquent if not paid within eight (8) business days of the date of ticket.

C. Fine Amounts
1. No Registration Permit Fine	$ 5.00
2. Moving Regulation Fine	$ 15.00
3. Parking Fine	$ 15.00
4. Delinquent Payment Fine	$ 5.00
5. Field Impoundment Fine	$ 10.00
6. Transport Impoundment Fine	$ 30.00
7. Impoundment Storage Fine Per Day	$ 1.00
8. Maximum Impoundment Storage Fine	$ 20.00

D. Impoundment
1. **Impoundment Authority:** Whenever a bicycle is found in violation of the KSU Bicycle Regulations, any University Police Officer, Parking Control Officer or other person authorized by the University Police may field impound the bicycle or, remove the securing mechanism if necessary, to transport or the bicycle. The University shall not be liable to the owner of the securing device or the owner of the bicycle for the cost of repair or replacement of such securing device. Release of an impounded bicycle requires proof of ownership to the satisfaction of the University Police and payment of all fines and charges.

   Reasons for bicycle impoundment include:
   a. Bicycle impoundment will occur when bicycle is not parked in a bike rack but is parked in another location. Bikes parked along access routes or attached to handrails may interfere with emergency access or the access of those with physical limitations. Bikes parked on the lawn or planted area may hinder maintenance or cause damage. Bikes parked in buildings may impede access, disrupt maintenance and cause damage.
   b. Bicycles that appear to be abandoned may be impounded. Bicycle parts, equipment and locks abandoned in the bike parking areas will be removed.

Bicycle Guide and Regulations

KANSAS STATE UNIVERSITY

Parking Services Office
1 KSU Parking Garage
Manhattan, KS 66506–4809
(785) 532-PARK (7275)

Bike Regulations. (n.d.). Retrieved 2016, from https://www.k-state.edu/parking/bikeregsprintable.pdf

Appendix C - Survey

2017 Campus Access Survey - 2017-03-09

Q1.1 Welcome to the 2017 KSU Campus Access Survey!This survey is designed to gather information on how people in the K-State community get to campus. Participants who complete the survey are eligible to enter a raffle for one iPad Air2 and three FitBit Charge HRs. Please review the consent information below before continuing.

Q1.2 CONSENT   Title: K-State Manhattan Campus Access Survey   Principal Investigator: Greg Newmark, Assistant Professor, Landscape Architecture/Regional & Community Planning, Kansas State University   Collaborators: David Maynard, Regional & Community Planning Graduate Student Melissa Wilson, Regional & Community Planning Graduate Student   Purpose Statement: The purpose of this research is to understand how Kansas State University students, staff, and faculty travel to the Manhattan campus.   Study Procedure: Participants will be asked a series of questions about their travel behaviors and preferences as well as some demographic information for statistical purposes. The survey is expected to take between 15 and 20 minutes to complete.   Incentive: Participants who complete the survey will be given the option to enter a raffle with one iPadAir2 and three FitBit Charge HR activity monitors as prizes. Winners of these prizes will be randomly selected within one week of the close of the survey period. Participants who complete the survey will also be given the opportunity to enter a related survey after the spring break with the same incentives.   Confidentiality: This survey is entirely anonymous. No personally identifying information will be collected. The data collected will be stored in a password protected file by Prof. Newmark.The researchers are interested in offering similar studies in the future to see how travel behaviors to campus may change over time. To connect your response today to a future survey while preserving anonymity, you will be asked to create a unique identifier based on your favorite teacher in high school and the name of the street you lived on when you left high school. Finally, in order to collect contact information for the incentive drawing and for additional studies and focus groups while preserving your anonymity, upon completion of the main survey you will be directed to a short second survey where you can choose to leave your contact information. This approach allows the researchers to offer incentives and follow up research opportunities while maintaining the anonymity of your responses to the initial campus access survey.   Contact Information: If you have any questions or concerns about this research project, you may contact Greg Newmark at 510-282-8413 or gnewmark@ksu.edu. If you have any concerns or complaints about your rights as a research participant and/or your experiences while participating in this study, you may contact the Kansas State University Research Compliance Office: 203 Fairchild Hall Manhattan, KS 66502 Phone: (785) 532-3224 Email: comply@ksu.edu   Consent: Your participation in this study is entirely voluntary and you may refuse to participate or withdraw from the study at any time.

Q1.3 Would you like to participate in this research?
❍ Yes. By clicking this option I consent to participate and will continue with the survey (1)
❍ No. By clicking this option I will immediately exit this survey (2)

Q2.1 Are you physically working or studying at the K-State Manhattan campus this semester?
- ❍ Yes (1)
- ❍ No, I am away this semester (Sabbatical, Study Abroad, Field Work, Visiting Scholar, etc.) (2)
- ❍ No, I attend another K-State Campus (i.e. Olathe, Salina) (3)
- ❍ No, I am an online student (4)

Q3.1 This first set of questions focuses on your relationship to the Manhattan campus of Kansas State University.

Q3.2 What is your primary role at Kansas State University (K-State)?(Student workers should identify as undergraduate or graduate students not staff)
- ❍ Undergraduate Student (1)
- ❍ Graduate Student (2)
- ❍ Staff (3)
- ❍ Faculty (4)

Q3.3 Including the current semester, how many semesters have you been studying or working at K-State? (For example, if you are a sophomore who started in Fall 2015, please enter 4)
- ❍ 1 (2)
- ❍ 2 (3)
- ❍ 3 (4)
- ❍ 4 (19)
- ❍ 5 (20)
- ❍ 6 (21)
- ❍ 7 (22)
- ❍ 8 (23)
- ❍ 9 (24)
- ❍ 10 (25)
- ❍ 11 (26)
- ❍ 12 (27)
- ❍ More than 12 (29)

Q3.4 What college are you primarily associated with?
- ❍ College of Agriculture (1)
- ❍ College of Architecture, Planning and Design (2)
- ❍ College of Arts and Sciences (4)
- ❍ College of Business Administration (5)
- ❍ College of Education (6)
- ❍ College of Engineering (3)
- ❍ College of Human Ecology (7)
- ❍ College of Veterinary Medicine (8)
- ❍ K-State Libraries (9)
- ❍ Staley School of Leadership Studies (10)
- ❍ Other (11) _____

Q3.6 Do you live on campus?
- ○ Yes (19)
- ○ No (20)

Q3.7 Which residence hall complex do you live in?
- ○ Derby (1)
- ○ Van Zile (2)
- ○ Kramer (3)
- ○ Jardine (4)

Q3.8 Select all the days you typically come to campus this semester.This includes any K-State affiliated building, e.g. APD West, Lafene Health Center, K-State Foundation, etc.
- ❏ Monday (1)
- ❏ Tuesday (2)
- ❏ Wednesday (3)
- ❏ Thursday (4)
- ❏ Friday (5)
- ❏ Saturday (6)
- ❏ Sunday (7)

Q3.9 What is your local zip code?

Q3.10 In order to determine the general origin of your trips to campus, what intersection is nearest to where you live?
    Your Street (1)
    Nearest Cross Street (3)

Q4.1 This section asks which transportation modes are available to you.

Q4.2 Do you have physical disabilities that limit your use of the following modes?

	Yes (1)	No (2)
Walking (1)	○	○
Biking (2)	○	○
Driving (3)	○	○
Public Transit (4)	○	○

Q4.3 How available to you are the following transportation modes in Manhattan?

	Not Available (1)	Occasionally Available (4)	Usually Available (2)	Always Available (6)
Skate (Skate/Longboard, Hoverboard, Roller Blade, Kick Scooter) (2)	○	○	○	○
Bike (Privately-owned, not Green Apple Bike) (3)	○	○	○	○
Electric Bike (4)	○	○	○	○
Motorcycle, Motorscooter, Moped (5)	○	○	○	○
Car or Truck (either as driver or passenger) (6)	○	○	○	○
Green Apple Bike (7)	○	○	○	○

Q4.4 Please take a moment to think about your trips to and from campus this semester.(If you live on campus, consider trips between where you live and other parts of campus)Please estimate the percentage of these trips that you made by the following modes.(The total percentages will not exceed 100)

_____ Walking (the whole way) (1)
_____ Car or Truck (as driver or passenger) (2)
_____ Bike (including Green Apple Bikes and electric bikes) (3)
_____ Motorcycling (including by Motorscooter or Moped) (4)
_____ Bus / Shuttle (5)
_____ Skate (including Hoverboards, Roller Blades, Kick scooters) (6)

Q6.1 This section asks about your use of private vehicles and parking on campus.

Q6.2 Do you have a driver's license?
○ Yes (1)
○ No (2)

Q7.1 This section explores your use of the bicycle available to you and your thoughts on biking in Manhattan.

Q7.2 In a typical week during this semester, which days, if any, do you ride a bike?(If you generally do not use your bike select only the first option)
- ❏ I don't usually ride (1)
- ❏ Monday (2)
- ❏ Tuesday (3)
- ❏ Wednesday (4)
- ❏ Thursday (5)
- ❏ Friday (6)
- ❏ Saturday (7)
- ❏ Sunday (8)

Q7.3 What are your top two reasons for bicycling? (Choose 2)
- ❏ Exercise/Fitness (1)
- ❏ Transportation (2)
- ❏ For Pleasure (3)
- ❏ To Enjoy Nature (4)

Q7.4 How would you describe your comfort biking on streets with car traffic?
- ❍ Strong and Fearless - I will ride regardless of roadway condition (1)
- ❍ Enthused and Confident - I like cycling and am comfortable sharing the roadway (2)
- ❍ Interested but Concerned - I like riding a bicycle, but am nervous about riding on streets with car traffic (3)
- ❍ No Way No How - I am not interested in biking on streets at all (4)

Q7.5 Rank your three largest impediments to biking more in Manhattan?(Please drag the options on the left to the box on the right)

Top Impediments to Biking More, Ranked 1-3
_____ Concern for Personal Safety & Security (1)
_____ Difficult Intersections (2)
_____ Unattractive Surroundings (3)
_____ Time/Distance To Get To Destination (4)
_____ Lack of End-of-Trip Facilities (lockers/showers/bike parking) (5)
_____ Lack of Paths/Connections (6)
_____ Hazardous Conditions (darkness, debris in paths, path surface conditions) (7)
_____ Conflicts with Pedestrians (8)
_____ Conflicts with Motor Vehicles (9)
_____ Physical Exertion (10)
_____ Terrain (steep hills) (11)
_____ No Interest (12)
_____ Other (13)

Q7.6 Do you . . .

	Yes (1)	No (2)
Wear a helmet when you bike? (1)	○	○
Bike at night? (6)	○	○
Bike more on the sidewalks than the street? (8)	○	○

Q7.7 How likely are you to bike given these weather conditions?

	Always (18)	Most of the time (19)	About half the time (20)	Sometimes (21)	Never (22)
Rainy (1)	○	○	○	○	○
Snowy (2)	○	○	○	○	○
Foggy (3)	○	○	○	○	○
Cloudy (4)	○	○	○	○	○
Windy (5)	○	○	○	○	○

Q7.8 How often do you get off your bike when you see this pavement marking?

	Always (15)	Most of the time (16)	About half the time (17)	Sometimes (18)	Never (19)
Dismount frequency (1)	○	○	○	○	○

Q7.9 How satisfied are you with the following aspects of bicycle infrastructure on campus?

	Not Satisfied (1)	Somewhat Satisfied (2)	Very Satisfied (3)
Location of Bicycle Racks (1)	○	○	○
Availability of Space in Bicycle Racks (2)	○	○	○
Availability of Green Apple Bikes (3)	○	○	○
Availability of DIY Bicycle Repair Station (4)	○	○	○

Q7.10 Please choose the three most important elements that would encourage you to bicycle more often, ranking them from 1-3 with 1 being the most important. (Drag your choice from the list on the left to the box on the right)

Elements that would Encourage Me to Bike More, 1-3
_____ New off-street, multi-use paths (1)
_____ Wider outside lanes on roadways (2)
_____ Construct more roadway shoulders (3)
_____ More streets striped with bike lanes (4)
_____ Better links to or between routes/lanes/trails (8)
_____ Better maps (9)
_____ More streets signed as bicycle routes (10)
_____ Slow down traffic (11)
_____ Provide showers and lockers on campus (12)
_____ More bicycle racks at destination (13)
_____ Education on bicycle safety and how to ride a bicycle effectively (14)
_____ Other (18)

Q10.1 This section asks a few questions about respondent demographics.(P.S. Hang in there. You are almost done with the survey)

Q10.2 What year were you born? (YYYY)

Q10.3 What is your sex?
○ Male (1)
○ Female (2)
○ Prefer not to answer (3)

Q10.4 Where were you born?
○ In the US (2)
○ Outside of the US (3)

Display This Question:
    If Where were you born? Outside of the US Is Selected
Q10.5 What year did you come to the US?

Display This Question:
    If What is your position at KSU Staff Is Selected
    Or What is your position at KSU Faculty Is Selected
Q10.6 What is your estimated annual household income before taxes?
○ Less than $20,000 (1)
○ $20,000-$40,000 (2)
○ $40,000-$60,000 (3)
○ $60,000-$80,000 (4)
○ $80,000-$100,000 (5)
○ $100,000-$150,000 (6)
○ Greater than $150,000 (7)

Q11.1 We are interested in understanding how campus access behaviors change over time and may repeat this survey in a few years.Please answer the two questions below in order to create a unique and anonymous survey ID for the purpose of comparing your anonymous responses with those of future studies.

Q11.2 What is the last name of your favorite teacher in high school?

Q11.3 What was the name of the street you lived on when you left high school?

Q11.4 We invite you to provide any additional comments on your travel to campus experience.

Appendix D - IRB Approval

KANSAS STATE
U N I V E R S I T Y | University Research Compliance Office

TO: Dr. Gregory Newmark   Proposal Number: 8724
        Landscape Architecture/Regional and Community Planning
        301C Seaton Hall

FROM: Rick Scheidt, Chair
        Committee on Research Involving Human Subjects

DATE: 03/13/2017

RE: Proposal Entitled, "2017 Campus Access Survey"

The Committee on Research Involving Human Subjects / Institutional Review Board (IRB) for Kansas State University has reviewed the proposal identified above and has determined that it is EXEMPT from further IRB review. This exemption applies only to the proposal - as written – and currently on file with the IRB. Any change potentially affecting human subjects must be approved by the IRB prior to implementation and may disqualify the proposal from exemption.

Based upon information provided to the IRB, this activity is exempt under the criteria set forth in the Federal Policy for the Protection of Human Subjects, **45 CFR §46.101, paragraph b, category: 2, subsection: ii.**

Certain research is exempt from the requirements of HHS/OHRP regulations. A determination that research is exempt does not imply that investigators have no ethical responsibilities to subjects in such research; it means only that the regulatory requirements related to IRB review, informed consent, and assurance of compliance do not apply to the research.

Any unanticipated problems involving risk to subjects or to others must be reported immediately to the Chair of the Committee on Research Involving Human Subjects, the University Research Compliance Office, and if the subjects are KSU students, to the Director of the Student Health Center.

203 Fairchild Hall, Lower Mezzanine, 1601 Vattier St., Manhattan, KS 66506-1103 | 785-532-3224 | fax: 785-532-3278 | comply@ksu.edu | k-state.edu/research/comply

47