

---

# *BREAKING THE CHAIN*

*Author: Olvera, Rene*

*College of Architecture, Planning and Landscape Architecture  
Faculty: Sandra Bernal, Kenny Wong, Nataliya Apanovich*



THE UNIVERSITY  
OF ARIZONA

## **Abstract**

Tucson, Arizona is considered one of the most hazardous places for cycling. Despite the dangers, cycling has gained popularity as a convenient and beneficial mode of transportation, leading to a demand for improved infrastructure. To address the gender gap in cycling, this study examined the perceptions of different cyclists in Tucson. By employing a mixed-method approach that included a public survey and observation, the research identified key factors that contribute to the gender gap. The findings emphasize the need for new and adequate cycling infrastructure as the city expands and its residents seek more sustainable and equitable transportation options.

## **Key Words**

Cycling, Gender, Infrastructure, Sustainable, Transportation

## **Acknowledgements**

Thank you to all my supporters over the past four years and the professors that have given me the help I needed to make it through.

## Table of Contents

<b><i>Abstract</i></b> .....	<b>1</b>
<b>Key Words</b> .....	<b>1</b>
<b><i>Acknowledgements</i></b> .....	<b>2</b>
<b><i>Introduction</i></b> .....	<b>5</b>
<b>Literature review</b> .....	<b>7</b>
<b>Sustainability Statement</b> .....	<b>11</b>
<b>Research Question</b> .....	<b>11</b>
<b><i>Methodology</i></b> .....	<b>12</b>
<b>Study Area</b> .....	<b>12</b>
<b>Data and Measures</b> .....	<b>12</b>
.....	<b>13</b>
<b>Method One</b> .....	<b>13</b>
<b>Method Two</b> .....	<b>14</b>
<b>Justifications</b> .....	<b>16</b>
<b><i>Results</i></b> .....	<b>16</b>
<b>Survey results</b> .....	<b>16</b>
<b>Bike Lock Results</b> .....	<b>20</b>
<b><i>Discussion</i></b> .....	<b>22</b>
<b>Survey Section</b> .....	<b>22</b>
<b>Female Only Survey Section</b> .....	<b>24</b>
<b>Bike Lock Discussion</b> .....	<b>26</b>
<b>Summarized Findings</b> .....	<b>27</b>
<b><i>Conclusions</i></b> .....	<b>28</b>
<b><i>Works Cited</i></b> .....	<b>30</b>

**Table of Figures**

*Figure 1 bicycle and pedestrian collisions in Tucson* \_\_\_\_\_ 5

*Figure 2 Shows the survey flyer* \_\_\_\_\_ 13

*Figure 3 Shows the survey flyer posted on a bicycle cross light on Tucson and 3rd Street* \_\_\_\_\_ 13

*Figure 4 Shows the bike locks outside of ENR2* \_\_\_\_\_ 14

*Figure 5 Shows the outside of the main library buildings Source:  
[https://www.flickr.com/photos/arizona\\_native/3558009758/](https://www.flickr.com/photos/arizona_native/3558009758/)* \_\_\_\_\_ 14

*Figure 6 Shows the survey question: What do you ride your bike for?* \_\_\_\_\_ 17

*Figure 7 Table that shows responses to what routes participant took when cycling* \_\_\_\_\_ 17

*Figure 8 Shows statistical table of respondents feeling of safety while riding* \_\_\_\_\_ 18

*Figure 9 Shows what would make the respondents more comfortable when cycling* \_\_\_\_\_ 18

*Figure 10 Shows the gender identity of the respondents* \_\_\_\_\_ 18

*Figure 11 Shows a pie chart of what factors cause the most concern while cycling* \_\_\_\_\_ 19

*Figure 12 Shows how many female respondents would feel safer if they cycled in a protected bike lane* \_\_\_\_\_ 19

*Figure 13 Shows how many female respondents would feel safer riding in a group* \_\_\_\_\_ 19

*Figure 14 Shows the observational data from the bike lock counts* \_\_\_\_\_ 20

*Figure 15 shows male cycling patterns* \_\_\_\_\_ 23

*Figure 16 Shows female cycling patterns* \_\_\_\_\_ 23

*Figure 17 Shows feeling of safety amongst male and female riders* \_\_\_\_\_ 23

*Figure 18 Shows responses to understanding the gender gap* \_\_\_\_\_ 25

*Figure 19 Shows written responses by female respondents on what would make them want to cycle more* \_\_\_\_\_ 26

# Introduction

As cycling becomes a more prominent mode of transportation, cities are starting to see a prominent gender gap between male and female cyclists. Right now, the United States is

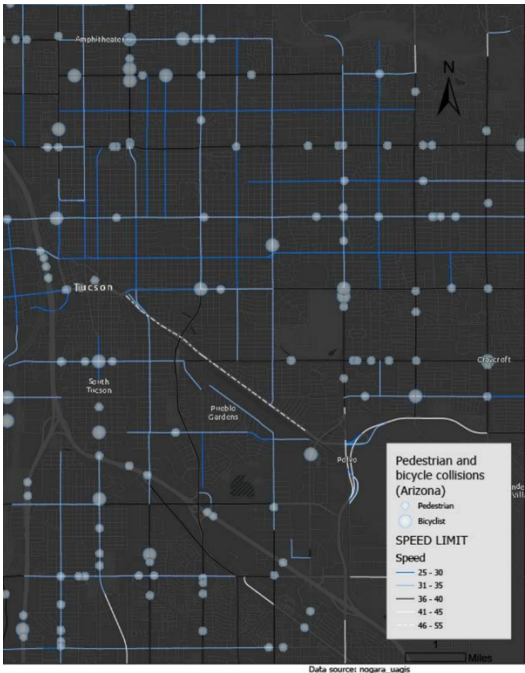


Figure 1 bicycle and pedestrian collisions in Tucson

considered a car-centric country. This means that every city that has become extremely car-dependent; citizens must drive to get to almost anywhere, even if their destination is five minutes away from their home. As the negative impacts of car-centric cities start to increase many people are looking for a better way to travel. Therefore, more cities are starting to see an increase in bike ridership. Cycling is known to have significant benefits of physical health, mental health, and even economic benefits.

Tucson, Arizona is home to the University of Arizona, which has a unique cycling culture because a majority of the population is made up of students. Although cycling would be the easiest and most beneficial mode of transportation for most people, given the city's compact size, most citizens choose not to because Tucson is one of the most dangerous cities to cycle in. This is because of not only the extreme weather conditions, but also because of the inadequate cycling infrastructure that leads to a high risk of collision and death due to collisions by car. This has

affected the number of ridership and feeling of safety for those who do ride. This research was designed to dive deeper into the cycling culture in the city to understand why there is a gender gap in a college town like Tucson.

## Literature review

There has been research done on how cycling in a city is extremely beneficial for its citizens and their well-being. Several studies have been done on the importance of the phenomenon known as feeling of safety. Feeling of safety is a key factor in understanding cycling trends in any city.

Many factors go into feeling of safety in a city for cycling. Factors include cycling infrastructure, weather, and traffic trends.

In a study done to understand what the risks of collisions or falls that are associated with different bicycle facilities that lead to hospitalization are, it was found that if there are more bicycle facilities on the road then the risk of accidents is lower (Cicchino et al., 2020). The study looked at several different factors including cycling lanes of major roads, local roads, lanes with or without bicycle facilities, and traffic calming measures. Then they compared protected bike lanes with heavy and light separation. After analyzing these features, they observed how they affected the 604 patients from emergency departments in major cities who fell or crashed while cycling (Cicchino et al., 2020). This evaluation showed that protected bike lanes vary in protection and heavier separated bike facilities reduced the risk more than other types of facilities (Cicchino et al., 2020). This study shows how important adequate bike infrastructure is to protect those who choose to cycle. Although the desire for safer bike lanes is observed by all cyclists, there may be more factors that deter female cyclists that don't affect others.

In a study done in five cities in the United States, (Dill et al., 2014), it was found that there is a significant gender gap in cycling in the US compared to other countries that have



higher rates of cycling overall. The study observed that if a city implemented protected bike lanes, then more women would ride bikes. The study collected data from the “Green Lane Project” and user surveys from people riding along the facilities and people who lived near by the facilities. The data showed that both men and women felt that a protected bicycle lane would create a safer and more comfortable commute. Women who were using the lane were much more positive towards the idea than men riding along the facilities. Female residents that were surveyed that don’t usually cycle revealed that their level of comfort would significantly increase if protected lanes were implemented and that they would increase their levels of cycling in general if implemented. This study solidified the importance for protected bike lanes because it shows how it would increase the feeling of safety for both males and females even if they did not use their bike beforehand.

The importance of protected bike lanes seems to be a common thing in the United States. In other countries there seems to be some factors of the gender gap in cycling that the United States has overlooked. In a study done in Solo, Indonesia they observed that many cities in Southeast Asia are facing challenges that are resulting in high rates of car and motorcycle ownership thus leading to high levels of congestion, pollution, and road traffic (Song et al., 2019). The study wanted to understand how a city can promote cycling among women who face mobility and accessibility barriers in rapidly urbanizing areas. They conducted multiple methods of data collection such as Focus Group Discussion, interviews, field observations, surveys, and some secondary research. They found that cycling has gained some popularity in the city and has led to new improvements such as slow lanes and car free days. Unfortunately, these improvements did not do much for female cyclists. This study found that these slow lanes and other cycling lanes stayed predominantly in the center of the city. Many of the interviewees

stated that this didn't help much because the lanes didn't reach into the neighborhoods and allow for mobility to and from these two areas. They also found that these lanes would often be taken up by street vendors and other users. For women, distance was also a large factor in if they decided to cycle. Shorter trips were the most popular to cycle for physical and safety reasons. They found that there was an age gap for women when it comes to cycling. Many of the women who choose to cycle are either young (ages 12-15) or older (ages 35-69). This is because of social implications revolving around the idea that riding a bicycle is not an attractive way to get around. Many young adults prefer motorcycles because of its popularity and status symbol. So, women who are more likely to be influenced by social norms are not part of the female cyclists group. All of these findings pointed to smaller scale solutions that would increase the ridership amongst females in the city. These solutions range from small things like community group initiatives that hold group rides and provide educational services on maintaining a bike to implementing bike routes and more public transportation to neighborhoods to increase mobility overall. The observation of gender roles in society that still play a role in women's lives are a crucial part in understanding the gender gap. A part of gender differentiation between men and women is the fact that women are at a higher risk for violence at all times.

In Ireland, a study wanted to understand why, although cycling ridership has increased overall in Ireland, only a quarter of cyclists are female. The study by, Carroll et al. (2020), hypothesized that differences in female risk aversion could partly explain the gender gap. They analyzed Census data on adults aged 18-64 that cycle to work by gender and cycling infrastructure between each electoral district. The research showed that women again did not prefer to travel long distances via bike. They also found that there was no significant correlation

between “safe” routes and female ridership. They did however find that these safe routes saw an increase in ridership from both males and females.

In another study done in New Zealand, Shaw et al. (2020), it was found that even with the known benefits of cycling and with advanced cycling infrastructure many cities have not seen significant rise in female riders. They wanted to know if personal, sociodemographic or household factors could explain the cycling gender gap. They did a regression analysis of travel data from the New Zealand Household Travel survey from 2002-2014 and looked at different factors like gender, age, personal income, ethnicity, status of employment, amount of driving experience, number of jobs a person has, if a person has a license, size of household, number of bikes in the household and individual travel patterns. Through analyzing this data, they found that cars were the dominant mode of transport. They found that women overall tend to travel less distance in cars than men and that more women traveled via public transport than men. They found that the same pattern was found amongst male and female cyclists. This shows that females are traveling less but they are traveling in more diverse ways thus emitting less greenhouse gasses than males.

All of these studies show that cycling is becoming more prominent around the world and that creating space and infrastructure will be a critical part of any cities future planning developments. These studies also show that for many different reasons the gender gap is being observed in all of these cities and more across the world. Understanding the need for bicycle infrastructure and making modifications to ensure that the development is as beneficial to males just as much as it is for females will give cities the chance to improve the lives of women like never before.

## **Sustainability Statement**

As cities start looking for new ways to adapt to the climate crisis sustainable development will become one of the most important tools to mitigate and adapt to the changes of the future. Many social constructs will have to change in order to make a truly sustainable city. One of the United Nations 17 goals of sustainability is gender equality. It is understood that when cities acknowledge inequality towards women and take actions against it the quality of life increases for everyone. This simple act can give cities and their communities resources to make sustainable changes. Therefore, when it comes to cycling it is important to acknowledge the growing gender gap and take action to dismantle it. Cycling will become a serious topic in the world of sustainable transportation. Cycling is a mode of transportation that has physical, mental, and economic benefits like no other. Cycling has virtually no greenhouse gas emissions and can bring structural advancement to any city. A city that builds adequate infrastructure while making sure it serves all people equally will be significantly more resilient to future impacts of climate change than a city that does not. This study is centered on the cycling culture in Tucson and recognizes the key factors that are causing the gender gap and by analyzing the results of the research understand how to merge the gap.

## **Research Question**

This study has one main research question and a related sub-question.

- How significant is the cycling gender gap in Tucson and what are the main factors that could help merge the gap?

-What are the similarities between male and female cyclists when it comes to Tucson cycling culture?

## **Methodology**

### **Study Area**

For this methodology there were two study sites. The site area for the qualitative data collection starts from University/ 3<sup>rd</sup> Street and Campbell to 3<sup>rd</sup> Street and Country Club in the Sam Hughes area of Tucson, Arizona. The site area for the quantitative data collection was located outside of the Main Library and outside of the Environmental and Natural Resources building both located on the University of Arizona campus.

### **Data and Measures**

This study uses a mixed method data collecting approach. The qualitative approach was to collect data through a public survey. The second quantitative approach was to do student count by observation.

**Method One**

The first method was to create a survey that would be distributed along the main three stops on the third street boulevard. This survey was created to gather data about how residents of Tucson, Arizona feel while riding their bikes.

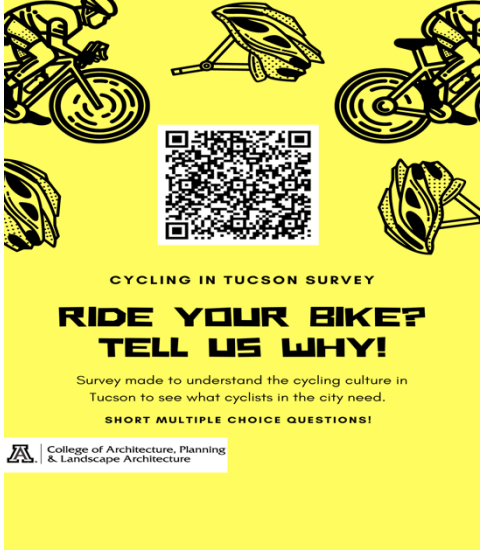


Figure 2 Shows the survey flyer

When creating this survey there was a need for separation of results via gender. To do this the survey was designed to have the first seven questions available to both male and female respondents. Question seven asked respondents to choose the gender they identified as and if the respondent answered male the survey would automatically end once the response was captured. If the respondent answered female the survey would continue with six more questions that were collecting much more in depth qualitative questions. There were two different distribution methods to get the survey out to the public. The first distribution started by turning the survey link into a barcode image. Then that barcode image was pasted onto a flyer that gave a small description of the survey question.



Figure 3 Shows the survey flyer posted on a bicycle cross light on Tucson and 3rd Street

Lastly, the flyers were distributed out to the 3<sup>rd</sup> Street boulevard along the three main stops closest to campus that run through the Sam Hughes neighborhood. The second distribution method was through electronic contact with local cyclists who were willing to participate in the study.

## Method Two

The second method was designed to gather qualitative data on the gender gap in cycling on the University of Arizona campus. This was done by doing observations outside the Environmental and Natural Resources building and the Main library building. The goal of the observations was to count how many male students and female students used the bike lock racks to store their bikes. This would give qualitative data on student cycling behaviors on campus.

The first part of this method was identifying the most heavily populated bike rack on campus. This was done over the span of one week and it was determined that the bike locks outside of the Environmental and Natural Resources building and the bike locks outside of the Main Library building were the most populated through the day.



*Figure 4 Shows the bike locks outside of ENR2*



*Figure 5 Shows the outside of the main library buildings* Source: [https://www.flickr.com/photos/arizona\\_native/3558009758/](https://www.flickr.com/photos/arizona_native/3558009758/)

The second part was determining the busiest hours on campus in terms of foot traffic. Over the span of a week, it was observed that around 12 pm on Mondays and Tuesdays there was heavy traffic at both buildings. With these observations done before hand the observation days were set.

On Monday April 10<sup>th</sup> the observation of the Environmental and Natural Resources building started at 12:15 pm and ended at 1:30pm later the afternoon. On Tuesday April 11<sup>th</sup> the observation of the Main library bike locks started at 12:10pm and ended at 1:15 pm. These two methods combine provided adequate qualitative and quantitative data for the study.



## **Justifications**

The significance of this research is high because it is a topic that cities all over the world are trying to understand. Every city should be working to become a sustainable city given the current conditions of the climate crisis. American cities like Tucson are a perfect place to start because of its size and its ability to be granted resources by the federal government. These data collection methods are an efficient way to understand cycling culture in a college town. The survey was distributed in an area that connects the east and west heart of Tucson. Many of the cyclists in Tucson pass by the post every day if they want to get to the most populated areas in the city like the University, Main Gate square, or Fourth Avenue Arts District. The bike lock count is the perfect way to see what students ride their bikes to school.

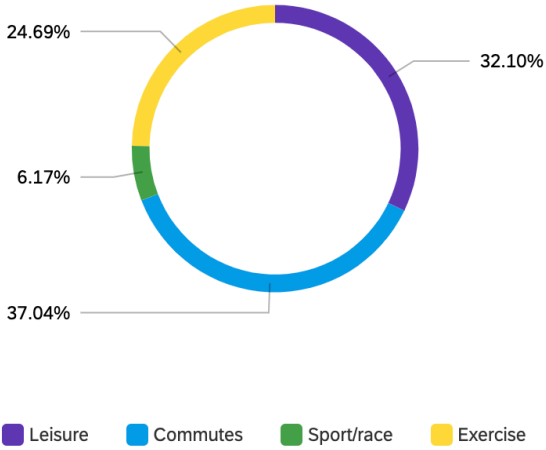
## **Results**

### **Survey results**

From the survey that was distributed the hypothesis was correct. This survey was made up of “cyclists” which classifies as someone who had ridden their bike in the last 6 months. The survey was conducted so that the male and female participants would answer seven of the same questions and female participants would answer 6 female only questions.

This survey received 33 responses in total.

The first significant question asked about the reasons why respondents rode their bikes. This was



a multiple choice and multiple answer question. It got 81 responses in total, and the most common answer was commutes with 30 counts, the second was leisure with 26 counts, the third was exercise with 20 counts, and last was sport/ race with only 5 counts.

Figure 6 Shows the survey question: What do you ride your bike for?

The following question asked what routes the respondents took when cycling. The bicycle boulevard had the most responses with 15 counts, then the loop with nine, then main campus with 4, and other with 5 counts. These respondents said they had a combination of Main campus and the bicycle boulevard.

1	Bicycle Boulevard (3rd street, Arcadia & Timrid, ect.)	45.45%	15
2	The Loop	27.27%	9
3	Main Campus (UA)	12.12%	4
4	Other	15.15%	5

Figure 7 Table that shows responses to what routes participant took when cycling

The next question asked about the feeling of safety on a scale of one to ten when cycling in Tucson. The most popular response was a seven out of ten with eight counts. The mean of all the responses was much lower standing at a 5.74.

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Feeling of Safety	2.00	10.00	5.74	1.97	3.87	31

Figure 8 Shows statistical table of respondents feeling of safety while riding

The preceding question was aimed specifically at infrastructure in Tucson. Asking what would make respondents feel safer and had them choose between more bicycle boulevards, better cycling lanes, or nothing at all. Only one respondent said nothing at all, and the rest was split evenly between the two other answers.

1	More Bicycle Boulevards	48.39%	15
2	Better Cycling Lanes	48.39%	15
3	Nothing Really	3.23%	1
			31

Figure 9 Shows what would make the respondents more comfortable when cycling

The last question before the gender spit asked respondents what gender they identified as. There were 12 female respondents and 15 male respondents. Three respondents identified as other.

Figure 10 Shows the gender identity of the respondents

1	Female	40.00%	12
2	Male	50.00%	15
3	Other	10.00%	3
			30

After that question the rest of the survey results were answered by female respondents.

The first question asked after the gender split asked the female respondents if they believed in the cycling gap. 41 % answered that they were not sure but that they assume there is one. Then they were asked what factors of cycling make them feel unsafe. This question was multiple choice answer with a total of 23 responses. The number one response was bicycle infrastructure with nine counts and there was a tie between vulnerability of being unprotected and cars with both receiving 7 counts. Tucson heat, other, and nothing collected no counts.

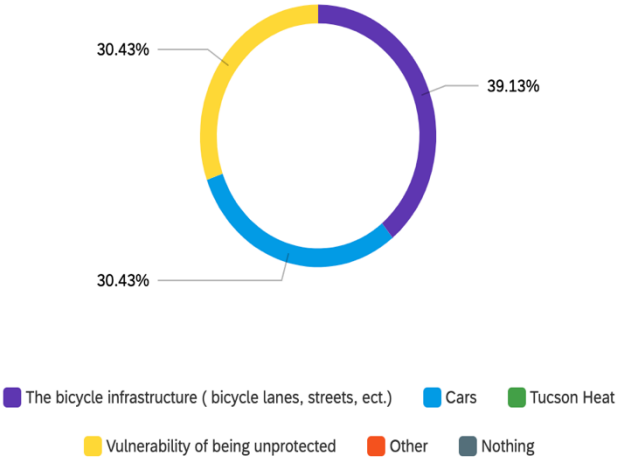


Figure 11 Shows a pie chart of what factors cause the most concern while cycling

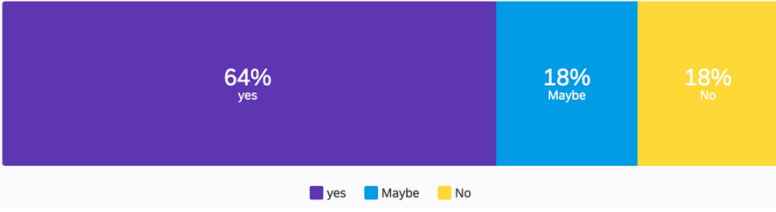


Figure 13 Shows how many female respondents would feel safer riding in a group

The following question asked if the female respondents would feel more comfortable riding in a group 64 % of the respondents answered yes. Of the rest of the respondents 18% said maybe and the rest said no.

The last significant question asked if the women would feel more comfortable riding a bike if the bike lane would physically separate them from cars. Every respondent answered yes.

Figure 12 Shows how many female respondents would feel safer if they cycled in a protected bike lane



### Bike Lock Results

During the Monday observations at the Environmental and Natural Resources building between 12:15 PM and 1:30 PM there were a total of 31 students who came to collect their bikes. Out of those 31, 10 were female and 21 were male. During the observations on Tuesday main library between 12:10 PM to 1:15 PM 27 students were recorded coming to collect their bikes. Out of the 27 students, 7 were female and 20 were male.

Bike Lock Counts	Time	Date	Male	Female	Observations
<b>ENR2</b>	Start Time: 12:15 PM End Time: 1:30 PM	Monday April 10th	21	10	91 degrees  Significant number of male students coming to retrieve bikes.  Many female students came in and out of the parking garage next to the building.
<b>Main Library</b>	Start Time: 12:10 PM End Time: 1:15 PM	Tuesday April 11th	20	7	91 degrees  Same pattern of male students coming to retrieve bikes.

Figure 14 Shows the observational data from the bike lock counts



## **Discussion**

This study focused on the gender cycling gap in Tucson, AZ. The main purpose was to understand what the gap looked like and find out what were some ways to merge the gap. This study wanted to examine how if female riders were given the option to ride in groups and with better cycling infrastructure to support them, that the feeling of safety would increase, and ridership would as well. We conducted surveys and bike lock counts to answer the posed question. We found that around the university there was a gender gap when it came to cyclists near and around campus. The qualitative surveys directed for female participants showed that many female cyclists have the same feeling of safety when riding as males. Results also showed that many of the female's riders had the same conclusion on what would make them feel safer on the road while cycling.

## **Survey Section**

From the survey that was distributed the hypothesis was correct. The survey was conducted so that the male and female participants would answer seven of the same questions and female participants would answer 6 female only questions. This was intended to help understand the differences that male and female participants face when cycling and to help gather qualitative data to gain insight to feeling of safety. First comparison that was made from the survey was what were the different reasons that the participants rode their bikes. The survey showed that males and females majority rode for commutes and leisure. Although female riders had higher rates of commuting than males at 37.5% of females riding for commutes and 34.8 % for males. The results

also showed that showed that more male participant rode their bikes for exercising purposes at 25.5 % than females at only 20%.

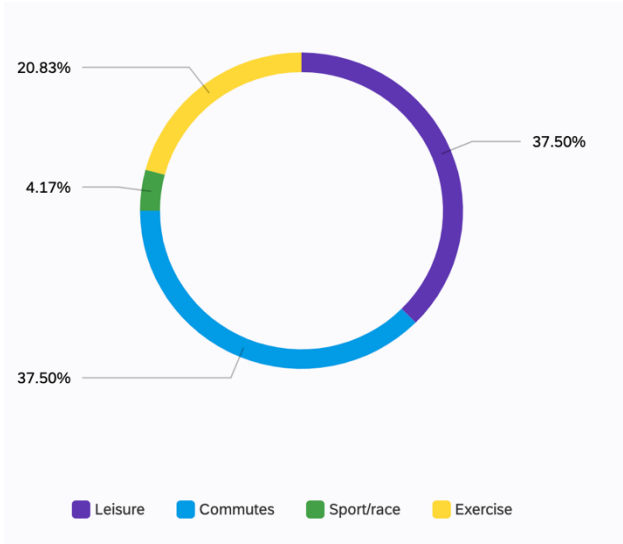


Figure 16 Shows female cycling patterns

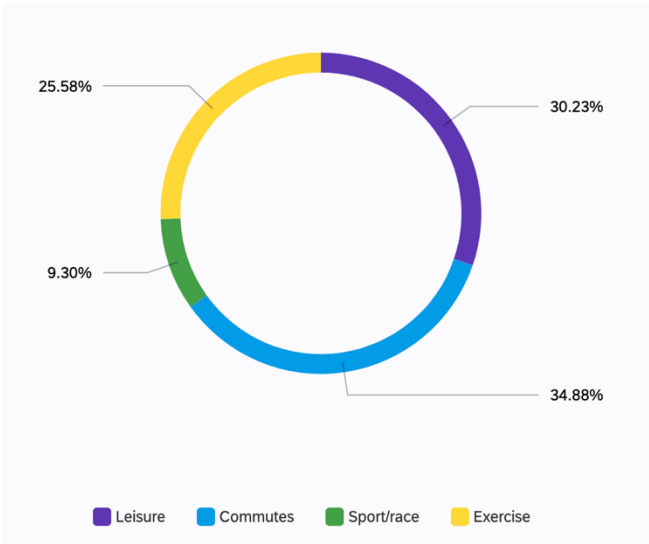


Figure 15 shows male cycling patterns

The feeling of safety was higher amongst the female respondents. When asked to show their feeling of safety while riding on a scale from one to ten the females had a higher maximum and a higher minimum than the male respondents. The women had a minimum feeling of safety at a three and male respondents had a minimum of two. The overall mean of the respondents was similar ranging at around 5. This is a significant finding because it goes against the reasoning of a gender gap. The hypothesized reasoning for this is that male riders have a lower aversion to risk as stated in Carroll et al. (2015). Meaning that male riders might take riskier routes or ride less cautiously than female riders.

Figure 17 Shows feeling of safety amongst male and female riders

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Feeling of Safety	2.00	8.00	5.33	1.96	3.82	15
#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Feeling of Safety	3.00	10.00	5.83	1.95	3.81	12



The last question asked the respondents to choose what gender they identified as. Out of the 33 respondents only 12 identified as female. Although this number seems relatively high it should be pointed out that method one distribution option two, 5 female cyclists were target participants and did not come across the survey via the bike route postings. Almost all male respondents acquired the survey from the bicycle boulevard posting. This goes to show the disproportionate number of female cyclists versus male cyclists on the bicycle boulevard.

### **Female Only Survey Section**

This portion of the survey was designed to collect more qualitative data from female riders. Understanding the feeling towards cycling is important especially when it plays a crucial part in ridership. The first question asked in this part of the survey was if they believed in the concept of the gender gap in cycling. Only three of the 12 female respondents answered with a definitive yes. The participants were not familiar with the concept of the gender gap but given that the highest response was “I’m guessing yes” most of the respondents don’t doubt there being one. This shows that inequality is often normal in most things. Especially when it comes to a physical activity like cycling. The next question focused on the main reasons for concern while cycling in Tucson. The number one response was bicycle infrastructure. This finding correlates exactly with the findings in every study in the literature review.

Figure 18 Shows responses to understanding the gender gap

1	No	0.00%	0
2	I have no idea	33.33%	4
3	I'm guessing yes	41.67%	5
4	yes	25.00%	3

12

The next question was aimed at the idea that female riders would feel safer riding in a group instead of riding alone and 64% percent said they would. It is known that community involvement creates a safer one and when it comes to cycling this statement stands. This finding shows the importance of creating community spaces for females to ride their bikes without being ostracized. Although there are many group rides in the city there are very few female centered rides that specifically seek out those who might be beginner riders. The following question asked if they would feel more comfortable cycling if there was a heavy physical barrier between them and cars. All the female participants answered yes to this question. This was the only question that did not have mixed answers and it further solidifies the importance on protection and what that can do for ridership amongst female riders.

The last question was a written response question that asked the participants what is one thing that would make them feel comfortable riding their bikes more often. Here are the responses:

Figure 19 Shows written responses by female respondents on what would make them want to cycle more

physical barriers (no cars please)

Bike lanes without people walking in them

safer bike paths throughout tucson so I could get around without interacting with cars

protected bike lanes/more bike boulevards

bike lane barriers

Having more bike infrastructure (protected lanes)

Quality roads that are paved well and dirt free would make me feel safer. Most of the times I have fallen off my bike it was been due to sand pockets in the street.

A slow rider line

## **Bike Lock Discussion**

The bike lock data was collected during two days of observations. The observation dates and times were calculated beforehand for optimal setting as described in the method two section. The observation collection shoed that there were similar cycling features at both sites. Both sites had more male students retrieving their bikes from the locks. The count for both days show that a total of 41 male students were seen retrieving their bikes compared to only 17 female students.

When observing the Environmental and Natural Resources building many female students leaving after class were seen going into the nearby parking garage. This gives a clear indication of a cycling gap on campus.

## **Summarized Findings**

When looking at the data there are some clear answers to the questions posed from this study. In the case of Tucson, it has been observed that there is a gender gap in cycling, especially in and around the University of Arizona campus. The data collected during the bike lock observations showed that there were twice as many male students riding their bikes on campus than female students during school hours. The survey also showed that there were more male cyclists riding the bike boulevard. The survey results helped understand why that is. Many women are deterred from cycling because of the inadequate infrastructure the city provides for everyday cycling. In a car centric city with high risk of collision and injury the need for protection is in high demand for female and male riders alike. If the city of Tucson wants to bridge the gap in cycling and create a more equal cycling culture steps must be made to ensure that the bicycle infrastructure can physically separate and protect riders. The city should partner with local non-profits to create female friendly bike rides that can jumpstart a new wave of female focused community work to close the gap.

## Conclusions

This study was focused on the cycling culture in Tucson, Arizona and wanted to observe the severity of the gender gap in a college town where cycling is becoming a common way of transport. This research is a step into the importance of new modes of transport as the city continues to grow and citizens will look more sustainable and cost-effective ways to commute.

This study sought to answer two important questions:

1. How significant is the cycling gender gap in Tucson and what are the main factors that could help merge the gap?
2. What are the similarities between male and female cyclists when it comes to Tucson cycling culture?

When looking at the data collected from both study methods there was significant evidence of a gender gap in and around the University of Arizona. During the qualitative female only data collection one significant main factor was identified that is promoting the gap. All female respondents said that they would feel a stronger feeling of safety with better infrastructure to protect them from cars. This suggests that more women in Tucson worried about being unprotected and having to use inadequate infrastructure over anything else. This seemed to be the main concern for male cyclists as well. These findings solidify the idea that safe and adequate protected cycling lanes are needed for not only a more equitable cycling culture but also a more populated cycling culture. There are simple protective infrastructures that any city can implement into a city. Further research should be done on the economic benefits of high rated cycling infrastructure and how increased bicycle ridership can benefit the local economy of any city. This study experienced

limitations due to weather conditions in the area that led to lower rates of cycling for several months during data collection.

## Works Cited

Cicchino, Jessica B., Melissa L. McCarthy, Craig D. Newgard, Stephen P. Wall, Charles J. DiMaggio, Paige E. Kulie, Brittany N. Arnold, and David S. Zuby. "Not All Protected Bike Lanes Are the Same: Infrastructure and Risk of Cyclist Collisions and Falls Leading to Emergency Department Visits in Three U.S. Cities." *Accident Analysis and Prevention* 141 (2020): 105490. Web.

Song, Lily, Mariel Kirschen, and John Taylor. "Women on Wheels: Gender and Cycling in Solo, Indonesia." *Singapore Journal of Tropical Geography* 40, no. 1 (2019): 140-57.

Carroll, James, William Brazil, Bruno Morando, and Eleanor Denny. "What Drives the Gender-cycling-gap? Census Analysis from Ireland." *Transport Policy* 97 (2020): 95-102

Shaw, Caroline, Marie Russell, Michael Keall, Sara MacBride-Stewart, Kirsty Wild, Dory Reeves, Rebecca Bentley, and Alistair Woodward. "Beyond the Bicycle: Seeing the Context of the Gender Gap in Cycling." *Journal of Transport & Health* 18 (2020): 100871

Dill, Jennifer; Goddard, Tara; Monsere, Christopher; and McNeil, Nathan, "Can Protected Bike Lanes Help Close the Gender Gap in Cycling? Lessons from Five Cities" (2014). Urban Studies and Planning Faculty Publications and Presentations. 123