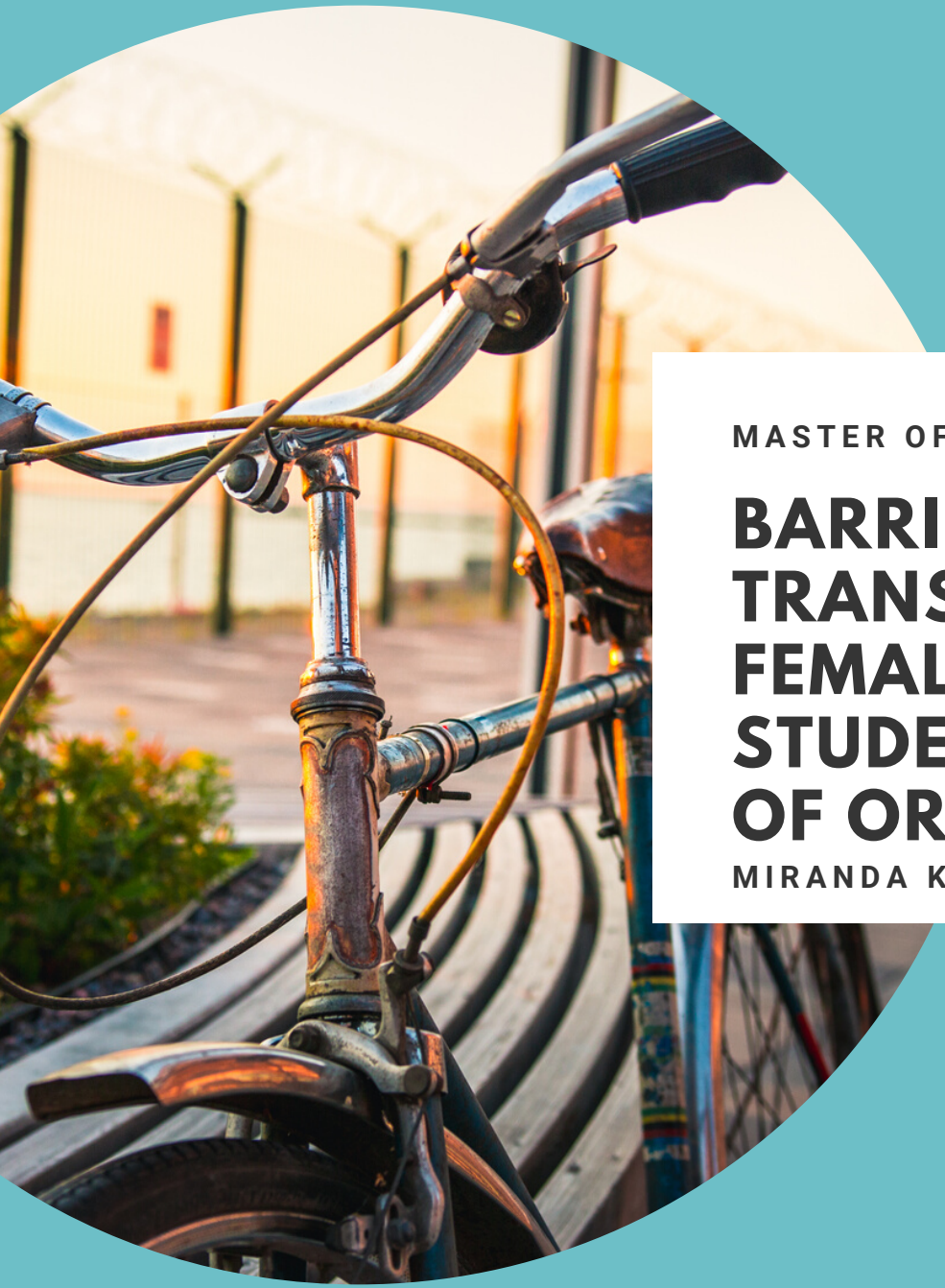

MASTER OF COMMUNITY & REGIONAL PLANNING, 2020

BARRIERS TO ACTIVE TRANSPORTATION AMONG FEMALE-IDENTIFYING STUDENTS AT THE UNIVERSITY OF OREGON

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1. INTRODUCTION

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Communities in the United States are pushing to improve the sustainability of their transportation systems by replacing automobile travel with active transportation. (Schneider, 2013). Active transportation are the human-powered forms of travel, such as walking, cycling and skating (Centers for Disease Control and Prevention, 2017). Active transport must be accessible and accommodate all users, breaking across the gender line for communities to make the shift towards these forms of travel. Identifying and addressing the many challenges in safety, equity and accessibility is required to encourage more users of active transport in communities, college campus communities included.

The University of Oregon (UO), like many campuses wants to promote and increase active transportation. This is due to congestion, high demand for parking and pressures on environmental impacts. The barriers female-identifying UO students—and university students more broadly—face to active transportation needs to be explored more thoroughly for the UO.

This paper identifies the barriers female students at the UO face to active transportation and offers recommendations for how to mitigate these barriers. I will refer to female identifying students as female for the remainder of this paper. I ask two related research questions: 1) What are the barriers that female students at the University of Oregon encounter with active transportation? And 2) what can be done to mitigate these barriers?

This research contributes to the literature on active travel and fills a gap in our understanding of barriers against active travel faced by female college students, in particular UO female students. In addition, this study will inform the University of Oregon of areas of concern that female students have around active travel to campus. The research can also assist the University of Oregon Transportation Services, as well as other universities, as they seek to promote active travel to campus.

2. BACKGROUND

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Located in Eugene, Oregon, the University of Oregon is home to 23,634 students, of which 12,253 are registered as female. Eugene is nationally recognized for being an active transportation friendly community, ranked third overall in the country (People for Bikes, 2019). The University and City of Eugene are making active transportation infrastructure investments on and around the University campus and working to provide car free transportation options (City of Eugene, 2020). A 2018 campus commute survey shows that 50% of students walk as their primary mode for campus trips (University of Oregon Campus Planning, 2018). In contrast, people in Eugene and the United States walk 4.6% and 10.5%, respectively, for their commute (US Census Bureau 2018, National Household Travel Survey 2017). See Table 1.

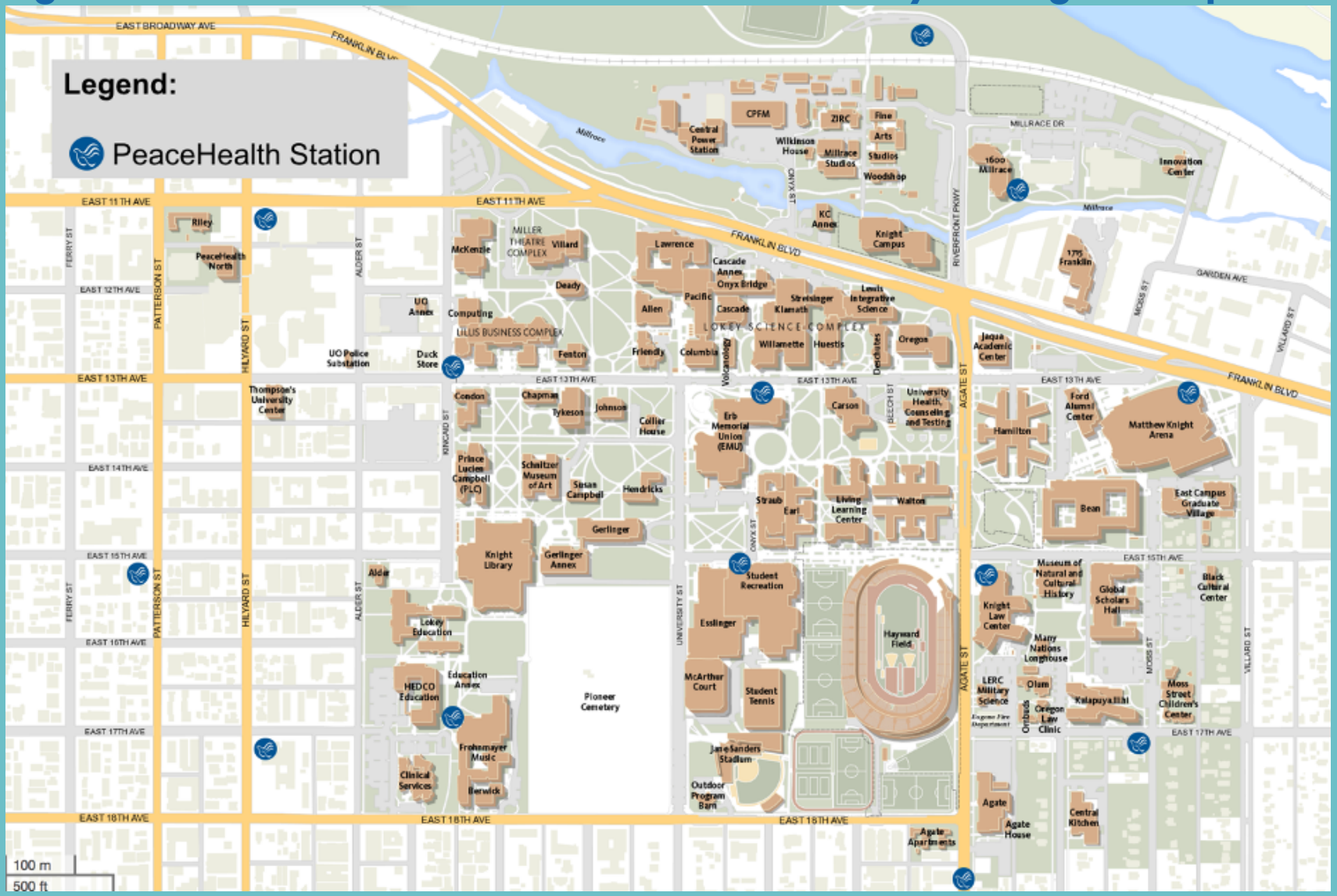
Table 1: Regional Comparison

	UNIVERSITY OF OREGON	EUGENE, OREGON	UNITED STATES
SOURCE	UO Commuter Survey, 2018	American Community Survey 5-Year Estimates Detailed Tables, 2018	National Household Travel Survey, 2017
BIKE	50%	8%	10.5%
PUBIC TRANSPORTATION	18%	6%	1%
FREE CALLS	14%	4%	2.5%
CAR (ALONE OR CAR POOL)	3%	75%	82.3%
OTHER	2%	1%	0.4%

Source: University of Oregon Campus Planning 2018, US Census Bureau 2018, National Household Travel Survey 2017

In 2018, PeaceHealth, a non-profit health care system that owns and operates hospitals, clinics and laboratories in the Western United States, sponsored a partnership between the City of Eugene, Lane Transit District and the University of Oregon to launch PeaceHealth Rides, Eugene's docked bike share system (see Figure 1). Nine stations on the UO campus attract users traveling to and from the university (PeaceHealth Rides, 2020). PeaceHealth Rides offers 15 minutes of free ride time per day and 10 cents per minute for additional ride time for UO students, staff, and faculty. The 2018 campus commute survey showed that 86% of student study respondents did not know about this benefit (Office of Campus Planning, 2018). A UO monthly plan is available for $5 per month that includes 60 minutes of free ride time per day and 10 cents per minute for additional ride time (PeaceHealth Rides | Transportation Services, 2019). Student ID cards also provide free access to all Lane Transit District buses (University of Oregon Transportation Services, 2019).

Figure 1: PeaceHealth Rides Stations on the University of Oregon Campus



3. LITERATURE REVIEW

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3.1. Influences on Active Travel

Active transportation behavior is complex and has a wide range of influences (Bopp et al., 2001). Choosing to walk is associated with connectivity and number of destinations within walking distance, while choosing to take public transit is associated with proximity to transit (Ewing and Cervero, 2011).

Street network and facility design can encourage active transportation and transit use (Cervero et al., 2003). When there is limited access to destinations and street design is unsupportive of active and public transport, automobile mode choice is favored (Ewing and Cervero, 2011). When the built environment accounts for walking and transit, those modes are favored (Ewing and Cervero, 2001).

Sociodemographic traits affect the decision to walk or bike as well as the distance and time of walking and biking trips (Aziz et al.,2006). Higher income people walk less than low income people (Aziz et al., 2006). For commute trips, higher household income decreases the likelihood of walk trips and low income (below $35,000 annual income) increases the likelihood of walk trips (Aziz et al., 2006).

A walking study in Halifax, Canada found that home is the most common origin and destination for walking travel.Dining and shopping is the most common trip purpose. Most walking trips are less than 600 meters (.37 mile) and rarely exceed 1,200 meters (.75 mile). The study suggests walkable neighborhoods be limited to those with destinations within 1000 meters (.62 mile) of the home (Millward et al.,2001). Understanding influences on active transport allows for more effective strategies for promoting active transportation to communities (Bopp et al., 2001).

3.2. Gender Divisions in Active Travel

There is a noticeable gender gap in active transportation in the United States (see Table 2). Research consistently finds that men bike more than women (McDonald, 2001; The League of American Bicyclists, 2012; Jan, et al., 2008; MacArthur et al., 2018). In countries like the Netherlands, Denmark, and other industrialized European countries there are equal or higher rates of female cyclists compared to male cyclists (Dill, 2017; MacArthur et al. 2018). Even in US cities with significant bicycle infrastructure women are not biking close to males rates like their European counterparts. Of total bike trips, women take 55% in the Netherlands, 49% in Germany, 45% in Denmark and 24% in the United States (Pucher and Buehler, 2018).

Table 2: Gender Divisions in Active Travel

STUDY	CITY	FEMALE	MALE
Citi Bike: The First Two Years, Kaufma et al, 2015	New York City	20%	80%
Can Protected Bike Lanes Help Close the Gender Gap in Cycling? Lessons from Five Cities, Dill et al., 2014	Austin, TX, Chicago, IL, Portland, OR, San Francisco, CA, and Washington, DC	23%-33%	67%-77%
National Household Travel Survey, 2009	United States	24%	76%
Gender gap generators for bicycle mode choice in Baltimore college campuses, Abasah et al, 2018	Baltimore, MD	33%	67%
Promoting transportation cycling for women: The role of bicycle infrastructure, Garrad, 2007	Melbourne, Australia	20.6%	79.4%
Are Millennials Really the Generation That Bikes?, Dill, 2017	United States	50%	50%

Gender gaps in biking are particularly true in the United States in unseparated mode and high speed environments where women feel unsafe (Jan, et al., 2008; Baca, 2012). High speed traffic is a significant barrier for female commuters but not male commuters (Mitra and Nash, 2006). A cycling commute study of 15 different locations found that among 6,500 cyclists, 79.4% were male and 20.6% were female (Garrard et al, 2001). The study showed that females prefer using off-road paths rather than roads with no bicycle facilities or roads with on-road bicycle lanes.

Socioeconomic factors of men and women play a role in gender divisions in active travel (Singleton and Goddard, 2016). An Oregon statewide survey asked 30,000 adults about their transportation mode habits. Survey results showed that women who lived alone, were not working, had low education, no driver's license, lived in low-income households and/or were part of zero-vehicle households were less likely to bicycle than other women. Men who lived alone, were not working, had low education, no driver's license, lived in low-income households and/or were part of zero-vehicle households were more likely to bicycle than women and other men (Singleton and Goddard, 2016).

The gender gap is prevalent among a range of age populations. On college campuses in the Baltimore Metropolitan area, females are about 30% less likely to bicycle from home to campus and are more sensitive to environmental and infrastructural conditions than men (Abasahl et al., 2018). Dedicated cycling infrastructure created higher rates of cycling to school, but only among female students (Mitra and Nash, 2006). As a generation, there is close to no gender gap between male and female Millennial bike users, unlike previous generations where the majority of bike users are male (Dill, 2019).

3.2.1 E Scooters and E Bikes

E-bikes and e-scooters are often included with active transportation. A commute study in Portland showed that like bikes, women are not riding e-scooters as often as men. In Portland,15% of men rode e-scooters three or more times a week, while 7% of women rode at the same frequency (MacArthur et al., 2018).

E-bikes offer solutions to some of the concerns that women have toward biking, such as topography, carrying cargo and being able to keep up with others when compared to males (MacArthur et al., 2015.). MacArthur et al. (2015) found that in Portland, e-bike utilization was male dominated, with males taking 76% of trips and women making up the remaining 24%. Over time, MacArthur et al. (2015) predicts the motor assist from e-bikes will help to generate more trips, longer trips and different types of bicycle trips, particularly by those who don't feel safe doing so on a regular bike.

3.3. Barriers to Active Travel

Barriers to active travel can include topography, cargo needs, physical ability, time and distance of trip and sense of safety (MacArthur et al., 2015). Lack of bicycle infrastructure and not feeling safe in traffic is a barrier for all ages (Dill, 2017). However, women and men exhibit differences in attitudes, preferences, and behaviors towards transportation; as a result, these shared barriers affect the genders differently (Beirão and Cabral, 2008).

Although men and women experience similar environmental opportunities and constraints, their perceptions in terms of safety and feasibility of alternative transportation modes differ (Akar et al., 2013). Females are more sensitive to topography and weather (MacArthur et al., 2015). Sixty-four percent of females identify hills as a barrier for biking while 49.9% of males are bothered by them (MacArthur et al., 2015). Keay (1992) found that higher rainfall caused a decline in cyclist volume with 50% decline of women cyclists in slight rain.

Women fear and are more likely to face sexual harassment and violence during their daily commutes, encouraging them to choose modes that do not require them to be commuting alone in dark places (Dunckel-Graglia, 2013; McGuckin and Murakami, 1999). Gender differences in risk aversion make it so female commuter cyclists prefer to use routes with maximum separation from motorized traffic (Garrard, 2008; Jan, et al., 2008). Separating bicycles from motorized traffic, improving safety in bicycle facilities, and enhancing public knowledge about bike routes promotes biking among female students (Abasahl et al., 2018).

An apparel design criteria study showed that for women to feel comfortable using active transport, their clothing must be functional for walking or biking, and appropriate for their work-place (Lastovich, 2013). In the all-female study, every participant mentioned the importance of fabric, fit, and aesthetic of the garment they wore when actively commuting to work (Lastovich, 2013).

3.4. Student Travel Patterns

There is much literature on active travel by elementary, middle, and high school students, largely due to Safe Routes to School, a national partnership to improve, educate and encourage safe walking and biking to school, and the examination of the effectiveness of the program (Cornwall, 2018; Beck and Nguyen, 2017; McDonald, 2012). Among American children (5-18), ineligibility for school bus service (due to distance the child lives to school) is strongly associated with walking or bicycling to school (Beck and Nguyen, 2017). Males walk and bike to and from school two to three times more than females (McDonald, 2012; National Household Travel Survey, 2018). Of these school-aged children (5-18), 46.6% ride in passenger vehicles for school trips (Beck and Nguyen,2017).

3.4.1 University Student Travel

Chen (2012) found that university student travel behavior is different from that of the general population, as the majority or their trips are to campus (work) and home, and in non-urban campus communities. Also, students necessities are in closer proximity which makes walking or biking more feasible (Chen, 2012). Chen (2012) found that urban universities have less active transportation trips than college-town universities, on-campus students make more frequent trips than off-campus students and most trips are for home and academic activities. Perceived norms and the level of control students had over their method of transportation—due to social norms and lack of knowledge and access— are important contributions to active transport use (Chaney et al., 2014).

Information appears to be a viable strategy for prompting travel behavior change among college students. An experiment where transportation information was provided to incoming college students before they selected a residential location revealed that students who were given transportation information prior to their housing selection traveled 68% fewer km/day by car and chose to live closer to the university and transit stops compared to the control group of students who were not given the information (Rodriguez and Rogers, 2014). Similarly, incoming graduate students at UCLA showed that behavioral change campaigns targeted towards recent movers and those preparing to move are effective in encouraging active transportation (Ralph and Brown, 2017).

Universities, including the University of Oregon are considering sustainable transportation (active transportation and public transit) in their campus transportation plans, and beginning to make infrastructure improvements for greater transportation options and provide enhanced education to students (University of California, Los Angeles, 2019; University of Washington, 2020). American universities and public transit agencies have created an arrangement called Unlimited Access, where universities pay transit agencies for the campus community ride fares (Brown et al., 2017). The partnership provides “free” transit service for all students. With the program, at the University of California, Los Angeles, bus ridership for campus commuting increased by 56% during the first year and single passenger driving trips lowered by 20%. These changes in car dependent Los Angeles suggest that Unlimited Access can be successful almost anywhere (Brown et al., 2017).

At the University of Florida, the transportation demand management (TDM) system emphasized active transportation. Partnerships between the university local transit and bikeshare helped to create a 284% increase in active transportation use between 1995 and 2008 (Bond and Steiner, 2006). The National University of Malaysia conducted a study to find out how their students are traveling as a first step to increase sustainable transportation. Schedule inefficiency and comfortability level were the main barriers that prevent public transport, walking and biking use for campus trips (Norzalwi and Ismail, 2011).

3.4.2 Female University Travel

A Baltimore college campus analysis shows that college women are more sensitive to environmental and infrastructural conditions then college men and are 30% less likely to bicycle from home to campus (Abasahl et al., 2018). Undergraduate females are less likely to bike to campus than other group of students. High speed traffic, far trips, longer travel times, lack of access to a bicycle, access to cars and an unsafe environment turn females from bicycling (Mitra and Nash, 2017). The integration of bicycle and transit services, advancing infrastructure, separating bicycles from motorized traffic, improving safety in bicycle facilities, and enhancing knowledge about routes promote bicycling among females (Abasahl et al., 2018). Access to dedicated cycling infrastructure and high business density are associated with slightly higher odds of cycling to school (10.3% without access to 11.6% with access), but only among female students (Mitra and Nash, 2017).

Females of all ages use active transportation less than males, due to lack of appropriate infrastructure and information. Limited research, however, has examined the gender gap in active travel specifically among university students and if female students face unique barriers to active travel.

4. DATA AND METHODOLOGY

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To identify the barriers that female students at the UO face against active transportation and the actions to mitigate these barriers, I held four focus groups with UO students. One focus group was male-only and three were female-only. Each focus group had 10-12 participants (42 individuals total—30 female, 12 male). Recruitment of participants took place via email to student organizations on campus. Student organizations included Undergraduate Women in Business, Sororities and The Women's Center to gather a variety of participants. Focus group space was filled on a first come, first served basis. No compensation was given. Students were very willing to participate in this study and agreed that this is a topic that needs attention at the UO campus. Participants were fluent English speakers and no part of the study activities were carried out in a language other than English. Focus group discussions lasted an average of 57 minutes. See appendix A and B for the discussion guide and survey.

Focus groups were used for this study in order to pull out specific details from the study respondents about their active transportation barriers and their thoughts on mitigation actions. Once discussions started, it did not take long for conversations to flow between study respondents. When I would ask a question from the focus group guide, respondents would answer and immediately expand on the topic. A survey was administered to each respondent at the beginning of each focus group to gather demographic and transportation mode data of participants.

Focus group discussions were analyzed to understand the barriers that female students face when using active modes for campus travel and how their perceived barriers differ, if at all, from male students. This study used a sample of the UO student population and did not survey or conduct focus groups with all UO students. This small sample of students is relatively similar in demographics of that of the overall University population. Like the University's student population, the majority of study respondents were white/Caucasian. The study respondent pool was graduate student dominant whereas the UO student population is undergraduate student dominant (84% UO population are undergraduate, 16% of study respondents are undergraduate). Study respondents were similar to student race/ethnicity makeup at the UO (see Table 3) .

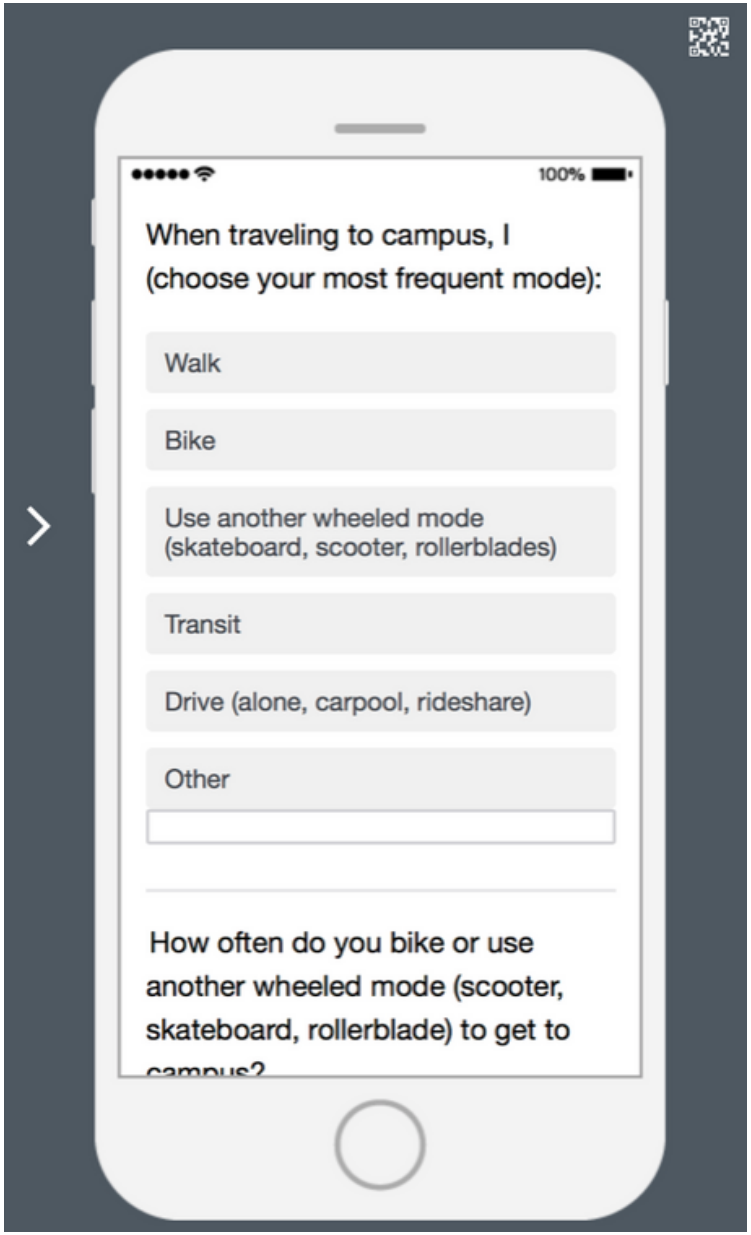

Table 3: UO & Study Demographics

	UO Student Population, 18-19	Study Participants, 2020
Total Students	22,760	42
Undergraduate	84%	16%
Students of Color	19%	22%
Demographics		
Hispanic or Latino	12%	18%
Black or African American students	2%	8%
White / Caucasian	60%	78%
Asian	5.90%	11%
American Indian or Alaskan	0.70%	3%
Native Hawaiian or other Pacific Islander	0.40%	0%
International students	10.50%	-
Students of two or more races	7.40%	0%
Gender		
Females	54%	69%
Males	47%	31%
Primary Mode for Campus Trips		
Walk	50%	57%
Bike	18%	7%
Pubic Transportation	14%	19%
Car (alone or car pool)	3%	17%
Other	1%	0%

Source: University of Oregon Campus Planning 2018, University of Oregon

Walking was the most common mode for campus trips among female and male study respondents (63% and 50%, respectively), parallel to the findings of the 2018 UO commute survey (55% of women and 38% of men). Unlike many previous studies, females in the focus groups walk and bike more than males (see Table 4 and 5).

Table 4: Study Respondent and UO Student Primary Mode for Campus Trips

	Female Study Respondents	Male Study Respondents	Female Respondents, UO Commute Survey, 2018	Male Respondents, UO Commute Survey, 2018
Walk	63%	50%	55%	38%
Bike	7%	0%	12%	30%
Transit	19%	25%	12%	15%
Drive (alone, carpool, rideshare)	11%	25%	17%	17%

Source: University of Oregon Campus Planning 2018

Table 5: Study Respondent Transportation Knowledge and Access

	Female Study Respondents	Male Study Respondents
Know that your Duck ID is a bus pass that lets you ride LTD buses for free	85%	100%
Has used PeaceHealth Rides bikeshare system	67%	50%
Knows that you get 15 minutes of free PeaceHealth rides bikeshare use every day as a UO student	75%	25%
Access to a personal vehicle in Eugene	74%	67%

PeaceHealth Rides student usage and access to personal vehicle access data were not collected in the 2018 UO commute survey.

5. FINDINGS

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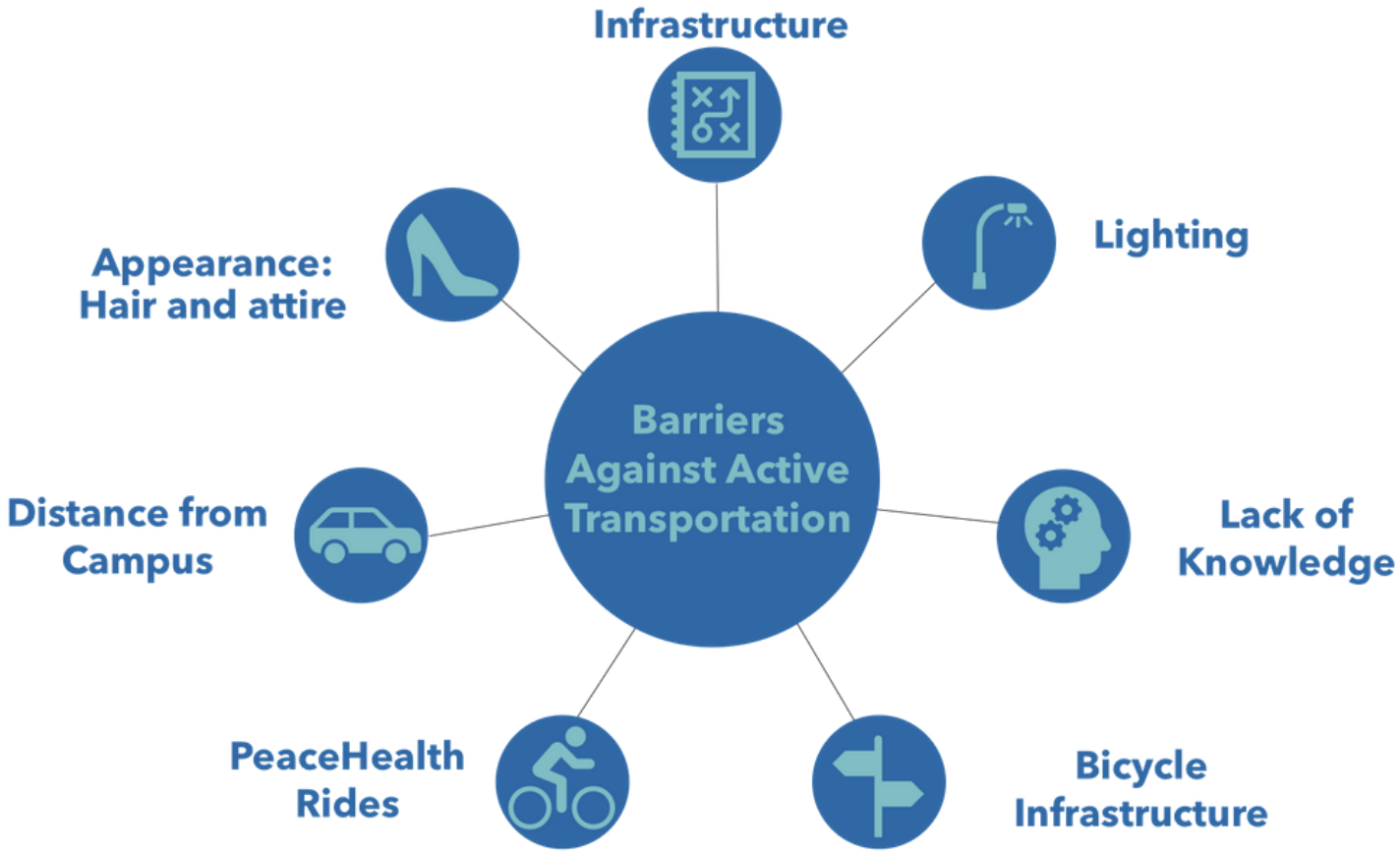
By conducting 4 focus groups, I identified the following themes among barriers and concerns students voice about making travel mode decisions for campus trips: lighting, lack of knowledge of bicycle infrastructure (including bikeshare), distance to campus, and personal appearance.



5.1 Infrastructure

Nineteen percent of female study respondents and 8% of male study respondents felt infrastructure was a barrier to actively commuting to campus. This was the largest gender gap in survey responses of the study, with an 11% difference between male and female study respondents. Discussions of bike lane infrastructure raised concerns of not knowing if it was actually safe to bike on the streets with "bike symbols" or if those symbols were just for show. Male study respondents expressed that Eugene was too accommodating for bikes and at times caused inconveniences for pedestrians, especially around campus where they perceived that bikers dominate space. Both male and female study respondents were not concerned about being separated from car and pedestrian traffic. The study respondents instead would prefer more clarification (directional signage) and compliance of the existing system. For example, they would like users of the Alder Street bike facility to bike within the lanes, travel in the appropriate direction, and use hand signals when turning. One respondent explained their perception about bike infrastructure as:

"I just don't like when people bike all over the place. If anything, Eugene and UO are overly accommodating to bikes. Why do they [bikers] need to weave in and out into where the cars and people are? I am on board for bikes and them having a special place, but if they have their own space—which they do—they need to stay there. I just don't see why they can't follow the rules. They don't even ride in the right direction or stop at signs. If you did the things bikers do in a car you would get a ticket or hurt someone".

5.1.1 Lighting

Of the study respondents, overall infrastructure (bike lanes, sidewalk, lighting, potholes, etc.) was not viewed to be as high of a barrier compared to other categories. However, with discussion, specific infrastructure—lighting—was concerning for both genders. All female participants felt that campus (and Eugene as a whole) was not well lit and were very concerned about safety when out at night. Female focus group respondents reported fears of people hiding in bushes and dark corners, assault, and cat-calling, which kept them from wanting to walk or bike home in the dark. Women in all three focus groups and men in the male- only focus group discussed the severity of cat-calling from homeless people and men along streets commonly used for campus commutes. One woman's comment, "I can't even go get a coffee between class without some random guy on 13th [street] making a comment about my looks", made the other respondents erupt, and share their similar personal experiences with cat-calling on campus and the surrounding corridors. These experiences and fears often made female respondents call a ride share (e.g. Uber or Lyft) or request that a friend (often male) to escort them home. Concerns about lighting were heightened on weekend days for going home trips in routes close to campus.

All male study respondents also had lighting concerns, but their concerns were primarily directed at safety for women rather than themselves. Male study respondents unanimously agreed that when a female friend or colleague was walking home from the campus area they, "would not let a women walk home in the dark, especially on a weekend, because who knows who is hiding in the dark". They agreed that their concern has nothing to do with the strength of women, but they felt that women's' vulnerability was heightened at night due to the combination of low street lighting and a large homeless population on routes home. One male focus group participant expressed concern over a lighting issue for himself at night, saying that he is concerned about the possibility of people hiding in the trees during his walk home from campus. Male study respondents expressed heavy concern over lighting on campus in routes to the Student Recreation Center (REC), particularly during school breaks when there is minimal people traffic on campus and poor lighting making it feel spooky. All study respondents do not feel comfortable being in close proximity, including walking on the adjacent paths, to the Pioneer Graveyard because they felt that it is dark and scary.

5.2 Lack of Knowledge: Bicycle Infrastructure & PeaceHealth Rides

Part of the reason study respondents were not concerned with bike lane infrastructure is because they did not know where it was, nor if they would feel comfortable using it. Male and female study respondents discussed that the only bike facilities they knew about were the "Walk to Autzen" and the "bike path next to 7-11". The "Walk to Autzen" is a bike and pedestrian path connecting the University, across the Willamette River, to UO sports facilities (Auzten Stadium—football, and PK Park—baseball). This route is a rite of passage for UO students. The "bike path next to 7-11" is the two-way Alder Street Bikeway that runs north-south adjacent to campus and is next to a 7-11 shop.

Sixty percent of all study respondents have used PeaceHealth Rides. More female participants have used PeaceHealth Rides (67%) than male participants (50%). Forty-three percent of study respondents knew that as a UO student they receive 15 minutes of free PeaceHealth rides bikeshare use every day. Of the students that knew about the free 15 minutes, 83% percent of female and 75% of male students have used the bikes. Of study respondents who had used bikeshare, there was an even distribution of those who knew they got 15 minutes free and those who did not know they got a free 15 minutes. Study respondents who have used bikeshare and did not know it was free were disappointed they had not known about the student perk before. Male study respondents that don't use PeaceHealth did not report anxiety around riding the bikes. Female study respondents who have not used the bikes expressed concern using the PeaceHealth bikes (and biking in general) because they had not ridden in years and were not sure if they will be able to operate the PeaceHealth bikes because of their weight and size. One female study respondent stated, "They [PeaceHealth bikes] are so big and heavy I feel like I am going to fall over. It's also really hard to turn corners with them". Several study respondents (both male and female) were unsure how to use the bikes (how to set up and use the PeaceHealth Rides phone app, properly locking the bike, locking the bike in the correct location, being overcharged for incorrect drop-off location). In one female-only focus group, study respondents all agreed to a respondents comment about the PeaceHealth Rides phone app who said, " The app is not nearly as straight forward as it should be. It always glitches or I get charged a totally different amount than I agreed to". Focus group respondents unanimously agreed that they did not learn about PeaceHealth Rides from UO orientations or events. Instead, they were shown the service by students who were already familiar with the bikes or from recognizing the system from other cities with bikeshare. In focus group conversation, male and female respondents (bikers and non-bikers) agreed that bikeshare looks fun.

5.3 Distance from Campus

Slightly more female study respondents (45%) report logistics (faster to use other modes, live too far away, need a place to stow belongings, do not have access to a bike, unable to walk, etc.) as a barrier to walking or biking to campus compared to men (38%). Neither male or female study respondents expressed concern about stowing their belongings and all were physically able to walk. When making transportation mode choices for campus trips, study respondents agreed that distance was a barrier to walking or biking to campus. On average, study respondents lived .92 miles from campus. Seventy-eight percent of study respondents live within 1 mile of campus. Ninety percent of study respondents bike or walk to campus if they live within one mile of campus. Zero percent of those living further than one mile (21% of study respondents) walk or bike for campus trips. All study respondents living further than one mile from campus (21%) take transit (12% of study respondents living further than 1 mile) or car as their primary mode for campus trips. Male and female study respondents that live further from campus (1 or more miles) generally choose to drive because they have access to a car and do not want to spend the time to take public transit (1 hour or more due to bus transferring), walk or bike for campus trips. Study respondents who drive to campus were all graduate students and chose to live farther away from campus because of cost of living, anticipated a high level of public transportation service but found it to be inadequate, and/ or wanted to live outside the neighborhoods dominated by student housing. These study respondents all have University parking passes and park in lots far from the educational campus buildings, requiring them to take the EmX (Eugene's bus rapid transit service) or walk about 20 minutes to campus from the parking lot (except for one study respondent who rides with a family member who has a UO employee parking spot closer to campus). Drivers of this study lived over 1 mile from campus. They agreed that if they lived closer or there was better public transportation options they would not drive. Sixty-nine percent of all study respondents have access to a personal vehicle in Eugene (74% of women, 67% of men).

Male and female study respondents who walk for campus trips agree that they walk because it is convenient, and it is too expensive and would take more time to drive because of limited parking. One participant explained that, "Even if I'm running late for class I'll just run or something. There's no way I'll drive because I probably won't find a spot, making me even more late. And then I'll get a parking ticket anyway because the meters never work". They also discussed that when choosing to take active transportation or public transportation for non-campus trips, they did not feel comfortable in choosing a non-car reliant route. All male study respondents know that their Duck ID is a bus pass that allows them ride LTD buses for free; 85% of female study respondents were aware of this service (88% overall).

5.4 Appearance: Hair and attire

Social factors (friends drive, grew up driving, dress code for work, do not want to get helmet hair, etc.) were a barrier for both women (19%) and men (17%). All male and female study participants were concerned about their appearance when choosing how to get to and from campus, albeit not as concerned as they were about the above issues. Male study respondents were concerned that they will arrive to campus sweaty if they bike, as some reported being "naturally sweaty people". These men do not want to bike for campus trips in fear that they will look bad when they get to class but were not worried about being sweaty after other trips, like going to the grocery store or to a friend's house. Female study respondents were concerned about their hair and precipitation when choosing how to get to and from campus. Neither female study respondents who always wear a helmet when riding a bike nor those who feel comfortable riding without a helmet will bike if they need to arrive looking nice and will instead walk regardless of weather. Study respondents agreed that their appearance concerns were relatively low due to the Eugene's causal culture and might be different if they were in a different city. One respondent said, "It helps that no one cares what you wear here".

6. DISCUSSION AND RECOMMENDATIONS

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Despite the barriers against active transport identified by the women in this study, their rates of walking and biking are still greater than their male counterparts, unlike previous research which found that all women bike and walk at lower rates than men (McDonald, 2001; The League of American Bicyclists, 2012; Jan, et al., 2008; MacArthur et al., 2018). College age women have been found to walk and bike less than college-age men do to being more sensitive to environmental and infrastructural conditions than men (Abasahl et al., 2018). The results of this study agree with previous research that found females are more concerned than men about environmental and infrastructural condition concerns when choosing active transport (MacArthur et al., 2015).

Unlike female respondents from other studies (MacArthur et al., 2015), female respondents from this study did not express cargo concerns when choosing a mode for campus trips. This could be because study respondents live close enough to go home quickly and easily or do not have children to consider. This could also contribute to why the gap between male and female study respondents biking and walking rates was closer than previous male versus female studies.

Female study respondents expressed concern for the following barriers against active transportation: infrastructure, with lighting being their biggest concern, lack of knowledge of about bicycle infrastructure, the distance and convenience to campus from their home, and appearance.

When making recommendations, the barriers identified in this study and the long term campus goals were considered. The UO long-term transportation plan (1976) aims to create a Local Transport Area that is one to two miles in diameter around the campus. Within this area, University policies are to " encourage the use of pedestrian, bicycle, and public transport as modes of travel while discouraging the use of private cars". The purpose of the plan is, in part, to establish "transportation modes which provide inexpensive, safe and convenient access to campus facilities shall be employed" (University of Oregon: Campus Planning Committee, 1976). Partnerships and education are the biggest opportunity for mitigating the barriers women face against active transportation. Encouraging active transport among women and the university population while planning for the safety and convenience of campus travelers would adhere to the goals of campus planning.

6.1 Infrastructure

Overall, study respondents were not as concerned with overall infrastructure barriers as they were about other barriers, and women showed more concern then males (19% and 8%, respectively). However, this 11% gap of infrastructure concerns between genders supports previous research that found women are more sensitive to their environment when choosing a transportation mode than men (MacArthur et al., 2015).This study found that although infrastructure overall was not a big concern, lack of lighting was female study respondents' biggest barrier to active transportation for campus trips because they felt unsafe.

Men and women experience similar environmental opportunities and constraints, but their perceptions of safety and feasibility of alternative transportation modes differ (Akar et al., 2013). Women fear and are more likely to face sexual harassment and violence during commutes, encouraging them to choose modes that do not require them to be commuting alone in dark places (Dunckel-Graglia, 2013; McGuckin and Murakami, 1999). The women of this study showed these same concerns.

Future infrastructure projects could include improving the lighting (lightbulb replacements on existing structures and additional street lighting and campus path lighting installed) in areas surrounding the university, including neighborhoods and alleys, to address the female concerns identified by study respondents. There is an opportunity for collaboration to improve the transportation network and encourage active transportation.

Partnerships between universities and the city they reside in should be utilized to make the improvements along campus trip routes and encourage active transport. A partnership between the UO and City of Eugene can be utilized to design and build active transportation systems that address the infrastructure concerns reveled in this study, such as lighting infrastructure. UO Transportation Services may also consider partnering with the UO student group LiveMove, which focuses on livable cities and does a ByDesign project each year. A ByDesign project is a project created by the group that aims to tackle infrastructure issues that prevent safe and easy active transportation to campus, such as mode separation and lack of shared lane markings. These partnerships should be used as a catalyst for projects that will improve the built environment and encourage travel mode decision changes among women for campus trips.

6.2 Infrastructure Knowledge: PeaceHealth Rides and Bike Network

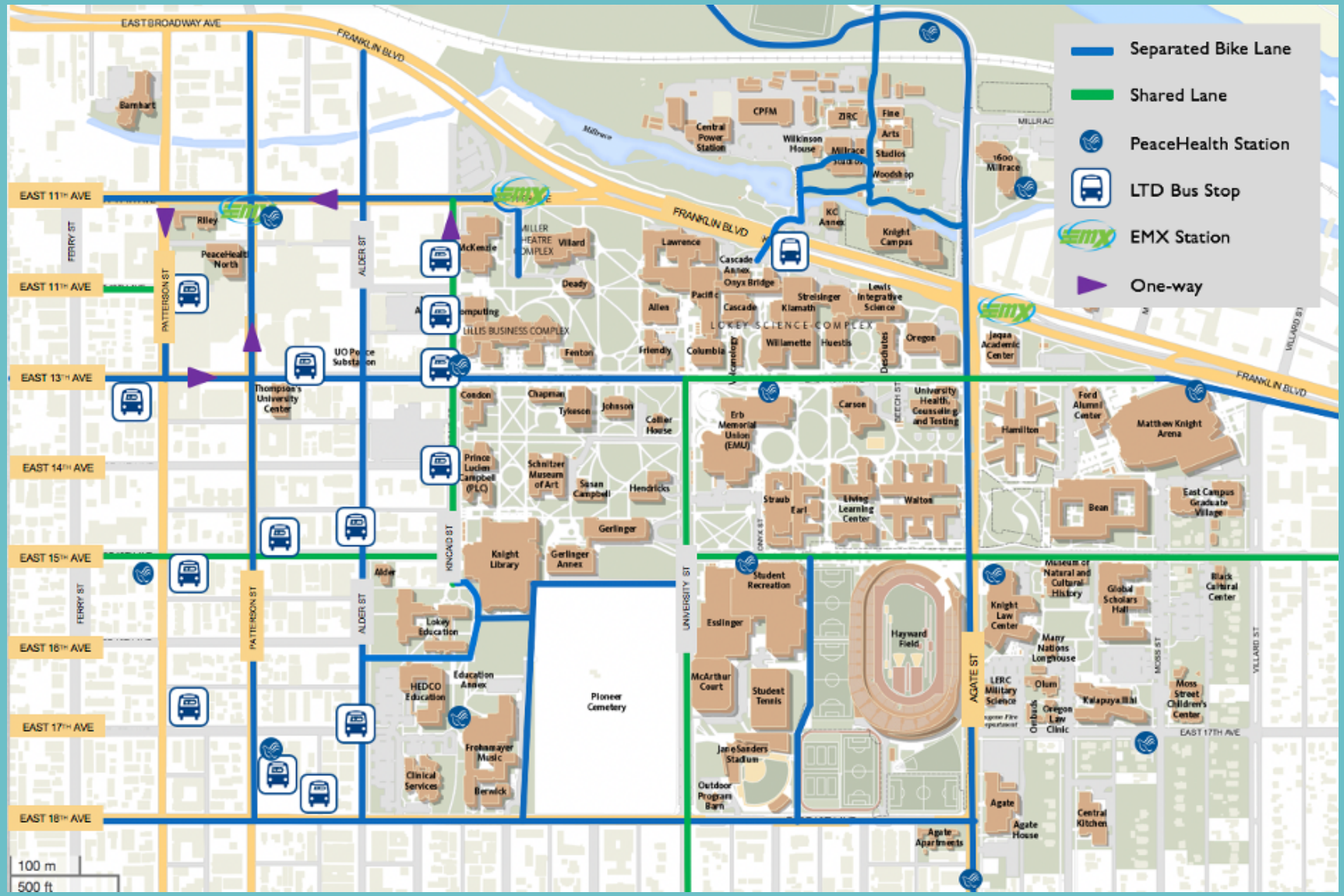
Focus group participants agreed that a factor in why they didn't bike, even if they felt comfortable doing so, is because they did not have a bike or know how to use PeaceHealth Rides, did not know where bike paths are, or did not know how paths will get them to their destinations. Ralph and Brown (2017) found that behavioral change campaigns that provided transportation network information to recent movers and those preparing to move are effective in encouraging active transportation. The University and PeaceHealth can work together to target female students (and other groups if desired) to increase active transportation use.

To bring awareness to bicycle and walking infrastructure and options, active transportation information can be provided at housing fairs when students are making upcoming housing decisions and for new non-student residents. Flyers can be put on bulletin boards, in table inserts at the EMU (student union), in campus cafes, dining and residence halls, and on social media. This can promote active transport for students, especially incoming students who are new to Eugene and might not have access to a vehicle on campus. Targeted marketing efforts can be made at female friendly areas such as the women's hour at the REC and in the Women's Center.

To assist in the biking logistics, a map of the University and the surrounding areas can be used to inform students where biking and walking facilities are located (including PeaceHealth stations and the Outdoor Center for longer term bike rentals). See Figure 2. This map can be added as a layer to the campus map that is provided on the University's website. The map can be made into a foldable handout to distribute at IntroDUCKtion and other events for incoming students and visitors and made into a usable mobile map available on the University's social media. Step-by-step instructions can be placed at the PeaceHealth stations and on hang tags that are attached to the bikes (like the May is Bike Month tags) at the beginning of the school year to invite new users. Student led (possibly by LiveMove students) bike rides can be held for interested students. These rides can have themes, like "women who bike" that encourage new female users to ensure continued female active transportation use for campus trips. Wayfinding destination signs can be used to connect the campus network with the rest of Eugene. The wayfinding signs should be the same aesthetic style as the current wayfinding signage to avoid confusion among users.

To increase active transportation usage among women (and the student population) it is essential that the University work with the City of Eugene, PeaceHealth Rides, off-campus housing and internal departments at the UO (like campus housing) to continue encouraging and promoting active transportation.

Figure 2: Campus Map with Active Transportation



6.3 Distance & Convenience

Previous research finds that a lack of quick and easy access to destinations, auto-oriented street design, and non-accommodating active and public transport street design increase automobile mode (Ewing and Cervero, 2011). These findings remain true in this study. Study participants reported that when they live close to school, walking is often the fastest and easiest way to get campus and when they live farther, driving is. Sixty-three percent of female study respondents walked to campus while only 50% of males walk for campus trips. Similarly, 7% of females bike to campus and 0% of males do. It is unrealistic to assume access and knowledge of bicycle and pedestrian systems will make students walk or bike to campus if it still takes substantial time and they have access to a car. However, the partnerships and promotion previously explained can help to encourage new active transportation users and more active transportation trips among women.

Policies that deter people from driving to school who live within a reasonable walking or biking distance should be implemented at the UO to help students establish transportation habits that do not revolve around a car. No personal vehicles allowed for students who live on-campus should be considered by the UO to encourage new students to learn and utilize active transportation options. This policy will allow students to learn how to get around Eugene without being reliant on a personal vehicle, making them better equipped to make active transportation campus trips when they move off campus. A parking pass price system should be created to prioritize passes to those who are not in a reasonable active transportation distance and raised for those who live within walking and biking distance. This system will nudge those who live within walking and biking distance to use active transport for campus trips (metrics of the pricing system to be decided by Transportation Services). The University's long-term transportation plan (1976) says that while discouraging the use of private cars, "those who benefit from parking on campus should pay the cost of doing so". The UO should regularly dedicate funding to transportation services such as the Designated Driver Shuttle and SafeRide that already exist at the University. This will provide students with a safe and free transportation option for when they do not feel comfortable walking or biking home, that does not require them to own a personal vehicle.

6.4 Appearance: Hair & Attire

Female study respondents agreed that appearance barriers against active transportation were low due to the Eugene's causal culture and might be different if they were in a different city. This could also contribute to why their appearance concerns around active transport were lower and their usage for campus trips was higher than previous studies in similar environments (Abasahl et al., 2018).

Non-college women have been found to care heavily about the comfortability of their attire when choosing to walk or bike for trips (Lastovich, 2013). Study respondents did not show concern about the comfortability of their attire when biking or walking. Study respondents did express concern over precipitation and needing to look nice for presentations and work. Appearance preservation was not the biggest barrier among female study respondents, but it was still a barrier.

Because appearance plays some role in the decision of mode for campus trips among women, these issues should be considered in active transport encouragement. A "Women Who Bike" campaign can be utilized to normalize and encourage women using active transportation for campus commuting. The campaign can show that female students who bike for campus trips can still wear normal clothes (and not road biking gear), don't need excessive extra gear or be an extreme environmentalist. The partnership could include the Women's Center and other individuals or organizations who already bike for campus trips to show that the real women can and do bike.

The UO can encourage using the REC shower and locker facilities for those who want to bike and not be sweaty or to store a change of clothes.

7. CONCLUSION

7. CONCLUSION

The University of Oregon (UO) is pursuing strategies to promote and increase active transportation because of congestion, high demand for parking and pressures on environmental concerns. The barriers female UO students—and university students more broadly—face to active transportation are essential when making infrastructure and programing improvements.

I conducted focus groups and conducted surveys to 42 UO students to discover: 1) What are the barriers that female students at the University of Oregon face against active transportation? And 2) what can be done to mitigate these barriers? Study respondents said that lighting, distance to campus and lack of service knowledge are the barriers identified. Infrastructure improvements, service promotion and encouragement can mitigate these barriers.

This research contributes to the literature on active travel and fills a gap in our understanding of barriers against active travel faced by female college students. Female college students are similar to non-college females as they are most concerned with their safety when choosing to use active transport. Like non-college women, the women in this study are susceptible to changing their mode habits if they are provided information about alternative options. The UO women in this study were different than college women in previous college active transportation studies because they biked and walked at higher rates than their male counterparts.

This study informs the University of Oregon of areas of concern that female students have around active transportation when traveling to campus. These results could assist the work of campus planning in their goals of establishing, "transportation modes which provide inexpensive, safe and convenient access to campus facilities" (University of Oregon: Campus Planning Committee, 1976). Study results can assist the University of Oregon Transportation Services, as well as other universities, as they seek to promote active travel to campus. When applying active transportation lessons from previous research, the UO and other universities must consider the unique features of their institution. Further research needs to be done exploring how information given to incoming students who live on campus affects active transportation use and the role hosted walks and bike rides from campus plays in active transportation use.

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APPENDIX A

Barriers to Active Transportation Discussion Guide

INTAKE SURVEY (15 minutes, see appendix B)

As people enter room, ask them to do a survey and make a nametag. Make sure they are finished with the survey before starting the discussion.

INTRODUCTION [5 min]

Discussion leader: Hello, my name is Miranda, and I am a graduate student at the University of Oregon.

I will be your discussion leader today and will be taking notes during the discussion.

I will also be audio recording today's meeting so I can review your comments at a later date and make sure I understand and hear your comments correctly and thoroughly. The tape will only be used so that I can review our discussions to help me write my report. The tapes will not be used for any other purpose, and what you say here is anonymous.

This discussion is part of a study to identify the barriers female identifying students face against active transportation to/from campus and how these barriers can be addressed.

I am holding several discussions with a variety of student groups this month. Some of what we discuss today will help to make recommendations to improve active transportation around the University. I appreciate your willingness to help us out with this.

There are a few ground rules for the discussion.

1. I want you to feel free to speak your mind – there are no right answers or wrong answers, so please say what you think. I expect that there may be differences of opinion and that is okay, in fact, I want to bring those out.

2. I want all of you to express your views, so please speak up—you don't have to raise your hand. From time to time, I may go around the room and ask each person to say a few words on the topic. If somebody is being quiet, I may ask that person to speak.

3. I have a short list of questions that I want to cover in the next hour, so I may occasionally have to end a discussion or comment and move onto another topic or ask a different person.

4. Finally, please treat what is said here today as private so don't repeat what someone says in the meeting later on to others. That way, everyone will feel better about saying what they think. There will be no recording of anyone's identity here - our only record of the discussion and the intake surveys are your badge letter.

So, let's get started.

INTRODUCTIONS FROM THE GROUP [5 MIN]

Ask people their first names generally where they live (city, general area), "your favorite place to go in Eugene"

GENERAL ACTIVE TRANSPORTATION CHALLENGES [20 MINS]

- How do you travel to/from campus?
- Why do you choose your travel modes to/from campus?
- (If applicable) Participants most commonly used active transportation corridor to/from campus?
- Participants perceptions of most commonly used corridors?
- Initial impressions of active transportation conditions around the University of Oregon.
- What places have you felt comfortable walking/biking? (In Eugene and other places)
- What is your biggest barrier to using active transport?
- Do environmental variables (darkness, weather) change these challenges? How?
- Way finding: does it encourage you to bike/walk?
- Language accessibility for way finding
- What are your experiences with the PeaceHealth bikeshare system? Are there changes (app changes, station siting, price, bike infrastructure) that would make you consider using bikeshare more?

DISCUSSION: SOLUTIONS [25 MINS]

- Ideas to inform and encourage active transportation for women at the University of Oregon?
- What changes to active transportation information would encourage you to use active transport? Infrastructure changes? Logistic changes?

FINAL INFO

The results of the study will be available in June 2020. Feel free to email me directly at mmenard@uoregon.edu and I can send you the report. [[Hand out business cards.]]

APPENDIX B

Barriers Against Active Transportation for Female-Identifying Students Survey

1. When traveling to campus, I (choose your most frequent mode):
o Walk
o Bike
o Use another wheeled mode (skateboard, scooter, rollerblades)
o Drive (alone, carpool, rideshare)
o Other: _____

2. How often do you bike or use another wheeled mode (scooter, skateboard, rollerblade) to get to campus?
o Never
o Some trips
o Most trips
o All trips

3. How often do you walk to campus?
o Never
o Some trips
o Most trips
o All trips

4. How many roundtrips per week do you go to campus?
o 0-2
o 3-4
o 5-6
o 6+

5. Do you have access to a personal vehicle in Eugene?
o Yes o No

6. Do you know that your Duck ID is a bus pass that lets you ride LTD buses for free?
o Yes o No

7. How safe do you feel walking to and from campus from your home?
o Very unsafe
o Somewhat unsafe
o Neutral
o Safe
o Very safe
o I do not walk to and from campus

8. How safe do you feel biking to and from campus from your home?
o Very unsafe
o Somewhat unsafeo Neutral
o Safe
o Very safe
o I do not bike to and from campus

9. Have you used PeaceHealth Rides bikeshare system?
o Yes o No

10. Do you know that you get 15 minutes of free PeaceHealth rides bikeshare use every day as a UO student?
o Yes o No

11. Rank the degree to which the following barriers prevent or reduce your use of active transportation to travel to/from campus.

- 11A. Infrastructure: e.g. bike lanes, sidewalk, lighting, potholes.
  o Not a Barrier
  o Somewhat of a barrier
  o A barrier
  o A major barrier

- 11B. Social: e.g. friends drive, grew up driving, dress code for work, do not want to get helmet hair.
o Not a Barrier
o Somewhat of a barrier
o A barrier
o A major barrier

- 11C. Logistics: e.g. faster to use other modes, live too far away, need a place to tow my belongings, do not have access to a bike, unable to walk
o Not a Barrier
o Somewhat of a barrier
o A barrier
o A major barrier

12. What is your class standing?
o Freshman
o Sophomore
o Junior
o Senior
o Graduate Student
o PhD student

13. What is the nearest intersection to your home in Eugene? _____

14. Are you:
o Female
o Male
o Non-Binary / Third Gender
o Prefer to Self-Describe:_____
o Prefer not to say

15. Are you Hispanic or Latino (of any race)?
o Yeso No

16. What is your race? (please select all that apply)
o Black or African American
o White / Caucasiano American Indian or Alaskan
o Asiano Native Hawaiian or Other Pacific Islander
o Two or More Races
o Prefer to Self-Describe _____

mmenard@uoregon.edu
likedin.com/in/mirandamenard

THANK YOU.

IF YOU HAVE ANY QUESTIONS, PLEASE DON'T HESITATE TO CONTACT US.