MASSBIKE'S WORCESTER E-BIKE PROGRAM ASSESSMENT

An Interactive Qualifying Project submitted to the faculty of WORCESTER POLYTECHNIC INSTITUTE in partial fulfillment of the requirements for the degree of Bachelor of Science

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Abstract

MassBike provided roughly 100 electric pedal-assist bicycles to individuals with low income residing or working in Worcester during the first iteration of their program. To assist in improving upon the first iteration, the team worked to identify barriers to e-bike adoption and gather data surrounding e-bike adoption and experiences riding in Worcester. The team held interviews with the Worcester Department of Transport and Mobility to ascertain professional views on the state of cycling in Worcester. The team also evaluated participants' experiences riding in the city through a focus group setting. The team found many overlapping themes between the data gathered and prior research, allowing the creation of an improved data collection instrument for MassBike based upon the identified themes.

Acknowledgements

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- Our advisors, Alejandro Manga and Mimi Sheller, for supporting us and providing feedback throughout our project.
- MassBike for sponsoring this project, extending a special thanks to Alex Salcedo and Galen Mook for meeting with us on multiple occasions to provide continuous guidance throughout the project.
- The MassBike participants who joined the focus group, for allowing us to gather data from their experiences riding in the city.
- MassCEC for meeting with us to provide initial guidance on potential areas of focus and for allowing us to present during one of their monthly check-in meetings.
- The Department of Transport and Mobility, for meeting with us to discuss the state of transportation in Worcester.
- Metro Mobility for meeting with us to provide information regarding their program and the NREL data collection app.

Executive Summary

In today's world, where environmental concerns are on the rise, the call for eco-friendly transportation has never been more urgent. MassBike is an organization that has recognized the need for sustainable transport and has dedicated itself to advocating for its widespread adoption with a mission to establish biking as a safe and respected mode of transportation in Massachusetts. MassBikes Worcester E-Bike Program, which is concluding its initial phase, holds immense potential for growth, offering a unique opportunity to shape sustainable transport in Worcester. The research, aimed at contributing to MassBike's program growth, focuses on refining data collection through interviews and a focus group, resulting in an advanced survey tool for quantifiable community insights.

The goals of this project are to help MassBike identify the barriers to e-bike adoption in Worcester and to help improve the next iteration of the Worcester E-Bike Program by improving the data collection practices. To accomplish this goal, the following steps were taken:

1. Determine challenges of the pilot program from MassBike and MassCEC's perspective.
2. Interview policymakers to gain insights on the challenges of riding in Worcester from a professional perspective.
3. Conduct interviews and/or focus groups to gather feedback from participants about their experiences riding in Worcester.
4. Create an improved data collection tool that will be distributed during the next iteration of the project using feedback from the interviews and focus group.

Through interviews with key stakeholders, including MassBike and policy makers from the Department of Transport and Mobility, the study uncovered critical insights into the challenges and aspirations shaping the program. Policy makers highlighted safety concerns, infrastructural gaps, and the pivotal role of educational campaigns, providing a foundational understanding of

the broader transportation landscape in Worcester. The focus group discussions with program participants brought forth nuanced perspectives, emphasizing safety concerns, infrastructural needs, and the impact of weather on e-bike adoption. Furthermore, participant observations during community events added a dynamic dimension to the findings, showcasing the community's engagement and concerns through interactive poster boards. The convergence of insights from these varied sources paints a comprehensive picture, identifying key themes such as infrastructure, topography, safety, and environmental awareness as pivotal elements influencing the success of the e-bike program. The study also involved the completion of MassBike's current survey by the research team, shedding light on the existing data collection practices and setting the stage for the development of an improved questionnaire.

Moving forward, the team offers tailored recommendations for MassBike and the City of Worcester based on the results gathered. For MassBike, collaboration with the city is emphasized, particularly in organizing educational campaigns for both riders and drivers. Strengthening the existing education initiatives through collaborative efforts can enhance community awareness and contribute to safer biking practices. Simultaneously, the city is urged to address the critical need for improved biking infrastructure, focusing on the development of dedicated bike lanes. This infrastructure enhancement not only promotes safety but also contributes to a more inclusive environment, as reiterated in every discussion. Additionally, recognizing the impact of weather on biking habits, the recommendation includes the incorporation of weather-resilient infrastructure solutions. This strategic approach ensures year-round accessibility and safety for e-bike enthusiasts, aligning with the diverse weather conditions prevalent in Worcester.

Authorship

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List of Abbreviations

Abbreviation	Definition
BNA	Bicycle Network Analysis
CO2	Carbon Dioxide
DTM	Department of Transport and Mobility
EES	Estimated Emissions Savings
GHG	Greenhouse Gas
MOU	Memorandum of Understanding
NREL	National Renewable Energy Laboratory
WPI	Worcester Polytechnic Institute

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Chapter 1: Introduction

In an era marked by growing environmental concerns and an increasing societal shift toward sustainability, the need for eco-friendly modes of transportation has become evident. Greenhouse gas emissions are taking center stage as a major problem when considering climate change, and the transportation sector is one of the largest contributors to anthropogenic U.S. greenhouse gas (GHG) emissions (US EPA, 2023). As climate change accelerates and environmental awareness takes center stage, the urgency to adopt sustainable transport options is more critical than ever. This research delves into the evolving landscape of urban transportation, exploring the pivotal role of e-bikes in mitigating environmental impact and fostering a sustainable future.

MassBike is an organization that has not only recognized the pressing need for sustainable transport but has also dedicated itself to advocating for its widespread adoption. With a mission to make biking a safe and respected mode of transportation in Massachusetts, MassBike envisions a future where cycling is an integral part of the state's transportation network. The organization's commitment aligns seamlessly with the broader goal of creating environmentally conscious and sustainable urban mobility.

MassBike's multifaceted approach encompasses educational campaigns, political advocacy, and community engagement. Through these initiatives, MassBike aims to not only promote the benefits of cycling but also address the challenges that hinder its widespread adoption. As the Worcester E-Bike Program is finishing its first iteration, there exists immense potential for growth and community impact. The program's early stages lay the foundation for future enhancements and expansions, presenting a unique opportunity to shape the trajectory of sustainable transport in Worcester.

The primary objective of this research is to contribute to the growth and effectiveness of MassBike's Worcester E-Bike Program. The focus is on improving data collection methods through interviews and a focus group session, providing valuable insights into the conditions of cycling in Worcester. This effort culminates in the creation of an improved survey tool designed to quantitatively measure the identified themes. This will equip MassBike with a way to gather comprehensive understandings of the community's perceptions through quantifiable insights.

Chapter 2: Background

This chapter starts by offering a comprehensive exploration into the world of e-bikes, starting with their fundamental attributes and significance in sustainable urban transport. Then, it discusses the MassBike program and their work surrounding providing e-bikes to the Worcester community are highlighted. Next, the current conditions that cyclists are facing while riding in Worcester are explored, while also the existing barriers to cycling are addressed. The chapter also discusses the foundation for existing opportunities, highlighting current initiatives.

2.1 Overview

The rapid growth of e-bikes is redefining urban mobility and presenting an environmentally friendly alternative to traditional means of transportation. This section embarks on a thorough examination of e-bikes, a modern advent in sustainable urban transportation. The section starts with a detailed elucidation of what constitutes an e-bike and further explores the plethora of motivations driving different demographics towards e-biking. Insights from various studies and real-world implementations are summarized, shedding light on the transformative potential of e-bikes in not just augmenting individual mobility, but also in contributing significantly towards the broader goal of urban sustainability. Through the lens of the MassBike program and the cycling conditions in Worcester, the section also delves into the practical challenges and opportunities that e-bikes present in today's urban landscapes.

2.1.1 Understanding E-bikes

An e-bike is a bicycle equipped with an electric motor, often powered by a rechargeable battery, capable of sensing when a rider needs a helping hand over a hill, into a headwind, or accelerating from a stop (MassBike, 2023a). E-bikes deliver power to the motor based on how hard the rider is pedaling, and depending on the class of e-bike, the motor ceases to provide assistance once the bike hits certain speeds. E-bikes offer numerous advantages over conventional cycling, including faster urban commutes, assistance for longer rides and steep terrains, extended range with reduced fatigue, and increased inclusivity by accommodating riders of varying ages and fitness levels. However, it is notable that e-bikes come with some drawbacks, including a higher initial cost and increased maintenance expenses due to their electrical components. Additionally, e-bikes have limited riding ranges if riders choose to rely on the battery and face regional regulations, and they are also generally heavier than regular bikes.

The project's focus on e-bikes stems from the belief in sustainable urban mobility, as e-bikes represent a harmonious balance between the manual operation of traditional bicycles and

the efficiency of motor-assisted transport. Their role in reducing urban congestion, lowering carbon footprints, and providing an inclusive mobility solution position them as a pivotal tool in the future of sustainable transportation (Philips et al., 2022). Furthermore, with technological advancements, e-bikes are only set to become more efficient, accessible, and indispensable in tomorrow's cities.

2.1.2 Motivations for E-biking

E-bikes have gained popularity in recent years, appealing to a variety of people for many different reasons. Studies of motivations for e-cycling often find out that older adults' motivation to e-cycle includes having the ability to continue to ride despite physical limitations as well as the potential to maintain or increase physical activity and fitness, while younger adults are often motivated due to environmental concerns, reduction in travel time, reduced car use, and saving money (Bourne et al., 2020). The diversity in motivations highlights the versatility and broad appeal of e-bikes, catering to both the physical and environmental needs of different age groups, making them a promising solution for sustainable and equitable urban mobility.

In line with these findings, a Danish study conducted among a sample of e-bike users shows that the e-bike was considered as a replacement of the conventional bicycle as well as the car. In that study, 64% of the participants agreed that they used an e-bike on trips for which they would otherwise have used a conventional bike, and 49% agreed that they used it on trips for which they would otherwise have used a car (Haustein and Møller, 2016). This study sheds light on the fact that e-bikes are not only viewed as alternatives to traditional bicycles but also recognized as practical replacements for cars in various travel scenarios. The finding serves as a promising bridge towards encouraging greater e-bike adoption among the public.

2.2 Sustainable Transport

As the global community grapples with pressing challenges related to urban mobility, initiatives promoting sustainable and equitable transportation solutions have gained prominence. Transport is responsible for 29% of global direct carbon dioxide (CO2) emissions from fuel combustion, and the percentage continues to rise annually (EPA, 2021). Figure 1 depicts this statistic, highlighting transportation as the largest contributor to Greenhouse Gas (GHG) emissions.

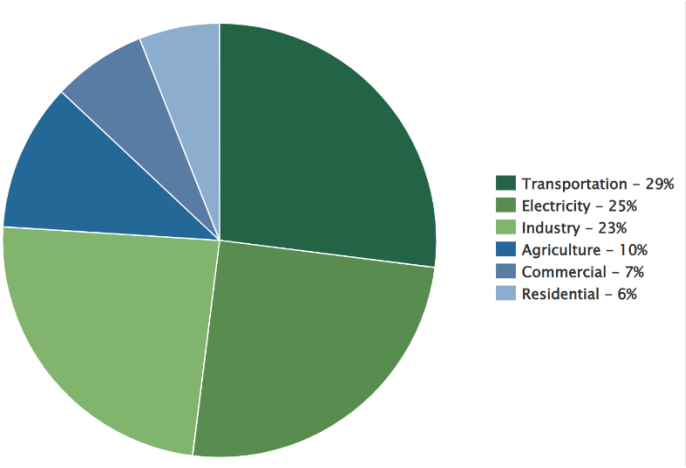

Figure 1: Total Greenhouse Gas Emissions in 2021 by Sector in the U.S. (United States Environmental Protection Agency, 2021)

Between 1990 and 2021, GHG emissions in the transportation sector increased more in absolute terms than any other sector (i.e., electricity generation, industry, agriculture, residential, commercial), in large part due to increased demand for travel (EPA, 2021). Focusing on the GHG produced from the transportation sector, light-duty vehicles, which encompass vehicles such as passenger cars and light-duty trucks, contributed a significant 58% of the total GHG emissions (Figure 2).

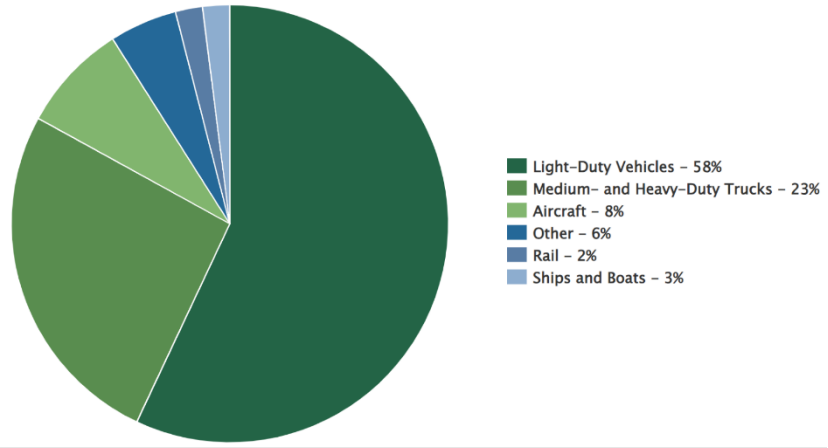

Figure 2: U.S. Transportation Sector Greenhouse Gas Emissions by Source in 2021 (United States Environmental Protection Agency, 2021)

Light-duty vehicles are commonly used for trips that hold the potential for substitution with e-bikes, such as going shopping or commuting to work or school. If such substitutions were to take place, it could lead to a notable reduction in overall transportation emissions, addressing the concerning trend of escalating GHG emissions in the transportation sector. While electricity production does generate GHG emissions, e-bikes remain among the most environmentally sustainable modes of transportation even when factoring in their batteries, surpassed in eco-friendliness only by walking and traditional cycling (Bucher et al., 2019). Considering both electricity generation-related emissions and the additional trips induced by e-bikes, there is the potential for a 12% reduction in CO2 emissions from passenger transportation. On an individual level, a single e-bike could contribute to an annual average reduction of 225 kg (496.04 lb.) of CO2 (McQueen et al., 2020). These statistics serve as a foundation for shaping policies and programs aimed at fostering the growth of e-bike adoption, building on GHG reduction.

2.3 MassBike

MassBike is a non-profit organization that envisions a future where biking is recognized not merely as a sport or recreational activity but as a mainstream, respected, and safe mode of transportation. The organization is steadfast in its aim to ensure that bicycling in Massachusetts

is a favorable experience, accessible to all demographics regardless of age, ability, or background. They are dedicated to advancing cycling advocacy at the state level, with the overarching mission of integrating bicycling as a fundamental component of people-centered communities, policies, culture, and infrastructure (Massbike, 2023b). MassBike receives grant funding under the Massachusetts Clean Energy Center's (MassCEC) innovative Accelerating Clean Transportation for All (ACT4All) Program to support a 2-year initiative, the Worcester E-bike Program, with the primary objective to provide roughly 100 electric pedal-assist bicycles to individuals with low income residing or working in Worcester, while monitoring their usage (Massbike, 2023c). This initiative serves as a pilot program to assess the viability of e-bikes as a dependable and eco-friendly transportation option in the city.

2.3.1 Worcester E-bike Program

The participants chosen for the Worcester E-Bike Program closely mirror the racial demographics of the City of Worcester, aligning with the data presented in Figure 3, which represents Worcester's Census Data from 2021. Concurrently, Figure 4 outlines the demographics specific to the Worcester E-bike Program participants. These figures collectively provide an accurate reflection of the city's population composition, enriching the reliability and relevance of the study's findings. Analyzing these figures offers valuable insights into the degree of representation and inclusivity achieved by the program and helps assess its effectiveness in catering to the diverse needs of the community.

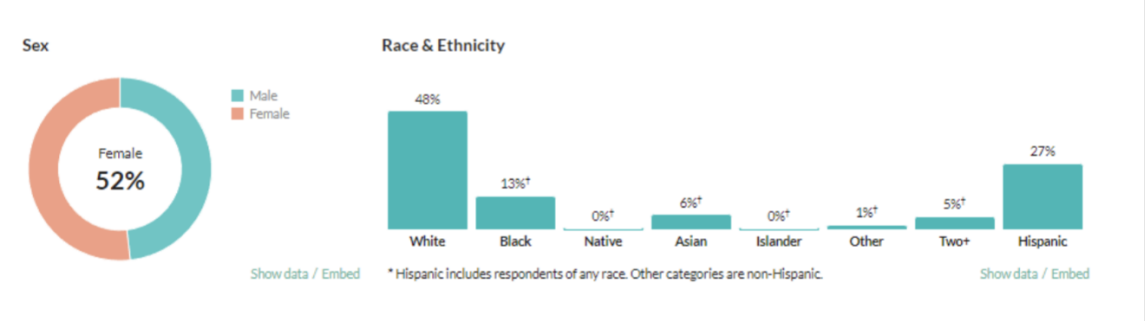

Figure 3: Worcester's Census Data from 2021 (U.S. Census Bureau, 2021)

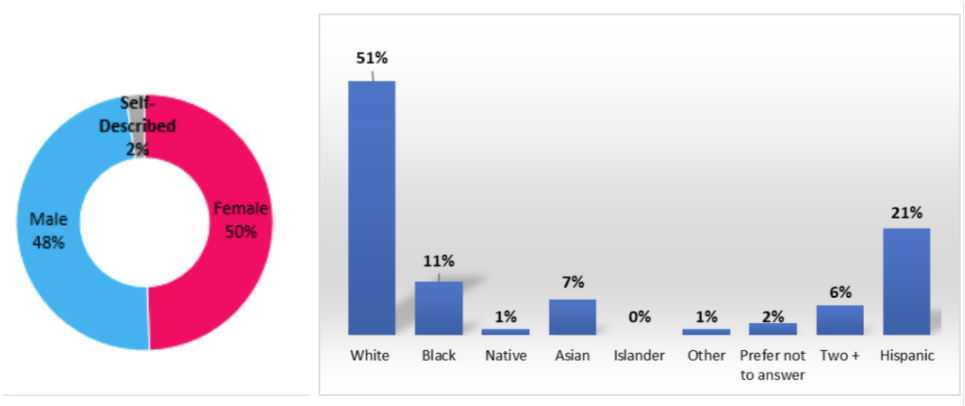

Figure 4: Worcester E-bike Program demographics (MassBike, 2023d)

2.3.2 MassBike Initiatives

MassBike offers a diverse range of resources to educate and empower the public about cycling. These resources are available through their classes and a variety of informative webpages, ensuring comprehensive support and knowledge sharing for cyclists of all skill levels. Research indicates that the implementation of cycling lessons and educational programs has been effective in boosting the confidence of older adults, whether they are returning to cycling or trying it for the first time (Leger et al., 2019). MassBike's provision of cycling education plays a pivotal role in bolstering the confidence of older adults enrolled in the program, thereby promoting increased cycling activity.

2.3.3 Worcester E-Bike's Environmental Impact

The Estimated Emissions Savings (EES) of the MassBike program is calculated using EPA's formula and operates under the assumption that recreational trips do not replace any polluting transportation mode. As of the third quarterly report, it is estimated that the cumulative EES from August 2022 through February 2023 is 13, 906 lbs. (Massbike, 2023d). These projected emissions savings emphasize the favorable environmental outcomes associated with the MassBike program, making it an enticing incentive to encourage greater e-bike adoption.

2.4 Worcester Biking Conditions

The MassDOT Bicycle Transportation Plan identified Worcester as one of the locations with the highest potential of everyday walking and biking in Massachusetts (Official City of Worcester, 2023). Worcester has a developing biking infrastructure, characterized by limited biking lanes, signage, and bike racks scattered across the city. Nevertheless, a significant challenge lies in public awareness, as a study at Worcester Polytechnic Institute (WPI) revealed that most participants perceived Worcester as having insufficient cycling resources (Ackerman & Colfer, 2015). This lack of information about safe and accessible routes can cause apprehension among individuals when contemplating biking, potentially deterring them from biking. Additionally, it's worth highlighting that an organization known as PeopleForBikes conducted a Bicycle Network Analysis (BNA) for Worcester, resulting in a score of 7 (PeopleForBikes, 2023). Worcester's BNA score map can be seen in figure 5. Upon looking at the map of Worcester, there is a noticeable number of red regions, which fall under the 0-9 score category, although there are some regions in the 20-29 range. The BNA score serves as an indicator for the effectiveness of the city's bicycle network in connecting people to their desired location on average. Worcester's score of 7 sheds light on the current state of the city's bicycle network, while also indicating the room for improvement that Worcester has.

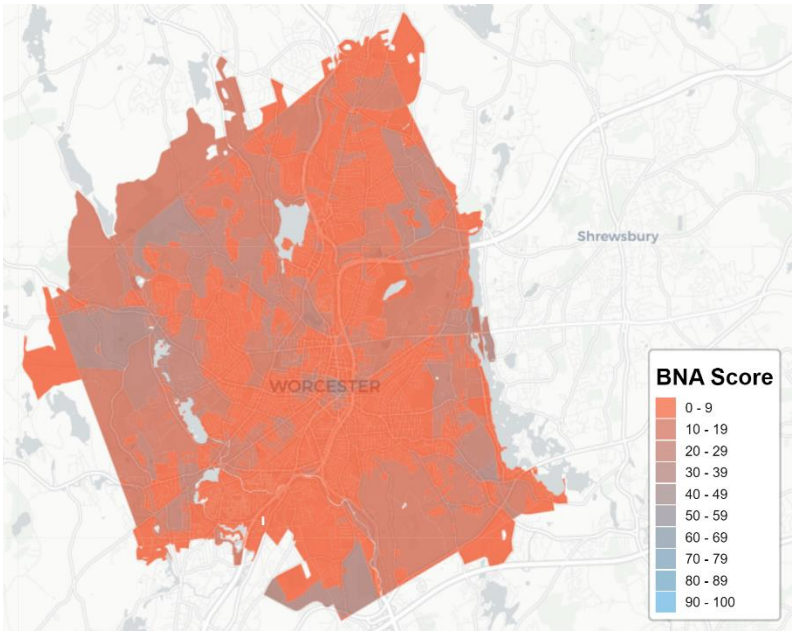

Figure 5: Map of Worcester's BNA Score (PeopleForCycling, 2023)

2.4.1 Worcester VS Other Cities

The BNA score ranges from 1-100, where a higher score indicates a more bike-friendly environment, and is based on various factors including infrastructure, safety measures, community engagement, and policies promoting cycling. According to the BNA scores, the best large cities to cycle in the US include San Francisco, CA (63), Seattle, WA (63), Philadelphia, PA (58), etc. These cities have done well in these factors, and they also have a well-developed a network of bike lanes, trails, and cyclist-centric amenities, ensuring a high standard of safety, accessibility, and convenience for riders.

Among cities in New England, Boston, the largest city, has the highest BNA score (29). As the capital city of Massachusetts and a significant urban center in New England, Boston has made considerable efforts to foster a bike-friendly environment. Despite its historic narrow streets and dense traffic, Boston has made impressive strides in recent years by expanding its network of protected bike lanes, implementing bike-sharing programs, and focusing on safety measures. These efforts have made its score significantly higher than Worcester’s.

It is known that Worcester is the second largest city in New England. However, the BNA scores indicate that many New England cities smaller than Worcester have a higher score, such as Springfield (9), Providence, RI (26), and Hartford, CT (16). Figure 6 shows the BNA maps for these cities (left to right: Springfield, Providence, Hartford). It is obvious that all these cities have more blue areas than Worcester. All these cities have made targeted investments in their cycling infrastructure over the past few years. Recognizing the benefits of promoting cycling — both for environmental reasons and to reduce traffic congestion — they have expanded bike lanes, improved signage, and engaged in community outreach to educate residents about cycling safety and benefits. Furthermore, these cities have been proactive in securing grants and partnerships for biking initiatives, leading to the development of bike-sharing programs and the integration of cycling considerations into broader urban planning. The collaboration between city officials, advocacy groups, and residents in these cities has been instrumental in fostering a more inclusive and safer environment for cyclists, factors that likely contribute to their higher scores in comparison to Worcester.

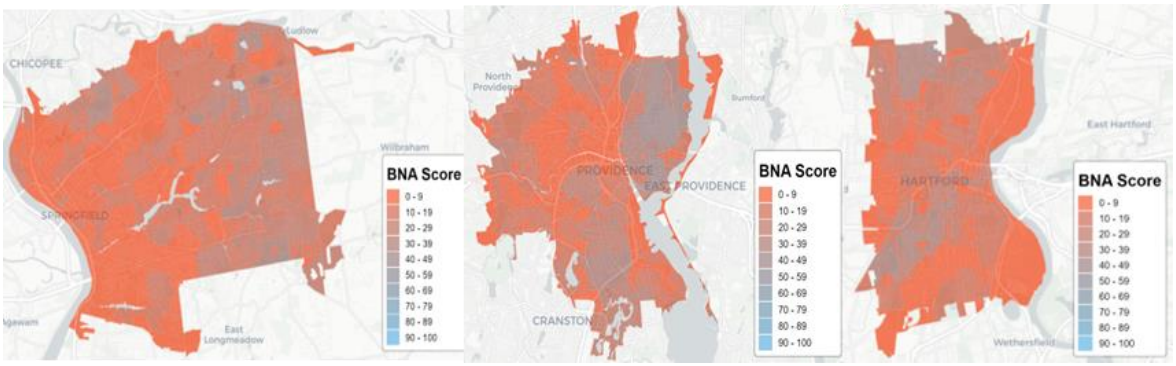

Figure 6: BNA Maps for Springfield, Providence, and Hartford

2.4.2 Worcester's Road Gradient

Worcester is known to be hilly, and this factor makes it difficult to bike around some areas in the city, which is also a deterrent for potential bikers. As illustrated in Figure 7,

Worcester's topography exhibits considerable diversity, featuring significant elevation changes distributed throughout various parts of the city (Topographic Map, 2023). Understanding these geographical features is crucial for addressing barriers associated with hilly terrain and creating cyclist-friendly solutions that will help make biking more accessible to all.

Figure 7: Topographic Graph of Worcester (Topographic Map, 2023)

Worcester's biking landscape is further characterized by a concerningly high number of high-risk intersections, as depicted in Figure 8. These intersections pose significant hazards to both cyclists and pedestrians due to factors such as slip lanes, the absence of marked or signalized crosswalks, and road geometries that inadvertently encourage speeding (Worcester Now and Next, 2023).

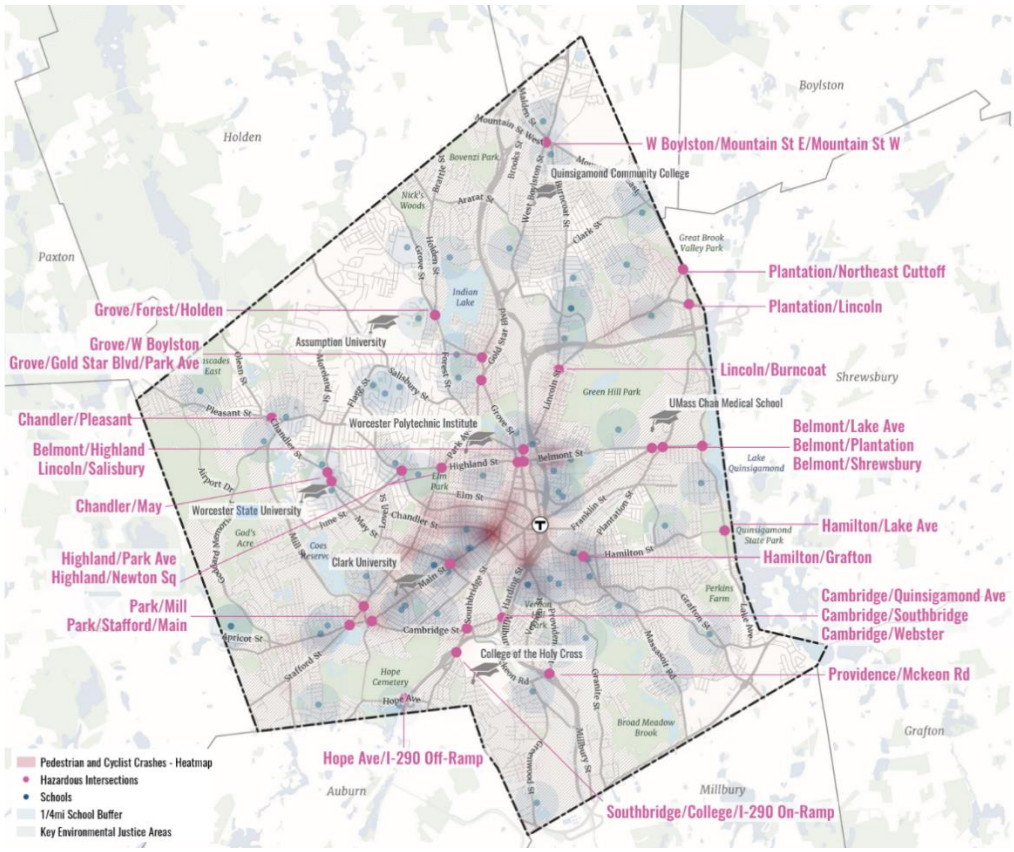

Figure 8: High Risk Intersections in Worcester as of April 2023 (Worcester Now and Next, 2023)

2.4.3 Hazardous Regions in Worcester

From 2016 to 2020, Worcester experienced 243 bicycle-involved accidents, resulting in 14 serious injuries or fatalities. It is noteworthy that a majority of these accidents occurred within areas designated as environmental justice zones (Official City of Worcester, 2023). In Massachusetts, an environmental justice population is a neighborhood where one or more of the following criteria are true; The annual median household income is 65 percent or less of the statewide annual median household income. minorities make up 40 percent or more of the population, 25 percent or more of households identify as speaking English less than "very well", or minorities make up 25 percent or more of the population and the annual median household income of the municipality in which the neighborhood is located does not exceed 150 percent of the statewide annual median household income (Commonwealth of Massachusetts, 2023). This

statistic underscores the need for improved safety measures, infrastructure enhancements, and targeted interventions at these high-risk intersections to ensure the well-being of cyclists and pedestrians and promote safer urban mobility in Worcester.

Efforts to address these mobility justice issues are being actively pursued by organizations such as People for Mobility Justice. This organization is dedicated to achieving radical safety for all by employing a multiracial organizing approach, emphasizing self-determination, and promoting economic empowerment (People for Mobility Justice, 2023). Their work is crucial in addressing the systemic disparities that often affect vulnerable communities, ensuring that urban mobility is equitable, safe, and accessible to all residents in their respective community.

2.5 Barriers to Cycling

Despite the numerous benefits of cycling, there are several significant barriers that can hinder individuals from embracing the eco-friendly mode of transportation. These barriers encompass a variety of factors, which include but are not limited to safety apprehensions, weather-related limitations, and the presence of stigmas associated with e-biking. These factors collectively present significant challenges. In a study conducted in Waterloo, Canada, the most prevalent barrier consistently highlighted by older adult interviewees and focus group participants was the inadequate cycling infrastructure and road safety issues, which significantly contributed to their concerns regarding motor vehicle collisions (Leger et al., 2019). This barrier to cycling is further substantiated by the challenges section outlined in the Worcester E-Bike Program's third quarterly report.

2.5.1 Road Safety Concerns

Road safety is a large concern when it comes to cycling as riders are afraid of speeding cars, being in blind spots, or even just careless driving. Worcester's BNA score further underscores this issue, as the city's map reveals a prevalence of high-stress regions, as depicted in Figure 9. This alignment of findings emphasizes the critical need for targeted efforts to improve cycling infrastructure and reduce high-stress regions within Worcester, creating a more inviting environment for cyclists of all levels.

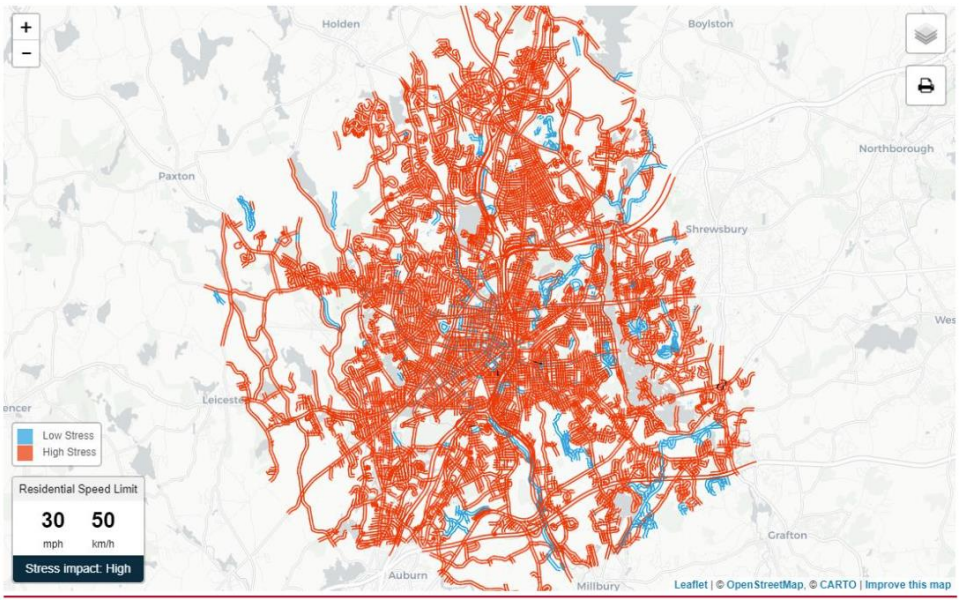

Figure 9: Stress impact of roads in Worcester based on BNA report (PeopleForBikes, 2023)

Efforts to mitigate this barrier can be as straightforward as public education and the provision of resources, such as guidance on the safest biking locations and recommended routes, instructions for handling accidents, advocacy for bicycle-friendly policies, or even the simple act of becoming a part of a cycling community.

2.5.2 Inclement Weather

Inclement weather is also one of the most common barriers to cycling discussed. This was expressed in a study conducted in a Utah community where the modal share for biking to work in Utah was 0.8% making it the 11th highest in the country. When asked about which

obstacles prevented riding a bicycle, 42% of participants identified inclement weather as the top factor (Hoj et al., 2018). This barrier is also prevalent in the Worcester E-Bike Program, as it listed in their third quarterly report that the number of miles decreased from December through February by 2/3 of what they were in prior months, mostly due to weather concerns (MassBike, 2023d).

While inclement weather is undoubtedly a prevalent barrier to cycling, there are effective strategies to overcome this obstacle. Cyclists can embrace weather-appropriate gear, utilize cycling infrastructure that offers shelter from the elements (if available), and carefully plan their rides based on weather forecasts. If the conditions are too harsh to bike, public transportation is a viable option to still save on GHG missions. Additionally, advocating for better weather-resistant cycling infrastructure and promoting a mindset shift that sees cycling as a year-round activity can further diminish the impact of inclement weather on cycling participation. In the paired t-test comparing bike to e-bikes (Hoj et al., 2018), analysis reveals that compared with their views after riding the conventional bicycle, participants significantly agreed more with the statements that they could ride an e-bike on most days in the cold, when they are tired, when they are dressed in formal attire, when carrying personal effects (backpack, groceries, books, etc.), on longer trips, and on steep or hilly terrain. This shows the potential a mindset shift can have on cycling participation in adverse weather conditions.

2.5.3 Stigmas Around E-Biking

Stigmas associated with e-biking can discourage potential users, but it is important to note that perceptions of e-bikes can vary. Individuals deeply involved in radical cycling or sports may be more prone to these stigmas, including the idea that e-bike riders are 'less than' or 'not real' cyclists and that using e-bikes is 'cheating' due to their perceived ease of use. This perception finds support in a study comparing the physical exertion required for e-bikes versus

traditional bikes, which revealed that e-bikes demanded less effort from the rider than conventional bicycles. The main difference in power demand occurred when users were riding uphill. When riding up a hill, regular bikes demanded higher energy intensity whereas the e-bike users' energy intensity stayed the same as it was prior to the hill (Langford et al., 2017). While this could seem like a downside to e-bikes, it represents one of the key advantages toward the uptake of e-bikes as it is shown to effectively mitigate terrain barriers such as high road gradients, which is one of the most prominent barriers. E-bikes can also serve as a technology to introduce active transportation to a wider audience, especially among sedentary individuals. This broader appeal extends the potential user base for e-bikes beyond that of regular bicycles.

While e-bikes indeed reduce the physical effort required for cycling, this aspect is counterbalanced by a significant finding from a study conducted in England (Castro et al., 2019). In this study, health and transportation data were collected from three distinct groups: electric bicycle users, conventional bicycle users, and non-cyclists. The primary objective was to compare the physical activity levels of these groups. The study revealed that e-bike users reported considerably longer trip distances for both e-bike trips (averaging 9.4 kilometers) and traditional bicycle trips (averaging 8.4 kilometers) compared to cyclists using traditional bicycles, whose trips averaged 4.8 kilometers. Furthermore, e-bike users also covered greater daily travel distances compared to traditional cyclists, with e-bikers averaging 8.0 kilometers per person per day, whereas cyclists covered 5.3 kilometers per person per day. These precise findings underscore that while e-bike riders experience reduced physical exertion during their journeys, they tend to compensate by embarking on longer trips, ultimately maintaining an active and healthy lifestyle comparable to traditional cyclists.

While e-bikes may not demand as much physical exertion as regular bikes, it is crucial to acknowledge that the perspective on using them varies among individuals due to cultural

differences. In fact, e-bike users often enjoy longer outings, and the versatility of e-bikes appeals to a broader audience, promoting increased usage. Recognizing the diversity of viewpoints is essential in addressing any misconceptions about e-bikes and emphasizing their advantages.

According to The Untokening, a multiracial collective that centers the lived experiences of marginalized communities to address mobility justice and equity, mobility justice addresses the intersecting inequalities faced by marginalized groups in public spaces like streets and transit systems. This includes BIPOC communities, people with disabilities, immigrants, trans and queer individuals, women, and youth. Achieving mobility justice involves targeted investments and innovations by these groups to enable fair, unrestricted, and fearless movement (Untokening, 2020). The cause of mobility justice is rooted in the belief that everyone should have the same opportunities to access essential services, employment, education, and recreation. However, various barriers, both physical and systemic, can hinder this goal.

To further discover the cause of mobility justice and enhance e-bike usage in Worcester, MassBike aims to leverage the insights gathered through data collection, interviews, and focus groups to overcome these barriers and improve the mobility justice scene in Worcester. By addressing and mitigating these obstacles to cycling, MassBike can play a pivotal role in expanding the e-bike community within the city, thus fostering a more sustainable and inclusive urban mobility environment that respects different cultural perspectives.

2.6 Basis for Opportunities

In Worcester, Massachusetts, a series of forward-thinking initiatives are laying the groundwork for transformative opportunities in the realm of urban mobility. These initiatives are driven by a shared commitment to create a city where safe, accessible, and sustainable transportation options are available to all residents, regardless of age or ability.

2.6.1 Complete Street Program

To improve the condition of Worcester's streets, making them safer, more convenient, and accessible to all people of all ages and abilities, the City of Worcester has begun the Complete Street Program. With this program, the city will redesign the high-risk streets, creating dedicated bike lanes and bike parking, transit priority and dedicated bus lanes, as well as high quality pedestrian infrastructure (Official City of Worcester, 2023). This will encourage a mode shift in transportation, increasing the number of residents who bike or walk, and improve safety and accessibility for pedestrians, cyclists, transit riders and drivers alike.

2.6.2 Blue & Green Space Network

There is also a plan for a “Blue & Green Space” Bicycle Network in Worcester, which would connect the green environments to the water areas (Worcester Now and Next, 2023). These spaces would be connected to key access points, and then the network ‘spine’ and connections to neighborhoods would also be added (Figure 10). This network would introduce an extensive bike path for the community, ensuring safer cycling, raising awareness of biking, and ideally attracting more participants.

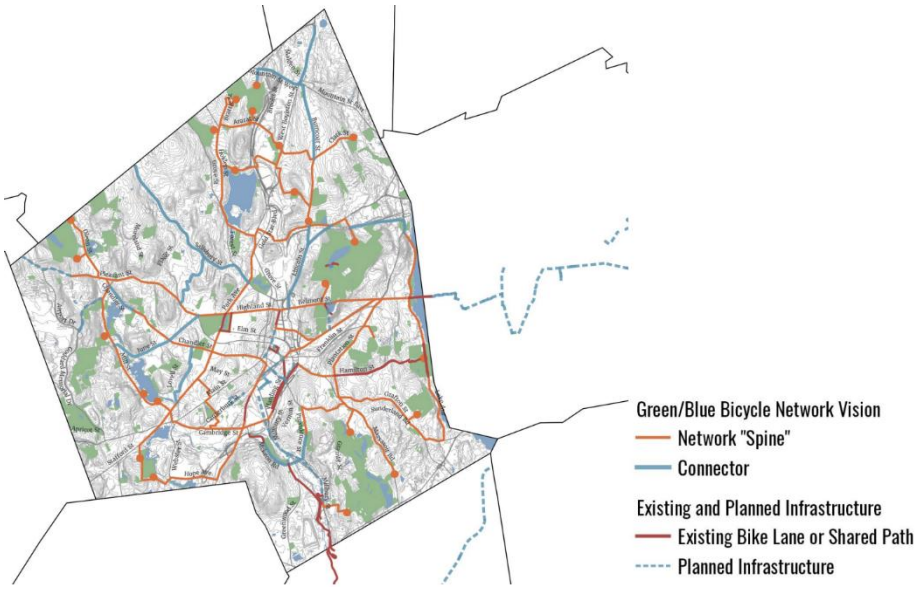

Figure 100: The Expected Result of The Blue & Green Space Network (Worcester Now and Next, 2023)

2.6.3 Vulnerable Road User Laws

The state of Massachusetts took a significant step in enhancing road safety by enacting vulnerable road user laws, which officially came into effect on April 1, 2023. These laws include safe passing, safer speed limits, track safety devices, crash reporting, and rear red-light requirements for bicyclists (Slavin, 2023). These comprehensive laws are designed to provide greater protection for individuals who are vulnerable while using roadways, including bicyclists, pedestrians, and other non-motorized road users. These laws are the basis to potentially making Massachusetts roadways safer and more accessible for everyone, encouraging active transportation and reducing the risks associated with cycling and walking.

2.7 Research Question and Purpose

For now, Worcester presents various barriers to cyclists, and MassBike is committed to working within the city to mitigate these barriers through their ongoing Worcester E-Bike Program to promote widespread adoption of e-biking. In gearing up to enhance the second iteration of this program, the aim is outlined by the research question: How can a new data collection device and focus groups as well as interviews assessing participant experiences on rides enhance the MassBike project's second iteration in Worcester, and foster a broader e-bike adoption in the community?

The purpose of the investigation is clear: to enhance the adoption of e-bikes as an environmentally friendly, healthy, and equitable mode of transportation by addressing the barriers that hinder individuals from cycling, especially within Worcester's context. It is believed that by addressing the barriers to cycling and improving data collection methods for the second iteration of MassBike’s program such as the implementation of a new data collection instrument and conducting focus groups and interviews, it is possible to create an environment in Worcester that fosters increased e-bike adoption as a sustainable and accessible transportation mode.

Chapter 3: Methodology

3.1 Introduction

The goals of this project are to help MassBike identify the barriers to e-bike adoption in Worcester and to help improve the next iteration of the Worcester E-Bike Program by improving the data collection practices. In order to accomplish this goal, the following steps were taken:

1. The challenges of the pilot program from MassBike and MassCEC's perspective were determined.
2. The interviews with policymakers, experts, and/or program partners were conducted to gain insights on the challenges of riding in Worcester from a professional perspective.
3. The interviews and focus groups were conducted to gather feedback from participants about their experiences riding in Worcester.
4. The feedback from the interviews was used to create an improved data collection tool that will be distributed during the next iteration of the project.

3.2 Determine Challenges of Pilot Program

To support MassBike in enhancing the next phase of their program, the initial step was to gain a deep understanding of the challenges encountered during the pilot program. This was achieved through a collaborative and informative interview session with MassBike and their sponsor, MassCEC, conducted over the Zoom platform.

During this virtual interview, the primary objective was to uncover their perspectives on the most significant challenges faced during the pilot program and explore potential solutions. The questions for the interview were crafted to remain focused on the experiences and potential enhancements related to the first iteration of the MassBike program, integrating questions that spoke to the unique expertise of each party, allowing us to gather a more comprehensive

understanding of certain aspects. We recognized that MassCEC was backing other projects under Act4All with similar objectives, which opened possibilities to broader questions about e-bike programs.

This prompted us to delve into the successes and setbacks of these other programs, seeking valuable insights that could inform improvements in MassBike's second iteration. The interview lasted approximately 45 minutes and both team members were present during this interview; both members swapped between asking questions and both members recorded notes. The interview questions and answers will be located in Appendix A.

3.3 Insight from Worcester Department of Transport and Mobility

To help identify barriers to e-bike adoption in Worcester, the team interviewed individuals from the Worcester Department of Transport and Mobility (DTM) as these individuals have valuable knowledge and influence in shaping transportation policies, infrastructure, and community initiatives. The interview aimed to capture the perspectives of key stakeholders in the Worcester community, regarding the challenges of cycling in Worcester and potential strategies for improving conditions and e-bike adoption. The individuals interviewed were chosen due to their connections with the regions central to our research, facilitated through MassBike's assistance. The interview involved three participants and was conducted on the Zoom platform, lasting approximately 30 minutes. Prior to the start of the meeting, the participants were read an informed consent agreement that was approved by the IRB, which can be found in Appendix B. The questions aimed to provide valuable insights into the current landscape of Worcester's cycling infrastructure, policies, and programs. The interviewees were also asked for their opinions on the role of e-bikes in sustainable transportation and the effectiveness of existing initiatives, specifically MassBike, and how to improve the program. Interview questions and answers can be found in Appendix C. The findings were compiled to

highlight common perspectives and unique insights gathered during the discussion, which will be in the results and analysis.

3.4 Participant Experiences While E-biking

Drawing from valuable insights provided by MassBike, MassCEC, and policymakers, the team recognized the importance of gathering firsthand perspectives from the individuals who had directly participated in the e-bike program. To actively engage with these participants and collect their contact information, the team decided to participate in a table sitting MassBike was holding at the REC Beaver Brook Farmers Marker on Friday September 8th, from 9 am to 12 pm. This approach involved the team immersing themselves in the event, interacting with participants, and obtaining information directly from them.

During the 3-hour event, each team member was present for two hours, one attending the initial two hours and the other attending the latter half, overlapping during the middle hour. As participants arrived, team members engaged in brief conversations about IQP research then asked about experiences riding in Worcester. Subsequently, the members requested participants contact information for future discussions, which resulted in the collection of four participants contact information.

The team aimed for an optimal focus group size of 10 participants, accounting for potential dropouts due to scheduling conflicts. Since the team did not have the required number of contacts, MassBike assisted by sending an email to their mailing list, inviting participants to join the discussion. With this collaborative effort, the team successfully reached out to 10 participants. Follow-up communications included a request for participants to fill out a When2Meet schedule, indicating their availability during the week of November 6th. After reviewing the responses, the team selected Thursday, November 9th, at 5:30 pm, a time that

accommodated the most schedules to maximize participant attendance. The focus group discussion questions and transcript can be found in Appendix C.

3.4.1 Privacy, Confidentiality and Data Protection

The team used the contact information collected through community events to connect with program participants and engage in a focus group. The gathered information served as qualitative data that will be used to refine and enhance the program for its next iteration. Information regarding privacy and confidentiality:

All data gathered from the discussion was treated with regard to respecting the participants' privacy and confidentiality. Respecting the importance of privacy, the team only reached out to participants who've consented to sharing their contact information, an approach which is in line with the privacy guidelines set forth by MassBike. To ensure confidentiality, the meeting was encrypted, password protected, and utilized a waiting room function to approve each new attendee before they could access the room. Discussion information was stored in the university one-drive cloud system with double authentication and access is exclusive to the student researchers and the advisers. The discussion data was kept until the end of the project period and securely deleted after this period ended to ensure it cannot be accessed or reconstructed. Adhering to privacy guidelines and to protect participant anonymity, the team refrained from using any information that could potentially connect back to participants and referred to participants using pseudonyms in the research analysis.

3.5 Metro Mobility and NREL

Metro Mobility is a cutting-edge digital platform designed to transform urban transportation experiences for its users. Through its user-friendly interface, the app offers real-time updates, route planning, and journey optimization, catering to various transportation modes

like buses, subways, trams, and even bicycles. It integrates data from diverse sources to provide accurate travel predictions, ensuring users can make informed decisions about their commute, reducing uncertainties and enhancing efficiency.

In the context of our project, Metro Mobility offers a contemporary lens to examine transportation holistically. Its multi-modal approach aligns with the project's objective to improve the biking ecosystem, since it underscores the interconnectedness of various transportation forms. Implementing an app like Metro Mobility in Worcester can provide cyclists with vital data, such as the best routes to take, bike lane availability, and even updates on maintenance or obstructions. Moreover, by integrating cycling seamlessly into the broader transportation landscape through the app, Worcester can encourage more residents to consider biking as a viable and efficient transportation option. By doing so, the city can potentially elevate its biking score, aligning it more closely with its New England counterparts.

To gain a deeper insight into the data collection methods utilized in similar initiatives, the team interviewed Metro Mobility about their data collection practices. The main focal point of this interview was the data collection app they use, NREL OpenPATH, and its potential applicability to MassBike's program. Conducted in a consistent manner to the previous interviews, the discussion took place over the zoom platform and lasted approximately 30 minutes. The questions for the interview revolved around Metro Mobility's participant outreach methods, challenges encountered while using the NREL OpenPATH app, and any solutions they've employed to enhance the data collection process. Both team members were present during this interview, swapping between asking questions and recording notes. The interview questions and answers will be found in Appendix D.

Using the information gathered from the interview, the team made an informed decision to move forward in contacting the National Renewable Energy Laboratory (NREL) about the procedures required for implementing the app within MassBike's program. In response, NREL advised the team to proceed with filling out the Memorandum of Understanding (MOU) template. They also mentioned it would take approximately one month from the time NREL receives the signed MOU to set up the environment and enable data collection activities. As part of the project deliverables, the team intended on at least submitting the signed MOU and possibly making progress in furthering the implementation process if time allowed. However, after further looking into the app, the implementation process became a dead end as the platform requires too much work and constant surveillance, which is beyond what our IQP project, or even subsequent projects, can provide.

3.6 Improved Data Collection Instrument

Using the information gathered from the focus groups and interviews, an improved survey was developed as a final product to be distributed by MassBike to participants during the second iteration of the Worcester E-Bike Program. This survey includes a combination of open and closed-ended questions to allow for both quantitative and qualitative data collection at the same time. Closed-ended questions, which includes the use of a Likert scale, provides quantitative data that can be statistically analyzed to identify trends and patterns, while open-ended questions allow participants to provide qualitative insights in their own words. The survey addresses specific themes, challenges, and motivations that were identified through conversations with participants, which ensures the survey will be tailored to collect data on the most relevant and impactful aspects of the program. The survey can also serve as a baseline assessment due to the inclusion of questions about participants' experiences before and after

joining the program. This enables the measurement of changes over time, which can be valuable for evaluating the program's impact.

Chapter 4: Results and Analysis

This section discusses the team's results and findings. By analyzing the data collected through research, interviews, and the focus group, the key topics to be addressed in the final survey were analyzed. The most commonly mentioned topics during our data collection process were infrastructure, topography, safety concerns, and environmental awareness.

4.1 Framing Research Question

Prior to the interview with MassCEC and MassBike, the team didn't know about the goals or objectives of the sponsors. The virtual interview allowed the team to gather knowledge on the experiences of each sponsor and potential enhancements related to the first iteration of the MassBike program from both perspectives. At the conclusion of the interview, the responses were compiled into a list that encompasses overarching themes and specific instances highlighted during our discussion. The main topics discussed in the interview were also compiled into a Venn Diagram, as shown in figure 11, to further visualize the contrast between the sponsors interests.

In our discussion, both MassCEC and MassBike acknowledged the potential for improving data collection methods, although they emphasize distinct data priorities. MassBike's focus centers on acquiring experiential data to gain a deeper understanding of participants' commuting experiences. On the other hand, MassCEC would like to enhance the precision of data regarding vehicle miles traveled and also identify the alternative transportation modes

participants might have selected if they had not chosen to use e-bikes. This can be seen in figure 10, which contains a Venn diagram comparing MassBike and MassCEC's goals.

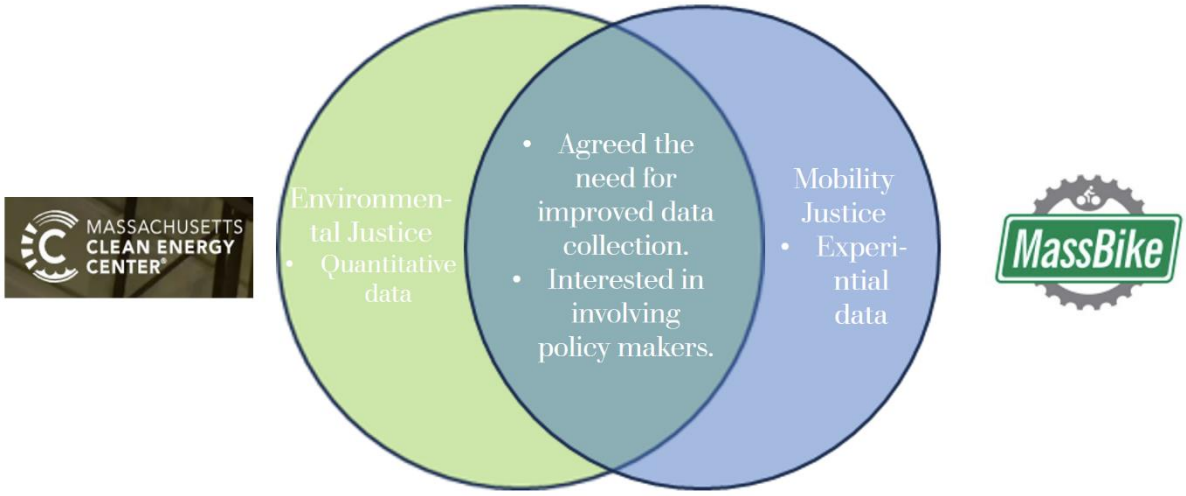

Figure 111: Venn Diagram comparing interests of MassCEC and MassBike

Additionally, MassCEC has expressed concerns about reporting bias, recognizing the possibility that participants may not provide entirely truthful information when sharing their riding data. When discussing challenges faced, MassBike found deciding how to give out the limited number of e-bikes available, while still mirroring the Worcester diversity, to be a challenge. They use lotteries and filters to decide this, which has proved to be challenging and time consuming for them. The required reporting, getting people to log their e-bike trips, was also a challenge as they only had a 60-70% response rate. It is worth noting that this MassBike runs on a voluntary reporting basis, so this reporting rate is considered good for the circumstances. Later in the discussion, MassCEC and MassBike both shared an interest in involving policy makers to help make e-biking more accessible. MassCEC's interest in motivating policy makers is to gather funding for similar programs and MassBike would like to get policy makers involved in order to help improve the conditions of cycling.

The insights gained from this interview helped lay the foundation moving forward with the project and allowed us to uncover the priorities related to improving the data collection methods.

4.2 Interview with Department of Transport and Mobility Discussion

The interview with MassBike and MassCEC led the team to interview policy makers to ascertain their views on current transport programs as well as barriers to cycling in Worcester from policy perspectives. Both team members actively participated, alternating between who asked questions and who took notes.

The team organized the data gathered from the interview into a coding chart on Microsoft Excel (Table 1). The chart organizes the categories and totals the frequency each topic was mentioned in order to analyze trends throughout the data. In the chart, each number represents the number of times that a participant mentioned a certain word or topic. For example, the number 2 in the "safety concern" row and "Ash" column represents that Ash mentioned about the safety concern twice during the interview. The interviewees demonstrated a cohesive perspective, echoing and expanding on each other's insights, cultivating a consensus throughout the discussion. The four key themes identified throughout the discussion with these experts were safety concerns, topography, environmental awareness, and infrastructure. The definitions of these key themes, as well as examples of interview responses, can be found in the DTM Interview Code Table (Table 2).

Table 1: Analysis of Department of Transport and Mobility Interview

	Ash	Bond	Blair	Total
Safety Concerns	**2**	**3**	**2**	7
Topography	**1**	**1**	**1**	3
Environmental Awareness	**1**	**1**	**1**	3
Infrastructure	**3**	**5**	**3**	11

Table 2 - DTM Interview Code Table

Code	Definition/Explanation	Examples
Safety Concerns	Answers that provide insight into issues directly impacting the riders' safety and well-being while navigating the city's roads	"The **number one** educational component is **safety** and the idea of **eliminating fatalities** and **serious injuries**" "Being a **little bicycle** on a path somewhere, I **feel very vulnerable**."
Topography	Answers mentioning Worcester's road gradients and their implications for cyclists	"Our **topography** is such that it's just **very tough to ride** a conventional bike **around the city** and get around."
Environmental Awareness	Answers discussing the idea of sustainable transportation and being consciousness of ones own environmental impact	"I **don't** necessarily want to hop in a **car** just to go to **grocery stores** and get, you know, one or two things. If I can just **walk there instead** or if I can, just like, **take the bus** or an **E-bike** or E-scooter or something else **that's not** necessarily **as impactful as a car**."
Infrastructure	Answers involving the existing lack of bike friendliness in the city's infrastructure and proposed solutions to address these shortcomings	"I'm **not sure** that the **streets** are really **designed** for the buses **properly**, certainly not right now. And they're **not designed for cyclists whatsoever**."

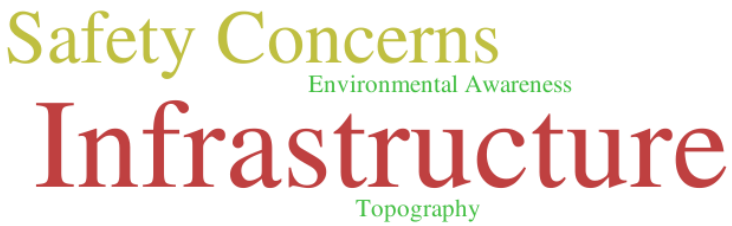

Figure 112: Word Cloud of DTM Interview Codes

The most common concerns found among the policy makers are the lack of proper infrastructure and safety concerns involving the biking community. Despite the lack of frequency involving the topic of environmental awareness, this was brought up to be a key theme the department wishes to focus on as they hope to expand and endorse sustainable transport within the Worcester community. Figure 12 is a word cloud created to give a visual representation of

the frequency each code topic was brought up. The larger words, infrastructure and safety concerns, dominated the discussions whereas the smaller words, environmental awareness and topography, were not as prevalent but were still important topics.

One of the goals of the Department of Transport and Mobility is to improve the current policies and Worcester bicycle network to make it safer for riders. Recognizing safety concerns among riders, the DTM is actively involved in developing educational campaigns targeting both drivers and cyclists. The emphasis of these campaigns is on disseminating crucial knowledge about the various types of bike lanes being implemented and how they function. Blair mentioned that in her view, "the number one educational component is safety and the idea of eliminating fatalities and serious injuries." This statement represents the DTM's acknowledgment of the high fatality and injury rates among bikers, which echoes the earlier discussion on the numerous high-risks intersections in Worcester. This acknowledgment further emphasizes the urgent need for intervention and proactive measures to address safety concerns. The DTM's commitment to education goes beyond its own internal efforts, as MassBike is also actively involved in providing educational resources to the community, as briefly discussed in our background literature review. This community-wide dedication to education reflects a shared belief that community knowledge will play a pivotal role in creating a safer and more aware environment for all road users. The emphasis on education represents a proactive approach by the community, aligning with the background literature's recognition of education as a crucial tool for promoting road safety and awareness.

Upon discussing the role of e-bikes in the Department of Transport and Mobility's pursuit of sustainable transportation adoption in Worcester, a unanimous sentiment emerged. E-bikes were described as a “potential game changer for Worcester" in terms of enhancing mobility access. Blair emphasized e-bikes' significance for fostering an age-friendly community, aligning

with our literature review's exploration of e-bikes as a mobility solution catering to diverse age groups' physical and environmental needs. Bond highlighted hills as possibly the biggest barrier to e-bike adoption in Worcester, which aligns with our background literature review as well. He expressed optimism that e-bikes' ability to enable users to overcome Worcester's geographical challenges and travel longer distances, could be "the difference between adopting biking and not." These sentiments expressed by the DMT show the pivotal role e-bikes play in the future of Worcester's sustainable transport initiatives and how important mitigating the barriers to cycling are for the city's future transport plans. E-bikes overcome the barrier to cycling that is the topography of Worcester, so the DMT is trying to help improve the conditions of this mode of transport to achieve their goal of increased sustainable transport in the city.

Addressing safety concerns, the Department of Transport and Mobility recognizes the prevalent issue of inadequate infrastructure in Worcester, hindering the adoption of sustainable transport. As pointed out by Ash during the focus group, the absence of proper infrastructure compels riders to resort to sidewalks for safety, stating, "you might see people on a sidewalk because we don't have the infrastructure in place for them to ride their bikes safely." This safety-driven behavior underscores the urgent need for enhanced infrastructure, particularly designated bike lanes, to create a secure environment for cyclists. The safety concerns expressed by participants directly contribute to the prevalent practice of riding on sidewalks. This underscores the critical requirement for improved infrastructure in Worcester, specifically the establishment of dedicated bike lanes. Notably, Blair and Bond highlighted the ongoing initiatives aimed at reshaping streets and fostering a more inclusive transport network, exemplified by policies like the Complete Streets initiative. However, the current low Bicycle Network Analysis (BNA) score for Worcester indicates a lack of inclusivity in the existing bicycle network. To address this deficiency, prioritizing the expansion of the bicycle network is crucial. This approach aligns with

the overarching goal of the Department of Transport and Mobility to boost bike adoption and inclusivity. By enhancing the city's infrastructure, particularly in the form of designated bike lanes, Worcester can achieve a higher BNA score, signaling progress towards a more inclusive and cyclist-friendly urban environment.

4.3 Participant Observation

During the MassBike farmers market pop-up event, there were two interactive poster boards that helped to enrich the participants' engagement. The first board, as seen in figure 13, features a map of Worcester, inviting participants to share their biking routes by writing location names on sticky notes and affixing them to the corresponding locations on the map. This activity fostered a sense of community participation, allowing individuals to visually represent their biking preferences and experiences across the city. As indicated on the map, a significant portion of participants frequently choose to ride their bicycles in downtown Worcester, particularly around Worcester Center. Referencing figure 14, the map illustrating high-risk intersections in Worcester, it is seen that this region aligns with a hotspot highlighted in the pedestrian and cyclist crashes heatmap. Similarly, other mentioned locations like Institute Park or the Lincoln Plaza area are in close proximity to the listed high-risk intersections. This pattern highlights the significant presence of cyclists in areas neighboring intersections with higher crash rates, emphasizing the need for improved cycling conditions in Worcester as a whole. The second board, as seen in figure 13, displayed a list detailing the benefits and challenges of riding in Worcester. Participants were encouraged to share their personal biking encounters, contributing to a collective understanding of the diverse experiences within the biking community. As seen in the figure, infrastructure and bike theft emerged as the primary concerns noted on this posterboard. Despite a limited number of responses, the noticeable absence of listed benefits suggests a lack of positive sentiment associated with cycling conditions in Worcester. These

interactive boards not only served as dynamic tools for participant expression but also facilitated a collaborative exploration of the varied aspects of biking in Worcester. These events serve as a platform for community members to connect with e-bike participants and gain a deeper understanding of the Worcester E-Bike Program.

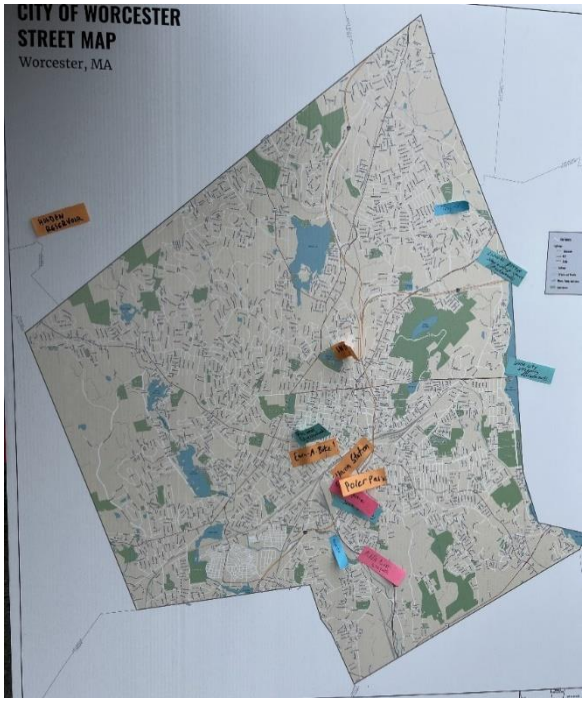

Figure 133: Posterboard showing different locations Worcester residents' bike

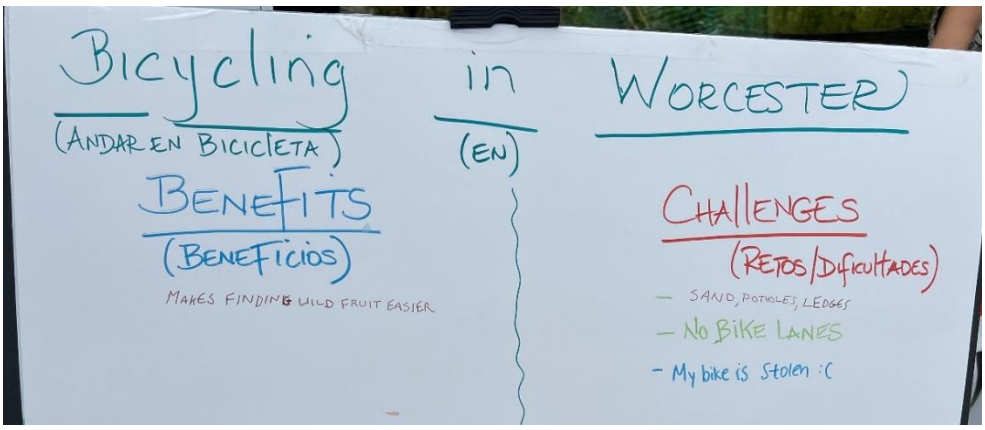

Figure 144: Posterboard showing benefits and challenges of riding in Worcester

4.4 Focus Group Discussion

The team's focus group session was held at 5:30 PM on Thursday, November 9th, 2023, with six of the ten participants who were reached out to attend. The aim of the focus group discussion was to gain a deeper understanding of participants' experiences, perspectives, and challenges related to riding in Worcester and the E-Bike Program. The session, conducted on the Zoom platform, lasted approximately 90 minutes, utilizing the recording and auto transcript features. Both team members actively participated, alternating between asking questions and taking notes. The team directed the conversation toward various aspects, delving into participants' motivations to ride, their riding habits and routines, general trip experiences, challenges and barriers faced while riding, and the impact of e-bikes on their lifestyles.

Following the same method used for the interview results with the Department of Transport and Mobility, the research team constructed a second coding chart, cataloging the frequency of specific topics raised during the focus group discussion (Table 3). The themes highlighted in blue signify those identified both in the focus group and the DTM interviews, establishing a link between participant perspectives and policy considerations. The topics presented in yellow denote additional main subjects discussed exclusively within the focus group. The main themes have been defined in the DTM Interview Code Table, and the definitions of the supplementary themes, as well as examples of participant responses, can be found in the Focus Group Code Table (Table 4).

Table 3: Analysis of Focus Group Discussion

	Talia	Troy	Reese	Kato	Sybil	Melissa	Total
Safety Concerns	**8**	**7**	**2**	**5**	**5**	**7**	34
Infrastructure	**5**	**4**	**3**	**4**	**2**	**2**	20
Topography	**3**	**3**	**1**	**2**	**1**	**2**	12
Environmental Awareness	**1**	**1**	**0**	**1**	**1**	**1**	5

Riding Preferences	**7**	**7**	**1**	**5**	**3**	**3**	26
Lifestyle	**8**	**3**	**3**	**6**	**3**	**3**	26
Cost	**2**	**2**	**1**	**0**	**0**	**1**	6

Table 4 - Focus Group Code Table

Code	Definition/Explanation	Examples
Riding Preferences	Answers exploring the impact of weather and riding preferences that contribute to the context in which individuals choose to ride their e-bikes	"I **avoid**, **wet** roads and, **slushy roads**, but the **heat** and the **cold doesn't bother** me." "I **resort** to the, although **not supposed to**, the **sidewalks more often than not**."
Lifestyle	Answers reflecting on individuals' motivations for e-biking and how the influence it's had on their lifestyle.	"I use it for **recreation**, sometimes **errands** or **work**" "I'm **doing something** that I **wasn't before**, using a **car before**, so a **little bit more in shape** yeah"
Cost	Answers related to the expenses of e-bikes in relation to purchase or maintenance.	"They're just, **ridiculously expensive**. So, I think the general public **wouldn't go for it**. You could almost get a **used car for the price**.

Figure 155: Word Cloud of Focus Group Codes

As shown in Table 3, the most prominent topics included safety concerns, infrastructure, contextual preferences, and lifestyle. Although topography does not have as high a total as others, this was a focal point for many conversations and came up during multiple responses to other topics as well. Figure 15 is a second word cloud created to give a visual representation of

the frequency each code topic was brought up during the focus group. Similar to the DTM interview word cloud, larger words like safety concerns, dominated the discussions whereas the smaller words, such as topography, were not as prevalent but were still important topics.

The focus group served as a valuable platform to delve into the lived experiences and perspectives of participants in the Worcester E-Bike Program, featuring voices including Talia, Troy, Reese, Kato, and Sybil. Melissa, who was unable to speak during the session, used the Zoom chat box to participate in the discussion. The discussions unveiled the impact of individual riding preferences on biking habits, particularly emphasizing safety concerns and the lack of dedicated infrastructure.

A recurring theme among participants was the inclination to ride on sidewalks rather than roads, rooted in safety concerns and a perceived lack of infrastructure support. The participants pointed out the challenges of adhering to the legal requirement of three feet of space between bikes and cars on Worcester roads, highlighting the pressing need for improved safety measures and infrastructure. Sybil's statement, "I prefer the sidewalk because, you know, it feels safer," encapsulates this sentiment, underlining the importance of a secure riding environment.

Riding preferences were further discussed by Kato's observation about weather conditions. Kato expressed a preference for avoiding wet and slushy roads while remaining generally unfazed by extremes in temperature. This sentiment resonated with multiple participants, reflecting a cautious approach towards adverse weather conditions that might compromise safety. This avoidance strategy aligns with both safety concerns and the infrastructural needs mentioned by participants, reinforcing the integral role of weather-resilient infrastructure in fostering year-round e-biking. Participants' choices to avoid specific weather

conditions underscored broader safety concerns, indicating a hesitancy that lies in the fear of losing control in slippery conditions.

The connection between riding preferences, safety concerns, and infrastructural needs emphasizes the critical role of dedicated biking infrastructure in mitigating barriers to e-bike adoption. The participants' narratives emphasize the urgency of addressing these concerns through comprehensive safety measures and infrastructure development to ensure a secure and welcoming environment for e-bike enthusiasts in Worcester.

4.5 Discussion

From Chapter 2, multiple topics, including infrastructure, topography, inclement weather, road safety, and environmental awareness, were identified. These topics were brought up in both the interview with the Department of Transport and Mobility and the focus group discussion.

In the DTM interview, all three interviewees discuss the inadequacy of current infrastructure, particularly the lack of designated bike lanes. Blair mentions the ongoing efforts to redesign streets for safety, emphasizing the need for reconfiguring streets to accommodate all modes of transportation safely. Bond adds to this by noting the mismatch between the existing built environment and the original transportation network which was designed primarily for driving. This sentiment is echoed in the focus group, where many participants express a preference for riding on sidewalks due to safety concerns linked directly to the absence of dedicated biking spaces on roads. The consistent emphasis on infrastructure gaps in both sources highlights a critical barrier that needs attention for successful e-bike integration.

The DTM members recognize the topographical obstacles in Worcester, particularly the challenging hills, as a potential hindrance to widespread e-bike adoption. Nevertheless, they emphasize the pivotal role of e-bikes in making sustainable transport accessible to age-friendly and reduced mobility communities. Blair shared a poignant anecdote illustrating the

transformative impact of e-bikes on an individual's lifestyle. According to Blair, she encountered someone who attributed their adoption of a healthy and active lifestyle in their retirement years to e-bikes, enabling them to navigate challenging terrains effortlessly. This narrative echoes in Talia's personal experience, where the e-bike served as a motivating factor for her participation in the program. Talia reflects on the challenges of aging, acknowledging that as she became slower with age, her hesitancy to ride on roads grew. The introduction of e-bikes, however, has alleviated this concern, allowing her to regain comfort while navigating the varied terrain of Worcester. These stories from both Blair and Talia humanize the significance of e-bikes, portraying them not merely as vehicles but as enablers of active and healthy lifestyles, especially for individuals facing age-related mobility challenges.

In the focus group, Kato's cautious approach of avoiding wet and slushy roads due to safety concerns resonates with the DTM interview's strong emphasis on prioritizing safety in promoting sustainable transportation. Bond's insights during the interview shed light on the ongoing initiatives to educate both riders and drivers about the newly introduced bike lanes, highlighting the direct link between safety concerns and the necessity for comprehensive educational campaigns. The convergence of weather-related challenges, as expressed by Kato, and safety considerations emphasized by the DTM, underscores a shared concern within the community. This alignment reinforces the notion that effective solutions must holistically address both weather-related challenges and safety considerations to foster a conducive environment for e-bike adoption. Furthermore, this connection between safety concerns and the need for educational campaigns underscores the crucial role of infrastructure development, where well-designed bike lanes can contribute to enhanced safety and increased public awareness.

The focus group discussions shed light on participants' intrinsic motivation towards eco-friendly transportation. Melissa expressed her current desire to be more environmentally friendly than relying solely on cars. Troy also described being very conscious of his impact on the environment, which aligns with the broader goal emphasized in the DTM interview. Blair's insights during the interview highlight the positive impact of offering mobility choices that not only provide economic benefits but also contribute to the broader theme of environmental sustainability. The shared sentiments expressed by Melissa, Troy, and others in the focus group, coupled with Blair's remarks, collectively underscore a community-wide commitment to environmental awareness and the promotion of eco-friendly transportation options. This alignment emphasizes the interconnectedness of individual motivations and broader city-wide initiatives in fostering a sustainable and environmentally conscious community.

The evidence from both sources converges on these key themes, providing a comprehensive understanding of the challenges and opportunities associated with e-bike adoption in Worcester. Addressing infrastructure gaps, considering topographical factors, addressing weather-related challenges, and fostering environmental awareness are critical components of a successful sustainable transportation strategy for the city.

4.6 NREL OpenPATH

The team explored the potential integration of the NREL OpenPATH app into MassBike's operations to enhance the quantitative data collection process. The MOU from NREL was obtained, aiming to include the signed form as part of our deliverables to MassBike. The intention was to establish a foundation for future IQP groups to collaborate on and improve the app's capabilities. However, after careful consideration, it was concluded that implementing the app was not feasible.

In discussions with MassBike and project advisors, insights were gathered from other groups currently using the NREL app. It was revealed that the app demands constant monitoring for potential code issues and occasional breakdowns. These groups found it time-consuming to address code-related problems and faced challenges in ensuring the app's consistent functionality. Given these findings, it became apparent that neither MassBike nor WPI IQP teams have the estimated time and resources required for vigilant app monitoring, rendering its implementation impractical for our team.

4.7 Data Collection Survey

In order to gain a grasp of what MassBike ascertains from their current survey, the team completed the survey themselves. This helped the team to become acquainted with the survey's structure and function but also laid the foundation for crafting a more enriched questionnaire to understand identified topics regarding e-bike adoption in Worcester.

Aligned with the insights from interviews, literature, and focus groups, the updated survey aims to investigate the key themes gathered: safety concerns, topography, environmental awareness, infrastructure, riding preferences, and lifestyle considerations. Each question is designed to gather different facets of e-bike adoption, ascertaining the challenges and motivations within Worcester's biking community. By incorporating Likert scales into many of the questions, the survey not only gathers what participants think, but also the intensity and gradations of their sentiments. This approach allows for a more detailed analysis, offering MassBike a comprehensive understanding of the community's perceptions through quantifiable insights. This survey introduces questions delving into favorite biking cities, factors influencing route planning, and the lifestyle aspects.

A consistent topic through the interviews, literature, and focus groups highlighted the concern regarding Worcester's biking infrastructure. Participants across various data groups

consistently underscored the need for enhanced infrastructure, emphasizing its pivotal role in shaping the biking experience. Consequently, our survey strategically incorporates questions related to infrastructure, providing a nuanced lens to understand its impact on biking habits and preferences. Weather also emerged as a reoccurring factor influencing biking decisions, supported by insights from focus groups and interviews. Participants often touched upon Worcester's diverse weather conditions and the impact on their biking experience. To dissect this aspect, our survey investigates the relationship between weather considerations and route planning, revealing how climatic factors shape biking choices in the community.

The findings and the survey itself, encapsulating key themes and addressing concerns, will be handed over to MassBike, offering a versatile tool for community engagement and informed decision-making. The survey can be found in Appendix F.

4.8 Recommendations

Based on our findings, the team has recommendations for MassBike and the City of Worcester, as well as future WPI research teams. MassBike should collaborate with the City of Worcester to hold educational campaigns for both riders and drivers as this was mentioned to be an important metric to both groups. MassBike already offers education from their program, but with the city collaborating this could be expanded and established connections would open more possibilities for different direct collaborations. Moreover, in the next iteration of the E-bike program, MassBike can try to give out more e-bikes to let more people join their program.

A recommendation to the city is to address the critical need for improved biking infrastructure in Worcester. As was mentioned in every discussion, there is a need for the development of dedicated bike lanes which would create a safer and more inclusive environment for cyclists. Increased infrastructure will contribute to a higher Bicycle Network Analysis (BNA) score, signaling progress toward a more cyclist-friendly urban landscape. Another infrastructure

recommendation involves weather-related challenges and the idea of incorporating weather-resilient infrastructure solutions to the city. Considering the impact of diverse weather conditions on biking habits and preferences in Worcester, developing infrastructure that accommodates adverse weather would ensure year-round accessibility and safety for e-bike enthusiasts.

Besides the city of Worcester, improving the infrastructure can be a noteworthy focus for future IQP teams. Here are several ways they can consider: first, many roads in Worcester are so narrow that even the cars only have one lane per direction. It is a challenging task on how to add bike lanes on such roads. Second, many participants mentioned the recreational purpose for riding, such as riding in a park, but only a few parks, such as Blackstone Gateway Park, have constructed bike lanes. Therefore, future teams should also consider whether it is possible to add bike lanes to more parks in Worcester. Another consideration should be related to the efficiency of bike racks: assuming there is a limited number of bike racks, how should they be distributed in order to get the best effect? Last but not least, it is noteworthy that improving infrastructure needs a lot of money. Future teams should find ways to get more funds as well as to use the funds efficiently.

The current team also has some missed opportunities that future teams can possibly make up. One missed opportunity is that the current team was unable to join any MassBike's riding events. The team believes that joining such events can help to reach out to more participants as well as to get a better understanding of the e-bike program. Another opportunity is that the team only has limited information about the biking conditions, as such information provides references to Worcester about how to improve Worcester's biking conditions. Future teams can contact WPI's Global Experience Office (GEO) and ask them to send students to do a bike related IQP in cities around the world. The team's final missed opportunity is implementing the data collection app. Although difficult, the current team believes that it is not impossible to finish

the implementation process of the app. If any of the future teams have someone who is an expert in implementing apps, it will be a huge help for MassBike for the future e-bike programs.

Chapter 5: Conclusion

Exploring the realm of e-bikes, the team first identified what e-bikes were and illuminated their transformative potential in sustainable urban transport, highlighting their role in reducing carbon footprints. The focus then shifted to the MassBike program, commending its initiative to provide e-bikes to Worcester and mainstream biking as a respected mode of transport. Analyzing Worcester's cycling landscape, the team identified challenges such as limited infrastructure and safety concerns, paving the way for initiatives like the Complete Street Program and Blue & Green Space Network to enhance accessibility and sustainability.

Focusing on assisting MassBike in enhancing the Worcester E-Bike Program for the second iteration by identifying barriers to e-bike adoption and improving data collection practices, the team began conducting interviews. These discussions with MassBike, MassCEC, policymakers, and Worcester Department of Transport and Mobility illuminated an understanding of challenges faced during the pilot program and provided professional perspectives on Worcester's cycling conditions. Next the team engaged with participants at a community event, ultimately forming a focus group to gather firsthand experiences and insights on e-biking in Worcester. The team then explored potential collaboration with Metro Mobility, investigating their data collection app, NREL OpenPATH, but decided against its implementation due to resource constraints. This information was then to be culminated in an improved survey for MassBike's second program iteration, combining quantitative and qualitative questions to assess participant experiences comprehensively.

The team's research, interviews, and focus group cumulated in identifying overlapping key topics of interest which included infrastructure, topography, safety concerns, and environmental awareness. The interview with MassCEC and MassBike revealed distinct data priorities, with MassBike focusing on experiential data and MassCEC emphasizing vehicle miles traveled precision. The interview with the Department of Transport and Mobility highlighted safety concerns, topography, environmental awareness, and infrastructure as key themes among policymakers. Participant observation and the focus group discussion provided insights into community perspectives, emphasizing safety concerns, infrastructure, and weather-related challenges. The team explored integrating the NREL OpenPATH app, obtaining the MOU but determining its impracticality due to lack of resources and feasibility. The data collection survey, that includes questions aligning with insights from interviews and focus groups, addresses the key topics and provides a versatile tool for data quantification.

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Appendix A: Meeting with MassBike and MassCEC

09/20/2023 - Galen Mook "G" (MassBike), Elijah Sinclair "E" and Soumya Atnoor "S" (MassCEC)

Questions:

Q1. Briefly introduce yourself. What is your story about bikes or E-bikes?

E: I'm Elijah Sinclair, and I'm a program manager at MassCEC. About my story with e-bikes, I'm really passionate about reducing emissions and really excited about combining such passion to programs like the MassBike program.

S: I'm Soumya Atnoor, and I'm a program administrator at MassCEC. I started riding when I was very young, but I'm not familiar with e-bike until very recently. I'm really excited about e-bikes, since it is a clean transportation and is more accessible than electronic vehicles or some other form of transportation, as well as it is very useful.

G: I'm Galen Mook, and I've been working for MassBike for 5 years now. We have seen e-bikes as a major issue that has yet to be figured out. The regulations related to e-bikes seem relatively new. We are excited to help the state incentivize this as a mode shift, to get people out of single occupancy cars, and to reduce GHG emissions. One mission of MassBike is to get more people to ride more bikes. I'm excited about e-bikes, since it allows older, younger, and less athletic people to have open equity to transport.

Q2. Why did you/what motivated you to found the e-bike program?

G: We had prior interests in the field, but funding from Act4All allowed it to happen.

Q3. What are the challenges of this program?

G: One of the biggest challenges has been deciding with the limited number of bikes to be given away, since there are over 1,200 applicants for the e-bike program, but we only have around 100

bikes to be given. It is challenging to disperse the e-bikes to mirror the Worcester diversity. Another great challenge is about tracking the participants, since tracking all 100 people is impossible. We have 60-70% reporting rate, which I feel really good, but it is still a challenge to reach out to people who have busy lives to track their miles and trips.

Q4. Are there specific technologies or tools MassCEC believes would be valuable for improving data collection and analysis in this project?

E: One suggestion is that participants could put trackers on bikes. Another thing I want to mention is Metro Mobility, a project happening in Boston, and one of their programs is very similar to the MassBike program. The different thing is that it has an app that give participants the option to list what they would choose for transportation if not riding an e-bike. Another tool I want to say is education systems, similar to MassBike, on how to ride or charge bike safely without good infrastructure. We could talk to participants about things such as whether they feel more comfortable if they rode with more experienced riders.

Q5. Are there any practices or lessons learned from similar initiatives that you believe could be applied to optimize data collection and participant engagement in this program?

G: Massbike has tiered incentives in second iteration, which would be helpful info to MassCEC to see cost effects.

E: There's a National Renewable Energy Laboratory app from Metro mobility. The app helps to alleviate concerns around reporting bias. In the app, locations visited frequently during trips is easily viewed.

S: We could partner with more community organizations.

Q6. What is your advice to MassBike about what/how they should do next? What is your advice to us (wpi research teams or other researchers)?

E: The changes proposed for the second iteration align with MassCEC, who wants to build information compelling to people in charge of funding. It would be helpful if there were better ways to measure and collect data from participants. Vehicle miles traveled by participants as well as how they would have gotten there without bikes would also be helpful.

G: We are interested in experiential data from riders. This includes how their ride was, how the route was, how they could change the route to make it more comfortable. Also, it could include how commuting feels on different days and how they can make their ride safer.

S: We are deciding whether this should be a statewide program.

G: We want to focus more on the riders as well as the Worcester area.

Q7. What are MassCEC's plans with the data gathered?

E: We hope to create a statewide program for sustainable transportation, as well as to use emission data to motivate other policy makers to gather funding for similar programs

Appendix B: Consent Form for the Interviews

Informed Consent Agreement for Participation in a Research Study

Investigators: Dylan Furtado and Anzhe Tao

Contact Information: Dylan Furtado, Tel. 774-766-1219, Email: djfurtado@wpi.edu & Anzhe Tao, Email: atao@wpi.edu

Title of Research Study: MassBike Worcester E-Bike Program Assessment IQP

Sponsor: MassBike

Introduction:

You are being asked to participate in a research study. Before you agree, however, you must be fully informed about the purpose of the study, the procedures to be followed, and any benefits, risks or discomfort that you may experience as a result of your participation. This form presents information about the study so that you may make a fully informed decision regarding your participation.

Purpose of the study:

This student led project wants to help MassBike identify the barriers to e-bike adoption in Worcester, to help improve the next iteration of the project. Your participation will involve sharing your thoughts, experiences, and opinions in a focus group discussion.

Procedures to be followed:

- Focus Group Discussion: You will be asked to participate in a virtual focus group discussion with other Worcester E-Bike Program participants over Zoom. The discussion will be facilitated by the investigators and will revolve around topics such as motivations for e-biking and joining the program, your personal experiences and preferences riding, the challenges of riding, the practicality of your decision to use e-bikes, and the impact on your lifestyle. The duration of the focus group discussion is expected to be between 60-120 minutes long.
- Data Collection: The focus group discussion will be audio-recorded for research purposes. These recordings will be transcribed and analyzed as part of the study. There will also be a note-taker present to document key points, participant quotes, and non-verbal cues.

- **Risks to study participants:**

Foreseeable discomfort includes pressure to conform to group opinions or hesitation to express opposing viewpoints. To reduce this risk, the facilitator will emphasize the importance of open and respectful dialogue; participants will be encouraged to express their opinions, even if they differ from the group consensus.

Benefits to research participants and others:

Benefits of participation include the opportunity to contribute valuable insights that can help improve the second iteration of the MassBike program and the overall understanding of e-bike adoption. Through your participation, you'll not only gain valuable awareness of the challenges and experiences fellow riders face, but also engage in discussions about potential solutions that can be applied to your own riding journey.

Record keeping and confidentiality:

- We will use Zoom's built-in recording feature to capture the audio of the focus group discussion. This recording and any other data will then be stored in the university one-drive cloud system with double authentication, and exclusive access for the student researchers and the advisers.
    - Please be aware that any audio and video content created during our Zoom meeting is encrypted, which means that unauthorized individuals will not have access to this content. However, it is important to note that this information is not considered private by Zoom Inc., the company that provides the Zoom platform.
- The discussion answers are expected to be reported and to ensure anonymity, specific details that could lead to participants identification will be omitted. When referencing specific participants, pseudonyms will be used.
- Confidentiality will be maintained through:
    - We will create a private meeting so that the room is both encrypted and password protected. The waiting room function will also be used to approve each new attendee before they can access the room for added protection.
    - Display participants names in the recording will be unchecked to protect additional personally identifying data from being collected in association with their voice.
    - Data will be kept until the end of the project period and securely deleted after this period ends to ensure it cannot be accessed or reconstructed.

Records of your participation in this study will be held confidential so far as permitted by law. However, the study investigators, the sponsor or it's designee and, under certain circumstances, the Worcester Polytechnic Institute Institutional Review Board (WPI IRB) will be able to inspect and have access to confidential data that identify you by name. Any publication or presentation of the data will not identify you.

Compensation or treatment in the event of injury:

- We want to assure you that participating in this focus group involves minimal risk of injury or harm. The discussions will revolve around motivations for e-biking and joining the program, your personal experiences and preferences riding, the challenges of riding, the practicality of your decision to use e-bikes, and the impact on your lifestyle. However, in the unlikely event that you experience any discomfort, distress, or harm as a result of your participation, please be aware of the following:
    - Compensation: There is no compensation provided for participating in this focus group. Your participation is voluntary, and you will not receive any financial or material incentives.
    - Medical Treatment: If you experience any physical or emotional distress during the focus group, you should promptly inform the facilitator or moderator. They

will assess the situation and take appropriate action to ensure your well-being, which may include discontinuing your participation or seeking medical assistance if necessary.

You do not give up any of your legal rights by signing this statement.

For more information about this research or about the rights of research participants, or in case of research-related injury, contact: (Fill in your contact information or make reference to information provided at top of page. In addition, include the contact information for the IRB Manager (Ruth McKeogh, Tel. 508 831- 6699, Email: irb@wpi.edu) and the Human Protection Administrator (Gabriel Johnson, Tel. 508-831-4989, Email: gjohnson@wpi.edu). This section is required.)

- Student Investigator: Dylan Furtado, Tel. 774-766-1219, Email: djfurtado@wpi.edu
- Student Investigator: Anzhe Tao, Email: atao@wpi.edu
- Advisor: Alejandro Manga, Email: amanga@wpi.edu
- Advisor: Mimi Sheller, Email: msheller@wpi.edu
- IRB Manager: Ruth McKeogh, Tel. 508-831- 6699, Email: irb@wpi.edu
- Human Protection Administrator: Gabriel Johnson, Tel. 508-831-4989, Email: gjohnson@wpi.edu

Your participation in this research is voluntary. Your refusal to participate will not result in any penalty to you or any loss of benefits to which you may otherwise be entitled. You may decide to stop participating in the research at any time without penalty or loss of other benefits. The project investigators retain the right to cancel or postpone the experimental procedures at any time they see fit.

By signing below, you acknowledge that you have been informed about and consent to be a participant in the study described above. Make sure that your questions are answered to your satisfaction before signing. You are entitled to retain a copy of this consent agreement.

Study Participant Signature Date:

Study Participant Name (Please print)

Signature of Person who explained this study Date: _____

Appendix C: Interview with Department of Transport and Mobility

11/07/2023

00:00:01 Dylan Furtado

We are students at WPI engaging in what is known as an iqp. Which is the interactive qualifying project where students work in teams which students not in their major to tackle issues that relate science, engineering and technology to society. As I described, we are working with mass bikes to help them improve the data collection process for their second iteration of the Worcester ebike program And the the purpose of this interview is to understand the views on there is just cycling in Worcester from a political viewpoint. With that being said, my name is Dylan Furtado. I am a junior at WPI and my major is mechanical engineering.

00:00:55 Anzhe Tao

I'm Anzhe Tao. I'm a senior at WPI and my major is math.

00:01:03 Dylan Furtado

So just to begin, what were all of your motivations for working in the Department of Transport and Mobility?

00:01:14 Blair

Do you want to go by who joined the team in order chronologically. So Bond, you'd go first.

00:01:20 Bond

You're gonna kick it over to me, OK? Sure. Bond. I'm a senior transportation planner here with with DTM, and I actually started with the city about four and a half, almost five years ago. You know, before this department was created previously, I was in the the Planning Department and. Within that department, we were trying to launch a essentially a transportation planning program that the city really didn't have prior to. The creation of my position to essentially take a a more holistic look at at transportation than what we previously had in the city, which largely was had been kind of confined to

just focused on pavement condition. Yeah, streets would be Slated for repavement and they would be repaved and put back exactly as they had been without any real discussion or involvement of other departments about whether the current configuration makes sense, whether there are ways to improve access or improve safety so Join the city hoping to essentially promote complete streets in the city because that's always been an interest of mine and it's been where the majority of my work has been in the past.

00:02:47 Blair

Alright, I'm Blair, and I'm the transportation planning manager here at DTM. I joined the team last February. Prior to this, I worked for a regional planning agency in a different part of the state. So I did a lot of planning from more of a You know higher up level there are not many opportunities like this one. I think that creating departments like this is sort of an evolving process and more communities are interested in it. And when I saw that this opportunity had opened, it was really exciting to be go to go from, you know, planning where all you do is planning to being able to be part of a team that is both planning and implementation and taking a lot of the things that I've been preaching to communities to do and helping them do to actually being able to do it on the ground so that was my motivation.

00:03:49 Ash

Ash, I am the other senior transportation planner here at the department. I focus a little bit more specifically on GIS or geographic information systems slash science prior to working for the city and this department, I was doing a few other jobs like behavioral therapy, education. Those kinds of things. And then I began to learn. On my own, just more about transportation. And also, has always been a second home for me, so I've always noticed our struggles with transportation, or you know, access to better transportation. And I began to learn a little bit more about this department when it was formed and about ongoing projects and at the same time, a new position came up. And that's when I applied to the job and that's. Pretty much I ended up here.

00:04:38 Dylan Furtado

Thank you. Could you share any personal experiences relating to using alternative transport methods such as biking E biking in Worcester that you have, and if it has have these experiences influence your work in shaping policies or programs?

00:05:02 Bond

So I'll start there. So I think most of my experience with biking. Has really happened outside of Worcester. I was kind of inspired to pursue transportation planning as a profession based on my my experiences when I was in undergrad, I studied abroad in Europe and got to travel to Amsterdam and Copenhagen and and places like that that have really, really strong. Like networks in really high percentage of of mode share in. So having seen those places kind of inspired me to think, well, how can we apply that in the US? And before I moved out to Massachusetts, I lived in Chicago for a while and and would frequently. Bike around for uh. Just kind of everyday errands and things. Uh, in the section of town that I was living in and just found that to be a really enjoyable experience if I'm, you know, running to the store for milk and eggs. I don't need to get in a car for that. I can just go get on my bike, throw them in the bag and you know, have a better experience so having. Experience that in other places makes me wanna to bring it to Worcester.

00:06:24 Blair

I would say I also I have not done any bicycling in the City of Worcester. I worked here. Maybe 17 years ago, before this job as and I worked for the rails and Trails Conservancy. So the focus of that organization was to help communities build, convert old rail corridors into multi use paths like the Blackstone River bikeway, so. I've done a lot of biking. I've rode around the city where I live, but I have not yet done any here in Worcester. I've done more walking around neighborhoods to be on the ground, learning more about the neighborhoods.

00:07:10 Ash

Similar to Blair, you have now biked in Worcester and similar to Bond, a lot of my experience is from growing up in New York City, so most of my experience with public transportation and being able to walk around or use other means of transportation besides a car have been through. I guess my experience as a child in New York City, and I've always been interested, I've always. So with that in the city of Webster, we can also achieve that kind of level of transportation or like other forms of transportation, because similar to Bond, I don't necessarily want to hop in a car just to go to grocery stores and get, you know, one or two things. If I can just walk there instead or if I can, just like, take the bus or an E bike and E Scooter or something else? That's not necessarily as impactful as a car.

00:08:02 Dylan Furtado

Thank you.

00:08:03 Anzhe Tao

And what's your opinion about the current banking policy and what's like? Are you satisfied with the policies or do you think it needs improvement?

00:08:17 Bond

Yeah, I think it's a pretty resounding no. Uh, no, we're not satisfied with it, which is, uh, kind of why our department exists and is really a Big focus of all of our work is that it's not OK. Right now our the bike lanes that we do have don't connect to a lot of the neighborhoods. So we, you know, want to take a look at ways to Connects downtown with the neighborhoods and, you know, make sure that people can safely and comfortably get around by bike.

00:08:53 Blair

If you're asking about policies in particular, we don't have a whole lot of policies around bicycling. I'd say Bond can correct me if I'm wrong, but we do have a complete streets policy and it's a. Good policy, the needs to Implementation of that was, I don't know. I don't want to, sketchies not the right the right word. But you know, it was subpar and we're trying to raise that up and implement it the way it was intended to be implemented and then right now we are doing some a large plan. We'll look at additional policies in the city and how we can improve those to help expand the network, create a network, maintain and make it safer for people to. Get around the city and not in be in a car.

00:10:00 Ash

I don't have any comments.

00:10:03 Dylan Furtado

Thank you. How does the Department of Transport and Mobility view the role of E bikes in promoting sustainable transport in Worcester and from your perspective, how significant roles do ebike play and achieving sustainable goals related to urban mobility?

00:10:23 Bond

I would say it it's a huge component, uh, one of the biggest, I think. Probably the biggest barrier to bike adoption in Worcester is the hills. Our topography is such that it's just very tough to ride a conventional bike around the city and and get around. So the ability of ebikes to let people conquer those hills I think is. Absolutely huge. And to go further distances than they ordinarily would, I think really is going to be the difference between adopting biking and not.

00:11:01 Blair

I would agree completely with Bond. I also think that E bikes are going to be really important for an age friendly community. I know when I've been on rail trails and I was talking to my husband about the E bike program and this older woman was riding past me. She's like and she overheard me talking and she said, you know, if I hadn't gotten an E bike. I would never be riding my bike now because it's what got me started, because otherwise I wouldn't have been able to start and there she is riding in her retirement, being in and healthy, living in a healthy, active lifestyle and The city has just adopted the healthy aging plan. Is that what we just? I don't remember what exactly what it's called. But UM, you know, I think that it's a huge component. You know, the hills are big. It's for. All ages. It just makes it a lot easier I think also that it's. Just it doesn't cost you a lot to recharge your bike. The costs in general are lower, so it's open to more people and you can go farther. I think there's some issues around how heavy they are and that makes it hard for people for storing and, you know, getting on, like putting it on the bus for example, would be more challenging. But I think it's a game changer for Worcester.

00:12:28 Ash

I also think it's a game changer for Worcester. Again, like Bond said, with all the hills, it's can be challenging to ride your bike and move around with the regular bike just because it's a little bit more demanding on you physically. So with the bikes, it's a lot of people to. Try something that maybe hadn't tried before, right? Or like try if you ride a bike, this is now a different way of riding a bike, right? Like I've not. I haven't used an E bike, but it sounds pretty cool to me. It's like OK, I can just press a button and then like you just go about your day and it's a little bit easier to. Do then just having to put all the entire time. So for me I think it's cool. And I also think it opens up the room for other mobility options, right, like E scooters, which have been around for some time. So it's like, OK, well, now we have experience with the E bikes here and with Sir, we can also maybe do the E scooters and other forms of electric mobility options here.

00:13:20 Blair

I think just to also add on to that, while you were talking Ash, is you know E bikes also will car slightly less effort, and so if you're riding to work, perhaps it'll make it less likely that you need a shower after you ride your bike, which is huge for a lot of people, right? I mean, you're talking about barriers to use of mobility options, and that's one of them.

00:13:49 Bond

Yeah, I was going to comment the same thing. I think it opens up different types of riding versus just recreational.

00:14:00 Dylan Furtado

Thank you.

00:14:01 Anzhe Tao

Thank you. Have you been involved in any previous sustainable transport studies or programs specifically by correlated? And if so, could you share the outcomes of these initiatives and their impact from your perspective?

00:14:18 Blair

I don't think I've been involved in any studies.

00:14:22 Ash

I don't think so either.

00:14:26 Bond

Yeah, I'm trying to think. I don't think I have.

00:14:30 Dylan Furtado

I guess has the Department of Transport worked with any programs closely, like biking related.

00:14:40 Blair

We're so new that we just had our first birthday, so no, not as a department. No, I mean the city. Had a bike share program but I don't know what data the city had from that since.

00:15:09 Dylan Furtado

From your perspectives, what do you consider to be the most pressing transport challenges in Worcester? Uh, and what is currently in place to address these problems?

00:15:24 Blair

Well, I think right now our streets are designed for one, maybe one, you know, couple modes, I guess. I mean, it's the design predominantly for the car. And then you have sidewalks. You have buses out there, but I'm not sure that the streets are really designed for the buses properly, certainly not right now. And they're not designed for cyclists whatsoever. So I think what we're doing right now is trying to redesign those and reconfigure. Their streets. So they're safe for all modes and I think when you look at the data you find, Worcester has high crash rates, high crash rates for the state. We have a lot of congestion. We are, you know, the second largest city in New England. And uh, I think that having different mobility options gives people more choices, which is what you need. You don't want to just have one choice to get everywhere, you want to have multiple choice. And that will lead toward, you know, an actor and

more active community and might more allow for more diversity and sustainable transportation options.

00:16:46 Bond

And I would just add to that You know, we have a transportation network that is largely built around driving, but we have large parts of the city that were built out before the adoption of the automobile. So you Have neighborhoods that are really not built to store large numbers of cars where we have lots of people who have to rely on cars and there just isn't enough space for all of them. But prior to our department there was nobody really thinking about alternatives. So it just sort of a mismatch between the built environment that we have and the transportation network that people rely on.

00:17:33 Blair

I think 2:00. Just add one more thing is also the cost of transportation. As we know in Massachusetts, you know rents cost of housing is really high, cost of transportation is everything's high now, right. So by offering mobility choices in the city that are safe, that gives people More options to spend less on their transportation.

00:17:58 Ash

Kind of going off what you guys were saying. I think one of the biggest barriers is also just The lack of infrastructure to bike around the city, right, like people maybe don't feel comfortable riding on the streets. Umm, so then you might see people like on a sidewalk for example, because we don't have the infrastructure in place for them to ride their bikes safely. So that could be a huge barrier for many people who maybe would like to try it out, but they're just scared or hesitant. Because we don't currently have The infrastructure in place for them to be able to do so safely or In a way that they feel safer than what we currently have, right?

00:18:38 Dylan Furtado

Thank you.

00:18:40 Anzhe Tao

Is there any example of a challenge or barrier you've encountered while promoting sustainable transport in Worcester, and how was it addressed? What? Did you learn from that experience?

00:19:00 Bond

I I think we're kind of in the middle of that right now. We're rolling out some new bike lanes, specifically on Mill Street in a style that has not been. Try it out here before and so just a lot of people are. I don't want to say resistant to it, but they're just, they're unfamiliar with the idea. So we have some educational campaigns going on right now to teach both riders and drivers how to use those lanes, and I think it's just going to be an ongoing process of of educating people about what you know the different types of. Bike lanes and things we have are and how they function.

00:19:54 Dylan Furtado

What do you believe are the main factors influencing the public perception of E bikes or sustainable transport in Worcester, and what strategies could be employed to improve and promote positive images of these modes of transport?

00:20:12 Blair

I don't know. I guess I was thinking one of the worst images is people don't want to give. Up parking or they don't want to give up space on the roadway because they want to go faster. UMI think that. You know, we're about to embark on a safe streets for all vision zero planning process. And that's all about safety. And I think that that's probably the number one educational component is safety and the idea of eliminating fatalities and serious injuries that they're unnecessary deaths and injuries.

00:20:50 Blair

That have big impacts is. A really powerful message and it involves everybody to participate in order to make that happen. So I think we're hoping through both with. The outreach that we've been doing just through our mobility action plan process and then the big public campaign, we'll be doing around safe roads for everybody and all modes, all peoples is going to be. It's going to be cross-departmental and it should hopefully have the impact that we want to get people on board to make, make sure that they. Everybody can use the roads.

00:21:35 Bond

And two things that kind of stick out to me. You know, we get a lot of folks riding on the sidewalks and in Worcester. And a lot of people who are walking are really concerned about that because they don't want to get hit, obviously. And as the E bikes are adopted more E bikes can get a lot more speed than conventional bikes. So there's a lot of concern among people who are walking that, hey, I don't want these things on the sidewalk, which they shouldn't be there anyway. But there's kind of two main things that we need to to do on our end and that is educate riders on how to safely and and legally ride their bikes in the streets, but also build streets that they feel comfortable riding on in the first place. So I I would say like education and infrastructure are kind of the two. Routes that we would have to take to deal with that?

00:22:36 Dylan Furtado

Thank you.

00:22:37 Anzhe Tao

So from your perspective, how can local policies or initiatives be introduced to make it by the adoption more attractive and feasible for Worcester residents?

00:22:53 Bond

So one thing that's going on right now, so you may have seen the city is, uh, doing their first sort of long range master plan in 30 years. Now it's called Worcester now, Worcester next and one of the things they're gonna be looking at is looking at their zoning Codes. So when somebody's building a new apartment building, you know what are they required to do, to include and we don't know requirements about it necessarily right now, but we generally encourage when a new development is happening to have some sort of indoor bike storage, so that people have a safe place to store their bike if there's

charging infrastructure in there, that's even better because one of the big things is I think a lot of people are worried. About justifiably as that E bikes can be, you know, several $1000 and you don't want to leave that just out on the street where it can be, you know, stolen or vandalized or anything like that. So I think having a a safe place to keep them when you're at home, having places to lock them up. On the street, when you're when you get to your destination, having a bike rack that you can get to is important too, so it's really just having a place for them.

00:24:16 Anzhe Tao

Thank you.

00:24:22 Dylan Furtado

How can data collection and analysis gathered from E bikes play a role in shaping future transport policies and programs related to Worcester?

00:24:36 Bond

So we're hoping to get a sense of. You know from the the ebike data, where are people going? What's what destinations are important for them? What routes they take to get there that that lets us know where we should be focusing on building out bike lanes and building more racks. So just knowing where people want to get to and what route they want to take.

00:25:08 Dylan Furtado

And then in the context of sustainable transport, what specific data do you guys find most valuable for monitoring and evaluating the effectiveness of transport programs and policies?

00:25:26 Blair

Can you read that over one more time?

00:25:28 Dylan Furtado

Yes. What specific data do you find most valuable for monitoring the effectiveness of? Transport programs and policies in the context of sustainable transport.

00:26:00 Bond

I think maybe just looking at the the volumes of people who are writing so we can see over time you know has has there been an increase in the number of people writing on a particular on a particular Rd. is probably going to be one of the main things that we would look at.

00:26:19 Blair

Yeah, I think you have your quantitative data or you're looking at the volumes and then you've got your qualitative data where you're talking to people and getting their impressions and how it actually works. I think you those two items probably are Both needed.

00:26:42 Dylan Furtado

That is all we have prepared Thank you guys for coming and for taking the time out of your day. This was helpful for our project.

00:27:00 Blair

Great. Thank you very much.

00:27:03 Anzhe Tao

Thank you. Bye.

00:27:04 Bond

Thank you.

Appendix D: Focus Group Discussion

11/09/2023

[Dylan Furtado] 17:40:06

Alright, thank you. Now we can begin. So if everyone would like to introduce yourself, tell us about your experiences riding. Such as how long you've been riding. And what motivated you to join the bike program?

[Anzhe Tao] 17:40:34

Or maybe I can give an example about how to introduce yourself. So first begin with your name or pseudonym, so I'm Anzhe. And tell me about where you're from, how long have you been, and are you a student or working? So Just like I'm from China and I've been living in Worcester for 4 years since since. Starting my college and Yeah, now a college student. And I've been riding back since I was 5. Just like this. You can talk in any other you want. And. Yeah, most important. I will like to know your already experience and why did you join the, by program? So who wants to start?

[Reese] 17:41:28

I can start. Okay, hi everyone. My name is Reese. I'm currently a PhD student at WPI.

[Anzhe Tao] 17:41:30

Okay.

[Reese] 17:41:39

And I've been in Worcester for about 2 years and a half now, I think. Right, so, I guess I've been like riding bikes since I was pretty young, just like started like with my family and I've always like love biking but more is just kind of like a fun activity not for exercise or transportation. So I think like in college I didn't bike a lot, but then when I heard about this program, it just seemed like a really cool opportunity to. First like test out an electric bike and also try to like get back into biking more. But i didn't have a lot of experience prior experience like biking on roads with cars it was more like on trail like bike trails. Yeah, anything else?

[Dylan Furtado] 17:42:36

Know that hits everything. Thank you. Anybody else?

[Anzhe Tao] 17:42:41

One.

[Kato] 17:42:44

Yeah, I guess. Good.

[Talia] 17:42:44

Can you hear me? Alright, this is Talia, I'm Taliae Buff. I've lived in Worcester. Area all my life. I am retired. And I've been biking. Basically, you know, as an adult my whole adult life at least, you know, as a kid too, but all my adult life. I, biked a lot with like 7 hills whilman back. 30 years ago and the older I got the slower I got in I'm way too slow for that group now. So So, so I started doing like rail trails for a while. And now with this electric bike. Now I'm, you know, more comfortable on the roads in the city because it's a little bit. You know, easy to man over in traffic with when you can get a little bit better speed going and so that's basically what I was looking for when I get into the. The program I never really wrote in the city before. I always rode just you know, would put the bike on the car, go someplace and then ride out the back soon or you know other towns. It was never in the city of Worcester. So now, you know, a good part of my biking.

[Dylan Furtado] 17:44:06

Thank you. Somebody else?

[Kato] 17:44:13

Can you hear me? Okay, this is Kato. I'm semi retired right now.

[Dylan Furtado] 17:44:14

Yes.

[Kato] 17:44:20

Been ride bicycles since the 50. And get involved in this program. To see what's going on in the bike world nowadays. And see what, you can do for me. I'm getting older. And, wanted to have another avenue first and exercise. So I'm mainly staying outside the city in Worcester. I've been Worcester for Hmm, a long time. Probably. 40 years now. And I've been riding a motorcycle since 70. So, I wanted to see how I felt. Riding. So that's why I get involved with the program.

[Dylan Furtado] 17:45:05

Thank you.

[Sybil] 17:45:09

My name is Sybil. I'm a student. I have been riding for as long as I can remember. But it's like, I would only ride like on, never on the road, like it was always trails and things. So I think that's that was the biggest like change in the last year I've been in this program. But. So that's just an adjustment.

[Dylan Furtado] 17:45:40

Thank you.

17:45:42 Melissa:

I'm Melissa,lived in Worcester all my life. I work as a secretary and needed a lower impact form of exercise than walking. I used to ride a lot when younger and loved it and I wanted to be more environmentally friendly than driving a car everywhere. Things have changed...a lot more cars that don't seem aware of bikes so it's scarier but I'm more comfortable with the electric bike because of the speed I can attain.

[Dylan Furtado] 17:45:47

And thank you, Melissa.

[Troy] 17:45:59

You done, Melissa.

[Anzhe Tao] 17:46:01

Yeah, Melissa, I think Melissa has typed in the chat box.

[Dylan Furtado] 17:46:07

Yes. Melissa said she was only able to chat, not talk.

[Troy] 17:46:12

Oh. You think she's done?

[Dylan Furtado] 17:46:16

Yes.

[Troy] 17:46:18

Okay. I'm Troy. Lived in Worcester all my life. And when I see things for free, I like it. So I went for the E bike because the hills and Mr. Kind of Stop me from doing my typical riding. I used to commute to work a lot with a with a standard bike. But the old you get, more responsibilities, you find ways to not bike, given the dangers of Worcester. And given the hills of Worcester. So the e bike was was just a great thing and, I'm loving it. But it is concerning the road conditions, sidewalk conditions. Driving skills they're there not You're not good, I would say, 20% of the drivers of Worcester are distracted and rude. So I tend to use the sidewalks. And many of the sidewalks are not. Clear of brush and things like that so you have to be careful there Anyway, yeah, I've ridden the bike in Worcester. All my life, but this time I'm really doing a little bit more because of the e-bike program. So I do appreciate it. Thank you.

[Dylan Furtado] 17:47:41

Thank you.

[Anzhe Tao] 17:47:43

Welcome all of you to join the focus group today and I'm really happy to see you. And the next question is. What did you think of e-bikes prior to the start of the e-bike program. How has your perception changed since starting the program?

[Troy] 17:48:09

Did you repeat that, please?

[Talia] 17:48:16

I could answer it. Let me just answer it. I never really thought about Ebikes before I get in the program because it was just never anything I was ever going to buy. It was like not, you know, never gonna. Have money put aside for that. So it was just something that I never really considered. I still might be a snob. On rail trails that are flat. You know, I kind of like will say, oh, that person's on an e bike on the on the flat rail trails. But other than that, you know, again, it's it's still a good way of traveling. It's still exercise. It's still a good way to to get their exercise and get around. But But yeah, I like my bikes for my e-bike riding in the city and yeah, I just never would have thought myself being one on one before, before the program started.

[Dylan Furtado] 17:49:13

Thank you.

17:49:15 Melissa:

I didn't know anything about e-bikes before and I'd never be able to afford one

[Sybil] 17:49:19

I would agree with Talia. I didn't know much about them before I got one. But since having it, it does make it a lot easier. I would never have. Felt comfortable committing to like around the city. And since then it's, I seems like more people I know have gotten, for whatever reason health or so and so it seems like they're bigger now but still just like very few people.

[Dylan Furtado] 17:49:54

And then Troy, I don't know if you understand the question.

[Troy] 17:49:59

Yeah, yeah, I need it. If I can't read it, I need to hear it again because I'm not good at remembering.

[Dylan Furtado] 17:50:05

Yeah, it's what did you think of the bikes prior to starting the program and has your perception changed since you started the program?

[Troy] 17:50:17

I did hear about E-Bikes. Pride to the programs. My neighbor let me take his for just a couple of seconds and I loved it. And I kind of try to keep up on these new things and yeah the cost was ridiculous so I said forget it. So my perception is about the same they're awesome. They're just, ridiculously expensive. So I think the general public wouldn't go for it. You could almost get a used car for the price. But they're great. Makes life easy going up the hills.

[Dylan Furtado] 17:50:54

Thank you.

[Reese] 17:50:57

Yes, for me actually is funny because I remember when I was in middle school or high school, I was at a science fair. And so this was like a while ago and they had like a e-bike to test out. And I think at that time it was probably like a pretty new thing. So just like testing it was cool because then you just pedal and then you just like it was one of those we also like the ones we have or if you title you just you still have to pedal but then that pushes you forward.

[Troy] 17:51:21

Yeah.

[Reese] 17:51:24

And then like since then I hadn't really thought about e bikes until I until I saw this program. But then like Yeah, I realize like how useful they are for like if you do need transportation and there are like hills or stuff like that. But I agree with the. The price. That I hadn't even considered like buying one. Cause I had a regular bike before, but. That's why this, this program seemed like a cool thing.

17:51:58 Melissa:

I too was very surprised how much easier the hills are!

[Dylan Furtado] 17:52:01

Thank you. And then Kato, I don't know if you have anything to add to that.

[Kato] 17:52:07

Sure. You know, I had heard about them and wasn't anxious to grab one, but when I saw that the program was up there. Again, I was, I was trying to get myself. Out of the house and moving more. I do work out 3 nights a week, but, you know, peddling a bike is different. I thought it was a good exercise, low impact. That type of thing. Didn't think of the price, you know, again, I was just getting, trying to get in the program and I get lucky and I get called so. I appreciate what's going on in Worcester. But trying to get around in the city. So, you know, little scary. When I grew up, we always wrote. Against traffic and now they want you to ride with traffic Now don't have all the mirrors and stuff to see behind me like I do on my motorcycle. And yet again, you know, motorcycle, if I see something coming, I can slam on the brakes and control it on. I hit the gas and get out of the way. Peddling my old butt trying to get out of the way is a little more difficult. So I'm sticking to roads. Around my house. 3 4 mile radius. I have gone in the city with the rides we do. But you feel very vulnerable. Even some of the bike, the place have gone sort of on the outskirts towards some of the parks. You know, you see a bike, and you get going and then suddenly it ends. And you're in regular traffic. So I think the city has a long way to go before we bicycles of any sort, replacing vehicles. And I'm hoping they focus downtown more. Than the outskirts, which I think that's what would help. If they're trying to curb traffic in the city. But, yeah, I'm, I'm still trying to get used to, like, Troy. I resort to the, although not supposed to. The sidewalks more often than not. Cause I just can't, I don't like to feel the people as Troy said. The distracted drivers, I mean just drive a car. You know, I've got a big blue boat, people almost running to me, so. Being a little bicycle on a path somewhere. I feel very vulnerable. So, that's why I stick to neighborhoods and scooting around that area to get the miles in. But I think it's a a valuable program for the city if they can then get the, the lanes in there without. Causing more congestion on the roads. And I see a lot of people complaining about. You know, I think they just did Mill Street. They took a full lane out to put bike lanes, but. The markings on Mill Street. Pretty funny. It's, I don't know. It's almost suicidal. But, as we've done rides out that way too. But again, we get a long way to go and I think it's a great way to start. And it was a good opportunity for me to hop on one and try it out. That's it. That's it. Yeah. That's all I got.

[Dylan Furtado] 17:55:20

Alright. So I guess building off of, what Kato said, and Troy said, they both use the sidewalks. A lot. So where do you prefer to ride your device? Do you prefer sidewalks? or do you prefer roads. Do you avoid any specific routes or do you choose specific routes for any certain reasons? How do you plan your ride?

[Talia] 17:55:50

Okay, I'll go. Sorry. I do ride on the road most of the time. I do. Up for the sidewalk if it's a busy road and there is no place for you know if I've got less than 2 feet to bike in be without the traffic I'm gonna get on that sidewalk instead. And bike. I do try to since I've got been in the program. They suggested like trying to find an alternate route so even if it's a lot of times I can find a nice route that's parallel to the road I'm on and it's a much more pleasant ride if I'm on a back, you know, on a side road. You know, it might be a little bit further, it might have more hills, it, but it's gonna have less stop signs and it's gonna have You know less traffic so if I can be on a less traffic road that's gonna be a more pleasant ride for me and I do that. I may find a couple roots that. My biking into the city, there's a couple like exit rans from the highway that I had to cross. It's like, I know when I'm coming at an exit ramp. I'm not expecting to see a bike going by me at 10 miles an hour in front of me. So I found a couple of ways around behind that and you know I go a little bit further but I'm no longer putting myself in that situation where it's just your hold your breath and say a prayer in pedal. So it's So I mean, I've found ways around it. So that's one of the things I've changed since I've been biking. Okay. With the sidewalk part, there's one sidewalk that I'm surprised I didn't kill myself on. It has a curb on it. Has like a 6 inch curve as you ride it down. There's no orange paint on it, either a direction. And it's like if you're handicapped, you know, that's not a handicapped accessible. Hide by sidewalk anymore that if you go to 6 inch curve, you know, coming off of a bridge, it's like with no notification, I thought I was going to kill myself. It's like, whoa, there's no road in front of me. But, yeah, you just gotta figure out, a different, you know, I've just tried to figure it a different way, you know, a different way around it and, find some safer routes when you're planning.

[Dylan Furtado] 17:58:12

Thank you.

[Sybil] 17:58:14

Yeah, I would agree like it's, oftentimes useful, helpful, more, to take a longer route if it's a little bit safer, like if it's off of a main road or less traffic. Try to avoid lights just for more. I don't know, ease. I don't have to stop every. A couple times. But longer is better if it's safer is what I found.

17:58:45 Melissa:

I always plan out my route...try to stick to back roads where traffic is slower and less but find myself on sidewalks often. In my neighborhood I avoid May street because it's too narrow and the drivers are fast and rude

[Kato] 17:58:50

And I just add something I think it depends on which bike you were issued. The one I have is the just said the small battery pack over the real wheel. And Talia, I think you have one of the bigger heavier ones with the Sandistan, the yellow one.

[Talia] 17:59:06

Yeah.

[Kato] 17:59:07

Yeah, so it's easier for me and I've had to jump curves too, but it's a It's a much lighter bike, so I take advantage of handicapped ramps when I can but the bike I have, I could easily just You know, lowered over that 6 inch curve and then hop up. To get to the next spot. But I do most of my riding in the burn coat area to stay off the roads and and stay out of the city. So. That's just what I do. That's all.

[Talia] 17:59:39

That's where I am too.

[Troy] 17:59:42

Really? Cause that's where I am too.

[Kato] 17:59:42

Yeah, Okay, how can we have one into each other?

[Troy] 17:59:46

Burn code area.

[Talia] 17:59:48

Okay.

[Troy] 17:59:50

What's that?

[Talia] 17:59:51

They're about to get together.

[Kato] 17:59:51

I ride between Westport.

[Talia] 17:59:58

Alright, just said we'll have to get together for a ride if we're all in the same neighborhood.

[Troy] 18:00:01

Yeah, yeah.

[Talia] 18:00:02

Okay.

[Kato] 18:00:02

Yeah. Most of mine's in between burncoat and West Boyle's history. That's where I stick with those neighborhoods.

[Troy] 18:00:10

Yeah

[Kato] 18:00:11

People probably think I'm weird because I go around 3 or 4 times and they're like Just trying to get miles in.

[Troy] 18:00:16

Right, right. Okay, right. I'm, I'm pretty daring.

[Kato] 18:00:17

With the strange old man on the bike

[Troy] 18:00:24

I feel like I'm in good enough shape. So I get going pretty fast and I cross the city quite often to get from the burn code area, which is the northeast corner of Worcester. I got to get to the west side. At Worcester State College I often play sports over there or go to lunch over there or go to meetings over there. Cause I used to work there and It's a it's a tough thing to cross between all the different traffic lights and all the construction and the poor driving and the poor roads. It's no there's no easy route to get get there. But I end up choosing Millbrook Street because it has a definite sidewalk. The brush is an issue. You get slapped in the face with a This or that or some bushes leaking onto the sidebar. You get a Got to be careful not to you know, crash into things like that. Lose traction on a set of low bushes. But, yeah, it's tricky stuff. What was the question again?

[Kato] 18:01:27

Okay.

[Dylan Furtado] 18:01:29

Just where do you prefer to ride your bike? I know you said you prefer on the sidewalk sometimes and then just what specific routes do you choose slash avoid? And for what reason.

[Troy] 18:01:41

Sure, sure. I avoid that West Boylston Street to Gold Star. Well, it's really Not called Gold Star.

[Troy] 18:01:49

Was Boys and Street going parallel to Gold Star because again these these things that Talia mentioned sort of these on ramps from rather quickly moving vehicles. It's a tricky one. So I just stick with certain routes back roads. I cut through WPI quite often to avoid park ave snake through in order to get to the west side So there are some good tricks people should know him. Listen, just on Monday, I was coming back from Mr. State going a pretty good clip beautiful sunny day in a beautifully marked bike lane on Grove Street. Going pretty good and a guy pulls out with a nice new SUV and kind of cuts me off but I I was seeing them inching towards me so I was able to catch myself. And not, you know, have any problems. So then I, break the little bit, let him get out, and I, I went right along and I was going at a pretty good clip so I I was right on his side now I'm no longer behind him on his side. He then turns right into the next parking lot 20 feet later. And 30 feet later and he cuts me off and he does hit me. Now luckily, he's driving in to a lot, so he's going slow and I quickly tried to turn so I just bumped his mirror real good and got a little elbow injury and a little little back injury but I let it go because I just felt good about it. Turns out the next day Tuesday Wednesday and today I feel the pain a little bit more but it wasn't bad I didn't fall and I didn't get smashed, but he hit me. And I'm thinking who's fault was that I'm

in my bike lane but I guess I just figured who's gonna turn right just after coming out of. Coming out and going on the main road. So crazy things happen, even in a bike lane. If I was on a sidewalk, I would have had a little more time to adjust. To the timing of his turn a lot more time i guess so yeah, Worcester's tough and biking is dangerous. So you gotta You gotta take caution and be in shape so that if you do fall you You fall well, you know. That's it.

[Anzhe Tao] 18:04:04

And is there anyone? Who wants to add more? If there's not, I'll start the next question. So what transportation do you use most often? Before you received your e bike and how do you compare that transportation with a bike?

[Kato] 18:04:38

Well, I'll start and Kato. Most of my transportation is in a car. And, still that's my primary. Right. Again, I use the bike for. riding pleasure rather than. Commuting. So I'm lucky that way.

[Talia] 18:05:00

Before I get the e-bike, I, I hit my car with my main transportation. I am in a good area though to be able to walk to a lot of places that I go to. It's a really close, you know, not too far apart to walk to places. So now when I'm planning to go someplace now, I have to say, you know, I kind of think to myself, okay, you know, if the weather is decent.

18:05:39 Melissa:

A car is still my primary transportation and my bike is mostly recreation

[Talia] 18:05:26

And it's within like a 5 mile, you know, quick ride down to the post office or whatever. I can, I would prefer to take the bike. So I do take the bike a lot more now. Rather than walk or drop the car like I used to.

[Dylan Furtado] 18:05:43

Thank you.

[Troy] 18:05:50

Yeah, before I got the e bike, I was a car person. And a little bit of walking too, but mostly car and now that I have the bike I I, I like it for sunny days. To have the car if it's a rainy day. I don't like night time, e biking, so. But then again, I don't go out at night much, so I'm using the e bike more than I'm using the car now. It's working out great.

[Reese] 18:06:26

Yeah, I still before and now I would say I still primarily use a car walking. Just cause I'm I'm still kind of in that stage where I'm anxious to use the to bike on streets because like to get to my like lab slash office space. I mean, I guess this ties back into the previous question where it's like, I either have to go on like Highland or Institute. And it's still like, I don't know, like, so usually when I'm like making that decision. Of like biking, then I'm usually like anxious so I'm like okay I'll just walk or drive instead which is which is kind of like still where I'm at, but I prefer using the bike for like leisure instead of transportation.

[Anzhe Tao] 18:07:16

Is Sybil answer?

[Sybil] 18:07:20

Yeah, I can. So I think I walked mostly put time. Before the bike. And I probably still do, but I like biking. But I'm still like getting used to like trying to figure I think I found a route that I trust within like I always have a reason like the sun setting early or the weather is not the weather's raining or you know something. So I'm I'm hopeful I keep every day this week I'm saying I'm gonna bike and then I haven't. But I got a reflective like jacket so hopefully in lights, hopefully I'll like more in the dark soon, but it's just, it's, it, there is that anxiety behind it.

[Dylan Furtado] 18:08:11

Thank you. Does anyone have anything else to add? Alright, so can you describe your overall engagement with the Worcester E-bike program? And, if you go on the group rides.

[Kato] 18:08:22

There.

[Dylan Furtado] 18:08:32

Like, does it enhance your overall experience, make riding more enjoyable? Have it had, has it had any significant impact on your riding experience?

[Kato] 18:08:49

Hi, this is Kato. I'll go first. That hasn't really influenced me. It's fun to get together with the group. You know that and do those rides But when we're far away from Worcester, I throw it on the in the trunk of my car. Yeah, not throw it, but place it gently. And I'll drive there and I'll make those rides but it's nice to be in a group rather than riding alone when I'm, you know, doing it. During the week to put miles on. So yeah, that makes it more fun.

[Talia] 18:09:22

Yeah, I go on as many of the group rides as I can too. And I do typically bike across the city to where they're starting.

18:09:29 Melissa:

I love, love, love the group rides and it makes me feel a little safer being with a group and I love meeting other people

[Talia] 18:09:31

It's It's kinda hard to. Really socialize on the rides though where you do leave a space between each bike and you know so it's when I'm on a real trail bike in with friends you know we're probably side by side most of the time and we get out of the way if somebody's coming. Like on our on the on the rail trails that we that we bike here with the group. We typically, you know, leave the space between us. So it's a little bit harder to we stop at the end and we talk it but you know at the halfway point and then stop at the end and and we can talk and socialize. But during the ride, you don't really. Socialized too much. But it's fun. Good, it's funny. And like talking to people too, you get a lot of good ideas. I mean, somebody will say, hey, I do this or I do that. And you do get different ideas of even like places to go. It's like somebody will say, oh, there's a free thing it was just state this week and why don't we go there, right?You know, there's this park over here. Let's go to this park or. Toa Park, we had Halloween after a Halloween ride. So, you know, it was you know, just those types of ideas you can get new places to bike too.

[Troy] 18:10:49

Yeah, I'm not a social kind of rider, recreation rider. I ride for transportation. Pretty much exclusively get do my shopping. Go to the college, play some sports, cause I guess I'm just too busy to think about. Riding just for riding pleasure, but I do want to engage with the program and I have and it was fun when we did some of those group rides. I wouldn't have done it unless they asked and I felt. Obligated because I signed the contract that I would participate. And I didn't mind it, it was nice. But, not my thing

otherwise. So it hasn't had much impact since. I used to, I used to bike anyway for functional reasons and I'm just Finally, now doing it again. In my older age.

[Dylan Furtado] 18:11:41

Thank you. Anybody else have anything to add to the question?

[Anzhe Tao] 18:11:58

Okay. So. Okay, besides riding here. What others cities have you been riding in and how is your experience different from WOrcester and in your opinion what is the best city to ride bikes and why.

[Troy] 18:12:22

I can't add much to that. I'm only in Worcester little touch of Shrewsbury, but that's barely over the line. I got nothing to add to that. I haven't ridden in other cities. I just know that I've driven another cities and Worcester drivers are. Not that good.

18:12:36 Melissa:

Only Worcester for me

[Reese] 18:12:42

Well, I've taken the e-bike to, in my car into Boston and Cambridge. Because I used to enjoy just like for leisure biking like along with Charles or something. So I really enjoy that because they do have like a lot of trails there that's just for like biking walking like running. And on the road to like I know like Cambridge I mean Cambridge has a lot of good like bike lanes now that are per protected. And I think Boston is adding more, so. I do like that and I can envision like if I was working in Boston I would use the bike more for transportation.

[Talia] 18:13:25

Around here, I bike. I've built into Holden and to Princeton and to, you know. Sterling, so, you know, different locations like that. Over the years. In my lifetime, I biked in several countries. Amsterdam and Holland in the Netherlands is definitely you know, years and years and years and years ahead of us right now. We, we would be on group rights and, if they would be something like we were planning to take a ferry and you know that would have cut off a whole bunch of miles on our ride. But our leader, our tour leader was able to get us but the ferry was closed so he was able to get us, you know, back on track without being on traffic at all. There's so many bike trails. There's markings on bike trails. So every bike

trail has a number on it. And, so you can kinda follow a map by the numbers and know exactly where you are. But you can go for miles and miles and 40 miles without seeing another car and a road and just be on bike trails. So it's really amazing out there. So that is the best. City that I've biked in my best country that I liked in. And everybody follows the rule. Somebody in our group was, like ringing their bell all the time, like when we're on a bike path. You've been you're coming up to somebody you ring your bell just to kind of say on here. Well, that's like a no-no there. It's like you only ring a bell if somebody's doing something wrong. Everybody's expected to follow the rules. Of the, you know, if you're not following the rules of the road, then they're going to back at you, then they're gonna yell at you. But, everybody, you're just going to assume that the person in front of you and the person in back of you is also following the rules. The cars are going to hit you if you don't follow the roles. It's not like a matter of, you know, staying your lane or, you know, go over here and the cars will move out of the way. The cars are gonna hit you if you don't if you get out of your line, you know, in your turn, we're not supposed to. The cars are going when they're like turns and they're expecting you to follow the rules just like everybody else is too. So, but it's a really good country to bike and that's my favorite city.

[Kato] 18:15:52

Yeah, I've only biked in Worcester. I mean, as a kid, Shrewsbury around the areas, but currently it's just it's just Worcester right now.

[Dylan Furtado] 18:16:09

Alright, thank you. So I know Everyone's mentioned, obviously bike lanes. The cars not following the rules, but I guess what other things do you think should be done in Worcester to make Wester more bicycle friendly.

[Kato] 18:16:33

I'll go first. I again, it obviously more bike lanes. But they should at least put some type of barrier, maybe like those slapsticks they have on. Some of the roads like route 20 and out that way where people tend to drift over the lanes, leases something in the way that Wake someone up. You know, so it's collapsible. Little posts in the road. I think that would help a lot. Some type of barrier. Without. Make me move. Feel more safe. Otherwise, going over painted line doesn't. Alert the drive or anything. And as you know, they distract the driving, they drifting all over the place. Something that would wake up the driver I think and not those little speed pumps because you run on into those everywhere. So something a little more significant that would, you know, those 3 foot poles. Hi, slapsticks, cause you know, if you hit them. It really makes the sound on your car, so it'll wake you right up. Like that be a big safety issue.

[Talia] 18:17:39

My fight is better road conditions. You know, keeping up with the, with the paving of the roads and, I mean, Barco Street, I think is gonna be nice in a couple of years. Once they finish it, the section. Going

into the city. But right now, and I think my bike too is just the way I sit on the bike. I think I feel a more bumps than I would on a normal bike. I think my bike's designed to to feel every bump. But yeah, they definitely, need to try to keep up on, I don't really know what they could do for glass. I'm always on a road. In our roads, no matter what ride I'm going, if I'm going more than. 5 or 6 miles. I know I'm gonna run into glass on the ground. I know I'm gonna run into, you know, decent sized puddles and bad sections. Again, in other countries when you bike in other countries, you don't see glass on the road. It's just not there. It's like, I don't know what the difference is here, but you don't see it in other countries. It's like I booked for a full weekend in Amsterdam once and I saw one glass like in a park and it was near a trash barrel. It wasn't really where people were biking, but you don't see glass at all. So I don't know why we see so much in the city and It's in the same places. I've cleaned it up some, you know, I go and I say, okay, I'm gonna get my remote. And I'm gonna clean this up before I get the flat tire on it and I do and like 2 weeks later it's back there again the same spot it's like You know, there's gotta be, I don't know what to do about that, But glass in puddles I hate.

[Troy] 18:19:19

Yes, street sweeping. Could increase a little more. I mean, I know When I was a kid, I spent some time in Queens, New York and Hey, would sweep the streets twice a week, not twice a year. Because maybe the dogs, poop would go there. They would tell you curb your dog so you put the poop there. But yeah, trash, you know, so they stood up the streets that would be a little help. But I think the rules should change. Bikers should be allowed to be on the sidewalk with the understanding that if a pedestrian is there, they have the full right of way, you should be stopping so there's no issue, but there's so few people walking. Mine as well use the sidewalks no one's going to pull you over anyway because you don't want did. Bikers. It's not worth it. So I, with all these handicap accessible things now, only a few that Talia mentioned aren't. You know, I, there's very few places for me that I don't think that I Can't find a ramp onto the sidewalk and then back off. It's just great and I feel really safe. And so few people walking. That that's my bike lane.

[Kato] 18:20:39

I'll second that.

[Dylan Furtado] 18:20:47

Any other thoughts?

[Talia] 18:20:48

Well, my other side too is when you when you are required to. When you're riding in the road, some of the things I do riding in the road is If there isn't. If I'm not feeling safe like in my 2 feet on the side of the road, you can you pull out and you take your lane you can take a full lane in the road and you can you know especially with the ebike down you can go a little bit faster than if you're a pedal in a road bike.

You take your lane if and that's safer for you to take your lane, you know, try to drive following the rules in the road, but you take your lane. You soon as you can pull back overshore, get out of the road, get out of the way of the drivers. But take your lane in the road and you know you have just as the right to be there as the cars do so you take your spot if it's not safe if the cars I'm giving you your 4 feet then take your space on the road. The other thing I do is I don't like making left hand turns. So like if I'm at a four-way crossing, I'll turn right, then I'll make a UE and I'll come back out so that now my, now my left hand turn is going straight. So I kind of turn like that and it's like my left hand turn is going straight. So I kind of turn like that and it's like because I mean, I do signal and get over to the left hand lane when I'm making a left hand turn, but Sometimes it's just too much traffic. I don't like, I don't like anything with more than 2 lanes. When I get to 3 lanes, it's like, okay, there's 2 lanes. When I get to 3 lanes, it's like, okay, there's too many guys for me here, 3 lanes going this way and 3 lanes going that way. So that's when I'll do everything to try to get out of that 3 lane traffic. But yeah, certainly take your lane in the road if you know until you have room to pull over. Do, do what you can to keep your speed up so that you're not being too much of a pain behind you because of the if the drive is behind you if you're holding them up they're gonna then throws up at the next bicycle. That's it, bicycclist up, they see, being on the road because they're mad at you. So, you know, just keep that in mind. Do what you can, but take the road and, you know, get out of the way as soon as you can. And, You know, again, my left hand turns, my other thing that bu me, so I, do it, I can to avoid them whenever I can.

[Dylan Furtado] 18:23:08

Thank you.

[Anzhe Tao] 18:23:14

Okay. Do you ride your bike in climate weather such as rings, snow or extreme code? Or maybe extreme hot. If so, how do you adapt yourself to the inclement weather?

[Kato] 18:23:34

This is steep. I avoid, wet roads and, slushy roads, but the heat and the cold doesn't bother me. I'm again, you're pedaling. You know, I don't get cold. And generally I, I do more in the summer than I do in the winter. If it's, you know, it's really been snowy. I won't go out. You know, you get a boat on my bike, I got, I don't half an inch of rubber on the road at any given time. Just like I put the motorcycles away in the winter too. You know, you just don't have much rubber on the road. So to me, in climate, you know, raining, something like that, precipitation, I stay off the roads. Other than that, I'll ride. Warm a cold.

[Troy] 18:24:17

Exactly repeat for me. I don't mind extreme heat or extreme cold, but any kind of snow slush or rain. Forget it.

[Kato] 18:24:26

Yeah.

18:24:27 Melissa :

No I don't yet have fenders to stop the spray of rain and I'm older and cautious of slippery conditions

[Anzhe Tao] 18:24:32

Anyone else?

[Talia] 18:24:34

I, biked, I just liked Dr. Rhoda Springs. The other day for ice cream and it was a cold day before they closed. I had 2 layers on. Of everything, 2 layers of gloves to lay as a Go to layers of pits, but I was going up for ice cream so it's like I can't really talk too much. But I know that cold. I'm sorry, I don't like cold, but I do, have like wind pants that I put on in a wind jacket that had put on because the breeze. You know, you make your own win. So on a hot day when you're biking, you do make your own wind and you breeze and it doesn't feel so bad. But the same thing happens on the cold days is that, you know, if you don't have a wind layer. You're gonna feel like she's cold.

[Dylan Furtado] 18:25:23

Anybody else wanna add anything to the question?

[Talia] 18:25:29

Last year we had a really good winter. Maybe we'll have a good winter this year. We had a warm winter.

[Dylan Furtado] 18:25:36

Hopefully. I guess similarly. Are there any specific situations or conditions that make you hesitant to ride? Do you avoid riding during rush hour? Do you avoid riding at night in heavy traffic?

[Sybil] 18:25:55

Yeah, so I've mentioned this before. I try, well, it's just, it's difficult to ride at night. But I think the way that I will do it is just, a little bit later, like after the, like, main traffic has gone, cause then it'll be, easier to, navigate around I guess people will be more attentive less I don't know more aware

[Talia] 18:26:29

The lights on the bike are good. If you get caught at night, I try not to ride. I know sometimes it's gonna be. Yeah, I get I get caught riding at night and I, you know, make sure I'm prepared for it if I am, but

18:26:43 Melissa:

Night and heavy traffic is super scarey

[Talia] 18:26:44

But I try not to bike at night.

[Troy] 18:26:49

Agreed. I don't like at night.

[Kato] 18:26:53

Same here, daytime.

[Dylan Furtado] 18:27:00

Any any other comments. Thank you.

[Anzhe Tao] 18:27:10

So what is the greatest challenge or barrier you've encountered while using the e-bikes And during the e-bike program. And if you solve the challenge, how did you solve? Or if you haven't solved the challenge. What do you believe is the possible solution.

[Troy] 18:27:40

I already said it, I think. Biggest challenge is the safety issue and the only solution I can come up with is change the Change the law so people feel better about the riding on the sidewalk. And my solution is I'm riding on the sidewalk because I know they're not going to enforce it anyway.

[Kato] 18:28:06

Yeah, I'll second that too.

18:28:13 Melissa:

I'll 3rd that

[Troy] 18:28:17

Nice.

[Dylan Furtado] 18:28:20

Anybody else?

[Talia] 18:28:21

Yeah, I mean, and again, also like. I also ride in the sidewalk a lot when it's, you know, when I'm in that relaying traffic and I instead of crossing the streets sometimes I'll get off the bike and do the do the crosswalks rather than, you know, crash route night and with the traffic. It's just, you know, again, I'll get off the bike. I'll then turn into a pedestrian and go across the street in the crosswalk. But again, I'm going to be taking the road. The biker, the cars need to be educated too that yes, you have to give us our 4 feet of space. You have to, you know, if we're in the road. We have a right to be in the road. So I mean, but we also have like is that I agree that I can also use the sidewalk that whenever I'm, you know, Whatever I can't ride in the road, but yeah, the road is, for both of us. In bikes.

[Dylan Furtado] 18:29:27

Okay. I guess what is the most often purpose you ride your e-bike for? Do you use it to commute to work, to go shopping? Or just any other recreational activities.

[Kato] 18:29:48

Minds are recreational.

[Sybil] 18:29:54

I use it for work and recreation.

[Talia] 18:30:00

I do. Grocery shopping. You know, any types of, whether I'm going to the gym, whether I'm going to the Park a couple of towns over, I, you know, hold it or Princeton or, you know, wherever I'll ride to wherever I'm going.

18:30:12 Melissa:

Recreation, sometimes errands or work

[Talia] 18:30:18

Whether I'm going you know whatever whatever thing I do if it's a nicer day and if I can get there on my bike. I'm gonna take my bike to do whatever it is I'm doing, but It's usually errands. I don't typically I don't typically use it for recreation, but you know, I do ride out to. You know, Sterling or, you know, whatever, which is a nice ride. Using the back roads using DAC roads.

[Troy] 18:30:52

Yeah, I go to doctors office. Sorry, I go to the doctor's office and. Like I say, go to play sports, go to meet somebody for lunch.

[Reese] 18:30:53

Go ahead. Sorry.

[Troy] 18:31:01

So it's functional stuff shopping. That's it.

[Reese] 18:31:06

Yeah, mainly recreational for me, but. Trying to do some more just transportation to work.

[Dylan Furtado] 18:31:18

Alright, any other comments? Thank you.

[Anzhe Tao] 18:31:26

Have you noticed any changes in your? Physical health or exercise routine. See, since you've seen the, back in your life.

[Troy] 18:31:38

I'm a little more in shape a little more because I'm . You know, 2, 3 times a week. I'm doing something that I wasn't before using a car before so a little little bit more in shape yeah

[Talia] 18:31:56

I'll go up with other people, other friends and do like Bruce Freeman Railroad and So I don't know what tons are in. You know, but if we ride on a, like a 20 mile rail trail. A lot of times it's a whole lot easier. It's not on the e-bike that I would, I bring my break for that one. But, But I see that that's a lot easier to just to be able to do whatever type of a riding and you know it's I can see compared to the friends that I'm riding with that, you know, that it's. Better, better riding. Healthier.

[Kato] 18:32:33

Yeah, for me, it's just extra exercise for me. I work out. I in martial arts 3 nights a week and It's just, you know, this is complementary as far as I'm concerned.

18:32:36 Melissa:

I don't think I ride often enough yet to see changes

[Kato] 18:32:45

Just keep pushing. The hills are a challenge, you know, your quads get worked up, but you know, you do the zig-zag.Cause the bike won't cake me up a hill. But, yeah. What's that?

[Troy] 18:32:55

Oh. Why?

[Kato] 18:32:59

I don't know, maybe because I'm heavy. Well, I just got the one, you know, the little, the little battery in the back. You know, and if I'm going up, Something like King Philip.

[Troy] 18:33:08

Oh.

[Kato] 18:33:14

Or Clock Street, you know, you can't pedal it just won't. Just burns up my thighs, so I'll do the old zigzag.

[Troy] 18:33:14

Yeah. Yeah.

[Kato] 18:33:21

And you know, do it that way. Yeah.

[Troy] 18:33:23

I gotcha. Alright.

[Talia] 18:33:24

Do you like a lot of times I'll be in that third gear but then I'll use my 7 gears. A lot of times on those steeper hills and errors. I have to ship. Use the power and then then use the gears that the 7 gears that are there.

[Troy] 18:33:43

Yeah, go to go to first gear then. Yeah, that always works.

[Talia] 18:33:45

Yeah.

[Kato] 18:33:46

Yeah, you should always be shifting between gears. Right. Unless you're on a flat surface with it

[Troy] 18:33:54

So Kato you do first gear and you still not finding the batteries kicking in for you enough.

[Kato] 18:34:02

Well, it kicks in. Course first g is so low. I mean, you're pedaling.20 times to get, you know, 5 feet. So I'll keep it in like second or third because I got some speed up.

[Troy] 18:34:10

Yeah. Yeah.

[Kato] 18:34:12

And then I'll just zigzag. First gear is like, yeah, just like on a motorcycle. It's just or a car. It's just to go from a dead stop to moving and it hit second, you third, that type of thing.

[Troy] 18:34:24

No, I get it, but for me, if I'm going up a steep hill and there's a few around here as you know and I'll, sometimes get to I guess second. I have no problem, the battery kicks in enough that I never have to stand up.I never have to zigzag. But I think I'm a little younger than you as well and I've been biking a lot so maybe that's a little different.

[Dylan Furtado] 18:34:54

Thank you.

[Kato] 18:34:54

We'll have to set up a race. Okay. George Street, yeah. Well, they used to do that, right?

[Troy] 18:34:56

Yeah, George Street, George. Challenge. Every year they still do. Oh yeah.

[Kato] 18:35:02

Yeah. Okay, they'd still do. They don't do the dead horse Hill one anymore that would be another one to bike out Cool.

[Troy] 18:35:07

No, that would be, that would be tough.

[Kato] 18:35:12

Yeah.

[Talia] 18:35:13

Somebody in the group bikes that to work. She lives out of town and she bikes dead hostile to work.

[Kato] 18:35:20

Well, she needs a psychiatrist. I'd like to see I'd like to see her come down it.

[Troy] 18:35:22

Yeah, she's got a battery though.

[Kato] 18:35:26

Never mind up.

[Troy] 18:35:26

Roof.

[Talia] 18:35:28

No, she does.

[Kato] 18:35:29

Wow. Good for her.

[Talia] 18:35:35

Got me.

[Dylan Furtado] 18:35:39

Alright. Are there any significant shifts in your perceptions of environmental sustainability or your carbon footprint as a result of using your Is that something you thought of when you signed up for the e-bike. Or is that just? In the back of your mind while using it.

[Kato] 18:36:02

I'm gonna know on that.

[Troy] 18:36:06

I think I got the question, right? But yeah, I. I'm a super conservationist. It's got the solar panels. Don't heat the house. Much past 48 degrees. Cause I figure if everybody Wasted and wasted the world would be much worse off so we need We need a lot of poor countries that can't waste or we need rich countries that have people that are willing. So I knew it going in that this would help me save a little bit more. So yeah, I'm, I'm sort of into that And I think I have made a little, little difference. With these trips that I've eliminated. Bye the car and and now I'm using the e bike. So yeah, I I knew it going in and I like it.

[Kato] 18:36:55

Yeah, if you're my age though, you know, you can serve back then anyways. You know, everything's glass bottles, reused.

[Troy] 18:36:59

Yeah, sure. Yeah, sure. I get it. I get it.

[Kato] 18:37:02

You know, you didn't waste anything. You know, even a lumen foil was used over. So, you know, to me this is a tiny little measure. But yeah, any, every little bit helps, that's for sure.

[Talia] 18:37:19

Yep, so using the electric bike, I do. Yeah, keep the car parked in the dry way a lot more than it used to. So yeah. I think that way I have.

[Sybil] 18:37:36

Yeah, it's definitely a thought. when I'm using, a bike car, but most often it is deciding between walking in a car. So then, that's sort of my most often it is deciding between walking in a car. So then, that's sort of my most often decision.

[Dylan Furtado] 18:37:56

Thank you.

[Anzhe Tao] 18:37:59

So is there any other? Okay, advantages or disadvantages of ebike you want to add. Based on your only experience.

[Troy] 18:38:21

Hmm, any other.

[Kato] 18:38:25

Nothing I can think of.

[Troy] 18:38:26

I mean the obvious one is the E in the in the word, getting up those Worcester hills really makes the difference for me.So, but we've already talked about that. The e-bike program, obvious advantage is that lot of us wouldn't be doing it because it's cost prohibitive.That all the access ories and and the tune-ups and the initial cost. But we kind of mentioned that also.

[Talia] 18:39:01

And it's good that they're doing it again because, I, don't go out on one ride where I don't have, somebody say to me. Oh, is that an electric bike and oh, I've been thinking of getting one or you know, how much of the cost and you know, I get questions every single time I'm out and it's amazing at how many people. Ask that question. Hey, are interested in getting bikes, you know, again, it sounds like money is always one of the concerns for them. Okay, I know. And out of the way question here. The behind the major tailor, statue at the library, is that there's a bike rack there. Does anybody know if that's new? I noticed it there last week and it was like I've been like chaining my bike up against a pole out of the way that And I asked somebody who was unlocking his bike and he says, oh, I don't know.

[Troy] 18:39:53

Okay.

[Talia] 18:39:58

He said, I think it's been here. But I think you might have been stealing the bike because I eat the truth. You pick a block for all I know. But, there's a new bike break there, I think. At the library.

[Troy] 18:40:10

Nice.

[Reese] 18:40:16

I guess another thing, I don't know if it was mentioned, cause like the difference with the e- is like you do have to charge it and it is heavier. So like thankfully, like I'm in like. A building that like has a garage that like our units share. But I can imagine like if you live somewhere else, it could be hard to. Figure out where to store it and then also charge it.

[Troy] 18:40:39

That's true. Good point. Good disadvantage there, yeah.

[Sybil] 18:40:44

And back to what Troy is saying about the locks. It's like around town. I don't generally run errands, especially like downtown because I don't feel comfortable leaving my bike.

[Kato] 18:40:45

Okay.

[Sybil] 18:40:58

That's for long periods of time, but, I'm sure quick, Aaron would be fine.

[Sybil] 18:41:03

I just, that's just something like I haven't found it. Area that I would trust right now.

[Talia] 18:41:10

What do you lock it? Yeah.

[Sybil] 18:41:12

Yeah, and I have a good luck. I've just had 2 bikes stolen, so I'm nervous about leaving bikes. Like a nice bike downtown. Do you have a like you said you just lock it up to a poll downtown?

[Talia] 18:41:22

Yeah.

[Troy] 18:41:23

Yeah.

[Talia] 18:41:27

I mean, I lock it up like wherever I, you know, if it's a bike rack, yeah, the bike rack is where I would go but like any fences or anything that's, you know, I go to check delay a lot and I, you know, I'm only in the restaurant for 10Â min or whatever, but you know, I lock it to their fence or I go to the library and I lock it to their fence. But you just find something that they're not going to be able to pick it up over, you know. And throw it in their truck. You just wanna make sure that yeah. Find someplace secure. But I leave stuff, I have a friend basket, I do leave my helmet and you know, my gloves or, you know, whatever else my best in the in the front basket and knock on wood haven't had any issues. Yeah, but. And I figure, you know, worst case scenario, somebody will still the helmet and You know, totally, so anyway, I don't know. But, yeah.

[Troy] 18:42:22

Yeah.

[Kato] 18:42:26

Well, I think the challenging to see like Worcester is 3 deckers. You know, if you live in, I have a single family home, so To me, it's like I put it in the garage and I can lock it up and. Full of battery inside and charge it up. You know, my bike has the removable battery. But if I lived in a 3 deco, which I had, you know, many years ago. I don't know how I'd get it up the stairs to, you know, protect it so that can be a big challenge for that type of thing.

[Talia] 18:42:54

Yeah, in the past that I've lived in the third floor and I had a lighter bike and I carried that bike up the stairs, you know, and kept it out on the back porch. But yeah, the heavier bike rolling it up the stairs would be a challenge.

[Kato] 18:43:07

Yeah.

[Dylan Furtado] 18:43:12

Going back to the fear of bike theft, how does that affect your mentality of planning rides? Do you avoid specific areas or doing certain things because you're worried about that?

18:43:19 Melissa:

They've all been discussed

[Troy] 18:43:36

Theft. Yeah. Yeah. I do avoid some areas. Yeah, I guess I do worry.

[Talia] 18:43:48

Just saying I trust my lock, I lock it up good. You know, they take. Getting that back wheel off, go for it if you can get that back well off before I get back to it. Actually, the tools are in the bag. So you think it probably do it now that you mention it. Cause I'm given the tools now. Since my last flat.

18:44:14 Melissa:

Yes if I get somewhere and there isn't a place to lock it good

[Sybil] 18:44:16

Yeah, I think it's just about timing. Like if it's just a quick end, I'd say probably half an hour or less. It's okay, but if I'm there longer, then it's definitely something. I avoid.

[Dylan Furtado] 18:44:35

Any other thoughts? Thank you.

[Anzhe Tao] 18:44:46

Is there anything else you would like to share or any idea? You believe are important for us to consider regarding the backs in the EBA program.

[Talia] 18:45:01

Well, the the program, I like Alex's, that she sends us each week. All the biking, you know, events that are happening, all the biking, tips, all the, you know, this. It's been a long time since I've been in the biking community. I used to be, you know, used to be back, you know, 30 years ago in 7 Hills was a big biking community, you know, it was up on other biking stuff, but, but she's sending out all, you know, a lot of new. Information weekly. I didn't realize that they were doing so much in Worcester for biking and for bike safety and you know walk bike, issues and stuff. So, It's good to get all that information.

[Troy] 18:45:46

Yeah.

[Kato] 18:45:46

And I think maybe someone should be penalized if they're not. Give it a I know she has trouble getting information from a lot of people You said it dropped off, but you know, there should be something, hey, if you're not going to participate in the feedback, then you should give up the bike and Alex, she had, I think, several 100. Request for bike since you only like a hundred so

[Troy] 18:46:09

Yeah, 1,200 requests for 100 bikes and. A good percentage. I don't know what she said 30% or so just aren't reporting So it is sad not much they can do because they didn't really have an aggressive policy with that. I would like to see the e-bike program coordinate with the new department in the city department of Transportation or something. A new new department in the city only a couple years old. And kinda Have a point person that talks to them and says, listen, this Sidewalk needs attention in terms of the growth of the tree branches into the sidewalk. In other things like that repair of certain spots or that curb that Talia mentioned. Needs a ramp. So it'd be nice to have a connection. In the from the e-bike program to the Worcester. New department there.

[Talia] 18:47:15

Or some type of even like a phone number to call in or like a website that you can just say hey. You know, there's this. Drop in the sidewalk of 6 inches could you know have somebody take a look at that if you know say where it is or

[Troy] 18:47:30

Actually, there is. There is a very nice website. That you can do that, but you can be very specific. What house is it in front of and detail this? And it's one of those things I've done it plenty of times for little manhole covers that are off not so much for the biking situation just for general road issues and they do respond so it's there it's just would be nice to have a more aggressive organized way of approaching them and have their ear a little more closely. With a point person that says okay i'll collect up your ideas and present them.

[Dylan Furtado] 18:48:12

Any other comments?

[Anzhe Tao] 18:50:12

And here's the final question. Is there? Anything else you want to say or any suggestions for us or questions for us?

[Kato] 18:50:29

Take a ride with the group.

[Anzhe Tao] 18:50:32

That's cool.

[Troy] 18:50:34

That's cool. Yeah, join us. Yeah.

[Kato] 18:50:35

Perfect. Percent experience.

[Dylan Furtado] 18:50:36

Yeah.

[Talia] 18:50:44

Sort of unrelated how are you using like all the data you're doing? How are you using it? Quickly, you know, as how will you What do you plan to? To do with all the data you're collecting.

[Dylan Furtado] 18:51:07

So, we have been. Interviewing a couple of different groups. Obviously we're conducting this focus group. Our deadline for our project is December, like mid December. So we plan to do before then. Is to either to create a new survey that mask like distributes to the participants. I guess to cause better data, which the questions on there will be. Structured around the data we've gathered. Such as the concerns we've gathered from here. The comments we've gathered from here will help shape the questions of that survey. To allow Mass Bike to get more qualitative. Or quantitative data.

[Talia] 18:52:00

It's good and going forward like with the new program like, I think Troy was saying that or Somebody was saying that they need to have more accountability for people, you know. So that it doesn't, I wouldn't promote it as free bikes or raffle for a free bike. You get your free bike. It's if it's going to be. You know that you have to I would promote it with yes, it is a free bike you're gonna get But you have to do things along with the program before you sign before you even sign up for it. You kind of have to know. I would suggest kinda. You know, saying that there's responsibility going along with it. You know that you're reporting all your weekly to your mileage your reporting you know there's things that you need to do in the program it's not just take my free bike and riding if I if I remember, you know, it's you know, I'd like to see more responsibility, more. And people knowing what they're getting into when they sign up for the program.

[Troy] 18:53:05

Yeah, I agree. I think it would be hard. And for them to do much more than I mean if she had everybody signed a contract she was they were grilling us over everything. So. Clearly you can't trust, you know, all people. I mean, I, I would have. And for Buying the bike myself for 3,000 in the deal would be I get the full 3,000 back once I successfully complete the program. Obviously they wouldn't do that because they want low income people. To be part of this that was the main push is to get get them more mobile. Now I'm sort of low income because I don't know, I'm not working for 15 years, but I have some savings. So I could come up with 3,000 and and and have bought the whole package or whatever it was, $2,500. And then, and then feel good about getting it all back in 2 years. So that would be something to think about. But anyway, that's more for Alex, not so much for these WPI students. I don't know. So I think you covered most of it, you guys. Yeah.

[Dylan Furtado] 18:54:20

Thank you. If there are no more comments, questions. This concludes the focus group. Thank you for taking the time out of your day. To meet with us for the discussion.

Appendix E: Interview with Metro Mobility

10/06/2023 - Metro Mobility

Questions (bold) and Answers:

- **Can you describe the strategies Metro Mobility employs to reach out to hard-to-reach participants in your program?**
    - When participants apply Metro Mobility makes sure they understand they need to report
    - Gift card incentives available if they report majority of trips each quarter
    - Participants agree they can keep the bike if they upkeep reporting requirements
    - Metro Mobility reaches out to people who are not reporting, reminding them of incentives and requirement
- **What could be done to improve data collection with their app?**
    - Improvement in people's rates of labeling the trips

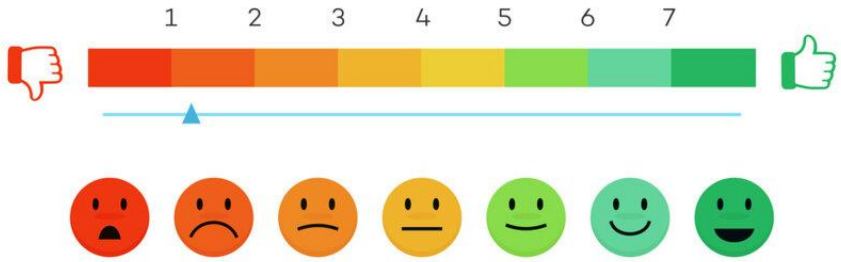
        - Incentives help rates, Metro Mobility experimented with competitions for those who participated, added leaderboard to make it fun

- **Are there any additional data collection strategies that Metro Mobility utilizes to gather insights from program participants?**
    - Older users sometimes create barriers to this technological wise, so Metro Mobility offers a simple survey form for them to use
- **What are the primary challenges or barriers encountered in implementing and maintaining Metro Mobility's program?**
    - They need NREL on board to help set up a study and provide access to dashboard so they can see data
        - This took a while and required approvals from US department of energy
        - Shared exports and spreadsheets are available at the start until this process is complete.
    - It wasn't easy to tie data to individual users.
- **What specific data points or metrics does Metro Mobility believe are crucial for evaluating the success and impact of their program?**
    - Frequency of usage of bikes, purpose of trips, what would've been alternative mode of transportation
    - Insight into new transportation options/access
        - Found e-bikes were replacing a lot of walking trips, they don't have alternative options so it's broadening trip options for some
- **How did you implementing the app, did you do any tweaks they did and what are the technical skills needed to transfer the use to MassBike?**

  - Did not tweak app, but provided suggestions to NREL as they're looking to improve their app overall
  - Get NREL to set up study, provide QR codes, then get admin access
  - Adapting to NREL midway through a study, might be different privacy wise for those participants who choose to continue, but for MassBike's second iteration we can make them agree prior

- **What is Metro Mobility currently doing regarding e-bikes?**
  - Deployed e-bikes in 3 different models; locking and charging e-bikes, and station based.
  - As rental or deployment as assigned to participant, but they will have access to charging station in buildings using Metro Mobility's app
  - Bikes are GPS tracked and sim card tracked for data purposes
    - Users required to use Metro Mobility app to open bike
  - They are also trying a control group of ownership-based e-bikes, like MassBike, where participants get a discount but responsible for everything regarding bike and they use the NREL app
- **Can you describe your experience with the NREL app?**
  - Comparatively less helpful as they have their own app, but they think it's better than a survey as it provides accurate data if participants use the app
  - It is on the ownness of participant to record data, so f a participant disables or uninstalls app that is a problem that could be encountered

Appendix F: Final Survey:



Likert scale to be referenced

1. How often do you currently ride a bike in Worcester? (Likert)

1 (Never) 2 (Rarely) 3 (Occasionally) 4 (Few times a week) 5 (Daily)

2. How would you rate Worcester cycling conditions?

(Never) (Always)

1 2 3 4 5 6 7

3. Have you been riding in other cities than Worcester? If so, what is your favorite city, and why? (Free Response)

4. In what ways does your favorite city stand out from all the cities you've been riding in? (Select all that apply)

1) Safe
2) Well-developed infrastructure
3) Clement weather at most of the times
4) Friendly cycling environment – many people in the city use bikes as their main transportation
5) Well-developed policies related to cycling
6) Others (Please specify)
7) Not applicable (I've been riding in only Worcester)

5. Where are your favorite spots to ride in Worcester? Why? (Free response)

6. What barriers, if any, have you encountered while biking in Worcester? (Free response)

7. In what ways do you typically use a bike in Worcester? (Select all that apply)
a. Commuting to work or school
b. Leisure or recreational rides
c. Running errands
d. Exercise or fitness
e. Other (please specify)
f. I do not ride in Worcester

8. How much do the following options influence how you plan a bike route in Worcester?

(Never) (Always)

Weather

1 2 3 4 5 6 7

Avoidance of traffic

1 2 3 4 5 6 7

Time of day

1 2 3 4 5 6 7

Hills

1 2 3 4 5 6 7

Road conditions

1 2 3 4 5 6 7

9. How do the following factors influence your decision to bike in Worcester?

(Never) (Always)

Rain

1 2 3 4 5 6 7

Heat

1 2 3 4 5 6 7

Cold

1 2 3 4 5 6 7

Snow

1 2 3 4 5 6 7

Wind

1 2 3 4 5 6 7

Fog

1 2 3 4 5 6 7

10. How likely are you to ride during the listed time of day?

(Never) (Always)

Morning (5:00 am - 12:00 pm)

1 2 3 4 5 6 7

Afternoon (12:00 pm - 5:00 pm)

1 2 3 4 5 6 7

Evening (5:00 pm – 9:00 pm)

1 2 3 4 5 6 7

Night (9:00 pm – 5:00 am)

1 2 3 4 5 6 7

11. How likely are the following to influence your decision to bike in Worcester overall?

(Never) (Always)

Weather conditions

1 2 3 4 5 6 7

Availability of infrastructure

1 2 3 4 5 6 7

Distance to your destination

1 2 3 4 5 6 7

Concerns over personal safety

1 2 3 4 5 6 7

12. How much do these features or amenities make biking more appealing in Worcester?

(Never) (Always)

Bike lanes

1 2 3 4 5 6 7

Bike racks

1 2 3 4 5 6 7

Traffic-calming measures (speed bumps, traffic circles)

1 2 3 4 5 6 7

Well-lit bike paths

1 2 3 4 5 6 7

13. What is your interest in attending these different bike related events and initiatives?

(Never) (Always)

Bicycle community events

1 2 3 4 5 6 7

Group rides

1 2 3 4 5 6 7

Providing feedback & recommendations on bicycle mobility to city planning staff

1 2 3 4 5 6 7

14. Anything else that you'd like to add (Free Response, not required)