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# Portland Bicycle Share Health Impact Assessment

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Portland Bicycle Share Health Impact Assessment

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## ABSTRACT

The Portland Bicycle Share Health Impact Assessment project was completed as a Capstone report for the Muskie School of Public Service Master of Public Health Degree. The version completed for this project is considered a Desktop Health Impact Assessment, the most basic, cost effective and rapid version of a Health Impact Assessment. This report is available for use by the City of Portland, Maine in order to select a cost-effective bicycle share program that maximizes health and equity for users in Portland.

The findings of this project have shown the potential health impact for implementing a bike share program in Portland, including improved air quality and rates of physical activity for bike share users. The recommendations to create the most health-conscious bike share program include basic requests of the bike share vendors that will provide the program to Portland including: recommending the use of helmets, distributing bike share stations throughout the City, tracking bicycle crashes, tracking minutes of physical activity, etc. The findings and recommendations show the importance of a potential bike share program, while creating a program that is safe and accessible to people from all backgrounds.

## ACKNOWLEDGEMENTS

This project was made possible due to the collaboration of City Planning Staff Bruce Hyman and Kristine Keeney; as well as USM Muskie School Faculty Judith Tupper and Elise Bolda's guiding wisdom. Other contributors to the process include the Bicycle Coalition of Maine, the Portland Bicycle Pedestrian Advocacy Committee and Portland's Public Health in Transportation Coalition.

The main content of this paper is strictly informational regarding the process of the HIA. The appendix contains the HIA report itself, as well as other useful information.

# Portland Bicycle Share Health Impact Assessment, June 29, 2015

## EXECUTIVE SUMMARY

The Portland Bicycle Share Health Impact Assessment (Portland Bike Share HIA) is a project that aims to bring the Public Health perspective to the City of Portland’s pending implementation of a proposed bike share program. The bike share program would allow residents and visitors to engage in active transportation, as part of the City’s mission to reduce automobile traffic and increase sustainability.

A Health Impact Assessment (HIA) is a tool that analyzes policies and provides recommendations for upcoming projects, such as the Portland Bike Share Project. The full report details the process of this HIA, explain findings and provides recommendations regarding the Portland bike share project.

### **Health Impact Assessment (HIA)**

Support for securing funding and Health in All Policies are among the many catalysts for completion of an HIA. A 2014 study looking at the business case for HIA found “from a funding standpoint, HIA can provide useful and objective documentation of the health impacts of a proposed project and can demonstrate its social return on investment upon a community” (Chen, Keppard, Sportiche, & Wood, 2014). One of the current barriers to the City’s implementation of a bike share program is a lack of funding. As evidenced by Chen(2014) HIA can demonstrate the potential public health benefits of the program in a meaningful manner that speaks to City officials as they make financial decisions.

Health in All Policies is a Public Health concept that furthers the work of Public Health by bringing health objectives into other fields, such as planning. Health in All Policies aims to incorporate health into decision-making across sectors with the goal of improving the health of the community (Rudolph, Caplan, Ben-Moshe & Dillon, 2013). HIA’s are just one example of a specific tool that uses the concept of Health in All Policies to address pending projects.

Table 1: Overall Recommendations presents a summary of the recommendations of the full HIA. The two health determinants topics are noted with an asterisk (\*), the remaining four topics focus on improving the equity and safety components of the proposed bike share program.

Table 2: Recommendations to Vendors offers recommendations to improve the program in Portland proposed by the top two bike share vendors under consideration.

Topic	TABLE 1: Overall Recommendations
<b>Physical Activity*</b>	Track total minutes of physical activity per trip per person via built in GPS systems on bicycles
<b>Air Quality*</b>	Annual tracking of Air Quality Conformity for the City.
<b>Safety</b>	Tracking crashes and collisions with cars, other bicycles and pedestrians. Helmet use is encouraged, although helmets will likely not be provided by the bike share.
<b>Accessibility</b>	Eight speed bicycles are recommended to help provide access to all areas of the city including hillier starting points and destinations.
<b>Site Location</b>	Two full service kiosks are recommended where both cash and credit cards are accepted. Sites should be located in all geographic areas of the City, making bike share accessible to all residents and visitors. Locate sites near transit stops.
<b>Demographics</b>	Collect and review data on demographics via zip code to assess if bike share users are representative of all Portland residents, with a goal to reach residents from all backgrounds in particular those from low income backgrounds who may lack access to transportation.

Vendors	Table 2: Recommendations To Vendors
<ul style="list-style-type: none"> <li data-bbox="240 1367 391 1398">• <b>B Cycle</b></li> <li data-bbox="240 1472 472 1503">• <b>Social Bicycle</b></li> </ul>	<ul style="list-style-type: none"> <li data-bbox="646 1367 1057 1398">• Upgrade bicycles to 8 speed.</li> <li data-bbox="646 1472 1052 1503">• Install on bicycle GPS units.</li> <li data-bbox="646 1566 1495 1669">• Allow for cash and credit card access to bike share program. Reevaluate best practice standards for encouraging low income participants to trial bike share, and implement as necessary.</li> </ul>

## PORTLAND BIKE SHARE HEALTH IMPACT ASSESSMENT (HIA)

The Portland Bicycle Share Health Impact Assessment (Portland Bike Share HIA) is a project that aims to bring the Public Health perspective to the City of Portland's pending implementation of a proposed bike share program. The bike share program would allow residents and visitors to engage in active transportation, as part of the City's mission to reduce automobile traffic and increase sustainability.

### **Background on Health Impact Assessment (HIA)**

Support for securing funding and Health in All Policies are among the many catalysts for completion of an HIA. A 2014 study looking at the business case for HIA found "from a funding standpoint, HIA can provide useful and objective documentation of the health impacts of a proposed project and can demonstrate its social return on investment upon a community" (Chen, Keppard, Sportiche, & Wood, 2014). One of the current barriers to the City's implementation of a bike share program is a lack of funding. As evidenced by Chen 2014, HIA can demonstrate the potential public health benefits of the program in a meaningful manner that speaks to City officials as they make financial decisions.

Health in All Policies is a Public Health concept that furthers the work of Public Health by bringing health objectives into other fields, such as planning. Health in All Policies aims to incorporate health into decision-making across sectors with the goal of improving the health of the community (Rudolph, Caplan, Ben-Moshe & Dillon, 2013). HIA's are just one example of a specific tool that uses the concept of Health in All Policies to address pending projects.

Benefits of HIA's in Maine and elsewhere are increasing awareness of the impact of policies and programs upon health; or "connecting the dots between health and other factors" (Chen, et al, 2014). In part, this benefit derives from the inclusion of community members in the decision making process. This can help address the needs of the community, and create a project most likely to succeed because members are part of the process and their opinions are valued and shared with the decision makers (Chen, et al, 2014). In this case, the community members most involved are those active on local advocacy committees that are dedicated to improving bicycle and pedestrian facilities in the City.

Drawbacks to HIA include the extensive resources needed for the work, including time, staff will and connections needed to research the topic and complete the HIA report.

### **Health Impact Assessment (HIA) is an Extensive Process.**

The value of conducting and HIA to illustrate the connections between health and other priorities of the city has been a key factor identified by City Staff, with the hopes that potential outside



funderson will see the impact the Portland Bike Share Program will have on employee health and resident health, and assist in funding the project.

The HIA was performed in adherence to the six documented steps of HIA (Human Impact Partners, 2015). Details on the methods of this HIA including timing, participants and information gathered while conducting this HIA process for the Portland Bike Share Program are included in Appendix I: HIA Report. Below are brief definitions of the HIA steps and key parameters of the Portland Bike Share HIA. The remainder of this report focuses on the interpretation of findings from the literature and the HIA process in Maine, recommendations based on findings from the HIA for the proposed Portland Bike Share program, and lessons learned in conducting the Portland Bike Share HIA.

### *SCREENING PHASE*

Screening verifies the need and value of the Portland Bike Share HIA. Screening methods include review and information gathering for the bike share proposals, assessing potential impact of the HIA process and sharing with stakeholders that an HIA will be completed.

### *SCOPING PHASE*

Scoping is completed in the effort to determine significant health outcomes, and which health impacts to evaluate. Scoping methods include analysis and mapping of existing data, and creation of pathway diagrams. The two health impacts to track include physical activity and improving air quality via reduction in carbon dioxide emissions. Physical activity was chosen as a health determinant because significant health benefits can be obtained by including a moderate amount of physical activity on most, if not all, days of the week.” (CDC, 1999). Air quality was chosen as a health determinant because the effect of air pollution on mortality is significant, accounting for about 1.1% of deaths annually or a total of 570,000 deaths (Friis, 2012).

### *ASSESSMENT PHASE*

Assessment is completed in the effort to analyze baseline health conditions, likely health events, and evaluation of potential health impacts. Assessment methods include gathering existing data and collecting primary data when necessary. Existing data that proves useful in many HIAs with similar themes may include rates of adults with adequate physical activity levels, rates of obesity, mortality rates, socioeconomic factors, education levels census data, safety and traffic data, journey to work data, air quality conformity data, etc. The data for this HIA were gathered from the EPA report (EPA (b) 2013) provided to the City; data available from Healthy People reports (US DHHS, 2010); and data from the Behavioral Risk Factor Surveillance System (CDC, 2010).

Other figures came from a meta-analysis of public bike share programs as part of the literature review (Shaheen, 2014).

Assessment values extrapolated from these sources for the Portland Bike Share HIA, based on population data for the City of Portland estimate:

- Trips per year: 14,000 trips per year
- Average Distance per trip: 2.5 miles per trip
- Total CO<sub>2</sub> reduction in Kg per year: 35380 Kg CO<sub>2</sub> reduction per year
- Average Minutes of Physical Activity per trip (per person): 13 minutes

### *RECOMMENDATIONS PHASE*

Recommendations are made based on both health determinants and the ultimate goal of the initiative. Recommendations for HIAs are most successful if they are tied to indicators that are available and can be monitored.

Recommendation methods are based on information learned through the first four steps of the HIA.

The recommendations phase for this HIA was to review submissions in response to Portland's Request for Information (RFI) seeking vendors proposals for how they would operate the public bike share program for the City. Four vendor submissions were received in November of 2014. Criteria for vendor proposal review are included in [Appendix II RFI Evaluation Metrics](#).

### *REPORTING PHASE*

The ultimate goal of this HIA is to provide the framework for a health and equity minded bike share program, while demonstrating to potential funders that this is a worthwhile investment. For the author this reporting phase is used to disseminate key findings to stakeholders and decision makers including City Transportation Staff, Portland Bicycle Pedestrian Advocacy Committee and the Public Health in Transportation coalition. Following this process, it will be up to City Staff to use the HIA to share health benefits of the bike share program with potential funders in the Portland area, including large area employers such as the hospitals.

### *MONITORING PHASE*

The goal of the monitoring phase is to monitor the results of the HIA and evaluate them with respect to process, impact, and outcomes criteria developed to assess the success or quality of the program. The results specifically identified from this HIA are the impact of the Bike Share on

physical activity and air quality. Since the project has not yet been implemented, the HIA contribution to the monitoring phase is to come up with a concrete, feasible plan for the Portland Bike Share program that will ensure health determinants are tracked as the project begins. The monitoring plan for the physical activity health determinant is to track minutes per trip, distance per trip and trips per year via the GPS tracking devices on the bicycles. The monitoring plan for the air quality health determinant is to track the Air Quality Conformity data at the onset of the program, and then on an annual basis subsequently via the Greater Portland Council of Governments.

### **Experience with HIA in Maine**

Based on the available options for the Portland Bike Share, this HIA reviewed proposals submitted and made recommendations for the City. The recommendations detailed below include health considerations that increase positive health outcomes, and minimize negative health outcomes relating to the bike share.

Previously, only two HIAs have been completed in Maine, though none based in Portland; the state's largest city. The Auburn Land Trust HIAs looked at the benefits to adding a greenway along the Androscoggin River, which was a largely land-use HIA. The Maine Paid Sick Days HIA looked at the potential health outcomes for this potential policy change in Maine. Both of these HIAs use the HIA framework to highlight the importance of health and the potential health outcomes from this shift in land-use and social policy (PEW, 2015.)

Collaboratives in Maine are currently working to bring more HIA projects to Maine in the near future. Part of this collaboration was a HIA training offered by USM, Human Impact Partners, and the Maine Centers for Disease Control in November 2014 for Public Health professionals. Human Impact Partners are a leading authority in Health Impact Assessments, and provide both training and technical assistance for HIA around the nation. The author participated in organizing the training as well as attending as a trainee to become fully trained in HIA in HIA. This experience brought both excitement and knowledge to the potential of HIA for Maine.

## **LITERATURE REVIEW**

The applicable literature was found from a variety of sources, including in a recent Bike Share HIA report from Atlanta, Portland specific sources. There are three major themes that were found in the literature: financial savings of HIA and bike share; the importance of bicycle station density of the bike share; and the importance of policy.

The financial savings of healthy community design were made apparent in a recent report that demonstrated savings could be realized if we designed our communities with built environment that supported health (Chen, 2014). Additionally, creating a healthy built environment doesn't

have to be a costly endeavor. A particularly relevant report that recommends best practices around Bike Share found that in terms of capital investments for transportation, Bike Share is among the least expensive options (Freemark, 2010).

The importance of bicycle station density (is this density of population or density in terms of numbers of bike station locations – your reader is swimming to keep up here! You may want to spend a paragraph defining terms that have specific meaning relative to bike share – general infrastructure – to many of us means bridges and roads when we think about a built environment ) and general infrastructure (ie, bicycle lanes, trails and paths) were made apparent in many studies. In the same study that looked at best practices for Bike Share, the findings show that the more dense the Bike Share program, the more successful the program (Freemark, 2010). Actual proximity of the stations demonstrates relevant as well. Stations should be located in very close proximity to transit stops, according to the Mineta Report, an extensive look at public Bike Share programs (Shaheen, 2014). Two separate studies also found that increasing cycling infrastructure leads to increased cycling (Dill, 2003; Capital Bikeshare, 2013). An EPA report about Bike Share for Portland recommends keeping the program dense and focusing the project in the most urban parts of the city (EPA, b 2013).

Policy impacts are documented in the literature as well. The literature also suggests that the values of health and equity with policy makers throughout the entire planning process. This creates a more comprehensive system view that includes health throughout the entire planning period, as evidenced by two recent reports (Haggerty 2013 and ICF International 2014). The Mineta report (Shaheen, 2014) echoes these thoughts with a recommendation to work with local government to improve cycling infrastructure throughout the planning of Bike Shares, such that improvements are well utilized.

Ultimately, the findings of the literature show that increasing cycling infrastructure will decrease driving trips and by working together with policy makers, it is possible to create safe built environments that support successful Bike Share programs.

## RECOMMENDATIONS

Section 1: Overall Recommendations presents a summary of the recommendations of the full HIA. The two health determinants topics are noted with an asterisk (\*), the remaining four topics focus on improving the equity and safety components of the proposed bike share program.

Section 2: Recommendations to Vendors offers recommendations to improve the program in Portland proposed by the top two bike share vendors under consideration.

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Vendors	Section 2: Recommendations To Vendors
<ul style="list-style-type: none"> <li>• <b>B Cycle</b></li> <li>• <b>Social Bicycle</b></li> </ul>	Upgrade bicycles to 8 speed. Install on bicycle GPS units. Allow for cash and credit card access to bike share program. Reevaluate best practice standards for encouraging low income participants to trial bike share, and implement as necessary.

## LESSONS LEARNED

The HIA process is best done in full collaboration with stakeholders and decision makers. However, when one is completing a desktop version of the HIA; the most rapid, cost effective version of an HIA, the process is done with less collaboration than optimal. The desktop version of the HIA was chosen due to the limited time and resources. The preferred version of HIA is to do a fully comprehensive HIA which takes up to a year to complete and can cost a lot in terms of both money and staff time.

An example of the importance of collaboration for this HIA was choosing the health determinants during the scoping phase. This scoping phase was done in collaboration with only the transportation manager for the City of Portland. The health determinants chosen were reflective of City priorities, however, it is important to note there are many other health determinants that could be considered based on the demographics of Portland. Air Quality was chosen because of the nature of Portland's recent population increase and the potential impact that transportation has on the quality of life in Portland. However significant Air Quality to those in transportation and planning, Portland is actually in conformity with the national safe levels for all the aspects of Air Quality. Economic development or employment status are examples of other choices for a second health determinant that could have been elicited with a broader HIA scoping process to assess community impact . Additionally, if the HIA was more comprehensive by design, there would have been several other health determinants chosen, but this is not necessarily an option in a Desktop HIA.

Full communication is vital when completing a HIA. Throughout the writing process of this HIA report, the City transportation staff were compiling their annual survey to share with people who live, work and play in Portland. Bicycling is always included in this transportation survey, as it is a vital mode of transit in Portland. As part of the survey, bike share was brought into the discussion to see if those completing the survey thought bike share was high on the priority list. This is a great venue for getting public input on bike share. When available, results from this survey will be added to the bike share HIA for the reporting phase. Survey questions are included in [Appendix 3: Bike Share Section of Portland Maine's 2015 Annual Transportation Survey](#).

Lastly, after speaking with the collaborators from the Atlanta Bike Share HIA, their strongest recommendation was to take full and complete notes throughout the process of every meeting and step. This was done, and has created a somewhat 'procedural' HIA report; which many readers may find interesting and which may prove to be excessive for casual readers. With this in

mind, there is an executive summary included at the beginning of the HIA to highlight the most significant aspects of the report and considerable detail is provided in appendices only.

## MPH INTEGRATION STATEMENT

The Portland Bike Share HIA was conducted as a Capstone project designed to integrate knowledge, skills and concepts from Public Health coursework. Specific courses and concepts applied in this work are highlighted below.

- **Epidemiology:** Analyzing and using data to improve health via a broad spectrum planning effort. Analyzing baseline health conditions and likely health events.
- **Finance:** Analyzing bike share proposals for the best value program.
- **Health Law:** Looking at the impact of policies on health outcomes. Creating recommendations for City Staff based on health outcomes that will improve equity.
- **Health Planning and Marketing:** Planning and implementing the Bike Share program in Portland. Planning to include siting the Bike Share locations based on past findings; as well as creating the Bike Share program that is most accessible to potential users.
- **Organizational Leadership:** Using partnerships and relationships to further the work of public health. Engaging community members and organizations to be a part of the Portland Bike Share HIA.
- **Quality Improvement:** Improving the quality of health outcomes via an additional layer of planning and policy work.
- **Social/Behavioral Health Determinants:** Recognizing key health disparities and planning to address them in the choosing of the best Bike Share proposal. Creating pathway diagrams for health determinants.

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## APPENDIX 1: HIA REPORT

The HIA was performed in adherence to the six documented steps of HIA (Human Impact Partners, 2015). Below are sections documenting the work and results of each phase of the HIA completed in 2014 and 2015. There are various subsections within each phase of the HIA with additional information.

### SCREENING PHASE

Screening verifies the need and value of the Portland Bike Share HIA. Screening methods include review and information gathering for the bike share proposals, assessing potential impact of the HIA process and sharing with stakeholders that an HIA will be completed.

Screening phase included various meetings:

- November 2014: I met with the Transportation Planning Manager, Bruce Hyman, for the City of Portland.
- December 2014: Met with the Portland Bicycle Pedestrian Advocacy Committee (PBPAAC) to request their approval of this project and suggestions for project.
- January 2015: Shared plans to conduct the Portland Bike Share HIA with the Public Health in Transportation (PHiT) Coalition.
- Staff and citizens approached are on board for the project and supportive.

Target Audience Identification:

- After the meeting with Bruce Hyman, the target audience was selected. The main audience for HIA report is the City of Portland. Additional audience members include the bike share vendors that have submitted proposals; as well as potential funders in the area that will receive information learned from the report in the effort to seek funding.

### SCOPING PHASE

Scoping is completed in the effort to determine significant health outcomes, and which health impacts to evaluate. Scoping methods include analysis and mapping of existing data, and creation of pathway diagrams. The two health impacts to track include physical activity and improving air quality via reduction in carbon dioxide emissions.

Physical activity was chosen as a health determinant because significant health benefits can be obtained by including a moderate amount of physical activity on most, if not all, days of the week.” (CDC, 1999). This landmark report found more than sixty percent of American adults are not regularly physically active and in fact, twenty five percent of all adults are not active at all. In the years since this landmark report debuted, the rates of Americans engaging in physical activity has improved, but not enough. In 2012, fifty percent of adults met the guidelines for physical activity (US Department of Health and Human Services, 2010). Maine follows suit very similarly to the nationwide data. In Maine, 50.3% of adults met the guidelines for physical activity. Additionally, 21.2% of Maine’s adults reported that during the past month, they had not participated in any physical activity (BRFSS, 2010).

Air quality was chosen as a health determinant because the effect of air pollution on mortality is significant, accounting for about 1.1% of deaths annually or a total of 570,000 deaths (Friis, 2012). Air quality has shown to be a significant health determinant affecting the quality of life for all, with significant area for improvement by decreasing automobile traffic in Portland. Bike sharing itself may not make a large effect on the overall air quality but would be part of a comprehensive suite of alternative transportation solutions, including walking, bicycling and transit, which do make a big collective impact. As part of Portland’s comprehensive plan, the City strives to become more sustainable and less dependent on automobiles.

Existing data has shown that these are currently measures that are accessible to track via the bike share software systems. These measures were requested to be included in the bike share software system. This is part of the effort to track health determinants as part of the bike share program, and to improve access and make the Portland Bike Share an equitable program; we have requested these and other measures be included by the bike share vendors that replied to the RFI.

## PATHWAY DIAGRAMS

Pathway Diagrams dissect the health determinants chosen in the scoping phase with the goal of explaining the impact of the project on future health outcomes. The two below diagrams are for the two chosen health determinants: Physical activity and air quality.

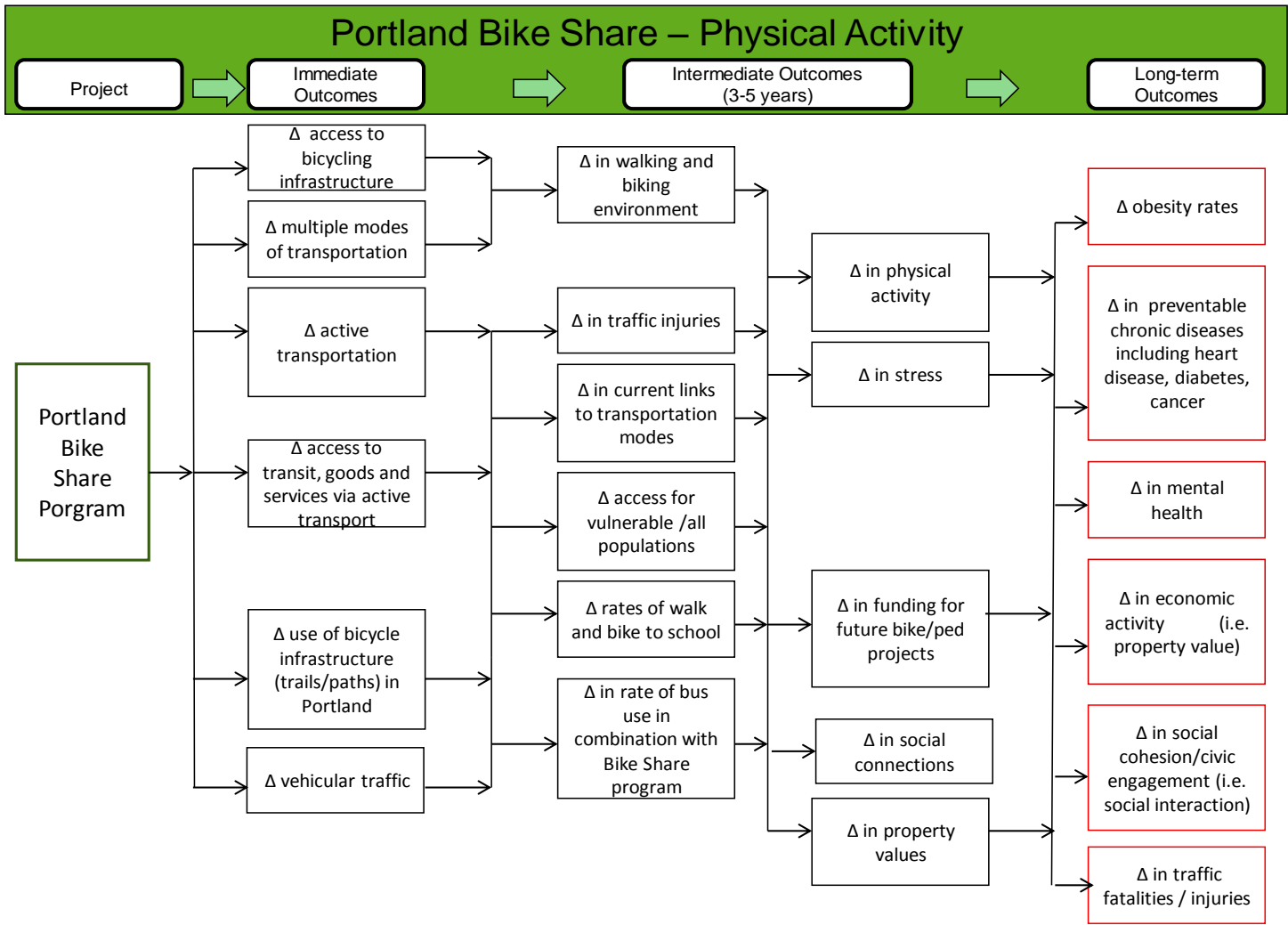


Figure 1. Pathway Diagram for Physical Activity

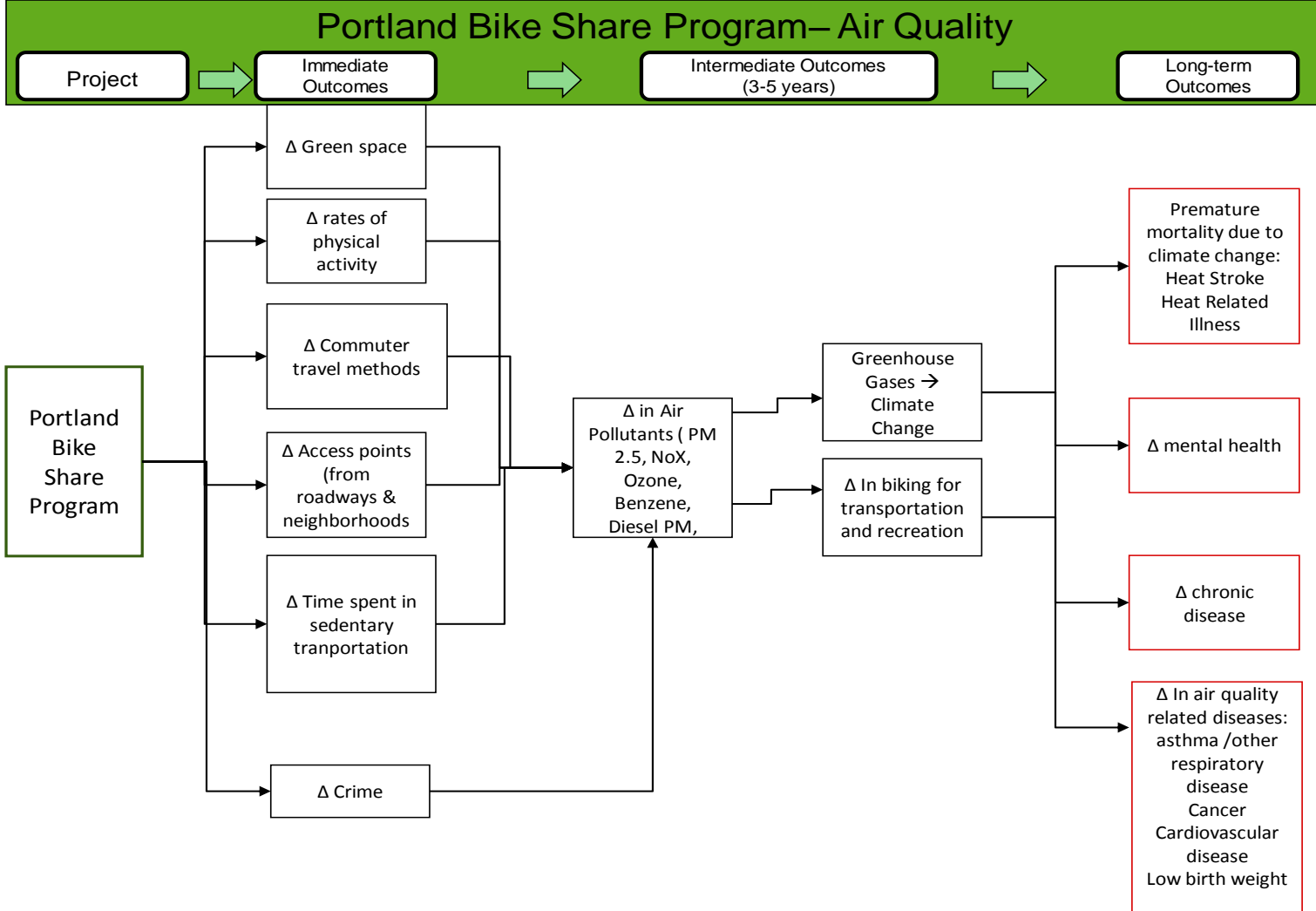


Figure 2. Pathway Diagram for Air Quality

## ASSESSMENT PHASE

Assessment values extrapolated as explained below, for the Portland Bike Share based on population data for the City of Portland:

- Trips per year: 14,000 trips per year
- Average Distance per trip: 2.5 miles per trip
- Total CO<sub>2</sub> reduction in Kg per year: 35380 Kg CO<sub>2</sub> reduction per year
- Average Minutes of Physical Activity per trip (per person): 13 minutes

Assessment is completed in the effort to analyze baseline health conditions, likely health events, and evaluation of potential health impacts. Assessment methods include gathering existing data and collecting primary data when necessary. Existing data that proves useful in many HIAs with similar themes may include rates of adults with adequate physical activity levels, rates of obesity, mortality rates, socioeconomic factors, education levels census data, safety and traffic data, journey to work data, air quality conformity data, etc. The data for this HIA was gathered from the EPA report provided to the City; data available from Healthy People reports; and data from the Behavioral Risk Factor Surveillance System. Other figures came from a meta-analysis of public bike share programs as part of the literature review.

Based on the health determinants reviewed in the scoping phase, values for certain health indicators were found from the existing data, including those just described. The Mineta report is a very thorough meta-analysis of the various Bike Share programs worldwide (Shaheed, Martin, Chan, Cohen & Pogodzinski, 2014). The Mineta report provided many of the values this HIA aims to evaluate in other cities including: values for trips per year (from Boston, MA, USA), Carbon dioxide reduction in kilograms per year (from Boulder, CO, USA), and distance per trip data (from Denver, CO, USA and Hangzhou, China). Using these figures from other bike share programs to begin to provide some estimates of the health benefits of the bike share program, projections were extrapolated out for Portland, using Portland's current population (66,318 people). The numbers extrapolated out to include health benefits for implementing a bike share for even a small sized city, such as Portland.

The estimate for the impact of the bike share program on minutes of physical activity is about thirteen minutes per trip. In order to estimate physical activity, the Google Maps average speed estimate for cycling of ten miles per hour was used. Based on trip data, the estimate of 2.5 miles per trip, from averages provided via the Mineta report, the estimate for minutes of physical activity is thirteen minutes per trip.



## IMPACT OF PHYSICAL ACTIVITY ON HEALTH

The impact of the above figures demonstrates potential for a health effect. The CDC recommendations for physical activity are thirty minutes per day for adults. The Bike Share would provide almost half the recommended daily physical activity per trip. Regular physical activity can provide long term health benefits, including decreases in risk of early death, lower risk of coronary disease, stroke, diabetes, high blood pressure, reduced depression and weight loss (Office of Disease Prevention and Health Promotion). Nationwide, and in Maine, only about half of Americans engage in the recommended physical activity (US Department of Health and Human Services, 2010).

There are various ways to obtain the recommended thirty minutes of physical activity. The physical activity should be completed in at least ten minute increments, though it doesn't have to happen all in one thirty minute block (Office of Disease Prevention and Health Promotion, 2008). The average bike share trip time of about thirteen minutes would provide about half of the recommended amount of physical activity for a participant, while not being an overwhelmingly difficult amount of exercise for the average participant. Physical activity via bike share is, potentially, one of many needed methods for increasing physical activity for Americans with the goal of improved health.

Studies looking at the impact of inactivity have found major effects for Public Health. A 2012 study quantified the effect of physical inactivity on major non-communicable diseases by estimating how much disease could be avoided if inactive people were to become active. Inactivity caused about 5.3 million deaths that occurred worldwide in 2008 (or about nine percent). If inactivity were decreased by ten percent (as is possible with the implementation of increasing active transportation rates with programs such as effective bike share programs), that could prevent 533,000 deaths annually (Lee, Shiroma, Lobelo, Puska, Blair & Katzmarzyk, 2012). If we wanted to extrapolate that information to Portland based on the population of 66,318, five deaths annually could be avoided in Portland just from a modest decrease in physical activity; without including the other potential health benefits such as air quality.

## IMPACT OF IMPROVED AIR QUALITY ON HEALTH

Improving air quality is a definitive way to improve Public Health. Many studies have been completed on this topic. One study based on US life expectancy, socioeconomic status and demographic data looked at the impact of particulate air pollution and life expectancy during the 1970s and 1980s and then again in the 1990s and 2000s. Regression models were used to estimate the association between reductions in pollution and changes in life expectancy, with adjustment for changes in socioeconomic and demographic variables. The reductions in air pollution that occurred between the two time frames accounted for as much as 15% of the overall

increase in life expectancy in the United States (Pope, C. Arden Ezzati, Majid Dockery, Douglas W, 2009).

When considering air pollution levels, it is worthwhile to note that many urban areas have high air pollution levels and there will be an impact on health due to the recent trend of urbanization, with more people worldwide moving to cities (UNFPA, 2007). The effect of air pollution on those living in these urban areas is substantial; meanwhile urban areas house vulnerable populations such as low income individuals and families. The world-wide effect of air pollution on mortality was found to be a statistically significant association, with worldwide ranges up to 570,000 deaths annually, or about 1.1% of deaths (Friis, 2012).

## CONSIDERING EQUITY

An area of concern with regards to physical activity, and many other issues, is equity. People from higher educational backgrounds get more physical activity. Those that have less than a high school degree, or a high school degree are less likely than those with college degrees to get the recommended amount of physical activity (US Department of Health and Human Services). The groups that have less education are generally those that have lower incomes, and in particular less income to spend on automobile ownership and travel. Bike Share could naturally work to increase physical activity rates for this demographic, because of the low cost nature of Bike Share in comparison to automobile ownership.

Regarding equity and air quality, lower income groups suffer greater health effects from air pollution than others regardless of exposure. Children are more vulnerable to the respiratory effects of traffic-related air pollution (Health and Places Initiative, 2014). Children are at increased risk because their lungs are developing and they spend more time exerting themselves at high activity levels (EPA, 2013) Older adults are more vulnerable to heart attack or stroke, and air pollution increases those risks (Health and Places Initiative, 2014). Asthma is a frequent chronic condition, with about one in ten people in Maine affected (Maine CDC, 2014). Asthma is considered a public health problem that affects inner city residents, especially children and pollutants trigger asthma attacks with an association found between high levels of air pollution and asthma prevalence (Shima M, Nitta Y, Ando M, et al, 2002). Bike share has potential to mitigate air pollution, while also providing opportunities for physical activity. Both items can make a difference for vulnerable and/ or low income individuals and families living in Portland, by providing options for affordable transportation and reduced amounts of air pollution.

## RECOMMENDATIONS PHASE

Recommendations are made based on both health determinants and the ultimate goal of public bike share, which is to expand and integrate cycling into transportation systems, so that it can more readily become a daily transportation mode for commuting, personal trips, recreation, and improved health (Mineta, 2014). Recommendations for HIAs are most successful if they are tied to indicators that are available and can be monitored.

Recommendation methods are based on information learned through the first four steps of the HIA. Part one of the recommendations phase was to review the bike share vendors RFI's for thorough applications. A meeting was held to review the 4 RFI's that were received in November of 2014. Those in attendance included staff from the Planning office, the Bicycle Coalition of Maine and me.

The review process was guided by City staff and included an evaluation sheet created by the City Planning office, and a scoring sheet to compare all four bike share vendor applications. This process showed that two bike share vendors had the most complete applications, including B Cycle and Social Bicycles. All four applications were compared on a scoring rubric (see appendices 4-7) with criteria determined by the Planning office. Categories included cost, equity, user interface, experience and relationship with the City. See below image for the scoring rubric with final tallies for best RFI.

<i>Bike Share RFI Evaluation Matrix</i>	Company Background		Capital Costs		Operating Costs		Software Tools			Potential Funding		Case Studies		Warranty															
Please rank each company compared to the others from weak (1) to strong (4) for each of the metrics to the right	Years in industry		Successful launches		Product features/options		Cost vs. quality of hardware		Experience as an operator		Software features		Back-end capabilities		Front-end user interface		Suggested funding sources		Fundraising support		Experience in similar cities		Relationship with host city		Lengthy/level of coverage		Good fit for Portland		
																											Total		
	<b>B-cycle</b>	1	4	4	2	3	4	3	3	3	2	2	3	3	4	4													25
	<b>Social Bicycles</b>	3	2	2	3	1	no	2	1	2	4	4	4	3	3	3													21.166667
	<b>Zagster</b>	2	3	1	4	4	3	1	2	1	3	3	2	4	2	2													19.833333
	<b>Nextbike</b>	4	1	3	1	2	no	4	4	4	4	1	1	1	3	1	1												15.5

Figure 3: Scoring rubric used for comparison of bike share proposals

The bike share vendors that had the highest scores and are therefore recommended for the Portland bike share program are B-Cycle and Social Bicycles. Recommendations based on the Atlanta Bike Share HIA and other recent findings were sent back to the top two vendors to see if these considerations could be included in the Portland Bike Share, and how those items would affect cost. The recommendations shared initially included providing GPS tracking equipment on the bicycles to track minutes of physical activity per trip, and providing eight speed bicycles to make the bicycles more accessible to all levels of rider (vs three speed bicycles which can be more strenuous in hilly terrain). Additional considerations shared with the vendors are as follows: the ability to track miles travelled per ride via GPS software (to measure minutes of physical activity per trip); the ability to collect traffic related deaths and injuries as part of the ongoing program monitoring; and the ability to collect demographic information via zip code collection (to adequately gather if the Bike Share is reaching people from all demographics). B Cycle responded to these inquiries stating that cost would be affected. Installing GPS on the bicycles is possible with additional cost, and providing eight speed bicycles is also possible, with additional cost because most of their products are three speeds and the fleet for Portland would be a special build.

As discussed in the section on the “Assessment Phase”, air quality can also have major impacts on health. As the population of Portland grows, it is worthwhile to recognize the effects this may have on air quality as increased numbers of vehicles are on the streets in Portland, the largest employer in Southern Maine. The Portland metro area posted the second-largest population increase in New England during the past year, according to a U.S. Census Bureau report. The bureau released figures on its estimates of population growth at the metro and county level, and they showed that the Portland metro area grew by 3,189 people – from 520,363 people on July 1, 2013, to 523,552 on July 1, 2014 – an increase of 0.61 percent (Portland Press Herald, 2015).

Air quality data is tracked at the regional level to verify that federally funded transportation projects are reviewed for their impacts on air quality (Maine DOT, 2011). These are requirements created by the Clean Air Act. The purpose of the transportation conformity process is to ensure that federally funded or approved transportation projects, programs and plans are reviewed and evaluated for their impacts on air quality (Maine DOT, 2011). The Air Quality Conformity data is available via the local regional planning organization, Greater Portland Council of Governments. Currently, Portland is in conformity with the air quality regulations. However, given population growth, the recommendation provided in this HIA is to gather the Air Quality Conformity data annually to compare alongside usage of the bike share program.

Phase 2 of the recommendations will largely include the siting of the various stations throughout the City of Portland, in order to guarantee that all residents of Portland have access to the bike

share stations. The recommendations found in the literature show that increasing access and density of stations has been found to increase the success of bike shares. The recommendation is to follow this guidance, and not only place stations throughout all neighborhoods of Portland, but to also have a high density of stations. The current recommendations for siting are that the City has at least two fully operational kiosks; where credit cards can be swiped and /or cash can be paid in order to access the bicycle rentals, as well as stations located in various parts of the City that make the program accessible to all Portland residents and visitors. The US Environmental Protection Agency (EPA) selected Portland for study for a potential Bikes Share program in 2013 (EPA (b), 2013). As part of this study, sites were selected by citizens and City staff). These sites are located in the most densely settled areas of Portland, and include a variety of locations representative of Portland’s diverse neighborhoods.



Figure 4: Site locations determined at EPA workshop in 2013.



## SPECIAL NOTE ON ADDITIONAL RECOMMENDATIONS

Full recommendations have not been made for all aspects of bike share. The two topics missing full recommendations include helmet use and pricing. Helmets are recommended, but bike shares do not generally provide these. Signage at the kiosks and stations should encourage use of helmets and provide information on where to purchase helmets at local bicycle shops. Regarding pricing of bike share, a main intent of bike share is to increase access to a low cost form of transportation. That said, bike share should be deemed affordable for all potential users. Many bike shares have offered low cost programs for participants who have a low income, however there is limited research on the effectiveness of this strategy. One strategy employed in many different bike shares is to charge free use of the bike share program for the first thirty minutes of riding, with a low annual fee and a small fee after the first thirty minutes.

In order to gauge whether the Portland Bike Share is reaching users from various economic backgrounds, demographic information will be collected about users by collecting zip code at registration. Zip codes demonstrate information about the participant's income, ethnic race and background. In public bike sharing, gathering data via zip code is the current recommendation to look at demographic reach of the program. This data can be reviewed and based on the overall reach of the participants pricing structures can be altered with an effort to recruit more low income participants. Other bike share programs have largely reached white, highly educated users and despite popularity of the programs nationwide, the goal is to engage users from all backgrounds in a more equitable way. One recent example of this trend was found in Capital Bikeshare's annual survey based in the Washington DC area. The overall theme was that the users of bike share were more educated, more often white, younger, male, and slightly less affluent than the average commuters (Capital Bikeshare, 2013). The chance that bike share users are less affluent speaks to a key need in making transit more accessible.

## REPORTING PHASE

The goal of this phase is to disseminate key findings to stakeholders and decision makers. This includes sharing the HIA report with stakeholders such as PBPAC and the PHiT coalition, and the City Transportation Staff. The HIA findings regarding potential health benefits of a bike share program are available for decision makers to make an informed decision regarding the funding of a bike share program in Portland. The reporting phase will occur after the HIA report has been shared with USM faculty and students in an effort to provide the most complete report to the City.

A goal of the reporting phase is for City Staff to share health benefits of the bike share program with potential funders in the Portland area. This includes large employers such as the hospitals. The ultimate goal of the HIA is to provide the framework for a health and equity minded bike

share program, while proving to potential funders that this is a worthwhile project to spend their funds on.

## MONITORING PHASE

The goal of the monitoring phase is to monitor the results of the HIA and evaluate them in respect to process, impact, and outcomes. The results specifically identified are the impact of the Bike Share on physical activity and air quality. Since the project has not yet been implemented, the monitoring phase is to come up with a concrete, feasible plan for the Portland Bike Share program that will ensure health determinants are tracked as the project begins. The monitoring plan for the physical activity health determinant is to track minutes per trip, distance per trip and trips per year via the GPS tracking devices on the bicycles. The monitoring plan for the air quality health determinant is to track the Air Quality Conformity data at the onset of the program, and then on an annual basis subsequently via the Greater Portland Council of Governments.



## APPENDIX 2: RFI EVALUATION METRIC SHEET

### City of Portland Bike Share RFI Evaluation Metrics

January 2015

- 1) Company Background & Experience
  - a. Years in the industry:
  - b. Typical market:
  - c. Number of employees:
  - d. Successful launches
    - i. System sizes:
    - ii. Expansions:
  - e. Delays:
- 2) Estimate of Capital Costs
  - a. Product features/options:
  - b. Cost per bike:
  - c. Costs versus quality of components:
- 3) Estimate of Operating Costs
  - a. Operational support available?:
  - b. Costs versus level of support:
- 4) Description of Software Tools
  - a. Software tool features:
  - b. User interface:
- 5) Potential Funding Sources
  - a. Funding options proposed:
  - b. Experience with obtaining sponsorships:
- 6) Case Studies from Existing Bike Share Locations
  - a. Experience in comparable cities:
  - b. Business model/nature of partnership with municipalities:
- 7) Hardware Warranty Description
  - a. Most inclusive warranty:
- 8) Other
  - a. Insurance:
  - b. Equity:
  - c. Overall response feedback

Appendix 3: Bike Share Section of Portland Maine's 2015 Annual Transportation Survey

Biking (rank from highest priority (1) to lowest priority (5))

Public bike sharing system for short term bike rentals

Improved bikeways on busy streets (for example: Forest Ave, Brighton Ave, Washington Ave)

Improved bikeways on neighborhood streets

More off-road paths (for example: Eastern Prom Trail)

More bicycle parking