Boston University Initiative on Cities

BOSTON UNIVERSITY

PROPOSED STRATEGIES FOR INCREASING RIDERSHIP ON BUS RAPID TRANSIT IN EVERETT, MA

METROBRIDGE

ABOUT THIS REPORT

Two student teams of undergraduate Political Science students addressed this transportation challenge in the Public Policy Lab course instructed by Associate Professor David Glick during the Spring 2019 semester.

The following report is a compilation of this work and includes literature reviews, policy analysis, and suggested strategies for the City of Everett to consider. During the semester, students met with staff from the City of Everett to understand the key challenges, learn more about the transportation needs of the community, and to present their findings.

The final version of this report was compiled and edited by Emily Robbins, MetroBridge Program Manager and Associate Professor David Glick, MetroBridge Faculty Director with assistance from Helen Houghton, a student in the Public Policy Lab course.

ACKNOWLEDGMENTS

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ABOUT BU METROBRIDGE

MetroBridge empowers students across Boston University to tackle urban issues, and at the same time, helps city leaders confront key challenges. MetroBridge connects with local governments to understand their priorities, and then collaborates with Boston University faculty to translate each city's unique needs into course projects. Students in undergraduate and graduate classes engage in city projects as class assignments while working directly with local government leaders during the semester. The goal of MetroBridge is to mutually benefit both the Boston University community and local governments by expanding access to experiential learning and by providing tailored support to under-resourced cities. MetroBridge is funded by the College of Arts and Sciences and housed at Boston University's Initiative on Cities.

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EXECUTIVE SUMMARY

CHALLENGE FROM THE CITY OF EVERETT: INCREASING RIDERSHIP OF BUS RAPID TRANSIT

The City of Everett is a densely-populated community bordering Boston with an estimated population of 50,000 people living within 3.5 square miles. There are approximately 42,000 vehicles registered within the City. Local leaders in Everett would like to reduce car-dependency and promote bus usage as well as other active transportation options.

The City has made recent efforts to influence residents' transportation decisions, including the creation of a morning rush hour bus-only lane down Everett's main street from 4 a.m. to 9 a.m. every weekday. Additionally, through a partnership with a private foundation, the City introduced elements of Bus Rapid Transit to reduce travel time and improve user experience.

In order to better understand how to expand the use of more sustainable transit options, particularly Bus Rapid Transit, the City of Everett is seeking more information about strategies for encouraging residents to utilize existing bus or active transportation options.

Some policy options to explore include:

- Wayfinding signage to encourage active transportation in the form of walking or biking
- Parking restrictions that would make car ownership less attractive for current residents
- Continued improvements to existing bus service

BACKGROUND

The City of Everett has a small land area, approximately 3.5 square miles, but has a large number of cars per resident, approximately 42,000 for 50,000 people. There are traffic concerns associated with the ingrained car culture, which are only expected to worsen with the opening of a new casino in Everett in Summer 2019. The City is thus looking to discourage car use by encouraging the use of alternative forms of transportation.

Everett is one of the most traffic-congested cities in the Greater Boston area, particularly due to the number of cars, narrow roadways, lack of direct access to the subway, and a large working-age population commuting to work. Although the city government and city residents have shown a willingness to accept change when it comes to transit, they are faced with outside constraints. The state of Massachusetts controls its public transportations through the Massachusetts Bay Transit Authority (MBTA), which controls and runs all bus, subway, and train lines in the state. The transit within Everett and transit connecting the City to Boston and surrounding areas is governed by the MBTA, which the City of Everett has no direct control over.

The purpose of these reports is not necessarily to suggest changes to improve the existing public transportation infrastructure, but rather, to improve awareness and public opinion of those systems, find easy-to-implement methods of encouraging use of alternative forms of transportation, and discourage car reliance without major system changes, which are infeasible if not impossible due to the constraints posed by the MBTA system.

The current transit infrastructure in Everett is the eight bus lines which run through the city and connect to subway lines into Boston. These bus routes are some of the busiest in the MBTA system, with over 18,700 daily bus boardings. The high rates of usage can be attributed to Everett having a large proportion of populations that tend to have higher rates if public transit usage, such as foreign-born residents, residents with disabilities, and young professionals. Twenty-four percent of Everett's residents use the transit system to commute to work, but these trips often involve multiple legs or line switches because of the lack of direct access into Boston. The average commuting time for Everett residents is 33 minutes, which is more than the national average of 25 minutes. Additionally, there

is a higher-than-average percentage of residents with “super commutes,” or those that exceed 90 minutes.

Despite constraints, Everett has made improvements to its bus service, particularly through the restriction of parking along Broadway (the city’s main thoroughfare) to create a bus only lane during peak commuting hours, as well as the installation of new platforms which help residents board the bus. These new improvements have been met with positive public reviews. Everett also launched LimeBikes in June 2018, a dockless bike share program, and they are installing Bluebike docks in Spring 2019, which are used by surrounding cities and can be taken across city lines. However, there have not been any noticeable changes in patterns of alternative transportation use.

Although the city does not have control over the transit system has a whole, they can implement small behavioral “nudges” in order to encourage transit use and discourage car use in the city. Nudges are non-intrusive strategies aimed at subtly making people change their attitudes without restraining their choices. Although changes to transit infrastructure also improve transit use, constraints make large-scale improvements infeasible and such improvements do not always necessarily lead to increased transit use because behavior becomes habitual. It is easier to modify opinion than behavior, but sustained opinion change has been shown to lead to behavior change over time. Cities have used nudges to influence their residents to adopt new, better behaviors for the city and for the people themselves. For example, text messages are often used to nudge people to remind them or inform them about certain things, such as to stop smoking or to contribute to their savings account. Even Everett City Hall uses a nudge to encourage people to use the stairs: on each step is written the number of calories burned while walking up or down the stairs. Nudges in this way help change habits for some people, particularly in contexts where there is a lack of information or disinformation about other options. Perceptions of lack of safety, inconvenience, or lack of information could create mental blocks to habit change which can be effectively overcome using nudges.

METHODS

Two teams of students explored this challenge over the course of the semester, and each offer a set of recommendations to the City of Everett. Team 1 conducted a literature review on behavioral “nudging” and encouraging the use of sustainable transportation methods, such as buses. The team presents ideas for using marketing

campaigns to promote public transit ridership, and shares examples of collateral from Chicago and Grand Rapids, MI. The team also created mock tweets, Facebook posts, and emails the City of Everett communications team can use as a reference in planning their own outreach to residents. Additionally, Team 1 researched best practices in maps and wayfinding, using London and Boston as models. Lastly, the team explores the connection between car-dependency and school drop-off routines and offers suggestions for encouraging parents and children to walk and/or use public transit.

Team 2 also conducted a literature review on behavioral change and encouraging the use of public transportation. This research led the team to propose strategies for the City of Everett related to shifting the "norms" of parking culture, including an analysis of parking permit fees, and improving the bus ridership experience through safety and informational tactics. Both teams also discuss methods for encouraging and supporting wider use of bike transit by Everett residents. Like Team 1, the students in Team 2 also encourage Everett to consider marketing approaches to influence ridership behavior, and offer sample promotional materials.

RECOMMENDATIONS

Addressing Transit Misperceptions Through Advertising

- Create advertising campaigns that combat misperceptions about public transit
- Promote Bus Rapid Transit as easy, affordable, and better use of commute time
- Employ strategies for "gamification" of transit use

Developing a Marketing Strategy for the Bus Rapid Transit Service

- Communicate to residents using multiple platforms (advertisements, billboards, social media, etc.)
- Establish a city-wide public transportation day/week, or a "Mayor Rides the Bus Day"
- Partner with area businesses on a "Car Free Week"
- Ensure all communications are in both English and Spanish

Improving the Ridership Experience

- Provide real-time arrival information at more bus stops (Tiers 1 and 2)
- Install security cameras at more bus stops (Tiers 1 and 2)

Encouraging Trip Planning

- Provide residents with information about planning trips on public transit

- Use current social media and email to send messaging at key times
- Incorporate language that addresses misperceptions about the bus and encourages gamification

Improving Maps and Wayfinding

- Strategically redesign transit maps to showcase connectivity and encourage bus usage
- Implement wayfinding signs on streets or other visible areas across the city

Tying in Strategies to the School Commute

- Encourage parent participation in the Safe Routes to School program
- Leverage children as change agents - their behavior will influence parents' behavior
- Promote alternative transit for commutes to school, including a walking school bus

Shifting the "Norms" of Parking Culture

- Consider increasing parking passes from $10 to $25

Integrating Bike-Transit

- Use bike infrastructure to address the "first and last mile home problem"
- Promote biking through advertising
- Plan to install Bluebike docking stations in close proximity to local bus stops or T stations, as well as on main roads
- In addition to Bluebike stations, develop a plan for city-wide installation of regular bike racks
- Increase safety by installing security cameras and adequate lighting infrastructure surrounding newly installed bike rails
- Create a "Youth Cycling Program" modeled after the bike curriculum in the Boston Public Schools

CONCLUSIONS

Both teams took very different approaches to dealing with the financial limitations of the city. One focused on increasing revenue through residential parking pass fees to pay for developments and changes, while the other focused on keeping costs as low as possible to avoid having to raise fees or taxes. Despite this, the focus on similar themes of trying to increase transit accessibility for underserved populations and improving on efforts the city has already made to the transit system.

TEAM 1 REPORT

SUMMARY OF RECOMMENDED STRATEGIES

Integrating Bike-Transit

- Use bike infrastructure to address the “first and last mile home problem”
- Place Bluebikes docks in locations connecting transit desserts to transit lines
- Promote biking through advertising

Addressing Transit Misperceptions Through Advertising

- Create advertising campaigns that combat misperceptions about public transit
- Promote Bus Rapid Transit as easy, affordable, and better use of commute time
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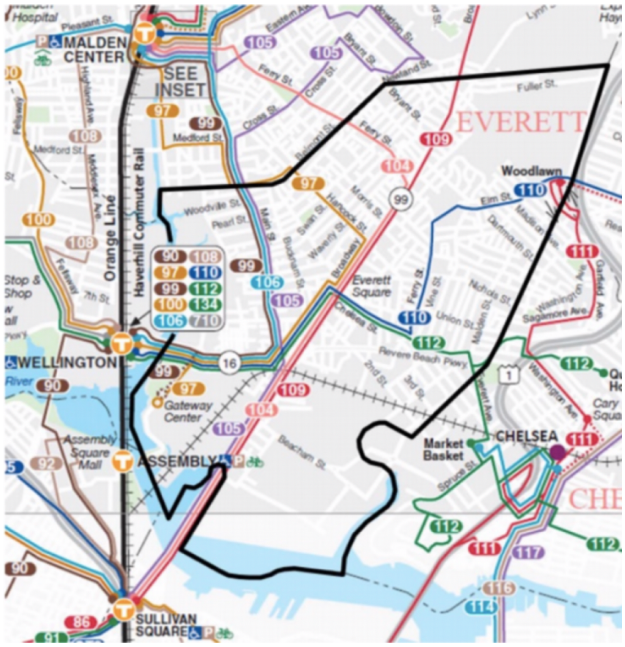
- Promote alternative transit for commutes to school, including a walking school bus

INTRODUCTION

Everett is facing the challenge of being one of the most traffic-congested cities in the Greater Boston Area. With a population nearing 50,000 people, Everett has nearly one car per resident in their small 3.5 square mile city. Many factors, aside from the large number of vehicles, contribute to the traffic Everett experiences on their major roadways: narrower streets due to the historic nature of the city, lack of direct subway access, and a large working-age population commuting longer distances to work. The average commute for an Everett resident is 32 minutes, which is much higher than nearby commutes, and trips into the City of Boston can take more than an hour during peak hours due to traffic levels.[1] Although the city government and city residents have shown willingness to accept change when it comes to transit, they are faced with outside constraints. The transit within Everett and transit connecting the City to Boston and surrounding areas is governed by the Massachusetts Bay Transit Authority (MBTA). Although Everett does not have direct access to any subway lines, eight bus lines run through Everett and connect residents to subways (**Image 1**). These routes are some of the busiest in the MBTA system. Everett has high populations of groups who are typically more likely to use public transit – such as foreign-born residents, residents with disabilities, and young professionals.[2]

Image 1: The current MBTA service map in Everett (from the Everett Transit Action Plan final report by MassDOT).



Everett has several options for alternative transportation and has implemented, or is planning on implementing, new policies and programs to encourage alternative transportation use. For example, Everett launched Lime bikes in June 2018, a dockless bike share program, and they are installing the Bluebikes docks in the city in Spring 2019. To improve bus service, the city restricted parking along Broadway, a main roadway, and implemented a bus-only lane during peak morning transit hours. This, along with new platforms facilitating boarding the bus, has improved transit service and received positive public reactions.[3]

However, there have not been any noticeable changes in patterns of alternative transportation use. Our research is focused on changing the behavior of Everett residents regarding transit. Although the city does not have control over the transit system as a whole, it can implement small behavioral "nudges" in order to encourage transit use and discourage car use in the city. Our team researched successful behavioral nudging strategies and transit advertising strategies from around the country and internationally to develop our recommendations for the City of Everett on how to discourage car culture and increase alternative transit use.

PSYCHOLOGICAL NUDGING

People have a hard time changing their habits and behaviors; thus, researchers have studied psychological nudging as a method to change behavior. Nudges are non-intrusive strategies aimed at subtly making people change their attitudes without restraining their choices. Although changes to transit infrastructure also improve transit use, constraints make large-scale improvements infeasible. However, cities have used nudges to influence their residents to adopt new, better behaviors for the city and for the people themselves.[4]For example, text messages are often used to nudge people to remind them or inform them about certain things, such as to stop smoking or to contribute to their savings account.[5]Even Everett City Hall uses a psychological nudge approach to encourage people to use the stairs: on each step is written the number of calories burned.

In a report by Transportation for Massachusetts, LiveableStreets, the Massachusetts Area Planning Council (MAPC), and WalkBoston, several initiatives are evaluated to show how low-cost nudging programs can encourage walking biking, and transit use.[6] Some examples were of programs in Massachusetts, like the Safe Routes to School program implemented in Revere, MA, to encourage students to walk to school. Also in Massachusetts was a Last Mile Connections to Rail project, where the town of Acton,

MA, offered bike parking at the train station to give commuters a safe, convenient way to access the train station. Across the country in Portland, OR, a social marketing campaign called “SmartTrips” was used to inform newcomers and residents about alternative forms of transportation which resulted in an increase in walking, biking, and transit use and decreased single occupancy vehicle trips. In London, the addition of wayfinding signs gave residents and visitors information on how to reach a location by walking. A similar, lower-cost program described as a “DIY” approach is a “Walk [Your City]” campaign which adds wayfinding signs on a smaller scale. Overall, this report offers methods of encouraging walking, biking, and transit use that have been tested and proven to be effective in both Massachusetts and around the world.

METHODOLOGY

Our research method is derived from the literature on behavioral nudging and encouraging alternative transportation and transit. Our group was limited by time and financial constraints and thus unable to conduct large-scale field research in the form of surveys or observational research. Experiments cannot be done ethically on civilian populations or in large enough scales without time and monetary resources. Instead, we relied on the research done by others, both in Everett and elsewhere, for data and outcomes. Our research is primarily conducted in the form of an extensive literature review. We reviewed the research for various policy options, then narrowed our selections to the few that would likely be the most practical and effective to solve Everett’s unique concerns. Then, our research team selected several topics to examine in-depth, proposing hypotheticals and thought experiments, backed by the data, about how each proposal would work in Everett. Particular attention was placed on the differences between Everett and the context that each policy was originally proposed or implemented in, to see if differences in city context would play an effect on the policies’ success or failure. All the relevant research was then compiled into an analysis for or against the desired policy.

While this method is useful, it is also limited. The method is flexible in that any policy with research could be considered in a timely manner. However, it is all hypothetical. Humans are not perfect, so no analysis would perfectly predict conditions post-policy implementation. It also requires that all else be held constant, which is difficult to do. Policies conducted in tandem or at similar times as well as changes in circumstance would confound our findings and would invalidate them. The limitations of our method do not outweigh the significant benefits. This was the most feasible and exhaustive method available to us at this time.

PROPOSED STRATEGIES

Integrating Bike Transit

Literature Summary: Encouraging the use of public transit involves navigating multiple obstacles, such as the "last mile home" problem. The problem, also referred to as the "first mile home," is best understood as a gap between where transit ends and where individual people live and the problems associated with getting to the transit stations. The distances bookending a commute are crucial to the use of public transit, as a report by researchers at the University of Southern California Price School of Public Policy finds.[7] This gap affects access to jobs and housing, but finds that, "Bicycle access, and first- last mile bike share programs, can be [...] effective at improving the job access from transit." Vulnerable populations, which are often those most underserved by current transit structures, stand to gain the most by the use of bicycles connections to transit. This particular study focuses on the economic effects of the gap, but research has also focused on how the unavailability of practical solutions to the last mile problem can and often does increase car use. During a Mineta Transportation Institute conference on biking, speakers cited statistics from the Metropolitan Transportation Commission from a study of the California Bay Area which found that people living within a half mile of a transit station are three times more likely to take transit, and that time to transit stops was a significant part of why they chose to or not to use transit.[8] In ten minutes, a person could walk about a half of a mile or bike two miles. A bike increases the accessibility to a transit a station sixteen-fold. When people do not have bikes and do not live within the half-mile range, they are more likely to drive to work for time and convenience reasons. Once in their cars, they do not drive the half mile to the transit station; they drive all the way to work because they're already in the cars anyways.

However, there are ways to counteract the difficulty posed by the last mile problem. A key one would be the integration of bicycling and public transport. Bicycle integration is an easy way to expand transit options into neighborhoods that are underserved by current transit lines without making significant investment. The APTA Standards Development Program provides an in-depth guide about how this could be done and provides case studies as well as recommendations of best practices.[9] According to their report, "prioritizing bicycle routes to transit stops and stations, reducing traffic, and improving bicycle and transit integration (bike parking, bikes-on-board capacity) is essential to getting transit customers out of their cars and on a bicycle for the first or last mile of travel." The easiest solution to the first/last mile problem is the encouragement of transit agencies and city transit authorities to facilitate and promote

bicycle use to and from existing transit lines via a variety of methods

Proposed Solutions: For the City of Everett, which faces a transit disconnect between the MBTA Orange Line to Boston and existing city bus systems, bike connection proposals are viable and useful solutions. In the short term, the integration of bikes with existing infrastructure could be best done by increasing bike parking at existing transit facilities. In Everett currently, the main Orange Line MBTA stop has one bike rack, but by expanding and promoting bike parking the city could encourage city residents to use these facilities rather than taking their cars to the facility or all the way into Boston. This expansion serves both the obvious practical effects of providing the racks themselves, but also has indirect marketing effects of showing biking as easy, useful, and popular.

The future Bluebikes bike-sharing program would be another method of achieving the same goal. The placement of docking stations at the end of the Everett transit line then at the beginning of the Orange Line would serve to bridge the gap and would also appeal to people concerned about the safety of their bike at the station, or who do not currently own a bike.

The City could also advertise that bikes are allowed on transit and increase the ease of use for these facilities. Bikes are currently allowed on the MBTA system and publicizing that ability could be particularly helpful to people who face a transit disconnect on both sides of their commute. Boston has front mounted bike racks on most of the city's buses and the commuter rail has special bike cars to facilitate people bringing their bikes on the train.[10] However, given the size and space availability on Everett transit, transit authorities need to be careful not to overly promote this option over others. According to APTA, "Making bicycle parking and bike share more convenient with easily accessible information will help manage demand and minimize the risk of running over capacity." [11] The City of Boston claims that 95% of the cities MBTA stops have accessible bike parking.[12] Both secure and open bike parking are significantly less expensive than automobile parking and occupy much less space per vehicle, making this an economical and efficient method of decreasing car use.

These proposed changes are simple, but could prove incredibly effective given the right combination of time and information outreach. Simply installing bike facilities does not guarantee they will be used, given the case of the New Jersey Transit Wesmont Station case study featured in the APTA study. Few people used bikes to get to and from the station, even after adding bike racks. However, after a year, the bike racks were being

used to full capacity. When a parking lot was added, the bike racks continued to be used. Additionally, once people were aware of how easy biking was compared to being in their car, they are likely to use bikes to get to other parts of the city as well. The longer a facility is in place, the more likely people are to use it and respond favorably to it, a phenomenon known as the mere-exposure effect. Understanding this effect can help city officials plan for and capitalize on the changes they make. Changes do not happen overnight; the effect requires time and consistent encounters with the facility.[11][12]

The placement of these facilities may have a significant impact, particularly if combined with the mere-exposure effect, but people need to know about and be informed of the locations of the facilities and the way they are used for the effect to occur. This would primarily involve information and marketing campaigns, which could be combined with current or future campaigns. Advertising the new bike sharing docks, bike racks, and providing the public with information about their locations could increase public consciousness about the facilities, and subconsciously change their opinions and behaviors in relation to them. Some suggestions for campaigns include brochures for cyclists including information about routes to transit lines, bike racks, and how to take your bike on transit to be distributed on buses and online, bike wayfinding signs showing nearby bike routes and docking stations, a website specifically for bicyclists providing pertinent information about bicycle and transit policies and procedures, videos showing people how to use the on-bus bike racks, a general advertising campaign showing maps and how easy it is to use bikes and transit together. These policies could be easily implemented and in the context of Everett, which is constrained by finances and its partnership with the MBTA, would be simple, low-cost solutions to help negate some of the problems associated with car culture.

Key Suggestions

- Use bike infrastructure to address the "First and last mile home problem"
- Place Blue Bike docks to connect transit desserts to transit lines
- Promote biking through advertising

Addressing Transit Misperceptions Through Advertising

Literature Summary: Past research suggests that negative opinions or misperceptions around buses and public transit play a major role in preventing people from using public transit instead of their cars. In a study of Canadian transit, performed by ALTA Behavioral Insights, researchers found that most people are incapable of making a rational decision about commutes because it involves a more complex calculation.[13] For many commuters, while using transit would be more cost and time effective, people choose to drive alone because it has a lower cognitive cost. The study discusses methods to change the misperceptions about transit use, to increase ridership and decrease car use. Surveys also help discover attitudes toward public transportation and the role of perceptions in determining transit ridership. In one Norway study, the researchers found that car users may view transit use as inconvenient if they are traveling with children or may believe that transit use is "lower class."[14] These perceptions are powerful in determining intentions to use public transit. However, another study suggests that these perceptions are not permanent, and may be able to be changed through "involvement" in public transit. Using public transit increased the chance of riders reusing transit in the future as well as the likelihood that they will recommend public transit to others. In addition, involvement leads to better perceptions of service, which in turn increases the possibility of future transit use.

Strong stigmas also exist around the bus: even though a majority of people will say that they are favorable to public transit systems, and are even willing to pay for it through taxes, it does not mean that these same people are using public transit. An article infers that Americans view public transit as a way to solve social problems, rather than as an actual way to get around: they rely on other persons to use the transit system, and thus do not feel like they have to use it, too.[15] On the other hand, it seems that, at least in Boston, people are willing to pay more to live near transit.

Gamification is also a popular strategy shown to motivate people to make changes in their everyday lives through games, and activities, and competing with one another. Fitness trackers like FitBit encourage people to reach a goal of 10,000 steps per day which can influence users to walk when they may usually take a car or train. In addition, users can share their progress with friends and family and compete against each other to achieve the most steps. Walking and exercising is thus turned into a fun, competitive activity. Implementation of fitness trackers and other healthy lifestyle tools in the workplace through a competition-setting has been shown to increase exercise among employees.[16] Gamification is also often used to give people incentives to use public

transit: based on their use of public transit or which distance they walk in a day, people are encouraged to use their cars less and compete with one another.

Proposed Solutions: Everett could create advertising campaigns promoting the bus and other alternative forms of transit. Marketing public transit as an attractive option, such as a place where you can relax, may help shift views, and help people form better, more positive views about transit.[17] There are numerous success stories of transit advertising campaigns in cities across the U.S., proving that advertising does change behaviors. Two campaigns are of particular interest for Everett and provide interesting examples of what could be done in the city: 1) the "There's More to the Ride" campaign in Grand Rapids, MI, and 2) the "Ride On" campaign in Chicago.

The Grand Rapids local transportation agency (The Rapid), launched the "There's more to the ride" campaign to reinforce public support of the transit system. The campaign relied on narrating the individual stories of some residents, highlighting why they used public transport. The Rapid filmed videos, in which the viewer was invited inside individuals' homes, as they were telling about their relationship with public transport. These videos were released online, displayed on posters and outdoor billboards across the Greater Grand Rapids area, and used as digital ads and on social media (**Image 2**). One of them stated "For Joel, who's autism makes driving a car impossible, [public transit] is a story of independence." These stories made a difference: over 7 million people realized that "there's more to the ride", and the campaign videos were viewed over 55,000 times online.[18]

Image 2: A billboard from the "There's More to the Ride" campaign in Michigan.

Another successful advertising campaign took place in Chicago. To work directly against the misperceptions surrounding bus transit - such as being uncomfortable, slow, and expensive - the City of Chicago and the Regional Transportation Authority (RTA), in conjunction with the Chicago Transit Authority (CTA), recently launched the campaign "Ride On."[19] This campaign has already exceeded projections in terms of increasing transit ridership. Through promotional posters/billboards/etc., it compares the hassles of driving (e.g., traffic, gas, time) with the ease of using public transit through humorous, relatable messaging, encouraging the use of public transit instead (**Image 3**). The campaign was broadcasted on a digital billboard, and also in print, on cable television, radio, social media. Overall, it proved very effective in reaching people and countering misperceptions about public transit.

Image 3: An image of a digital billboard from the "Ride On" campaign in Michigan.

Given these positive results, Everett could take some inspiration from these advertising campaigns. However, the implementation differs from Everett's context, as both campaigns were conducted by local transportation agencies. Thus, while Everett could put into place the following advertising campaign suggestions, it could be interesting and beneficial to consider partnering with the MBTA to work on them, and to spread these messages around the entire transit network. Additionally, the campaigns in Grand Rapids and Chicago were largely diffused, with both digital and physical content. If Everett was to create such advertising campaigns, they should be made as visible as possible across the city, in order to reach a large number of people. The advertisements could be displayed on public buildings (e.g., schools, City Hall), billboards across the city and along Broadway, on bus shelters and bus stops, next to parking spots, on the city's website, Twitter and Facebook. To reach the entire population, the marketing material could also be sent to households by mail.

Another study sheds light on the types of advertising campaigns, and marketing messages most effective on people to make them use more public transit.[20] It seems that marketing campaigns openly criticizing the use of cars, and in contrast encouraging bus use, may have a positive effect on occasional and habitual riders (as it comforts their own beliefs), but is a deterrent for non-bus users. Indeed, such messages directly criticize their practices and beliefs, which then tends to reinforce them. In this sense the marketing campaigns should be careful not to criticize directly cars, but instead focus on the bus and its advantages, as to not deter anyone. The campaign could also acknowledge that the car is often a first option, when the bus is only second, but that in certain situations, the bus can be more convenient (such as when the car does not work, when there is too much traffic, or when parking is too expensive). This would allow the campaign to be more credible near the car users, who are the primary.

The campaign could also acknowledge that the car is often a first option, when the bus is only second, but that in certain situations, the bus can be more convenient (such as when the car does not work, when there is too much traffic, or when parking is too expensive). This would allow the campaign to be more credible near the car users, who are the primary.

The study conducted by ALTA Planning + Design suggested some easy nudges to change negative perceptions about public transit.[21] The main idea was to reframe the thinking around public transit and traveling by bus, by making it look pleasant and enjoyable. They suggest showing that wasted hours in the car, stuck in traffic, can become productive when spent on public transportation. For example, the time spent in public transit can become "me" time, during which the bus riders can relax, read, watch a show, etc. Everett could create such type of ads, with messages such as "in the bus, Maria finally has time to watch her favorite show/latest episode/read her book," alongside a picture, for instance, of someone reading a book on the bus (**Image 4**).

Image 4: Chicago's "Ride On" campaign promotes the idea of productive time spent on public transportation.

Furthermore, thanks to the bus-only lane in Everett, taking the bus is now quicker than taking the car on Broadway during rush hour. A marketing campaign could promote more this initiative, by showing that users can gain time during their commute. To portray such an idea, an advertising poster could show Broadway from above, during rush hour, to show the contrast between the empty bus lane and the congested car lane. The city could also try to determine how many cars on average the bus passes thanks to the bus-only lane, and write it on the ads.

The advertising campaign could also promote the other actions that have already been taken by Everett to improve the bus transit, such as the new boarding platforms. Indeed, they directly address misperceptions about the bus being difficult to access for certain people. Continuing to communicate about these interventions would show people that the city is committed to making the bus a more enjoyable experience for them.

Another type of message could address the fact that public transit is sometimes considered unaffordable (**Image 5**). Some messages could compare the price of fuel and parking in Everett to the price of a bus ticket, which could make people realize that in comparison, taking public transit is not that expensive. Such advertisements could be displayed on billboards across the city, but also near parking spots and parking meters in the city.

Image 5: Chicago's "Ride On" campaign aims to debunk the idea that public transportation is unaffordable.

Additionally, some messages could focus on health and well-being, by explaining that walking or biking make people healthier and happier. A message could be "join the club of the happier, healthier commuters, and walk or bike to work."

Finally, it appears that gamification is an effective nudge to encourage people to adopt certain behaviors. In the study by Lieberoth, Jensen, and Bredahl, a group of people was subject to gamification methods to try to motivate them to use the bus more frequently. This study group was compared to other groups.[22] They received badges for certain travel behaviors (such as taking public transit for a certain number of times during the week). At the end of the experiment, the group subjected to gamification was the one that used public transit the most. Studies have also shown that simple messages such as "90% of the people pay their taxes on time" actually pushes more people to pay their taxes on time. This gamification element can easily be added to the different marketing messages previously discussed. For instance, a message could state "X% of your neighbors have decided to leave a happier, stress-free life and take the bus. What about you?"

It seems that all these marketing messages would be more effective if they were made simply of a picture and a striking sentence to catch people's attention (**Image 6**). This is the model that the Chicago campaign used, and it had real, positive effects. Such messages are more easily remembered by the audience, and thus can have bigger repercussions. Having billboards (digital and physical) across the city and displaying the messages on public buildings would seem to be the easiest way to reach the majority of the population. But simultaneously, online ads (on social media or on the town's

website) should not be left aside.

Image 6: A mock-up of a potential ad the City of Everett could implement.

Key Suggestions

Encouraging Trip Planning

Literature Summary: To combat the habit of car use, encouraging people to plan their trips in advance and explaining all the different transit options can be effective in motivating more individuals to start using public transportation. Transit users are responding to the ease of ride-sharing apps compared to the perceived difficulty of planning trips on public transit.[23] Additionally, people who plan their trips themselves,

rather than just receiving information about routes, are more likely to change their behavior permanently.[24] The ALTA study found that subtle messages, like texts, that encourage using transit again and using trip planners have an impact on ridership. Since the MBTA information is already accessible through several trip planning apps, this information could be used to encourage transit use in Everett. Targeted messaging which promotes trip planning apps gets at a common misconception that public transit is inconvenient and incentivizes people to choose public transit over driving.

Proposed Solutions: Messaging via email or text is likely more time consuming than a city-wide advertising campaign; however, it may be feasible in Everett. Additionally, the city's social media and email list have high interaction and response rates, which would facilitate electronically pushing information to residents. The Alta Behavioral Insights group has performed behavioral research and policy reports for a variety of policy areas and extrapolated their findings to transit behavior in a recent report. This report recommends identifying key "touch points" or behaviors which present cognitive barriers that prevent people from making the choice of public transit over using a car. Two touch points that are identified in this report are more applicable to the context in Everett: using a trip planner, and choosing to use transit for a commute.[25] These two behaviors have cognitive barriers which are currently causing Everett residents to choose their personal cars over transit for their commutes, and might even go hand-in-hand. Everett residents have a higher than average commute time, not factoring in whether these commutes are by car or public transit.[26] Trip planning could help residents overcome the cognitive barrier that driving is easier (a common perception). Additionally, Everett has a high population of groups typically more reliant on transit (e.g., people with disabilities, people born outside the US, and seniors), therefore if provided with information they should be very willing to use transit.[27] By having more information about the trip planning process, residents of Everett should be able to overcome the cognitive barrier of choosing transit over driving (the second touchpoint mentioned).

Designing a successful messaging strategy is key. According to the Alta team, there are four qualities of a successful "nudge." They are: easy, attractive, social, and timely. Easy means it presents the desired alternative as an easier option than the less desired behavior; attractive solutions are ones that are captivating; social solutions get at social pressure and norms that would change behavior; timely solutions consider the most effective timeline to implement solutions. The Alta report suggests that messaging regarding trip planning is most effective after a big change in someone's life, especially a move, because people are more willing to change other behaviors as well. However considering the small size of Everett and the goal of reducing car reliance among

current residents, this timing seems less appropriate. Instead, we would recommend focusing messaging on the ease and social nature of transit, using captivating language. This is a relatively uncharted field in the realm of transit demand management, therefore it is difficult to predict the effects on transit usage this type of intervention might have. The Alta report cited examples of targeted messaging, for example, for those who need to pay bills and/or fines, which found that messaging increased the speed at which the bills/fines were paid. This suggests that behavioral nudges in the form of[2] targeted messaging does have some impact, just an unknown amount in the realm of transit.

Luckily, the MBTA transit information is already available on several trip planning apps. Routes using transit can be planned using the Transit app, which includes live information on the locations of buses and trains. Transit is also the app endorsed by the MBTA. Additionally, arrival times of buses and subways are available on the app ProximiT. One easy way to promote trip planning would be to promote the MBTA-endorsed trip planning app through Everett's social media and email list.

An example Facebook post (**Image 7**) suggests to residents that the traffic on their main roadway is a hassle and public transit might be an easier option. Then, they are given the tools to plan their trip.

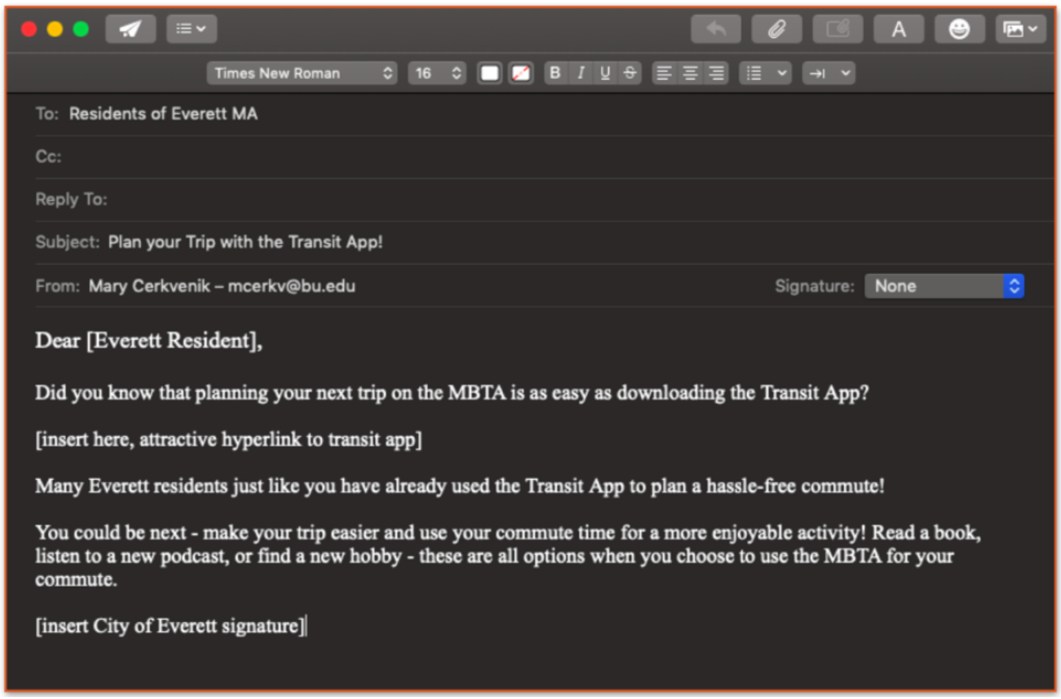
Image 7: A sample Facebook post the City of Everett could post to encourage the use of bus rapid transit.

The sample tweet below (**Image 8**) shows Everett residents that using transit is attractive; it communicates that their time usually spent driving could be used for a more enjoyable activity. Then, they are directed to the app to plan the trip.

Image 8: A sample Twitter post from the City of Everett about trip planning.

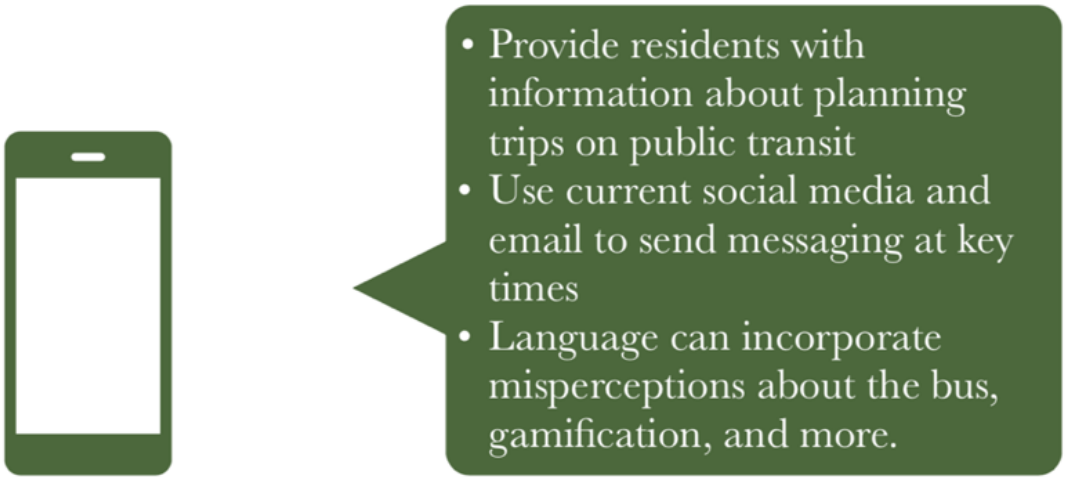
Email is another approach, and would hopefully be personalized, which makes it more attractive than a mass email from the city. Additionally, the messaging of an email could suggest a social norm/pressure that taking public transit is the more socially acceptable option. Finally, it can address the ease of public transit and the attractive options available during the commute (**Image 9**).

Image 9: A proposed email message to City of Everett residents about planning trips with public transit.



Overall, the approach of encouraging residents to use trip planning may have uncertain results. While previous behavioral research has shown that nudging is effective through targeted messaging, there is not any empirical evidence on the magnitude we can expect this to increase transit ridership. Furthermore, it is certainly a costlier solution, in terms of time. Social media posts need to be timed in order to reach residents when they are thinking about their next commute, but with enough time to change their decision. Emails sent from the city should be personalized and attractive which requires more time and attention to the design of the email. However, there are few monetary costs associated with this solution. Although there is little research using this type of behavioral nudge for transit use, it has been studied as a successful behavioral nudge in other areas. The low financial cost and the fact that Everett residents are already engaged with the city's social media and email are why we recommend this as a potential solution to be implemented. There is little harm if it does not work and can be implemented alongside other policy solutions to increase transit ridership.

Key Suggestions:



Improving Maps and Wayfinding

Literature Summary: Information plays a vital role in the decision-making process of individuals. Information about bus-routes enables citizens to make rational commuting decisions. Lack of information or imperfect information generates confusion which pushes commuters away from public transit, even in situations where public transit is more efficient than personal vehicles. For instance, if a resident in Everett is unaware of the bus route which takes approximately 16 minutes from Everett Ave to Broadway, he/she would continue to use the car which can take additional 10-15 minutes during

rush hour. This information gap could be narrowed down through development of efficient transit maps. A transit map has a tremendous impact on a passenger's perceptions and his or her usage of the transit system. If implemented appropriately, a transit map can be a valuable tool in enabling efficient trip planning, and increasing bus ridership. However, it is very important to understand the mechanics of designing an effective transit map.

Garland et al. tested the effect of transit map design on the quality of trip planning.[28] They found that when the street detail was high, color coding of transit lines led to greater trip planning accuracy, less perceived difficulty, less frustration, and higher confidence. A study on the impact of schematic transit maps on passengers' travel decisions was conducted by Zhan Guo of New York University.[29] The research indicates that most successful public transit systems, like the London Underground, have developed transit maps that contain four unique features:

1. Distortion: Transit maps are usually not geographically accurate; instead, they use straight lines and fixed angles and often illustrate a fixed distance between stations, compressing those in the outer area of the system and expanding those close to the center. Such distortion in a schematic map can lead the user's attention to decision points, and routes can be more easily derived from a schematic map than more general maps.

2. Restoration: Restoration is normally done by including geographic features, such as major roads, green spaces, or mountains on the map.

3. Codification: Codification refers to how lines, stations, and connections are coded as symbols on a schematic map.

4. Cognition: Human psychology has proven that the diagrammatic type of visualization affects internal cognitive representations (Uttal, 2000; Hegarty, 2004). Many transit agencies view transit maps as a valuable tool to establish a corporate identity.

The information delivered by a transit map through distortion, restoration, codification, and cognition might affect travel decisions in the following two ways:

1. It influences the number of available opportunities and travel options perceived by travelers.

2. It affects the perceived attributes of these opportunities and travel options, such as the desirability of a place and travel time and cost.

One of the classic maps which incorporates all the above-mentioned features is the one designed for the London Underground (**Images 10-11**). It was designed by Harry Harry Beck in the 1930s, but proves to be effective even today. The effectiveness of this map could be judged from the fact that an estimated 95 percent of Londoners are said to have a copy at home (Vertesi, 2008).

Image 10: Map of the London Underground subway system design by Harry Beck.

(a) Geographical Map (Source: Simon Clarke)

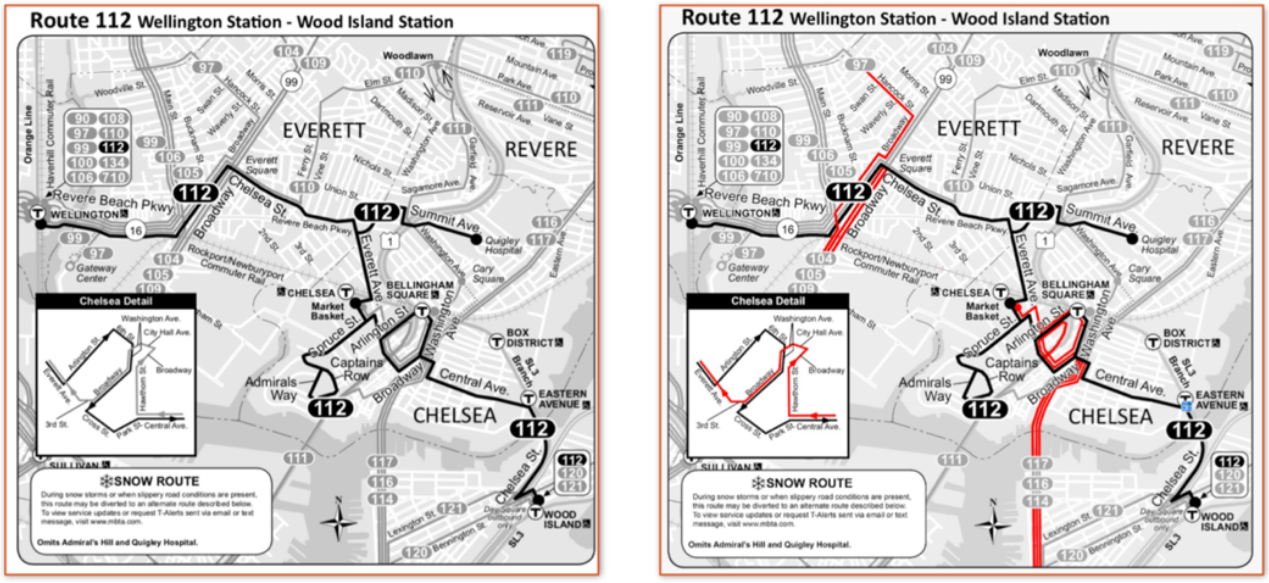
Image 11: A second map of the London Underground subway system design by Harry Beck.

(b) Schematic Tube Map (Source: London Underground)

Wayfinding is described as spatial problem solving that allows people to identify their location, find their destination, and know how to go from point A to point B.[30] In an attempt to improve walking in London, a wayfinding system was introduced that included signs, printed and digital walking maps, and transit information. The "Legible London" program is one of the first and best examples of wayfinding and providing information to make traversing and exploring a city easier.[31] Boston also has a wayfinding system that uses digital kiosks optimized for pedestrian access and use in sunny weather conditions that allow users to create customized maps that show points of interest and provide directions.[32] These kiosks show users walking distances from their current location and suggest transit and biking options. Similarly, the Bluebikes docking stations offer non-interactive maps that show walking and biking distance from the docks and locations of other Bluebikes stations.

Proposed Solutions: In our research, we compared Everett's Route 112 Map with the London Underground Map. After careful analysis of the traffic data in Everett, we have tried to make a basic new version of route 112 Map which is similar to Beck's design of the London map (see **Image 12**).

Image 12: Mock-up of the 112 bus in Everett modeled after the style of Beck's London Underground map.



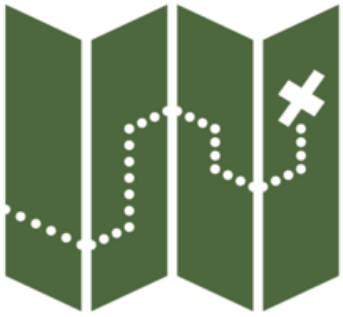
Once the design of the transit map is modified as per the recommendations in the study, it is important to ensure that every potential bus user has access to the bus routes map. This could be achieved by mailing physical copies of the map or sending them

electronically to the residents. This process would certainly require time and resources. However, the potential benefits of this work exceed its projected costs. Even if the projected costs put an additional burden on public funds, past experience indicates that satisfied commuters are often ready to share the burden.

Also, WalkBoston and other local organizations have worked on implementing wayfinding into the infrastructure of Boston and the surrounding area.[33] Signs can be installed on street sign poles to show pedestrians distance and walking time to locations and points of interest. Beyond signs, street decals can also be installed that provide pedestrians with clear and informative directions (**Image 13**). These organizations partner with cities to implement wayfinding in the community and can help increase walking and biking among residents.

Image 13: Example of wayfinding from WalkBoston.

Key Suggestions



- Strategically redesign transit maps
- Implement wayfinding signs on streets or other visible areas
- Alternative transit will appear easier and more accessible

Tying in Strategies to the School Commute

Literature Summary: The MAPC and WalkBoston evaluated the district- and school-level walkability of Boston-area cities to determine the feasibility of students walking or biking for their school commute.[34] According to the regional findings, 79% of school-age children live within a mile of at least one school. A more in-depth survey was conducted to find school commute habits, and while Everett was not surveyed, the neighboring towns of Malden and Revere were, among others. The survey revealed that commute by family vehicle was the most popular choice in both the morning and afternoon, followed by walking, then school bus. Most of the trips dropping off and picking up students from school were "en route" to another place, like parents commuting to work. For students who lived within 0.5 miles from a school in Malden and Revere, walking was a popular choice for the school commute.

However, living more than 0.5 miles from a school showed greater reliance on cars for the school commute. The variability of school commute choices is consistent across all cities and towns. The study suggested that schools provide information and tools to parents to give them the opportunity to choose a better option for their children's school commutes. The Safe Routes to School program promotes increasing physical activity, involvement in the community, and improvements in safety and infrastructure. By assessing the viability for walk- or bike-to-school programs, cities and schools can make informed recommendations to parents on the best school commute. An analysis of the National Household Travel Survey safety and infrastructure. By assessing the viability for walk- or bike-to-school programs, cities and schools can make informed

recommendations to parents on the best school commute. An analysis of the National Household Travel Survey found that 10-14% of morning peak-period traffic is attributable to school-related commutes.[35] Taking these cars off the roads would be beneficial for not only the traffic, but for commuters' health and the environment.

Proposed Solutions: The motivations for the Safe Routes to School (SRTS) program included reversing the trend of declining rates of walking and biking for transportation and the increasing rates of car use, as well as the increasing rates of childhood obesity associated with increased car use and decreased activity. Studies have acknowledged the impact of school commute on traffic patterns, attributing about 14% of traffic specifically to school commutes.[36] In a survey of several Boston-area schools, 60% of the morning car trips to school are made by parents on their way to work.[37] While much has been done to evaluate the SRTS program and the influences upon children's commutes to school, little research focuses on how to encourage parents to change their habits in the school commute.

The benefits of using alternative transportation for commutes include increased physical activity, reduced environmental impact, and increased time spent with children. Modeling positive behaviors like walking or biking to school and work can impact how children choose to commute for the rest of their lives. Promoting active transportation to school (ATS) may be effective because parents would see it as an option directly benefiting their children's health. Showing parents that walking or biking with their child to school and then using public transit or alternative forms of transportation to continue the commute to work through the methods highlighted in this report can help form better habits that move people away from their cars. People may be swayed by appeals to their own health or satisfaction (e.g., saving money, saving time) or about the environment, and promoting these same routines for their children is likely to be even more effective. Children have been recognized as effective change agents for parents to shape behavior related to health and the environment.[38] This idea is reflected through the educational component of SRTS as well as the hosting of "walking and biking days" at school. Encouraging the behavior in children can increase the behavior for their parents as well.

Since SRTS has been implemented in all of the K-8 schools in Everett, the next step would be to utilize the program's benefits to encourage ATS. The Massachusetts chapter of the SRTS program is active in encouraging ATS all year long. For example, on May 1, 2019, the Massachusetts SRTS will host "Walk, Bike, and Roll to School Day." Schools and communities can sign up to participate and receive free promotional

materials. These programs may already be happening within Everett Public Schools, but no indication could be found on the school district or city's social media outlets. If these events are happening, then advertising them on social media may be helpful to inform parents and community members.

In a study of SRTS schools in Idaho, researchers looked at whether hosting designated days for walking and biking increased ATS such as "International Walk to School Day" or "iWalk" in the fall; "Polar Walk" in the winter; and "Fill the Racks!" in the summer. Following designated days on which schools encouraged ATS, more students walked or biked to school and more parents escorted their children to school. The day also propelled students to continue to walk to school after the day. The study acknowledged that the benefits of the programs are harder to quantify than the costs, but the total costs of hosting the events for materials such as advertising and prizes came out to about $0.80 per student.[39]

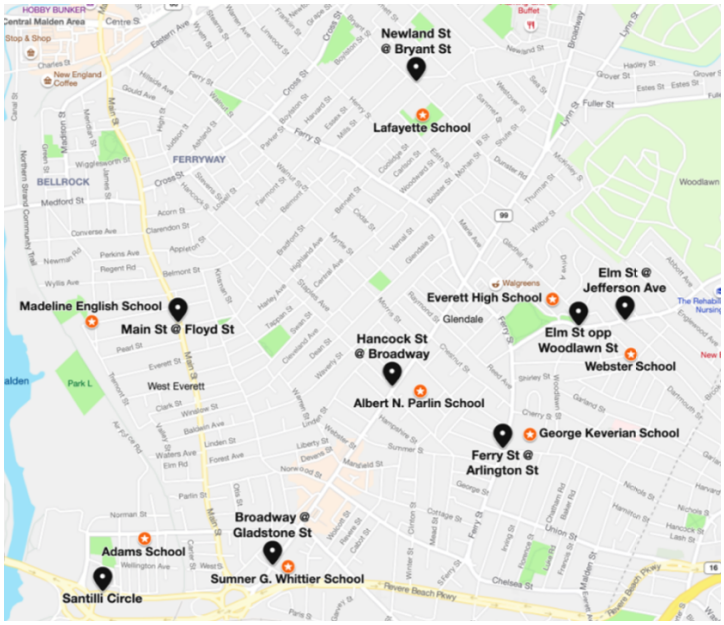
Parents may forgo walking children to school since dropping them off in a car is just a stop on their commute to work. But ATS can also benefit parents' commute. It is suggested that using public transportation or ATS for school commutes can lead to parents choosing an alternative transportation method to commute to work. Giving kids the option of a non-car commute frees up a parent's obligation to drive their kids to school and thus drive themselves to work. The walking school bus is a common option to take away parents' need to drive their kids to school.[40] The city council plays an important role in initiating the creation of a Walking School Bus (WSB) program, and schools usually do not have to commit much time or resources to the program. Reports show that WSBs can be very successful and beneficial for families, students, and communities.

Distance to school is one of the key deciding factors in the commuting method to school. Parents may be hesitant to allow children to walk to school because they live too far away. An option in between a car commute and a full walking commute is using "kiss and walk" locations. Parents can drop kids off at a distance closer to school to give them the ability to exercise while parents are able to avoid the traffic around schools and take other routes.

For the seven identified public schools offering Pre-K-12th grade, the farthest distance from the school to a bus stop that is served by a bus route that stops at an Orange Line T station is 0.3 miles. The closest distance is 128 feet from the school area to a bus stop. Parents could walk their child to school and walk less than 0.3 miles to catch a bus and

take public transportation to anywhere in the Boston area. (See **Image 14** for a map of schools and the nearest bus stop.) While getting around Everett may not be the easiest via the bus, parents could walk their child from their home to school, giving parents easily accessible transit options and increasing physical activity for their children. When considering potential advertising campaigns and nudges encouraging alternative transportation, accounting for parent and family needs may be beneficial in reaching a wide audience and helping the community as a whole.

Image 14: A depiction of Everett schools (orange stars) and nearest bus stops (black flags).



Key Suggestions:

- Safe Routes to School program
- Children as change agents - their behavior will influence parents behavior
- Encourage alternative transit for commutes to school, including a walking school bus

More Ambitious Policy Suggestions

In the course of our research, we found potential solutions that were more ambitious and required more time and resources than may be possible. These alternatives are listed below:

- Use a gamification strategy and create some sort of competition between the people of Everett. The city could create a competition among residents for walking using pedometers. This would encourage people to become conscious of the number of steps they walk each day, and push them to increase this number, by walking on short distances, or even walking to a bus stop, instead of taking the car.

- To provide people with incentives to use their bikes, Everett could offer free tools, useful for biking, and that people may lack. This would include a helmet, reflective accessories, a lock, an air pump, etc.

- Everett could encourage its companies to incentivize their employees to walk/bike/use public transportation to come to work, by rewarding such employees with a little bonus or prize at the end of each month.

- The city could exchange free bus passes against parking permits. Or provide free bus passes, with an expiration date, to the population. It would make non-frequent bus riders more familiar with how the bus system works in the city, and they could experience it by themselves, and understand that using the bus can be an enjoyable way to commute.

- More ambitious projects to encourage ATS have included instituting policies that make dropping kids off at school in a car harder, such as by reducing the number of parking spots for visitors at schools.[41] One program at a university rewarded students and faculty for arriving early or leaving later to reduce traffic during peak commute times. People who came into school or work early, before morning rush hour, or stayed later in the evening were given small incentives, either $0.10 each time they changed their schedule or entries into a raffle for larger prizes.[42]

CONCLUSION

Measuring the success of the policy suggestions highlighted in this report can be done by looking at two main elements. The main objective was to decrease the use of car in the City of Everett, and instead encourage the use of other means of transportation. Thus, evaluating the success of the suggested policies after their implementation could

be done primarily by looking at the use of alternative transportation means, and whether it has increased. For instance, looking at the bus use rates in Everett (in partnership with the MBTA) during and after the implementation of the policy suggestions, and comparing them to the rates prior to the implementation, hoping that they have increased significantly in between. The same principle would be used to measure the use of bikes, by asking Bluebikes about the rates of bike use, and how it compares to personal bike and Lime bike use rates prior to the suggested policies. An increase in the use of alternative means of transportation would also mean a decrease of the traffic in Everett, another element that could be measured to evaluate the success of the recommendations. This would be done by measuring the average commute time in Everett and how long it takes to drive through Broadway during peak hours, both by bus and by car. Hopefully, with a decrease in car use, the road would be less congested and the travel time would be reduced as well. Measuring the number of cars at pickup and drop-off at the public schools before and after implementation of active transportation to school programs would hopefully show a decrease in school commutes by car and thus less car commute traffic. Evaluating the reduction of traffic would also go through simple observations around the city, that would confirm that roads are less congested than they used to be. Finally, decreased traffic would also mean fewer complaints by the people of Everett about traffic and long commutes.

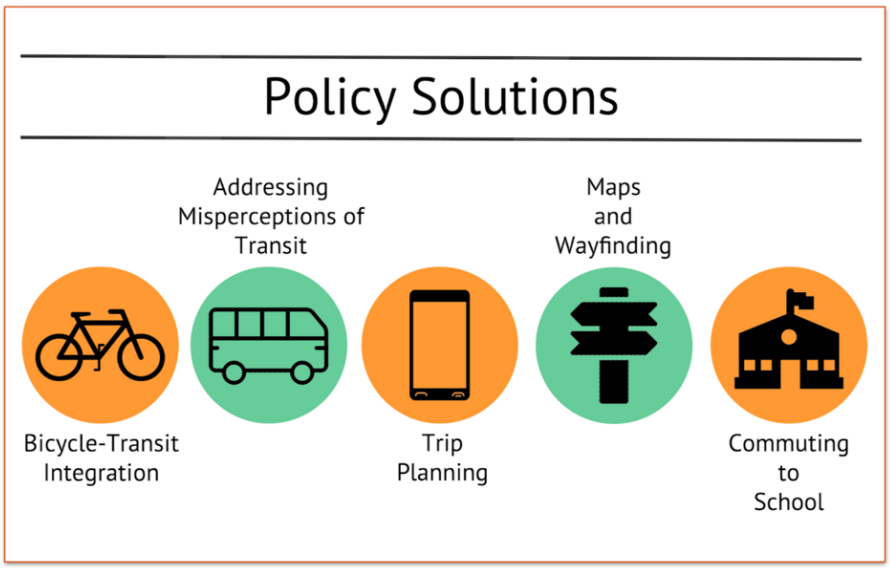
All the main suggestions of this report are easy to implement and low-cost, and are all based on research and experiments conducted elsewhere and that have proven successful. Based off of our research the costs could be easily folded into the current city's budgets or allocated funds. For advertising and social media campaigns, an additional part-time or full-time worker may need to be hired, but such cost would not dramatically affect the city budget. Thus, the trade-off between cost and success of policy implementation would likely be very low.

All of the policies are based off of months of extensive research and planning. Our first recommendation is based off of solving a common transportation problem, the first and last mile problem. By trying to close the gap between transit and people's homes and places of work with bicycles, we hope to encourage more people to take transit. Next we looked into how to debunk common misperceptions about the bus, like being slow, unaffordable, unreliable, etc., then countering those perceptions to make the bus look like an enjoyable way to commute. Advertising campaigns, implemented either by the city or in partnership with the MBTA and centered around the models shown, could help in changing negative perceptions about the bus and encourage increased use of public

transportation. Our research suggested that information about trip planning helped address misperceptions about public transit and increase regular transit use. Based on strategies used in other areas, we developed example targeted messaging through social media and emails that encourage Everett residents to plan their public transit commutes ahead of time. The structure of maps and how people visualize the transit system also has an impact on the perceived ease of using the system. By modeling the maps in Everett after the London City transit maps, we hope to increase user understanding and hopefully increase transit use. Creating wayfinding signs can be an impactful way to encourage walking and biking in the city. Giving people the tools they need to choose alternative forms of transportation is an important step in promoting the behavior.

While these recommendations target the City of Everett population as a whole, a more specific demographic to reach could be children. Children can be powerful agents of change in their parents' lives, and adults may be motivated to change their habits for the benefit of their children. The Safe Routes to School program and innovative projects promoting walking, biking, and public transit have the power to reduce car traffic and congestion during peak commute hours. These projects can complement the other recommended advertising, trip planning, and biking campaigns.

The recommendations given in this report all aim to change people's behaviors about their car and change the way they commute by encouraging the use of alternate modes of transportation. They all work together and reinforce one another to hopefully to obtain the best results possible: a decrease in car use in Everett, less traffic congestion, and an increase in the use of alternate modes of transportation.



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TEAM 2 REPORT

SUMMARY OF RECOMMENDED STRATEGIES

Shifting the "Norms" of Parking Culture

- Consider increasing parking passes from $10 to $25

Improving the Ridership Experience

- Provide real-time arrival information at more bus stops (Tiers 1 and 2)
- Install security cameras at more bus stops (Tiers 1 and 2)

Supporting Biking as a Method of Daily Transportation

- Plan to install Bluebike docking stations in close proximity to local bus stops or T stations, as well as on main roads
- In addition to Bluebike stations, develop a plan for city-wide installation of regular bike racks
- Increase safety by installing security cameras and adequate lighting infrastructure surrounding newly installed bike rails
- Create a “Youth Cycling Program” modeled after the bike curriculum in the Boston Public Schools

Developing a Marketing Strategy for the Bus Rapid Transit Service

- Communicate to residents using multiple platforms (advertisements, billboards, social media, etc.)
- Establish a city-wide public transportation day/week, or a “Mayor Rides the Bus Day”
- Partner with area businesses on a “Car Free Week”
- Ensure all communications are in both English and Spanish

INTRODUCTION

Traffic congestion is a major issue that has become increasingly problematic in the City of Everett. In past years, Everett has made efforts to improve upon this issue, including the implementation of a Bus Rapid Transit (BRT) system and the expansion of bike infrastructure via short-term bike rentals and bike lanes. However, the issue of congestion has not yet subsided. The simple solution for reducing congestion is

increasing use of public transportation, which is the focus of this report. Specifically, we look at increasing ridership by encouraging behavioral change and modifying existing infrastructure to better the lives of Everett's commuters.

Since the 1990s, the average American's commute to work has been steadily increasing, and Massachusetts consistently ranks as one of the states with the longest average commutes. This has led many cities to turn to public transportation in order to relieve traffic congestion, but even as cities improve their public transportation, many residents remain reluctant to relinquish their cars. The purpose of this report is not necessarily to suggest changes to improve the existing public transportation infrastructure but rather to improve awareness and public opinion of those systems, find easy-to-implement methods of encouraging use of alternative forms of transportation, and discourage car reliance without major system changes. In this report, we examine existing literature and research regarding behavior change and public transportation usage to produce a comprehensive recommendation for the City of Everett to reduce car reliance and increase resident usage of alternative forms of transportation, while acknowledging potential trade-offs and limitations.

BACKGROUND

The City of Everett is roughly 3.5 square miles of densely packed residential housing. The city is home to an estimated 50,000 residents with nearly 42,000 registered vehicles. Everett is located just north of Boston yet lacks direct access to an MBTA subway station, instead there is a multi-bus system within the city limits for public transportation. An estimated 24% of Everett's working citizens rely on public transportation to get to work, but because of the city's lack of direct access to Boston, these commutes are often multi-seat trips (Massachusetts Department of Transportation, 2018). The average commute time for Everett residents is 33.1 minutes, compared to the national average of 25.1 minutes, and 3.28% of Everett residents have "super commutes" that exceed 90 minutes (Data USA, 2017).

Everett is in a unique position in that the city is already in the process of implementing a long-term plan aimed at improving public transportation. Since the city falls under the jurisdiction of the MBTA, it has limited control over features such as bus routes or timing. Instead, Everett must rely on creative improvements to incentivize residents to utilize public transportation whenever possible. The final copy of the Everett Transit Action Plan was published in 2016 and the city has been making gradual improvements ever

since, working to implement parts of a Bus Rapid Transit (BRT) system. Everett created a dedicated bus-only lane during rush hour, installed elevated platforms to expedite the boarding process, and made improvements to already existing bus shelters. Even still, the city would like more of its citizens to embrace alternative means of transportation, whether it be the improved bus system, biking, walking, etc.

Everett's demographics further contribute to its uniqueness. Everett is one of the most diverse cities in the Greater Boston area, with 41.2% of its residents born outside of the U.S., compared to only 18.2% of Boston foreign-born residents, or 16.4% for the state of Massachusetts (Data USA, 2017). Furthermore, 23.2% of Everett residents are not U.S. citizens, while only 8.8% of Boston residents and 7.6% of Massachusetts residents are not U.S. citizens (Data USA, 2017). Regarding ethnicity, 22.9% of Everett residents are Hispanic/Latinx and 19.3% are Black/African American (Data USA, 2017). Languages in Everett follow a similar pattern: 19.0% of Everett residents speak Spanish or Spanish Creole, 15.8% speak Portuguese or Portuguese Creole, and 10.1% speak French Creole, contributing to a strong majority (56.4%) of Everett residents who speak a non-English language, which is much higher than the national average of 21.5% (Data USA, 2017). The potential for ethnic and linguistic barriers should be taken into consideration when considering potential improvements to Everett's existing transportation network.

LITERATURE REVIEW

General Behavior and Opinion Change

In order to increase bus ridership in the City of Everett, residents who typically drive will not only have to be convinced to take the bus, but will also need to modify their daily routine by transitioning from driving to taking the bus. This process of opinion and behavior change can be difficult to enact and maintain.

Behavior change is often hampered by a disconnect between attitude and behavior. One study found that persuasive communication regarding a particular opinion was effective in opinion change in the six months after subjects were initially interviewed, but the persuasive communication actually had a reverse effect on behavior change, ultimately indicating no effect on behavior of a clear and persistent change in opinion brought about by a persuasive communication (Maccoby et al., 1962 in Festinger, 1964). Persuasive communication to enact behavior change is most effective when presented with only a minimal to moderate appeal to change, rather than a strong appeal. Studies have shown that a strong appeal actually decreases behavior change over time,

potentially because it creates fear and thus causes subjects to avoid thinking about it (Janis & Feshbach, 1953 in Festinger, 1964).

The construction and deconstruction of habits play a major role in behavior change. Habits are formed when implicit associations between contexts and responses develop in memory as a result of repeatedly performing a particular behavior in a particular context, such as one's daily routine of driving to work every morning (Carden & Wood, 2018). As a behavior is repeated in a stable context, the behavior becomes less guided by goals and intentions and more guided by habits (Carden & Wood, 2018). While this shift from goal-directed to habitual behavior through repeated learning is largely accepted, people often utilize goal-directed explanations for why they perform habits that are not actually guided by goals and intentions (Carden & Wood, 2018). Goal-directed behavior is more flexible, while habit-based behavior is slow to develop and highly resistant to change (Carden & Wood, 2018).

The habit discontinuity effect states that behavior change interventions are most effective during life changes that interrupt existing habit cues (e.g. moving, changing jobs) (Carden & Wood, 2018). A relevant example comes from the two-day-long London Tube workers strike in February 2014. By tracking card swipe data, researchers examined commuters' transportations habits and found that 5% of commuters adopted new, more optimal travel-route habits, particularly in areas where the Tube map was incorrectly drawn or train speed could not be accurately estimated (Carden & Wood, 2018). By disrupting old cues, commuters were able to discover and form more optimal traveling habits by continuing their newly-discovered Tube routes.

Mental Barriers to Alternative Forms of Transportation

Peopleforbikes, a company looking to improve bike ridership, created a survey in which they asked why people did not ride their bikes and what would motivate them to do so. Most respondents cited a lack of infrastructure (Andersen, 2015). While over half of adult respondents wanted to ride their bike more, only one-third indicated a desire for more improvements made to bike infrastructure before committing to biking (Andersen, 2015). The vast majority wanted these improvements in the form of protected bike lanes, a sentiment repeated in similar surveys (Andersen, 2015). Cities that utilized protected bike lanes established a safer environment in which riders no longer felt that they were in danger of being injured by a car or injuring a pedestrian (Moving, 2016). They also signaled to those still driving cars that the city was making efforts to improve transportation for alternative forms of transportation despite cars having dominated the roads for decades (Moving, 2016).

Many survey respondents were also in favor of using bike lanes as a way to connect existing public transportation rather than creating an entirely new system of lanes for bikes (Andersen, 2015). These kinds of lanes could be lanes shared between pedestrians and bikers or even buses and bikers but it was clear that residents wanted a designated area for bikers to ride (Andersen, 2015). Cities can also make improvements to areas where bikes are left unattended for significant periods of time, like the addition of rails to lock bikes onto, cameras to monitor the area, and lights to ensure the area is well lit for those retrieving bikes in the early morning or late at night (Cycle, 2010). These kinds of infrastructure improvements would help increase the perceived safety of biking and could help shift public opinion.

More than anything this desire for perceived safety seems to be a major motivation behind people's reluctance to biking (Moving, 2016). However, the number of deaths from bicycling accidents is drastically lower than the number of deaths resulting from car crashes (Moving, 2016). Studies have shown that there is a safety in numbers for biking, indicating that as more people begin to bike, drivers become more aware of bicyclists and injury rates fall (Moving, 2016). Even if cities are unable to implement major changes to biking infrastructure, studies have shown that improvements to sidewalks and crosswalks can still encourage change from people looking to adopt biking as a means of transportation (Moving, 2016).

Smaller community efforts can also have a larger overall impact on certain groups. A possible way to do this is by adopting new programs alongside infrastructure improvements in order to see the biggest changes. The implementation of programs like Bike to Work Day or Ciclovia where the entire community is forced to go without their cars for a short period of time can help encourage riders to adopt new habits (Moving, 2016). Studies show that residents must be informed every step of the way to ensure that they understand that their voice in the matter has not been lost, but informing them does not mean one or two town halls; instead, cities should host events where they can train the public in bike maintenance while also detailing future improvements and taking suggestions (Cycle, 2010).

Residents who could benefit the most from bikes often face barriers to using them in the first place. Low-income residents often cannot afford to own or maintain a bike, and minorities are also disproportionately concerned about getting stopped by the authorities while riding bikes (Andersen, 2015). Areas that house higher proportions of low-income families are often home to the densest traffic, creating potentially unsafe

conditions for bikers (Building, 2017). Cities that want to encourage bike ridership among lower income and minority populations must first ensure these individuals feel safe biking through their community. Also, the cost of purchasing a new bike outright in addition to perceived maintenance costs can often discourage people in low-income housing from transitioning to biking (Building, 2017). However, the recent surge in short-term bike rental programs has helped reduce parts of that strain (Building, 2017). This has also helped address the stigma that surrounds biking in the U.S., by bringing it into the mainstream and making it commercially acceptable (Building, 2017).

Costs and Benefits of Car Usage and Alternative Forms of Transportation

Before a government implements changes to their system, they must know if the benefits of said changes would outweigh the costs. A study conducted for the City of Pittsburgh examined the benefits of implementing light-rail transit and/or an express bus in order to mediate growing environmental concerns (Brems, 1980). Findings indicate little difference in cost-effectiveness between light-rail transit lines or (express) buses (Brems, 1980). However, there are a number of factors to consider outside of cost. Light-rails are high-speed and pollution-free, but provide narrow coverage and are a large investment, while buses are low-speed and high-pollution, but provide wider coverage at less of an investment (Brems, 1980). The study ultimately found light-rail transit to be the most preferable of the two options, although recognizing that circumstances and preferences may vary in other cities (Brems, 1980).

Further analysis of costs and benefits of certain forms of transportation was explored in a study comparing 23 different transit systems and evaluating their ridership operating costs and capital costs of recent transit investments (Guerra & Cervero, 2011). The study then identified job and population densities that can support more cost-effective fixed-guideway transit service, and then estimated the marginal costs per passenger mile of increasing transit ridership through system expansion, increased service, and decreased fares (Guerra & Cervero, 2011). After controlling for neighborhood, regional, and transit service attributes, results demonstrated a positive correlation between population and job density with ridership and capital costs; as density increases, so does ridership and capital costs (Guerra & Cervero, 2011). This ultimately demonstrates that higher densities tend to improve transit cost effectiveness, in spite of higher capital costs (Guerra & Cervero, 2011).

Encouraging Ridership

In order to understand what changes could encourage ridership, it is beneficial to understand what types of services encourage ridership in the abstract. One of these services is high frequency networks (Walker, 2018). Frequency refers to the interval in between two buses arriving at the same stop, or how long a person has to wait for the next bus. Frequency alleviates the need for personal car travel, as it reduces the time needed to wait, and the pains of not having freedom to travel at your own pace (Walker, 2018).

Similarly, it is important to understand what factors harm frequency of service. Congestion on roads makes frequency of service poor which in turn decreases ridership, thus creating more congestion, and the easiest way to reduce this congestion is to move people from their cars onto buses (Walker, 2018). There are a number of policies which prove effective in encouraging behavioral changes such as increasing bus ridership, particularly policies that increase the perceived control over transportation and attractiveness of public transportation (Redman, 2013). Focusing on improved security, stations and stops, and information increases the perceived benefits or attractiveness of public transportation, allowing riders more control over their travel prospects (Redman, 2013). The perception over travel choices also explains why frequency is so important; travelers want to have control over when and how they travel (Redman, 2013).

Cities across the country pursue policies similar to this when designing and redesigning their transportation networks. In the summer of 2018, the City of Dublin in Ireland began a massive public transportation network overhaul which included a host of small policy changes aimed at making travel quicker on the margins and allowing riders more control over their travel choices (Walker, 2018). All Dublin bus stops were renovated to include structures and real-time tracking information (Walker, 2018). Other changes included simpler fare structures, allowing for mobile pay, and cashless payment implementation (Walker, 2018).

Nudges as a Means of Change

A nudge is defined as any aspect of a process that changes how people behave in predictable ways without excluding any of their options or providing and significant economic incentives (Benartzi et al. “Should governments”, 2017). Until the advent of nudges, governments and organizations have been struggling to cost-effectively encourage positive change. Studies suggest that small, quality-of-life changes have a higher impact on citizen behavior than traditional approaches such as subsidies, taxes, and education; people retain the freedom to make their own decisions while being subtly

influenced by their environments (Benartzi et al. “Governments are trying”, 2017). Studies and real-life applications of nudges have demonstrated positive results across multiple fields; results include cost-efficient increases in vaccinations, reductions in household energy usage, and reductions in meal sizes (Benartzi et al. “Should governments”, 2017).

PROPOSED STRATEGIES

Shifting the "Norms" of Parking Culture

There is an emphasis on the need to shift what people believe they deserve when it comes to car ownership. This means combatting the idea that a city is required to provide enough parking to accommodate residents when instead residents can use alternative modes of transportation.

One way this could be handled is by limiting the amount of residential parking passes allowed by the city. Limiting people's ability to park forces drivers that are unable to find easy parking to make the decision to ride public transportation. Everett currently provides parking passes for free every year through January and February. After March residents must pay a $10 fee to purchase a new parking sticker for the rest of the year. It is suggested that the city should limit the period in which parking passes are provided for free which could generate more revenue to allocate towards future transportation projects. This would help to encourage residents to reconsider unnecessary car ownership while not putting them under undue financial stress.

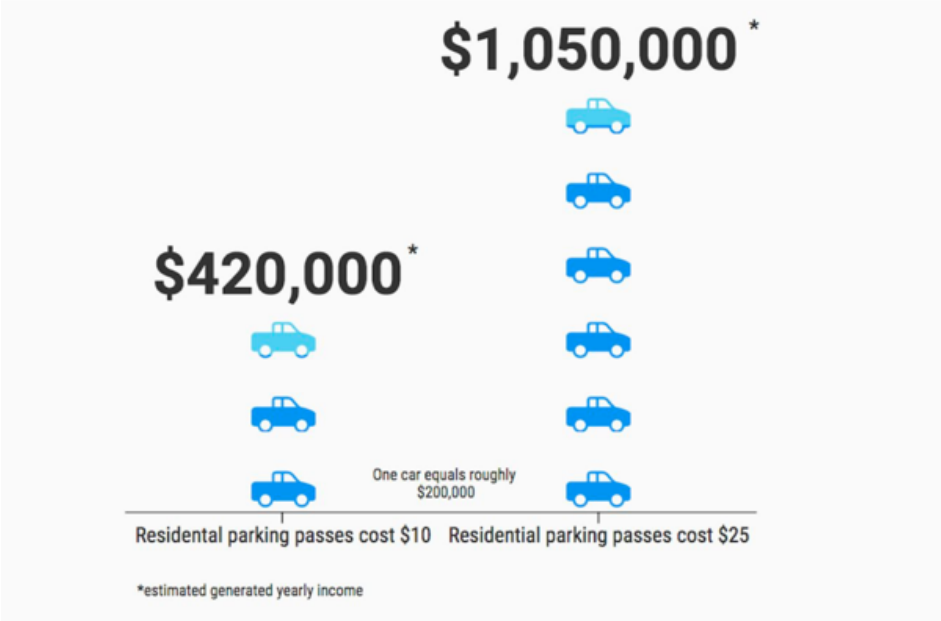
While the City of Boston does not charge for residential parking permits, it has considered making this change in recent years. The City of Cambridge already charges residents a $25 fee for the first time a car requests a residential parking pass. Brookline requires that residents pay $25 annually to renew their residential parking passes. There is obvious precedent in surrounding Massachusetts communities, making it so that Everett has a viable basis for implementing this. Everett can look at these cities and use their results to inform the city’s decision about whether or not to eliminate free parking passes and create a new standard rate of $10 annually per permit. After reviewing the long-term reactions and implications from residents in Brookline and Cambridge, the City of Everett could consider increasing annual parking passes from $10 to $25. By increasing the cost of parking passes, the City of Everett could generate more revenue towards future transportation projects and environmental efforts for the community while hopefully deterring people from wanting to spend money on a pass. There are currently 42,000 cars registered in Everett. If each of these car owners paid $10 per

parking pass, the city generates $420,000 in revenue annually. If the parking permit fee were raised to $25, then the city could potentially collect $1,050,000 (**Image 1**).

There may be concern with where the money from the increased parking passes may be allocated to in the city's budget. New revenue can go towards funding: improving bus stops, increasing the number of part-time employees or interns working on social media, marketing and public relations for Everett, and hiring more people to enforce parking violations.

The City of Everett should also consider, in addition to increasing the price of parking passes, limiting the number of parking passes to three per address. To ease residents' concerns around having to get rid of additional vehicles, households that own more than three cars could be grandfathered in under this new legislation, while new applicants may not receive more than three parking passes.

Image 1: Cost comparison of $10 vs. $25 parking pass fee.



It is expected for residents to be upset and react negatively with the rise in cost for parking passes. Therefore, it is suggested that Everett show they are listening to citizens' concerns by surveying residents about their satisfaction with transportation-related services every quarter. The survey would ask questions regarding how residents feel about the current cost in parking passes and suggestions on how to further improve parking. This way residents of Everett do not feel as if the city does not care about their needs or opinions on how these higher prices may affect them.

Improving the Ridership Experience

Keeping in mind that these recommendations aim to change the behavior of drivers in the City of Everett, we contemplate what considerations are likely to make a person use public transportation. Moreover, what drives the specific segment of the population that owns cars but chooses to use public transportation to make that decision. That choice depends, in part, on the perceived attributes of public transportation. Perceived attributes refer to a rider's sense of security, quality of network stations and stops, information available to riders, among other things.

One way, then, in which Everett can increase ridership is by increasing the attractiveness of public transportation. Everett already began making great steps into doing so, including elevating boarding platforms and improving bus shelters. In the draft version of the Everett Transportation Strategy, Everett explained plans to continue work on these improvements.

With regard to bus shelters, Everett created a tiered system, dictating how improvements would be made and what would be included. The tiered system operates according to the traffic experienced by a given a bus stop. Low-traffic bus stops fall under Tier 1, medium traffic stops are Tier 2, and high-traffic stops are Tier 3. The tiered system, and the specific improvements implemented under each category, identify a number of key ways in which Everett can increase the attractiveness of their bus network. For example, all bus stops provide shelter to riders, ranging from basic shelters to climate-controlled shelters. Everett plans to increase the signage and information available at stops as well. We recommend two minor adjustments to the three-tier system: one regarding information availability and one regarding security.

We begin with information availability. Currently, the tier system allots two informational signs to Tier 1 bus stops: a sign explaining which bus numbers stop at that particular stop and an entire system map. Tier 2 provides detailed schedule information, and Tier 3 provides real-time arrival information. This design provides information according to the traffic experienced at a given stop.

More information, however, should be provided at lower-traffic bus stops as well. Lack of information about bus arrival times could serve as a barrier for those people living near low-traffic bus stops. Providing more information at low-traffic stops better integrates the entirety of the bus network, making the attractiveness of these bus stops similar to those in the higher tiers.

As such, we recommend Tier 1 bus stops receive schedule information. With this design, both Tier 1 and 2 bus stops provide schedule information, and Tier 3 stops provide real-time information. In this way, riders at all stops attain information adequate to increasing the perceived attributes of public transportation. This approach more closely mirrors other successful bus networks, such as in City of Dublin.

Secondly, we recommend that Everett adjust its approach to security. Currently, the tier system provides for security cameras only at Tier 3 stops. These stops are visited and utilized by the greatest number of riders. As such, security cameras provide a greater sense of security for those patrons riding from these bus stops. In fact, our research leads to us to believe that the introduction of security cameras at Tier 1 and Tier 2 stops could make waiting for and riding buses from these stops more attractive to residents.

An important distinguishing factor of Tier 3 stops is their location. The highest ridership stops in Everett are Everett Square and Glendale Square. These locations lay along Broadway, surrounded by a number of business. Which is to say, these bus stops are highly visible, with respect to an individual's sense of security. Put more simply, they are around other people and businesses while they wait for the bus. Lower-traffic stops can be found in residential areas with less visibility.

Given that lower-traffic stops are found in areas with less visibility, the availability of security cameras at these stops could increase an individual's sense of security. In this simple way, commuting via bus from these locations becomes more attractive. We recommend that Everett include Tier 2, and if possible Tier 1, bus stops to those receiving the addition of security cameras.

Support Biking as a Method of Daily Transportation

Biking is an effective and cost-efficient alternative form of transportation given the limited size of Everett. For those who are travelling to-and-from work within the city limits, biking could easily become a reasonable substitute for driving. Even commuters into Boston may find biking to be a convenient means of travel if Everett creates the appropriate infrastructure to support both internal and external commuters.

Buses and trains are effective mediums of transportation for passengers wishing to travel longer distances. However, they travel on set routes and potentially restrict passengers from getting off at exactly the right destination. Bikes are the solution to that problem. Everett has already introduced Lime bikes and their dockless bike system o the city. Recently, Everett has been planning to further their bike campaign and

introduce Boston's very own Bluebikes into the equation. Unlike Lime bikes, Bluebikes uses a docking system that allows riders to rent and store their bikes after use. To facilitate travel times and ease of access, Everett should install Bluebike docking stations in close proximity to local bus stops or T stations, as well as on main roads. The goal is to promote alternative transportation and providing travelers with more options to travel contributes to that goal. The change in local environment that continues to offer people options while their behavior is unconsciously modified is an example of a nudge.

Furthermore, a city-wide installation of regular bike racks should provide travelers with another means of transport: riding their own personal bikes. Lastly, security cameras and adequate lighting infrastructure surrounding newly installed bike rails will allow travelers to feel more comfortable leaving their bikes unwatched for extended periods of time. While it does not fully address theft prevention or even resolution, these measures suggest accountability and discourage most people from stealing or damaging bikes.

The City of Boston manages a "Youth Cycling Program" that provides bikes, helmets, instructors, and a bike curriculum to students at Boston Public Schools (Youth, 2019). The program provides two Boston Bikes instructors to spend two weeks at schools and teach students about bike safety (e.g., helmets, traffic laws) before even allowing them to get on a bike. Once on bikes, students engage in drills and games to learn bicycle handling skills and even ride to local paths and parks (Youth, 2019). Everett could partner with Boston and Boston Bikes to expand their Youth Cycling Program to include Everett Public Schools, or establish a similar program of their own. Teaching and promoting bike usage in children and teens minimizes the need for parents to drive their children to and from school and other activities, and these children are also more likely to continue biking once they reach the age at which they would begin driving instead. Incorporating bikes in schools would create a generation of commuters who are bike-reliant rather than car-reliant.

Developing a Marketing Strategy for the Bus Rapid Transit Service

The goal of the marketing campaign is to raise awareness of and promote participation in Everett's revamped transportation infrastructure. Advertisements and billboards will be placed along the city's main streets, catching the attention of both pedestrians and drivers. One pivotal billboard placement is the part of the road where Alford Street meets Broadway.

These billboards should contain content that aids Everett's citizens in overcoming their aversion to alternate transportation, especially riding the bus (**Image 2**). The primary goal however, is to inform. The billboards may inform new bike riders on the rules and safety tips of bike riding as well as perhaps the opening of a new bus stop. Citizens of Everett should know the measures that the government has taken to revamp the traditional system, and the central location visible to all will only contribute toward that goal. A secondary role of the billboards could be to promote the convenient, cost effective, and environmentally friendly aspects of taking alternate forms of transportation.

Image 2: Sample billboard targeting Everett commuters.

Apart from billboards, coverage of the new transportation projects and related publicity events can be promoted on various forms of local media. Such events could include a city-wide transportation day or week, a "Mayor Rides the Bus" day, or the aforementioned Youth Cycling Program. Many of these initiatives have been implemented in other cities. For example, Wade Kapszukiewicz, Mayor of Toledo, Ohio, pledged to commute by bus one day a week (Schmitt, 2018). Aiming to "lead by example," Kapszukiewicz was inspired by former New York City Mayor Ed Koch, who would routinely take the bus to his office (Schmitt, 2018). Kapszukiewicz described the

bus system as convenient and affordable and continuously promoted its benefits to his constituents, thus bringing validity and increased awareness to the city's public transportation networks (Schmitt, 2018). By riding the bus to work for even one day and promoting it on social media accounts, Mayor Carlo DeMaria would demonstrate not only that any Everett resident is capable ride the bus, but also that riding the bus is an efficient and even desirable way of traveling throughout Everett and beyond (**Image 3**).

Image 3: Sample Tweet from Everett Mayor Carlo DeMaria.

The City of Everett should take advantage of their existing social media following to promote their public transit system and the improvements they have made. Social media posts should be consistent and thorough, covering topics from bus schedules to commute times to Bluebike locations (**Images 4-6**). Making these posts often and on different topics (related to transportation) will provide the most information to the most people.

Image 4: Sample Tweet from the City of Everett

Image 5: Sample status update from the City of Everett Facebook account.

Image 6: Sample graphic encouraging use of Bluebikes.

Everett can also consider partnering with local businesses and companies to promote a "Car Free Week." All employees would pledge to walk, bike, or take the bus to and from work each day for one week. To motivate employees to do so, employers could offer small incentives; for example, they could provide a free lunch on Friday to every employee who successfully did not use their car to get to or from work that week. The City of Everett could partially fund such initiatives (for their own employees) with the revenue gained from increased parking pass fees.

In the past, the Massachusetts Department of Transportation has held a "Car Free Week" as an extension of "Car Free Day", a worldwide initiative supported by 1,000 cities in 40 countries (Jessen, 2013). The purpose of the event is to promote "transit, bicycling, walking, carpooling, vanpooling and teleworking as greener modes of transportation providing environmental, financial, community and health benefits throughout the Commonwealth," and included raffles, events, and media (Jessen, 2013). The City of Everett could join this initiative or use it as a model for their own.

Along with Massachusetts initiative, Washington, D.C., could serve as another possible model for Everett's own "Car Free" day (Car, 2018). Washington, D.C., holds their "Car Free" days September 21st and 22nd, holding various street fairs and events to entice the general public into participating (Car, 2018). The city itself encouraged individuals to pledge to go car-free by signing up on the city's website, offered raffle prizes to those who signed the pledge, and allowed contests to decorate a few of the cities curbside parking spaces (Car, 2018). Along with this, the city held a street fair that celebrated healthy living, offering free yoga classes and walking tours of the downtown area (Car, 2018). This kind of event could be replicated in Everett, with the city providing bike maintenance workshops or classes in navigating the MBTA app, "Transit." As previously discussed, there is significant linguistic diversity amongst Everett residents. 19.0% of Everett residents speak Spanish or Spanish Creole, 15.8% speak Portuguese or Portuguese Creole, and 10.1% speak French Creole, contributing to a strong majority (56.4%) of Everett residents who speak a non-English language, much higher than the national average of 21.5% (Data USA, 2017). To increase distribution of information on their public transportation system, Everett can create promotional flyers and social media postings in these languages, in addition to English (**Image 7**). This will allow for a greater portion of Everett's residents to gain information about the buses and improvements that Everett has made to their public transit network.

Image 7: Sample flyer in both English and Spanish.

EVALUATING IMPACT

When considering the success of these recommendations, it's critical to keep in mind the explicit goals they are intended to achieve. Our goals are twofold: increasing the use of alternative forms of transportation and decreasing the use of personal cars for commuting. As such, the methods by which we analyze our recommendations are successful should aim to measure whether these explicit goals are realized.

Maximizing efficiency of travel is our ultimate concern. If our recommendations impact the behavior of Everett's commuters, then we expect a marked impact on their travel in two ways: a decrease in travel time and a decrease in travel costs. For that reason, these two considerations should be used to evaluate the success of our recommendations.

If our recommendations are successful, more people will use alternative forms of transportations for their commute. The research we conducted suggests that a decreased number of cars on the road will decrease congestion, allowing traffic of all kinds to move faster. Also, a decrease in overall traffic will allow for quicker bus service, especially in those areas without a dedicated bus lane. If our recommendations are successful, travel times across the board should fall. The average commute time should decrease; travel time is a significant indicator of our recommendations' success.

A second way to measure these recommendations success is to measure any changes in travel costs. Costs associated with travel by car are relatively high. Obvious examples

include: gas prices, parking, and tolls. These are not the only costs incurred by an individual's choice to travel by car, though. Regardless of whether or not an individual owns the car, they, at one point, needed to pay for the use of the car, as well as the maintenance of that car. We would expect a decrease in travel costs, even if we were to only factor the most obvious costs associated with car use (i.e., the less time a person sits in traffic, the less gas they will have to purchase). In order to measure whether there have been significant behavioral changes, especially those regarding the choice to purchase car, we have to factor in those less-obvious costs. In either case, travel costs are an intuitive way to measure our recommendations success. If people choose alternative transportation as a mode of commuting, then we would expect the average travel costs to decrease closer to the cost of a bus ticket or bike ride (around $2.50/ride for both purposes).

CONCLUSION

In order to reduce traffic congestion in the City of Everett, residents need to get out of their cars, and onto alternative forms of transportation. Doing so will improve the flow of traffic across the board; it will make bus service more reliable and make bike travel on previously congested roads safer. Our recommendations focus on creating a behavioral change, one that increases usage of alternative forms of transportation. That behavioral change can be accomplished via:

- Heightened residential parking permit fees creating additional revenue used towards implementing improvements and coordinating marketing campaigns

- Increased availability of bus schedule information and security cameras at bus stops with medium to low traffic in order to increase the perceived attributes of the bus network as a whole

- Expansion of bike infrastructure in order to connect bus stops and neighborhoods, while also providing a sense of security to those who choose to bike

- A holistic, variable, and on-going marketing campaign, alerting residents of the improvements already made to the bus network, as well as the new improvements above, aimed specifically at making alternative transportation more attractive

With this approach, our research leads us to believe that congestion in Everett will be

reduced. In order to track the success of these approaches, the city should monitor changes in average travel time and travel costs. By doing so, we are confident that the average Everett resident will experience shorter commutes at a lower cost.

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