Key Factors Of Public Transportation Usage In The MBTA Area

Introduction

As Robert Bullard said, “Transportation touches almost every aspect of our lives and plays a pivotal role in shaping human interaction, economic mobility, and sustainability. Transportation provides access to opportunity and serves as a key component in addressing poverty, unemployment, and equal opportunity goals.”

Different transportation systems can affect cities in different ways. As a result of the unaffordable effect of increased car use and resulting severe traffic congestion, rapid transit becomes the most important non-vehicle transportation mode in modern cities. Among some big cities in the US, Boston has a relatively well-developed rapid transit network, and a considerable amount of people are willing to take the public transportation instead of driving a car. However, it is impossible for the Massachusetts Bay Transportation Authority (MBTA) to serve every resident with the limited lines. Therefore, the rapid transit usage should be different in each town of the Great Boston Area. In addition, usage of rapid transit also can be influenced by many other factors, such as income status, accessibility and location of living places. With this in mind, the purpose of this project is to analyze the transit usage condition of a certain group of towns, while figuring out how some key factors could affect people’s transportation mode.

Methodology

The first step of this analysis is creating the study area. I selected 13 cities which are passed through by the MBTA transit Lines, together with Chelsea and Everett which are located between the Blue Line and the Orange Line from the town’s census boundary layer. Thus, my study area roughly covers all the Downtown Boston and the near suburb area.

I seek to find whether the MBTA provides rapid transit to the high-density communities in my study. I overlapped each line with the population density to show whether the high density communities are reached by MBTA Lines.

After that, I created a series of maps based on the data from the 2013 American Community Survey (5-years estimate), which include several significant factors such as household income level and availability of vehicles. Meanwhile, the map of public transportation usage was also created based on the same dataset. I joined each demographic data with my study area by using a spatial join, and then got the average condition of each cities by summarizing the demographic data based on the town group of each census tract.

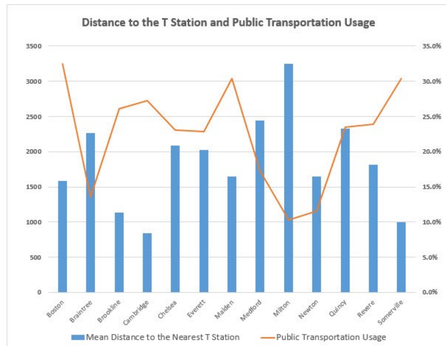
Finally, I produced the map showing the distance between every census tract and the nearest T station. To begin with, I calculated the distance by using the Euclidean distance tool and made it become the raster layer. Then, I chose the zonal statistics as table to get mean distance from the nearest T station for each census tract and town. Last, I put all the results into a excel table, and we were able to analyze the relationship or interaction between each two factors.

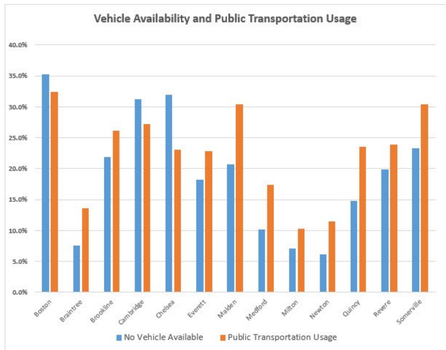
Limitation

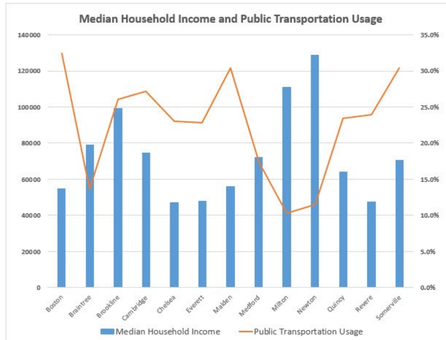
For sure, this study has some limitation because of the inaccurate data and incomprehensive analysis. For example, the demographic data of public transportation contains not only the usage of rapid transit, but also the buses and commuter rails, which can make our results more or less imprecise. Moreover, people’s transportation mode could definitely be influenced by some other factors, such as season and weather, or whether they have children.

Town	Total Population	Median Household Income	Mean Distance to Nearest Station	No Vehicle Available	Public Transportation Usage
Boston	617594	54903	1587	35.3%	32.5%
Braintree	35744	78981	2263	7.5%	13.6%
Brookline	58732	99100	1138	21.9%	26.1%
Cambridge	105162	74545	837	31.3%	27.2%
Chelsea	35177	47231	2088	31.9%	23.0%
Everett	41667	47827	2020	18.2%	22.9%
Malden	59450	55834	1646	20.6%	30.4%
Medford	56173	72170	2448	10.2%	17.4%
Milton	27003	111008	3245	7.1%	10.3%
Newton	85146	128617	1645	6.1%	11.5%
Quincy	92271	63932	2329	14.8%	23.5%
Revere	51755	47310	1814	19.9%	23.9%
Somerville	75754	70687	994	23.3%	30.4%

Findings



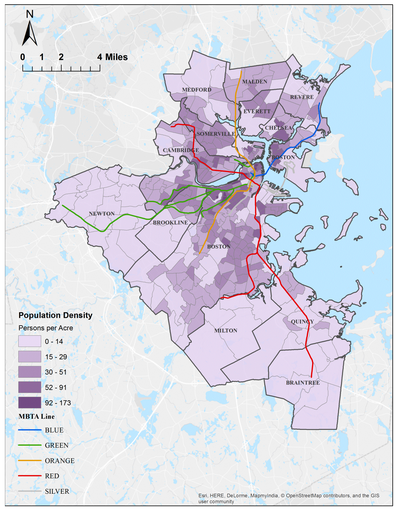


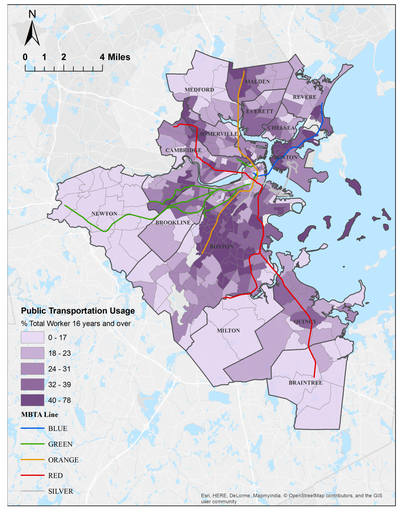


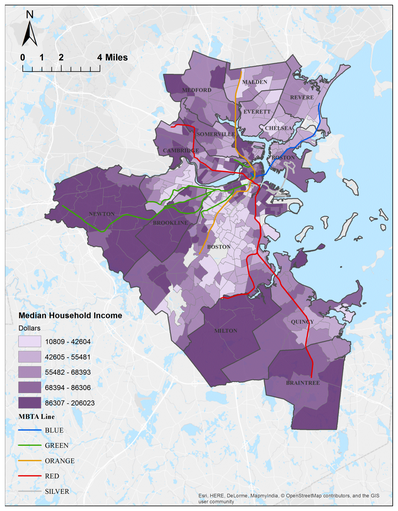
The results of this analysis show that the public transportation usage do has some interesting correlations with the factors such as income level, vehicle availability and transit access. As the maps and charts shows, generally, the MBTA rapid transit follows population density throughout the study area. The highest concentration of people reside around Boston, Cambridge, Somerville and Chelsea. These are the same neighborhoods that have the highest percentage of households without cars, and those residents are tend to rely on public transportation for their commuting. Similarly, those who within a walkable distance from the nearest T station are more likely to take the public transit than the residents in the suburb.

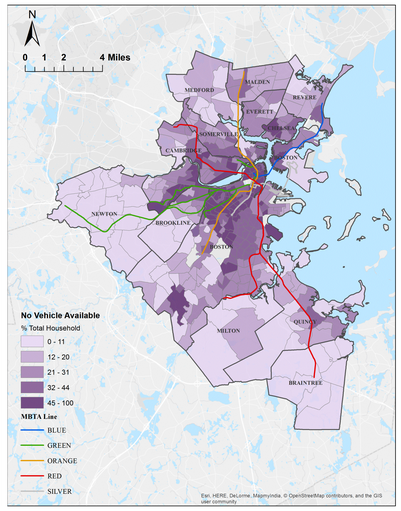
It is quite interesting when we look at the factor of household income. People with high income are more likely to live in the suburb area such as Newtown Milton and Braintree, and the major transportation mode of them is driving because of the enough affordability and the lack of public transportation accessibility. According to what we have learnt in other classes, suburbanization and previous streetcar could be a reason for this trend. However, this rule is suitable for the most towns of my study area except the City of Boston, which has a relatively high public transportation usage with a below-average income level. The significant income gap between each neighborhoods could be the explanation. For example, areas like Bacon Hill or Back Bay has a quite high income level, while communities in Roxbury and Dorchester may have a relatively low income. In order to find the differences between each neighborhoods in the City of Boston, more comprehensive researches are needed.

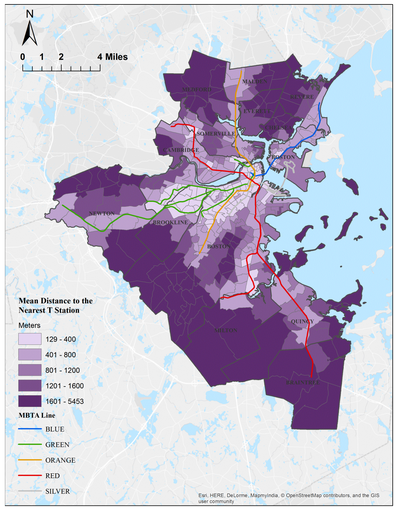
Maps











Cartographer: Xiang Yu

Projection: NAD 1983 Massachusetts State Plane

Data Sources: MassGIS, U.S. Census Bureau 2013, TIGER 2013

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