Assessing Equitable Transit Access along Boston Rail Corridor

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Executive Summary

We must understand the needs of our environment, take steps towards a sustainable transportation system, and focus on the health and well-being of individuals by promoting healthier lifestyles and ways of commute. Active transportation is often considered a commute mode with many benefits, but it also depends on the infrastructure present and the individual's perspective. It is also essential to understand how public transportation networks are current in the city, their interdependence on each other, and how that unfolds travel behavior in the city.

Boston has been actively working on enhancing its transportation infrastructure and promoting greater accessibility to public transit for its residents. One specific area of focus has been the Fairmount Line, which traverses through Dorchester, Mattapan, and Roxbury neighborhoods. Numerous studies and projects, including the Fairmount Indigo Planning Initiative and the Fairmount Line Improvement Coalition, are underway to address transportation equity in the region. These ongoing efforts are geared towards improving transportation and fostering economic opportunities in the mentioned neighborhoods.

To understand and unfold the dynamics between travel behavior and transit equity, this report will try to understand the urban fabric of socioeconomic factors, commute patterns, and accessibility in Boston City. The methodology for this report involves understanding the demographic and socio-economic data of Boston City and then analyzing commute patterns, travel behavior, and transportation equity through multiple sources. Ultimately, this report analyzes factors in determining equity and further suggests a policy framework and recommendations to promote public and active transportation use.

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Introduction

Walking is often seen as one of the most sustainable ways to get around the city, offering numerous advantages to its residents. It allows urban dwellers to connect with their surroundings and promotes physical activity. However, walking in a town is influenced by various factors, including urban design, socio-economic conditions, and accessibility to public transportation. This project aims to delve into the intricate web of these factors and their impact on transit access and transportation equity in Boston.

Boston, known for its historical significance and role in the American Revolution, boasts a diverse and vibrant population. The city's transportation system connects its residents with essential services and economic opportunities. Nonetheless, disparities in transportation accessibility persist, particularly in neighborhoods like Dorchester, Mattapan, and Roxbury, which face challenges such as limited access to bus stops and fewer reliable bus routes. This project aims to understand the interrelationship between travel behavior, socio-economic factors, and personal preferences by understanding travel patterns. It will also delve into factors that affect the accessibility to all.

To understand and unfold the dynamics between travel behavior and transit equity, this report will try to understand the urban fabric of socioeconomic factors, commute patterns, and accessibility in Boston City. Even though Boston is considered quite walkable compared to other cities, it is essential to understand that walking within a town or neighborhood is highly dependent on many factors, such as street network, walking conditions and infrastructure, and urban fabric.

While understanding the socio-economic background of Boston, this report focuses on population trends, racial compositions, median household income, and poverty rate. Disparities are observed in neighborhoods such as Roxbury, Mattapan, Dorchester, and East Boston. This is also important to understand transit access and equity in the region. Through this comprehensive lens, this study aims to understand the interrelationship patterns between these factors to understand factors influencing mode choice, transit access and propose policies that shape new urban forms.

This report further tries to analyze the effect of jobs within 45 minutes, public transit coverage in the city, and walkshed analysis using buffer analysis to understand if particular neighborhoods are walkable. It is crucial to address transportation equity that unfolds while we are trying to understand the travel behavior of people using public transit. Boston MPOs have specific programs focusing on equity but are again concentrated in certain neighborhoods.

Understanding the community's needs and achieving social and transportation equity is crucial. From the findings, this project will suggest short-term and long-term measures that the City of Boston and Massachusetts Bay Transportation Authority (MBTA) can implement to enhance equitable transit accessibility and walkability. The goal is to unfold the complexities and understand tangible solutions that will lead toward more inclusive, pedestrian-friendly, equitable transportation in Boston.

Literature Review

This section discusses the existing literature and research examining the relationship between urban form and travel behaviors, mainly focusing on individual travel preferences. Additionally, it delves into the significance of walking as a mode of transportation and the obstacles linked to pedestrian travel. The section sheds light on the ongoing initiatives within the City of Boston that explicitly address transportation equity concerns in minority neighborhoods. By presenting research insights and current initiatives, this section offers a comprehensive view of efforts toward creating an equitable and sustainable transportation system, all within the context of enhancing accessibility for individuals.

There have been over three decades of research on urban form and travel exploring how patterns in urban development – for example, whether residential, commercial, and retail uses are spread or more concentrated – affect how people travel, including the distance of travel, travel frequency, and mode choice. Specifically, researchers have demonstrated that residents of high-density, mixed land-use, and connected neighborhoods are less automobile-reliant, walking, cycling, and using transit more often to access daily destinations (Cao et al., 2009; Cervero & Murakami, 2010; Ewing & Cervero, 2010; Ewing et al., 2015; Frank, 2004; Handy, 2005, 2006) During the last two decades, many studies have focused on the influence of the urban built environment on motorized and non-motorized travel. One element of the built environment that shapes the nature of travel is density (whether measured as the concentration of population in a city or neighborhood, employment, dwelling units, or building floor area) (Cervero & Kockelman, 1997, pp. 199–219; Ewing et al., 2015) Residents in more dense neighborhoods are more likely to select non-motorized travel when compared to residents living in less dense neighborhoods (Chatman, 2009; Ewing et al., 2015). Increased job concentrations within a short driving distance also contribute to lower daily household VMT (vehicle miles traveled) and increased transit use (Cervero & Kockelman, 1997, pp. 199–219). In addition, greater commercial land use concentrations are also associated with fewer non-work automobile trips (Boarnet & Crane, 2001). Researchers have also used 'diversity measures' _as an alternative built environment indicator option in the study of urban form and travel (Boarnet & Crane, 2001; Cao et al., 2009; Cervero & Kockelman, 1997, pp. 199–219; Ewing & Cervero, 2010; Ewing et al., 2015; Frank & Pivo, 1995). Previous research has found links between diversity measures and travel, with diverse land uses mainly commercial concentrations, being significantly associated with less frequent trips, shorter miles of automobile travel (Boarnet & Crane, 2001; Ewing et al., 2015), and more frequent walking trips (Ewing & Cervero, 2010). The 'New Urbanism' and 'Smart Growth' (in the US) and 'Compact City' (in Europe) movements are trying to re-assess how to build and/or re-build our cities. The campaign is to bring residents closer to destinations and provide viable alternatives for achieving lower carbon-based travel patterns. The idea is that neighborhoods and cities, more generally, can be designed to change travel behavior. Proponents of this program argue that, among other benefits, increased pedestrian activity will reduce the adverse impacts of automobile travel while stimulating more significant public interaction and a higher quality of life overall.

Walking may be considered one of the most sustainable and democratic ways of travelling within a city, thus providing benefits to pedestrians a the urban environment. Besides, walking is also one of the means of transport most likely subjected to factors outside an individual's control, like social or physical abilities to walk and the presence of comfortable and safe street infrastructures and services. Therefore, improving urban conditions provided to pedestrians has positive impacts on walkability. At the same time, technological solutions and innovations have the power to encourage and support people to walk by overcoming immaterial barriers due to a lack of information or boring travel, and they give to decision-makers the possibility to gain data to understand how and where people travel.

Boston's transportation system is a crucial component of the city's economy and daily life for its residents. The city of Boston has been taking

initiatives to improve its transportation infrastructure and increase accessibility to public transportation for all its residents. The Fairmount Line, which runs through the neighborhoods of Dorchester, Mattapan, and Roxbury, has been a focus of several studies and projects aimed at improving transportation equity in the area. Ongoing efforts, such as the Fairmount Indigo Planning Initiative and the Fairmount Line Improvement Coalition, aim to improve economic opportunities in these areas. However, transportation equity remains a challenge for these neighborhoods, as they have lower accessibility to bus stops and fewer reliable bus routes than other parts of Boston. This transportation equity gap creates difficulties for residents to access essential services such as healthcare, education, and employment. Initiatives such as the Complete Streets program and the Better Bus Project aim to improve accessibility to bus stops, adding new bus lanes, sidewalks, and pedestrian crossings and signals. Neighborhood-specific plans, such as the Upham's Corner TOD Plan, also seek to improve access to transit in the area.

Despite the challenges, public transportation remains a vital mode of commuting for many workers in Boston, with 34% of workers in the city using it to commute to work. The percentage of workers who use public transportation is higher than the national average, indicating the importance of public transport in the city. However, the average commute time in neighborhoods along the Fairmount Line, such as Dorchester and Mattapan, is longer than the citywide average, indicating a need for continued efforts to improve transportation equity in these areas.

Transportation Equity

If we analyze the transportation in the city via public transport, It may be a railway, bus, or any other public transit, even though it is important to consider users, coverage, timing, and frequency, although equity analysis is most crucial. Even though it is supposed to be addressed, it must be addressed thoroughly, or no such tool directly measures transit equity in the region.

Equity in transportation seeks fairness in mobility and accessibility to meet the needs of all community members. (Federal Highway Administration's environmental justice website). There are two types of equity measures: vertical and horizontal. (Di Ciommo Shiftan, 2017; Romero Lankao and Nobler, 2021; Verlinghieri and Schwanen, 2020) Vertical equity in transportation should be affordable to all whereas horizontal equity should be served equally to all. Horizontal equity is most concerned about how everybody could benefit from transit service.

The Boston Region Metropolitan Organizations (MPO) Long Range Transportation Plan (LRTP) , Destination 2050, mainly focuses on the region's growth and long-term vitality for over 20 years. It is federally mandated Title VI and Environmental Justice analysis in the Boston region MPO's Destination 2040 plan, which ensures that transportation needs for disadvantaged populations are met. The MPO's LRTP plans Needs assessment has consideration for identifying the needs of such people. The Boston Region MPO's usually considers Transportation Equity Populations as follows: (Boston MPO's Destination 2050)

- People who identify as minority
- People with Limited English Proficiency
- People with Disability
- People aged 75 years or older
- People aged 17 years or younger
- People with low-income households or transit-dependent households.

In conclusion, the interplay between travel behavior, urban form, and transportation equity in the City of Boston. The emphasis on high-density, mixed land-use, and connected neighborhoods, as well as the promotion of sustainable modes of transportation, aligns with the goals of movements like 'New Urbanism' and 'Smart Growth.' Boston's ongoing initiatives, such as the Fairmount Indigo Planning Initiative and the Complete Streets program, demonstrate the city's commitment to improving transportation equity, particularly in historically underserved neighborhoods. However, challenges persist, necessitating continuous efforts to enhance accessibility and reduce commute times. As cities worldwide grapple with the complexities of urban mobility, the lessons learned from Boston's experiences underscore the importance of fostering equitable transportation systems that cater to the diverse needs of all community members.

Background and Context

Boston Transit History

The history of Boston is an integral part of the history of the United States as a country. Boston is one of the most historic towns in Massachusetts. It is considered the birthplace of the American Revolution because so many groundbreaking historical events took place there. Early Boston was a hilly peninsula initially inhabited by the Massachusetts tribe of Native Americans who have lived there since 2400 BC. In the 1600s, Boston was a mere peninsula where residents would walk through Roxbury, Cambridge, Malden, and Brighton. In 1631, Thomas Williams initiated the first chartered transit service in the United States, a ferry connecting the Shawmut Peninsula (present-day North End) and Charlestown. Boston continued to grow despite smallpox outbreaks in 1690, 1702, and 1721. The city had over 13,000 residents by 1730. By 1750, Boston's population had risen to 15,000 people. People could afford horse and carriage during these times, but transit became more important and prominent. By the 1800s, the Omnibus, a redesigned stagecoach with predetermined routes, gained popularity, although Boston's bumpy streets made for a less comfortable ride. During the early nineteenth century, Boston grew from a small town of 25,000 to a bustling urban center of approximately 93,000. [1]

Through such a dramatic increase in its population, redevelopments within Boston became necessary as massive amounts of European immigrants continually flooded into the city in search of new opportunities. Although housing became a major issue during the nineteenth century, through the growing popularity of slums and sprawl, developing new living areas and redesigning old residencies and the other regions within the city played a significant role as Boston transitioned from a colonial town to an urban metropolitan. In the late 19th century, Boston experienced a landscape expansion and growth from the annexation of towns, the park system's development, and the transit system's construction. The late 19th century witnessed the creation of the Tremont Street subway in 1897, North America's first subway tunnel, which still connects Government Center, Park Street, and Boylston stations. The Boston Elevated Railway Company (BERy), formed in 1897, played a significant role until financial struggles in 1918 led to the formation of the Massachusetts Bay Transportation Authority (MBTA) in 1947. The MBTA absorbed BERy and oversaw significant modernization projects, with the federal government's support through the Urban Mass Transportation Administration (UMTA). Concerns over gas shortage, air quality, and congestion in the 1970s led to the increased popularity of MBTA with over 300,000 riders. (MBTA, History of T)

The Massachusetts Bay Transportation Authority (MBTA) was established in 1964, integrating various railroads into a comprehensive public transit system serving 78 municipalities. The 'T' became the first combined regional transit system in the U.S. One of the most significant chapters in Boston's transportation history is the Central Artery/Tunnel Project, famously known as the Big Dig. This ambitious undertaking, spanning several decades and completed in the early 2000s, aimed to alleviate traffic congestion by rerouting the elevated Central Artery underground. The Big Dig modernized the city's infrastructure and redefined its skyline. Notably, as of 2021, the MBTA is the largest American transit agency using 100% renewable electricity. (MBTA, History of T)

In recent years, Boston has been proactive in addressing transportation equity. Initiatives such as the Fairmount Indigo Planning Initiative and the Complete Streets program reflect the city's commitment to providing accessible and equitable transportation options for all residents. This historical overview highlights Boston's rich transportation legacy, from pioneering subway systems to transformative projects like the Big Dig. Understanding this history is crucial for contextualizing the city's current state of transportation and transit equity.

1 1880-1920: Transformation \| People, Places & Planning in Boston. (n.d.). People, Places & Planning in Boston. Retrieved February 13, 2013, from http://planningboston.org/eras/1880-1920

Background and Context

Imagine Boston 2030

Imagine Boston 2030 is Boston's first citywide plan in 50 years. Shaped by more than 15,000 residents, a framework was created to preserve and enhance Boston. Imagine Boston identifies types of places for growth and enhancement. Today, Boston can be considered three distinct types of places: existing neighborhoods, the commercial core, and edge areas. Imagine Boston 2030 has set the following goals to guide implementation and evaluate success:

- Encourage affordability, reduce displacement, and improve quality of life.
- Increase access to opportunity.
- Drive inclusive economic growth.
- Promote a healthy environment, prepare for climate change, and
- invest in open space, arts and culture, transportation, and infrastructure.

Imagine Boston responds to the pro¬jections that Boston is on track to surpass its 1950 peak population of 801,000 and have a highly productive labor force of more than 900,000 workers by 2050. This growth is a remarkable achievement for a city that, like much of the northeastern United States, was in decline in the latter half of the twentieth century. It is a testament to the talented residents, businesses, and institutions that have created Boston's twenty-first-century solid economy. To house Boston's growing population and reducepressure on the housing market, Boston must add tens of thousands of housing units. To create new jobs and strengthen career pathways, Boston can encourage the growth of diverse new spaces to work, from labs for the growing biotech sector to commissary kitchens for food production. This new growth can also be essential in stitching together neighborhoods and supporting investment in main streets, parks, and transportation. Boston's continued growth allows the city to channel this momentum to serve all Bostonians.

Imagine Boston outlines ways to guide development, expand economic opportunities, prepare for climate change, and prevent displacement. (City of Boston. Go Boston 2030) The Enhancing Neighborhoods initiative seeks to improve the public realm, strengthen neighborhood services and connectivity, and encourage contextually sensitive development to improve urban vitality and affirm each neighborhood's distinct identity. This plan sets a vision for Boston in 2030: a city where Bostonians live in vibrant neighborhoods, where all residents can participate in the city's economic growth, and where one of our most significant resources—our waterfront—can thrive. To achieve this vision, Imagine Boston identifies places for growth and enhancement that will help the city become more equitable, improve quality of life, and prepare for climate change.

Today, Boston can be thought of as three distinct types of places. Each area requires a customized approach to growth, enhancement, and preservation responsive to the city's existing and varied fabric.

1. Enhance Neighborhoods

Improve the public realm, strengthen neighborhood services and connectivity, and encourage contextually sensitive development to improve urban vitality and affirm each neighborhood's distinct identity.

2. Encourage a Mixed-Use Core

Continue to encourage dense, walkable, mixed-use development and public realm improvements to foster a core where more people live, work, and gather.

3. Expand Neighborhoods

Provide significant new mixed-use housing and encourage job growth in transit-accessible areas at the edges of existing neighborhoods to reduce housing-price pressure, expand access to opportunity, and stabilize the city's physical fabric.

Background and Context

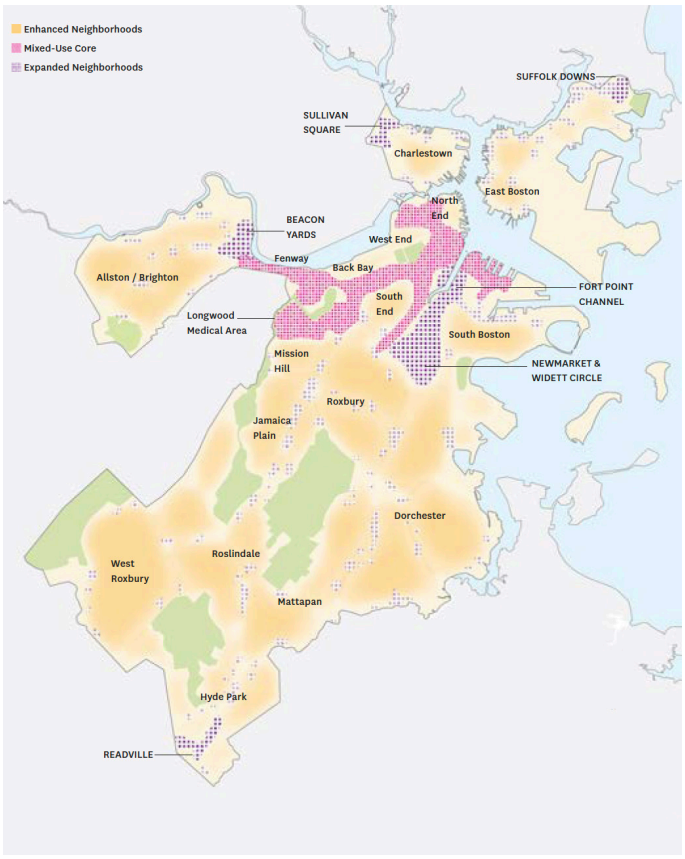


Figure 1: Enhance Neighboehoods, Mixed-use Core, and expanded Neighborhoods (Source: Imagine Boston 2030, 2016)

Go Boston 2030

Go Boston 2030 is an initiative of the Boston Transportation Department with collaboration and input from a mayoral advisory committee, other city departments, state agencies, a team of consultants, community organizations, and advocacy partners. Go Boston 2030 envisions a city in a region where all residents have better and more equitable travel choices and efficient transportation networks foster economic opportunity. The city has taken steps to prepare for climate change. The mobility demands and range of transportation choices within Boston have always been unique, serving the needs of Boston's residents and a larger metropolitan region as a job hub of New England. Changes in population density and demographics, income and wealth disparities, new kinds of employment clusters, sea level rise, responses to climate change, and disruptive technologies are creating new pressures on Boston to provide a fresh set of solutions to a new set of trends and challenges. (City of Boston. 2017)

Fairmount Planning Initiative

The Fairmount Line is the only Massachusetts Bay Transportation Authority (MBTA) commuter rail branch serving Boston through downtown, South Boston, Roxbury, Dorchester, Mattapan, and Hyde Park neighborhoods. (Boston Planning and Development Agency) The goal of the BRA's Fairmount Indigo Planning Initiative was to identify ways the City of Boston could address the critical need for economic growth and physical improvement along the Fairmount Line.

Through the planning initiative, the BRA considered short- and long-term strategies for encouraging public realm improvements and increasing job access and capital investment along the corridor. Over three years, the BRA completed a corridor plan and studies of the Upham's Corner, Four Corners/ Geneva Avenue, and Blue Hill Avenue station areas. The Fairmount Line opened in January 1855 as part of the Boston and New York Central Railroad "Midland Railroad." (KKO et al., 2002) The Town of Dorchester filed an injunction within six months of the line's opening that halted the trains until the railroad removed all grade crossings in Dorchester. Passenger service was abandoned on the line in 1944 after competition from other transit modes reduced ridership, but freight operations continued to use the line.

In 1979, construction along the southwest Corridor that runs from Back Bay Station to Forest Hills Station through the Back Bay, South End, Roxbury, and Jamaica Plain neighborhoods of Boston led the MBTA to restore passenger service on what is now the Fairmount Line when trains headed to South Station were redirected through Dorchester. (KKO et al., 2002) Infrastructure along the Dorchester Branch right-of-way was upgraded to accommodate the renewed passenger service. The MBTA considered the Dorchester Branch a temporary assistance, and most passenger services were reassigned to the Southwest Corridor in 1987 upon completion of the Southwest Corridor project, which developed recreational facilities and open space by creating the Southwest Corridor Park and providing mass transit by relocating the Orange Line along the Southwest Corridor. However, in spite of the MBTA's intentions, public sentiment pushed for continued Dorchester Branch service. (KKO et al., 2002)

Background and Context

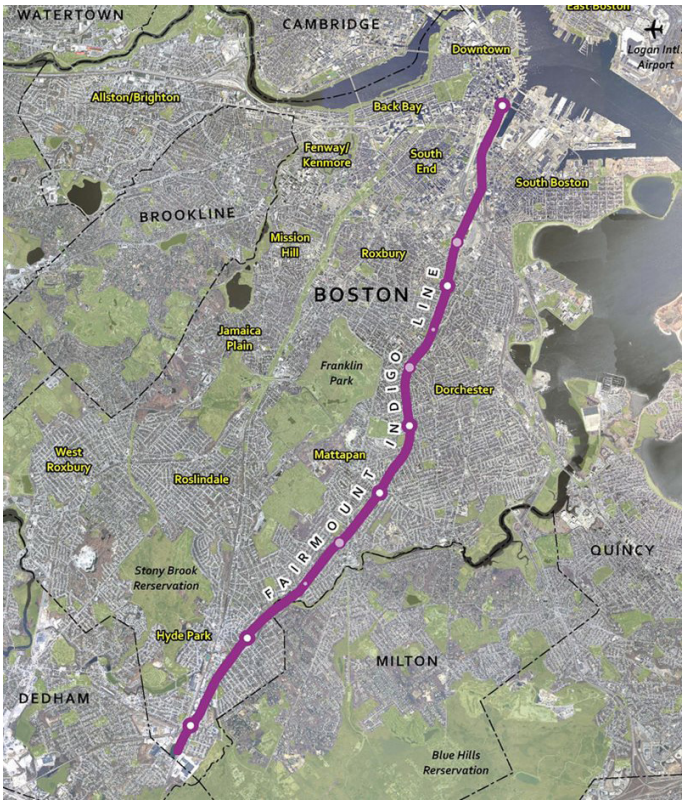


Figure 2: Fairmount Line Initative (Source: Fairmount Indigo Planning Initiative | Boston Planning & Development Agency)

In response, MBTA Railroad Operation designed the "Fairmount Line" as a rail-based shuttle service between Readville and South Station to replace the service rerouted to the Southwest Corridor. (KKO et al., 2002)

Accessibility to Fairmount Line

A walkability buffer around train stations is typically defined as the area within a 10-minute walking distance of the station, roughly equivalent to a half-mile radius or approximately 800 meters. However, the exact size of the buffer may vary depending on various factors such as the specific station, the surrounding neighborhood, and the level of pedestrian infrastructure in the area. A walkability buffer around train stations is important because it can influence the number of people who use public transportation. Studies have shown that people are more likely to use transit within walking distance and when there are safe and convenient pedestrian routes to the station. As a result, cities often prioritize improving pedestrian infrastructure within walking distance of transit stations to encourage more people to use public transportation and reduce reliance on cars.

A biking buffer along train stations is typically defined as the area within a 1-2 mile radius, or about a 15-30 minute bike ride, depending on the specific station, the surrounding neighborhood, and the level of biking infrastructure in the area.

A biking buffer around train stations is important because it can provide an alternative mode of transportation for people who live or work in the surrounding area. By providing safe and convenient biking routes to and from train stations, cities can encourage more people to use public transportation and reduce reliance on cars. Additionally, biking can be a faster and more affordable way to commute for some people, especially if they are traveling short distances or if traffic is congested.

Cities often prioritize improving biking infrastructure within biking distance of transit stations by creating dedicated bike lanes, shared use paths, and bike parking facilities near train stations to encourage more people to bike as a mode of transportation. This can help create a more connected and sustainable transportation system within a city.

Fairmount Green Neighborways

A nine-mile walking and biking route that parallels the Fairmount Indigo Line. (Go Boston, 2030) The Fairmount Greenway is a network of pedestrian and bicycle paths that connects neighborhoods along the Fairmount Corridor in Boston, Massachusetts. While the Fairmount Greenway has many benefits for the communities it serves, there are also some potential shortfalls to consider:

1. Limited coverage: The Fairmount Greenway only covers the area along the Fairmount corridor, which means the residents of the other neighborhoods in Boston may need access to the Greenway.
2. Equity Concerns: Even though Fairmount Greenway is designed to serve low-income communities and communities of color along the corridor, some residents may feel that the Greenway is not a fair use of resources because it does not address needs in the community, such as affordable housing or public transportation.
3. Maintenance challenges: The Fairmount corridor requires ongoing maintenance to remain safe and accessible for users.

4. Potential gentrification: The Fairmount corridor has been the subject of significant investment and redevelopment in recent years, which could lead to gentrification and displacement of longtime residents. While Greenway is intended to benefit the community, it may also contribute to this more significant trend if it attracts new, wealthier residents to the nearby area.

"A City of Neighborhoods"

Often called a "City of Neighborhoods," Boston has a unique physical structure.

1. Back Bay: Back Bay is one of the most well-planned neighborhoods in Boston, with a street grid designed in the late 19th century to create a beautiful, walkable environment. The neighborhood's signature wide boulevards, lined with elegant Victorian buildings, continue to be a model for urban planners worldwide.
2. Beacon Hill: Beacon Hill is one of Boston's oldest and most picturesque neighborhoods. It is known for its charming brick sidewalks, gas-lit streetlamps, and beautiful row houses.
3. South End: The South End is a trendy neighborhood with a vibrant arts scene, diverse dining options, and beautiful Victorian row houses.
4. North End: The North End is Boston's "Little Italy" and is known for its delicious Italian cuisine and narrow, winding streets.
5. West End: The West End was once a neighborhood of residential structures, shops, and commercial enterprises, an "urban village" much like the North Slope of Beacon Hill appears today. The urban renewal movement of the 1950s and 1960s razed the West End. In its place is the Charles River Park luxury housing complex, a self-contained mega-development that exemplifies Le Corbusier's "tower-in-the-park" urban design philosophy.
6. Jamaica Plain: Jamaica Plain is a diverse neighborhood in the southwest part of Boston, known for its beautiful parks, independent businesses, and community-driven culture.
7. Dorchester: Dorchester is a large neighborhood located in the southern part of Boston, with a mix of residential and commercial areas and a diverse population.
8. Charlestown: Charlestown is a historic waterfront neighborhood in Boston known for its charming brick homes and landmarks like the Bunker Hill Monument.

These are the most talked about and mentioned neighborhoods in the city. Boston has many distinct neighborhoods, each with its unique character and attractions.

From Boston's early days as a hilly peninsula inhabited by the Massachusetts tribe, through the transformative events of the revolution and industrial growth, Boston has witnessed significant changes. The city's population swelled during the 20th century, leading to challenges such as sub-urbanization and economic shifts. Boston has implemented visionary plans such as "Imagine Boston 2030" and "Go Boston 2030." These initiatives aim to guide the city's growth, enhance economic opportunities, and address pressing issues like climate change and transportation. The "Fairmount Planning Initiative" specifically targets economic growth and physical improvements along the Fairmount Line, recognizing the importance of public realm enhancements and job access. Recognizing and addressing the challenges and opportunities within these neighborhoods is crucial for creating a sustainable and inclusive urban environment. The lessons learned from Boston's history and ongoing initiatives provide valuable insights for urban planning and development projects, contributing to creating a more resilient and vibrant city.

Data and Methodology

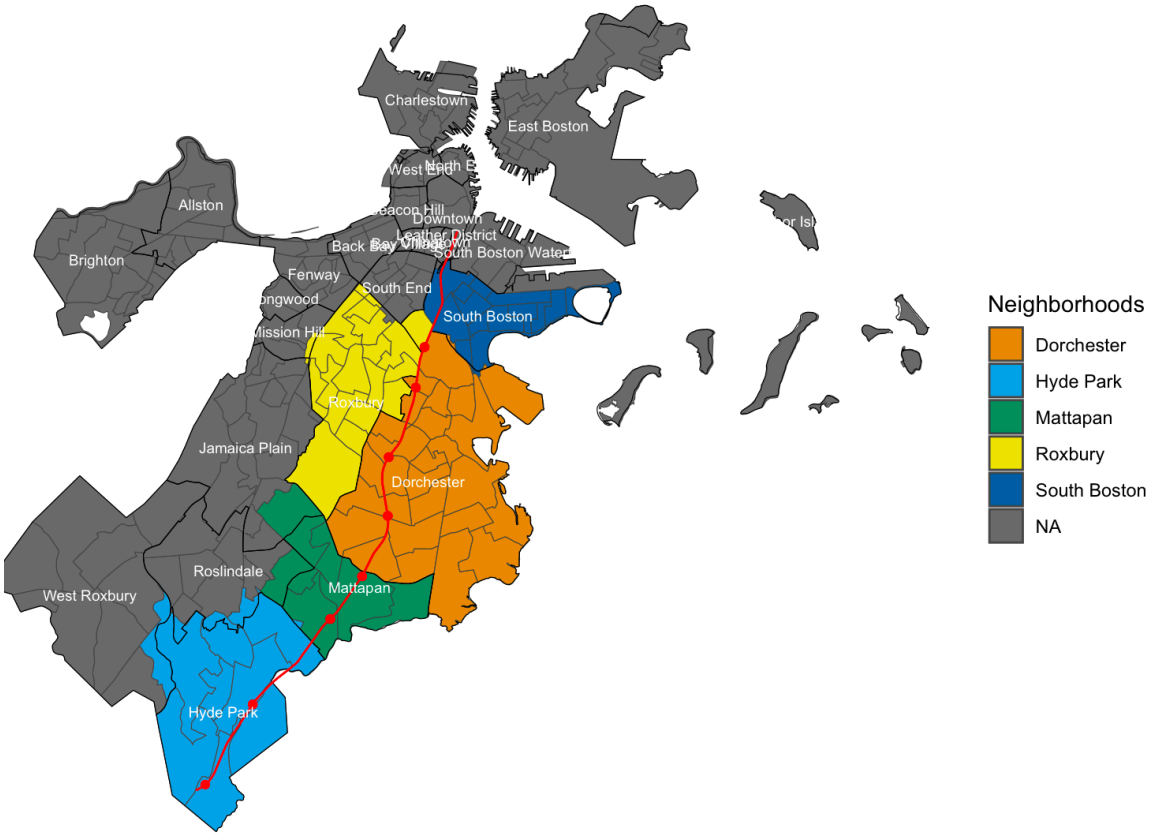


Figure 3: Neighborhoods along Fairmount Line Corridor in Boston (Source: Author)

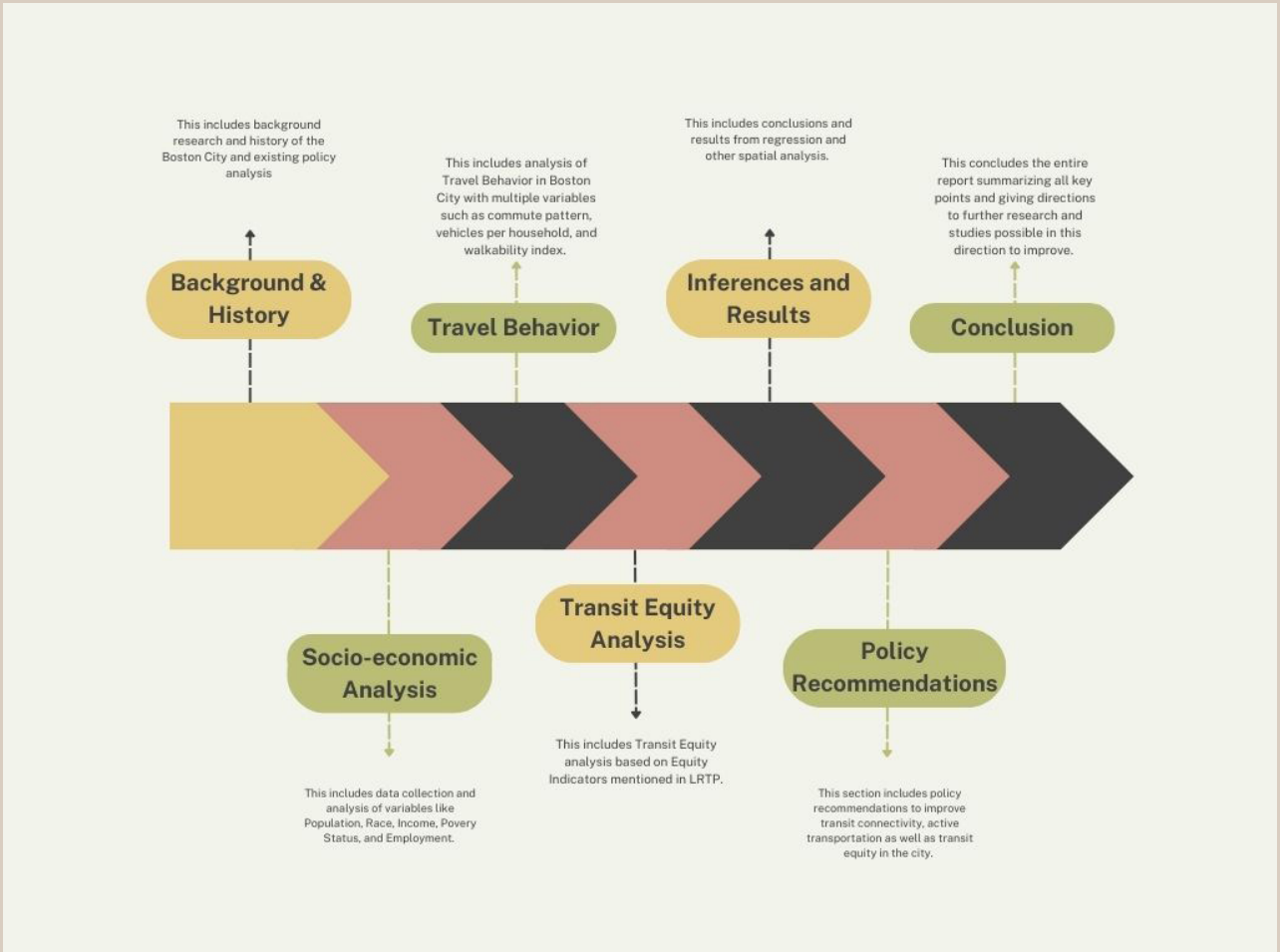
Data

1. U. S. Census 2021 (https://www.census.gov)
2. MassGIS Data: MBTA Rapid Transit (https://www.mass.gov/info-details/massgis-data-mbta-rapid-transit)
3. MassGIS Data: MBTA Bus Routes and Stops (https://www.mass.gov/info-details/massgis-data-mbta-bus-routes-and-stops)
4. Boston Open data (https://bostonopendata-boston.opendata.arcgis.com/datasets/boston::boston-neighborhood-boundaries-approximated-by-2020-census-block-groups/about)
5. Replica season trip tables (https://studio.replicahq.com)
6. EPA Smart Location Database (https://www.epa.gov/smartgrowth/smart-location-mapping)

Data and Methodology

The data used for this study is a combination of multiple datasets used to create a database for Boston, Suffolk County. To evaluate the possibility of unequal distribution towards transit accessibility, socioeconomic characteristics of the population are studied, and information for the year 2021 was gathered from the 5-year American Census Survey at the tract level. All the analysis and visualization is done in R-studio software. The variables included in the socio-economic analysis are population, race, income, poverty status, employment, and foreign-born people. Transportation variables from ACS are used to analyze travel behavior, such as commute patterns, vehicles per household, and commute time. The Massachusetts open GIS portal has been an excellent resource for extracting all the data related to MBTA rapid transit routes and stops, MBTA bus routes, and holidays, which was used to plot railway lines and calculate the number of bus stops at the tract level.

The walkability index was calculated using EPA's Smart Location Database (SLD), which provides a calculated walkability index. The SLD database also provides data on several jobs available within 45 minutes of transit commute. This SLD dataset is downloaded from the EPA's website and then joined with the ACS tiger line to get the shapefile and perform data analysis and visualization in R-studio. Then, Transit equity variables are extracted from ACS, but variables are followed as per Boston Region MPO's LRTP, Destination 2040. Then Linear model is performed to check the if all the variables are statistically significant and discussion of overall result. This study, therefore, stands as a comprehensive exploration into the dynamics of transit accessibility and equity within the intricate tapestry of Boston's urban landscape.



Socio-Economic Analysis

This section includes an analysis of socioeconomic variables such as Population, Race, Income, Poverty Status, Foreign-Born Population, and Employment, which will elaborate on background and provide information about location with the help of visualizations below. This report tries to find answers for transit access to people living in neighborhoods all across Boston. This socio-economic analysis will help in understanding and analyzing demographic composition. Furthermore, this will help understand the pattern emerging from this composition if a particular neighborhood is underserved or has minority populations.

This section of the report comprehensively analyzes various socio-economic factors that significantly influence transportation access in Boston. This mainly includes critical variables such as Population, Race, Income, Poverty Status, Foreign-Born Population, and Employment. This section aims to understand the detailed background, which is explained with the help of visualizations. This socio-economic analysis will help understand and analyze demographic composition that may indicate transportation challenges, particularly in minority populations or transit-dependent populations.

Population and Population Change

This section explains the population and population change observed in Boston in 2021 and 2011. Figures 4 & 5 show that the population has substantially increased in 10 years. The population has risen peculiarly in the central part of Boston. Figure 6 explains the percent population change in 2011 and 2021, some tracts observed a decrease in population change in the darkest brown color, and some tracts in the central part showed substantial percent change.

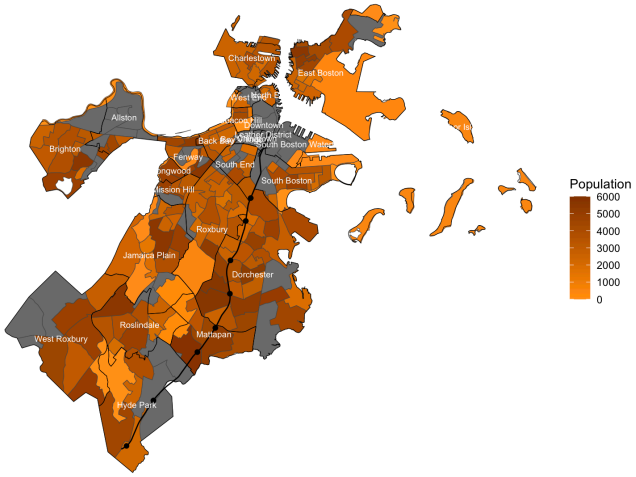


Figure 4: Total Population 2011 in Boston (Source: ACS, 2011)

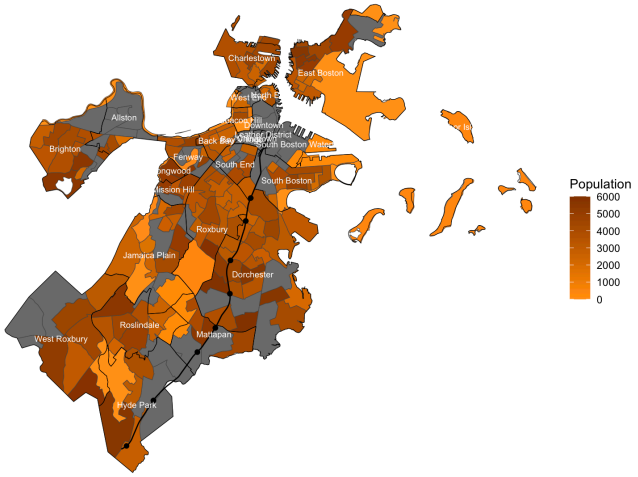


Figure 5: Total Population 2021 in Boston (Source: ACS, 2021)

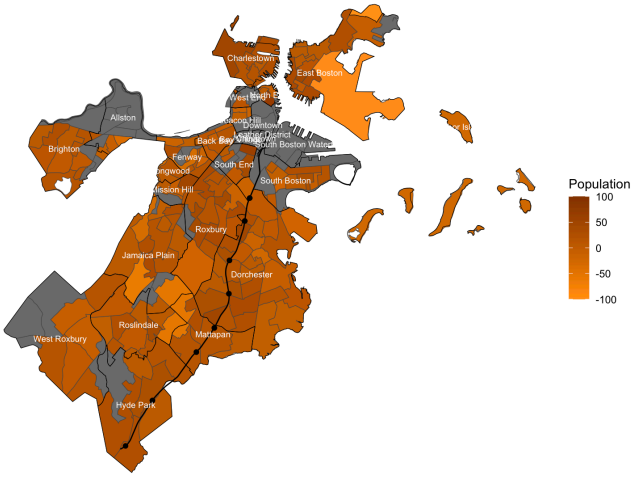


Figure 6: Population change in Boston City (Source: ACS, 2011 & 2021)

Socio-Economic Analysis

Race

This section explains the percent population by race for Boston city through figure 7. This includes the percent population by White, Black, Asian, Native, HIPI, and Hispanic ethnicities. Te figure shows that most of the population is White, followed by the Black population. The black population is majorly observed in central and southern tracts, whereas the Hispanic population is observed in similar tracts to the black population. Table 1 explains racial composition at the tract level by race in Boston city. As followed, three races are in the majority – White (48%), Hispanic (21.2%), and Black (17%).

Table 1: Racial Composition in Boston (Source: ACS, 2021)

Race	Tract Average Percent	Total Population
Asian	9.2	69,295
Black	17.0	151,743
HIPI	0	304
Hispanic	21.2	184,606
Native	0.2	1,387
Native	48.0	349,488

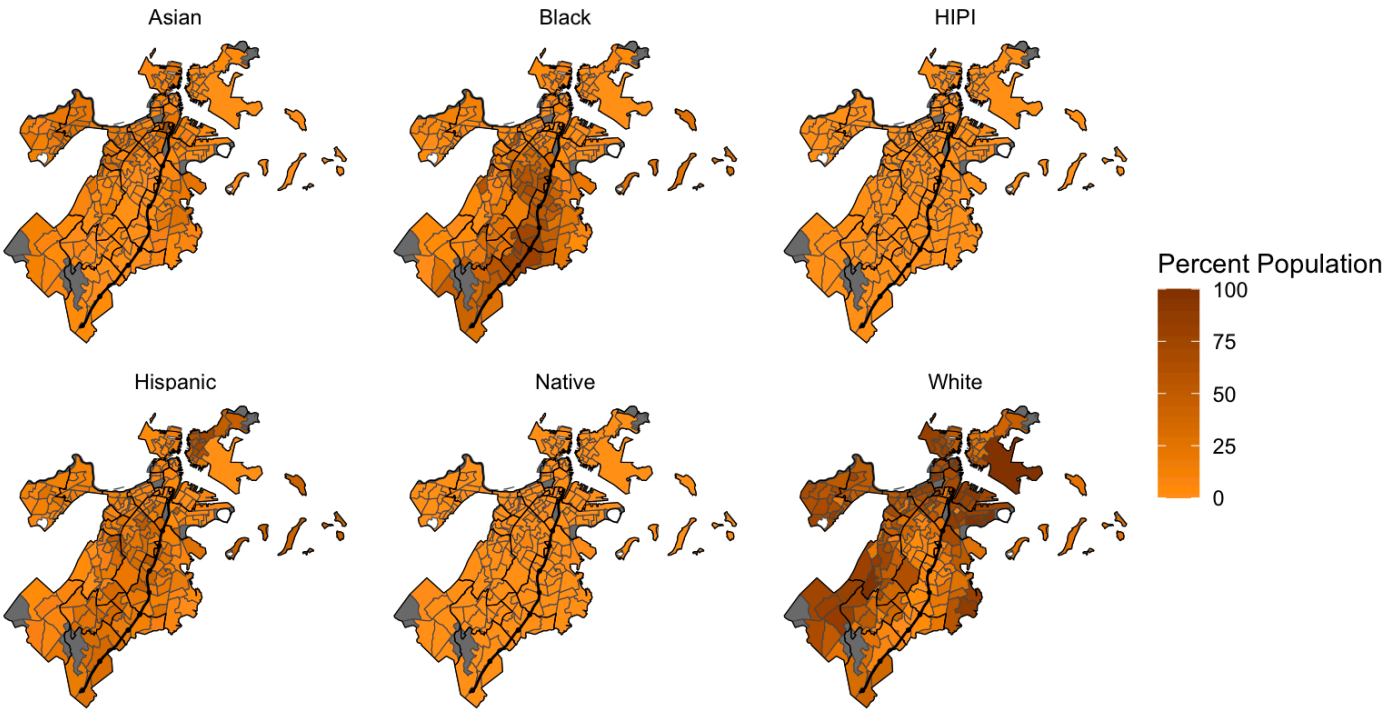


Figure 7: Racial Composition in Boston (Source: ACS, 2021)

Socio-Economic Analysis

Median Household Income

Figure 8 shows the median household income in Boston city. The median household income in Boston is $71.115, which is higher than the national median household income. As the figure shows, South Boston, Jamaica Plain, Charlestown, north end, beacon hill, and south end neighborhoods have above-average household income. At the same time, Dorchester and Roxbury have less than the median household income. Boston's lower-income households ar clustered in specific neighborhoods, many of them are observed along the Fairmount corridor. Median household income is a measure of the income of households in a specific area or population, calculated as the income that divides the income distribution into two equal groups, with half of the households earning more and half earning less. It's important to consider the distribution of median household income within different areas and buffers, as this can affect access to resources and services. For example, lower-income neighborhoods may have fewer resources and services available and more barriers to transportation or amenities. As a result, improving walkability and biking buffers in these areas can help to increase accessibility and mobility for residents, which can have positive social, economic, and health outcomes.

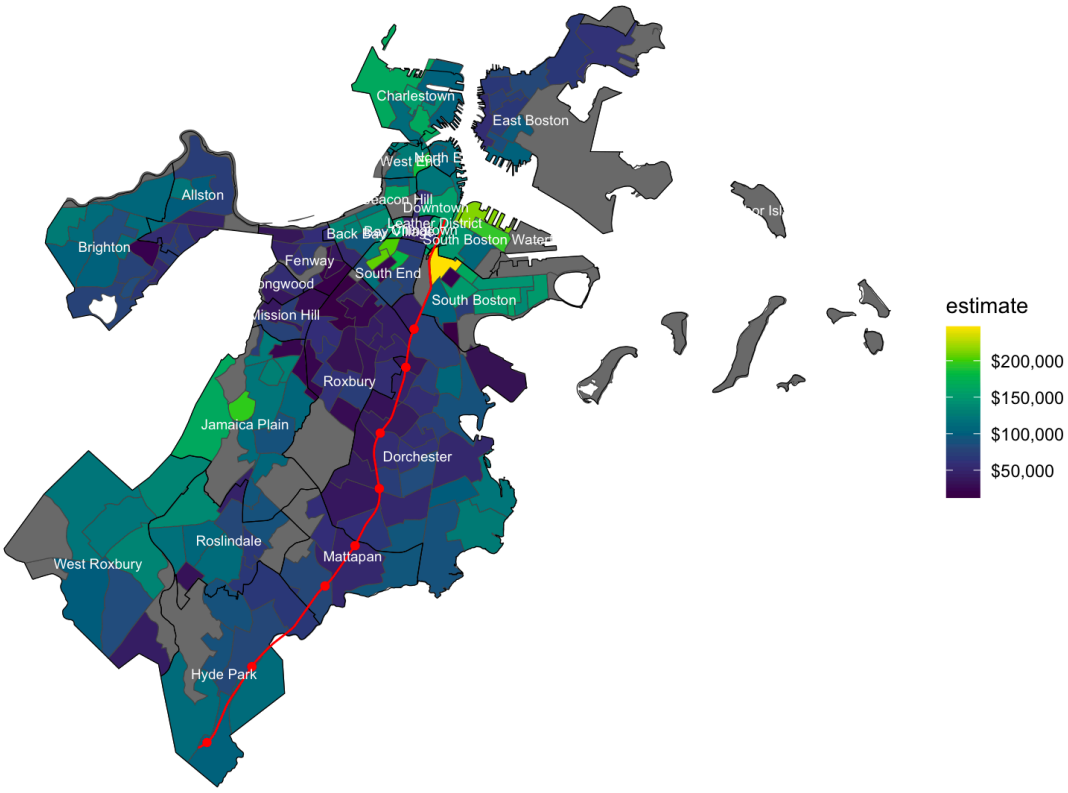


Figure 8: Median Household Income in Boston (Source: ACS, 2021)

Poverty Rate

According to the latest available data from the US Census Bureau, the poverty rate in the United States was 10.5% in 2019. This figure varies across different regions and cities, and Boston is no exception. As Figure 9 shows, poverty is a significant issue in Boston, with higher poverty rates in specific neighborhoods. The poverty rate in Boston in 2019 was 16.3%, which is significantly higher than the national average. This suggests that Boston faces unique challenges when it comes to reducing poverty and promoting economic opportunity for all residents. The factors contributing to the higher poverty rate in Boston and similar cities could include a higher cost of living, low-paying jobs, limited access to affordable housing, and limited access to education and job training opportunities. The neighborhoods with higher poverty rates in the city are – Roxbury, Dorchester, Mattapan, and East Boston.

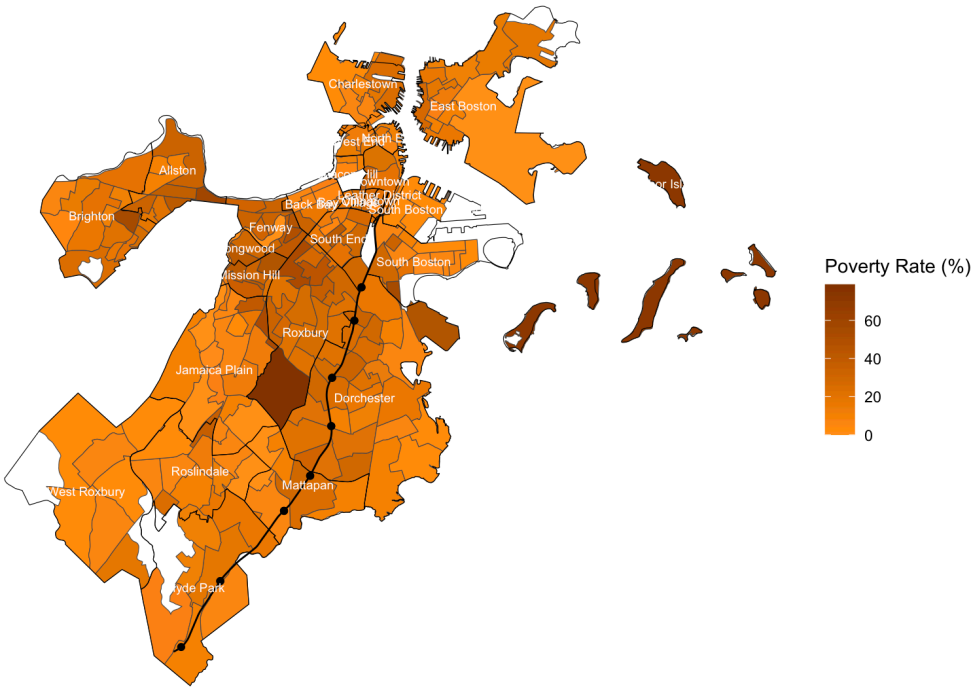


Figure 9: Poverty Rate in Boston (Source: ACS, 2021)

Foreign Born Population

In Figure 10, the representation of the percentage of the foreign-born population within the city of Boston is depicted. Notably, the data reveals that foreign-born residents constitute approximately 28 percent of the overall population in the city. Furthermore, it is worth acknowledging that Boston boasts a substantial international student population, with individuals enrolled in various universities and colleges contributing to the city's cultural diversity. This confluence of native and international residents reflects the cosmopolitan nature of Boston, enriching its social fabric with a tapestry of diverse backgrounds and experiences.

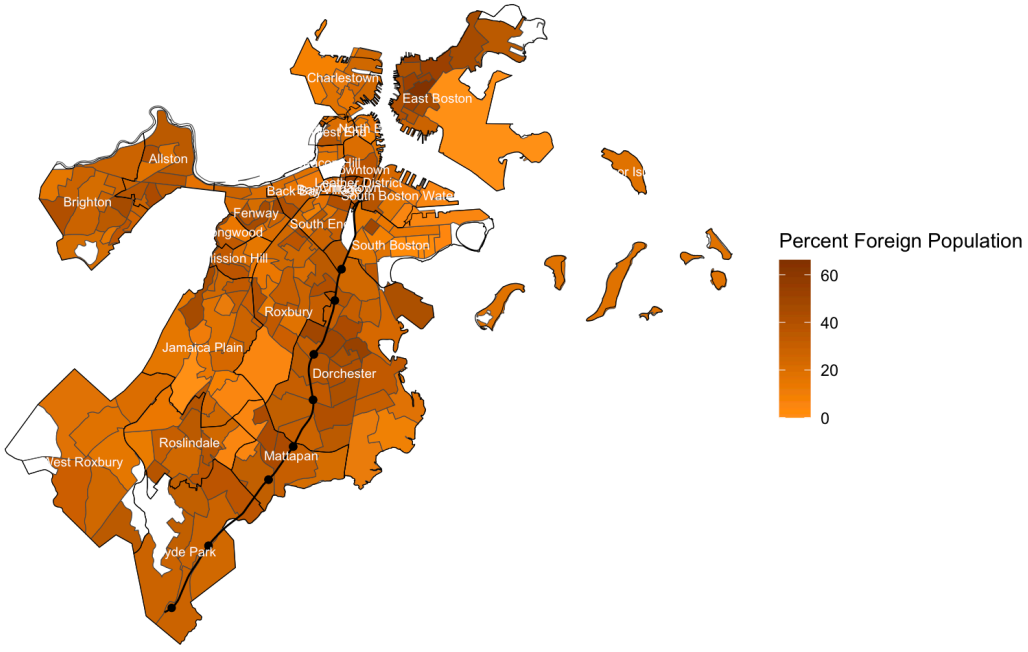


Figure 10: Foreign Born Population in Boston (Source: ACS, 2021)

Socio-Economic Analysis

Employment

The American Community Survey (ACS) provides data on various socio-economic indicators, including employment, for cities and towns across the United States. The "percent employment" data represents the percentage of the population aged 16 years and over who are employed in the civilian labor force. This includes those employed either full-time or part-time and those unemployed but actively seeking work.
In the case of Boston City, the percent employment data can provide insights into the overall health of the local economy and the job market. High employment levels suggest a strong job market and a growing economy, while low employment levels can indicate economic challenges and barriers to job growth. Policymakers, businesses, and individuals can use this data to make informed decisions about workforce development, job training programs, and other initiatives to improve the local economy and create new job opportunities. Figure 11 below shows the percent Employment in Boston City.

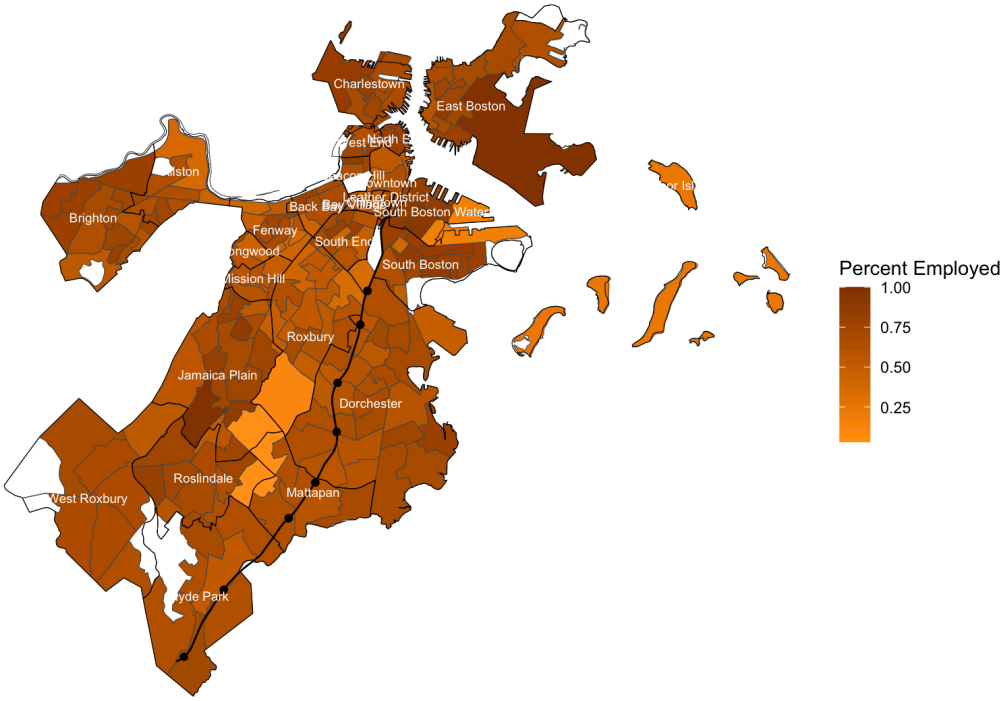


Figure 11: Percent Employed Population in Boston (Source: ACS, 2021)

This socio—economic analysis of Boston highlights dynamic shifts in demographics, income inequality, and concentrated poverty pockets. The visualization of the racial composition emphasizes the importance of nuanced policies, while income patterns underscore the necessity of targeted interventions, especially in economically diverse areas. The concentration of poverty in specific neighborhoods signals the urgency of initiatives to enhance economic opportunities and transit access. Understanding these factors is crucial for formulating an inclusive transportation strategy that accommodates the population's diverse needs. The focal points of poverty in specific neighborhoods indicate the immediate need for initiatives to improve economic prospects and transit accessibility. Recognizing the presence of Boston's foreign-born residents introduces a layer of cultural diversity that should be factored into transportation planning. The employment along the Fairmount Line corridor emphasizes its role as a minority hub, stressing the requirement for transit solutions designed to meet the specific requirements of these communities. Overall, the detailed socio-economic analysis provides a guide for developing fair and efficient transportation strategies that address the varied needs of Boston's inhabitants.

Travel Behavior in Boston

It is crucial to understand Boston's transportation landscape, which looks into who travels via public transit and transit accessibility. To examine this transportation pattern, commute patterns will unfold modes of transportation preferred by people. The analysis also involves accessibility by bus transit, travel times, and the National Walkability Index, which will give a holistic view of factors affecting transportation access and choices. This section also includes jobs within a 45-minute transit access and buffer analysis for transit commute, which provides in-depth understanding of transportation planning and equitable access in Boston. Understanding the commute patterns in Boston is important for transportation planning and policy decisions, as it can help identify areas that need more investment in public transportation infrastructure or other modes of transportation, as well as inform decisions about zoning and land use that can impact commuting behavior.

Commute Patterns

Figures 12 to 15 explains Commute Patterns in Boston City. The commute pattern in Boston varies across different neighborhoods and modes of transportation. According to the American Community Survey (ACS) data for 2021, about 44.4% of workers in Boston City commute using public transportation, 35.2% drive alone, 5.5% carpool, 5.9% walk, and 1.5% bike. The remaining 7.5% use other means of transportation or work from home. However, the commuting patterns vary widely across different neighborhoods in Boston. For example, some neighborhoods, such as East Boston and Chinatown, have a higher proportion of public transportation commuters. In comparison, other neighborhoods, such as West Roxbury and Hyde Park have a higher proportion of commuters who drive alone. While travel behavior varies across different cities in the United States, there are some general trends that can be observed in cities of a similar size to Boston. According to the US Census Bureau's American Community Survey data for 2019, the average commute time in cities with a population between 500,000 and 1 million people was 27.6 minutes. This is slightly longer than the average commute time in Boston, which was 27.2 minutes in 2019. In terms of mode share, the share of commuters who drive alone in cities of a similar size to Boston is typically higher than the share of commuters who use public transportation.

For example, in Seattle, another city with a population of around 700,000 people, only about 20% of commuters use public transportation, while around 53% drive alone. In San Francisco, a city with a similar population size to Boston and a well-developed public transportation system, around 34% of commuters use public transportation, while around 37% drive alone. However, it is important to note that travel behavior can vary widely even among cities of a similar size, and factors such as geography, demographics, and infrastructure can all influence commuting patterns. The Fairmount Line, one of the commuter rail lines in Boston, serves several neighborhoods with relatively low median household incomes, and the commute pattern along this line also varies.

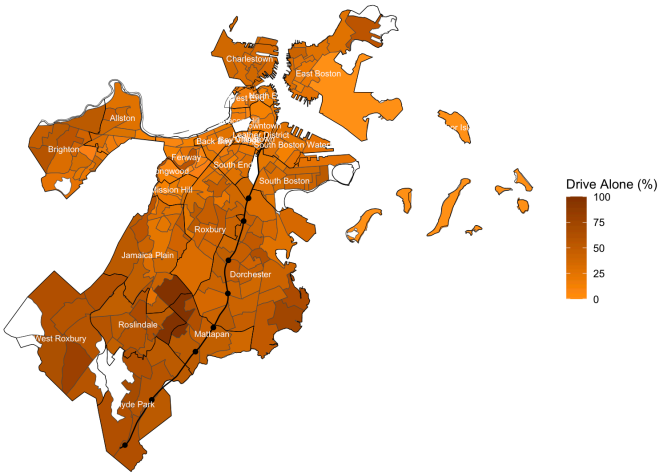


Figure 12: Drive Alone Percentage in Boston (Source: ACS, 2021)

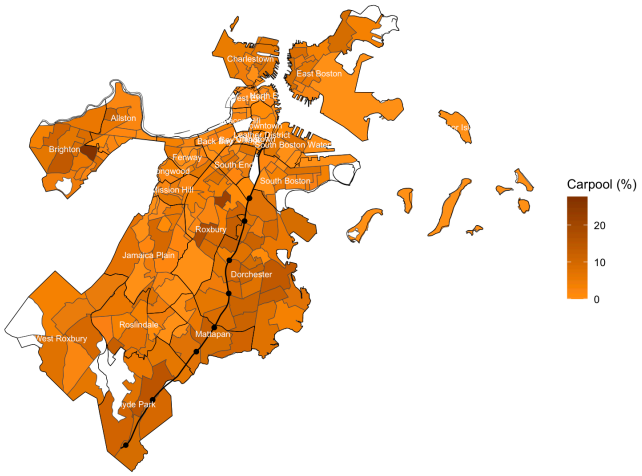


Figure 13: Carpool Percentage in Boston (Source: ACS, 2021)

Travel Behavior in Boston

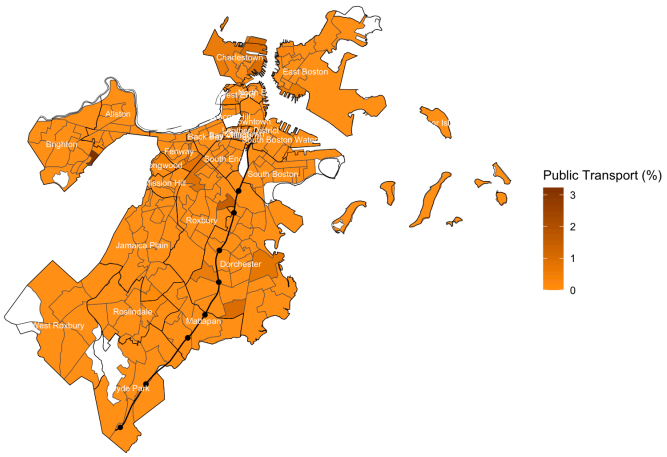


Figure 14: Public Transit User Percentage in Boston (Source: ACS, 2021)

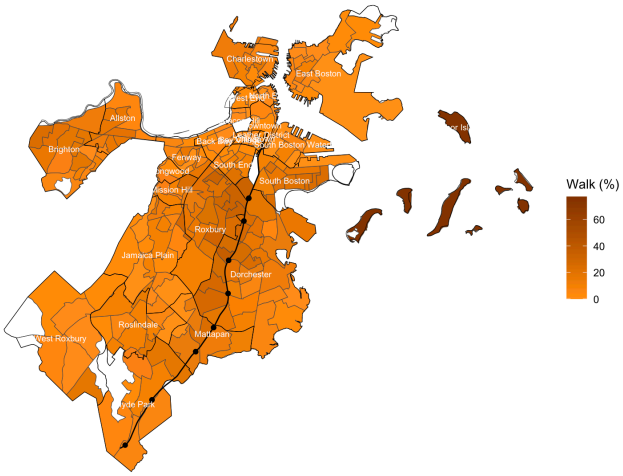


Figure 15: Walking Percentage in Boston (Source: ACS, 2021)

Bus transit

Accessibility to bus stops in Boston varies across the city, with some areas having better access than others. In general, bus stops tend to be more concentrated in densely populated urban areas, such as downtown Boston, and less common in suburban and rural areas. To improve accessibility to bus stops across the city, the Boston Transportation Department has implemented several initiatives. One such initiative is the Complete Streets program, which aims to create streets that are safe and accessible for all modes of transportation, including walking, biking, and public transit. This can include adding new bus lanes, improving sidewalks, and adding pedestrian crossings and signals.

Another initiative is the Better Bus Project, which seeks to improve the overall experience of using the bus system in Boston. This can include improving bus stop amenities such as benches and shelters, providing real-time bus arrival information, and optimizing bus routes to reduce wait times and increase frequency. In addition to these citywide initiatives, there are also neighborhood-specific efforts to improve bus stop accessibility. Figure 16 below shows bus stops per census tracts in Boston City.

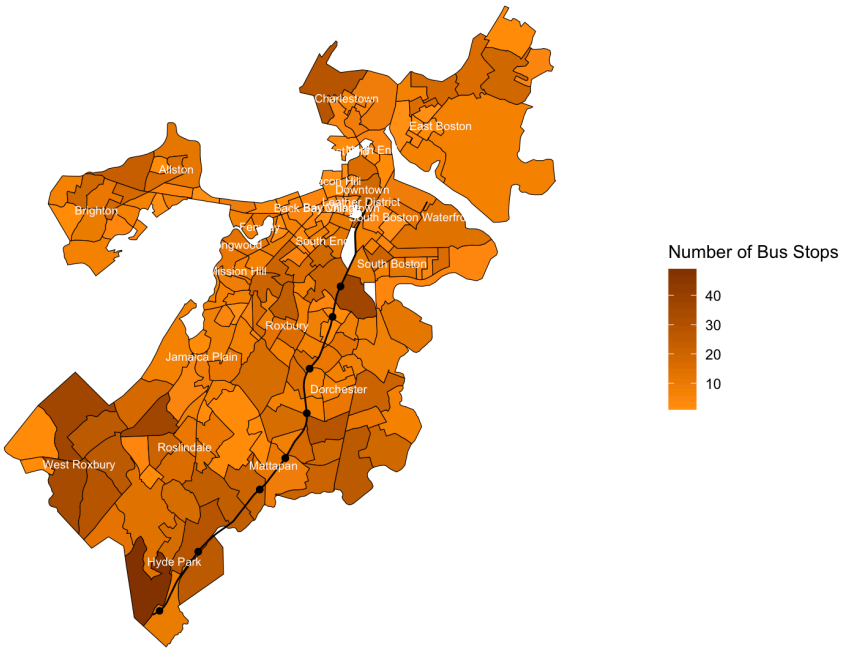


Figure 16: Number of Bus Stops in Boston (Source: ACS, 2021)

Travel Behavior in Boston

One of the major shortfalls in the accessibility of bus stops in Boston is that certain neighborhoods, particularly those with low-income residents and communities of color, have fewer and less reliable bus routes than others. It is observed that some of the neighborhoods along the fairmount corridor have less accessibility to bus stops. This creates a transportation equity gap, where people in these neighborhoods have a harder time accessing essential services such as jobs, healthcare, and education. Furthermore, some of the bus stops in Boston lack basic amenities such as shelters, seating, and lighting, which can make waiting for buses uncomfortable, particularly in inclement weather. This can be a significant barrier for people with disabilities, the elderly, and other vulnerable populations who rely on public transportation to get around the city. Additionally, the frequency and reliability of buses in Boston can be a challenge, especially during rush hour or inclement weather conditions. This can lead to longer wait times and more crowded buses, making it difficult for people to get to their destinations on time.

Commute Travel Time

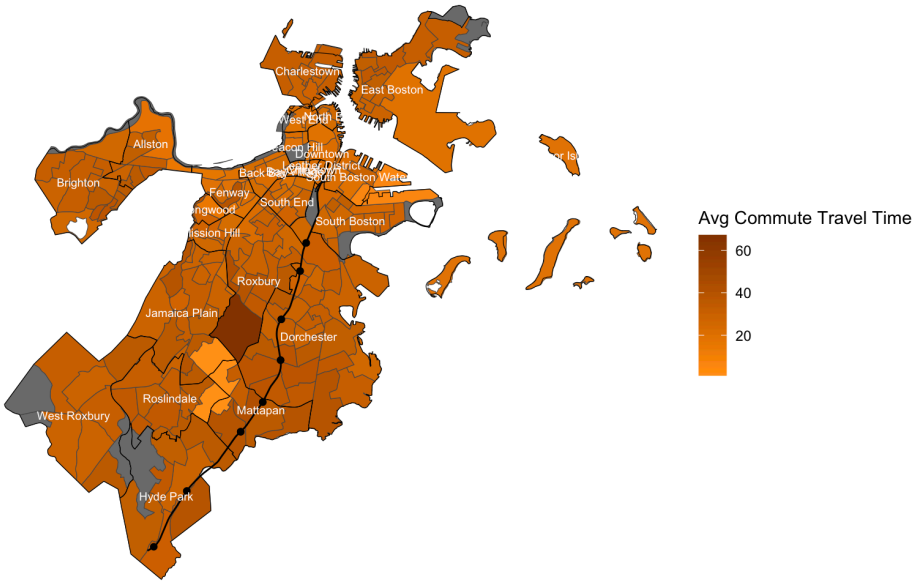


Figure 17: Average Commute Travel Time in Minutes in Boston (Source: ACS, 2021)

Figure 17 explains the average commute time in Boston city. The average commute times from Dorchester, Mattapan, and Roxbury in Boston City are important indicators of transportation equity, as these neighborhoods are predominantly composed of people of color and low-income residents. The average commute time in Dorchester is around 39 minutes, which is longer than the city-wide average of 33 minutes. The average commute time in Mattapan is around 42 minutes, which is also longer than the city-wide average. In Roxbury, the average commute time is around 34 minutes, which is close to the city-wide average. These longer commute times are often due to a lack of access to reliable public transportation and other transportation infrastructure and a lack of job opportunities in these neighborhoods. This can lead to a disproportionate burden on low-income residents, who may have to spend more time and money commuting to their jobs, as well as negative health impacts due to increased stress and exposure to air pollution. Improving transportation equity in these neighborhoods by increasing access to reliable public transportation, reducing commute times, and increasing job opportunities is essential for creating a more just and equitable society.

The percentage of workers in Boston who use public transportation to commute is a key indicator of the city's transportation efficiency and accessibility. Public transportation includes buses, trains, and subways, and it is an essential mode of transportation for many workers, especially those who do not own a car

or prefer not to drive. According to the American Community Survey (ACS) data from 2021, about 34% of workers in Boston used public transportation to commute to work. This percentage is higher than the national average, around 5%. This highlights the importance of public transportation in Boston as a means of commuting for a large number of workers. The availability of public transportation in Boston significantly affects the percentage of workers who use it. Figure 18 below explains the percentage of workers with public transportation in the city. It can be observed that a comparatively higher percentage of people from Dorchester, Mattapan, and Roxbury neighborhoods use public transportation as a mode of their transport.

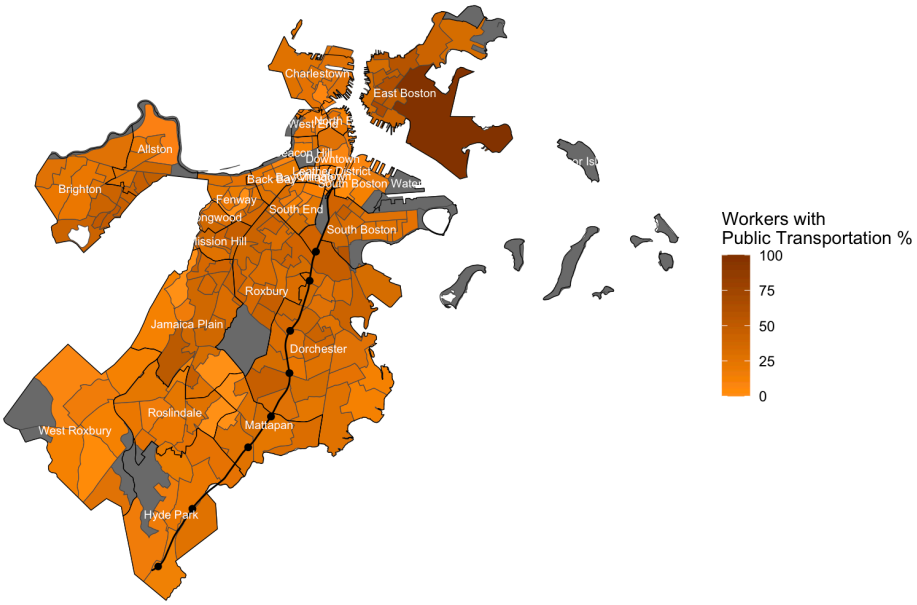


Figure 18: Percentage of workers using Public Transportation in Boston (Source: ACS, 2021)

Vehicles in Household

Figures 19 and 20 below show the percentage of one-vehicle and two-vehicle households in the city. Having at least one vehicle per household shows that one person is auto-dependent from the family. Having two cars per household also clarifies the home's income, travel choice, and home choice location. It is crucial to have strategies that address traffic congestion and enable efficient transportation. Increasing toll lanes and vehicle lane capacity and adding enough transit corridors to job locations must be focused. An increase in auto-oriented mode choice can also be improved with high-occupancy-vehicle lanes.

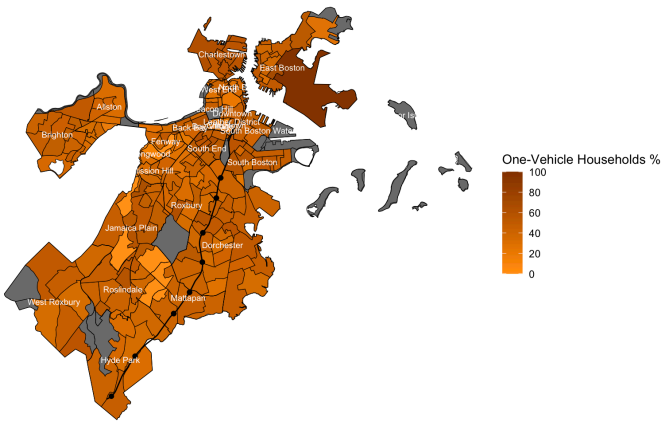


Figure 19: Percent of One-Vehicle Household in Boston (Source:ACS, 2021)

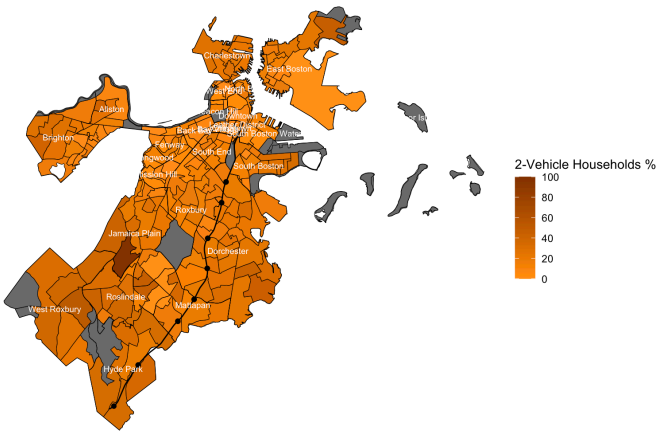


Figure 20: Percent of Two-Vehicle Household in Boston (Source: ACS, 2021)

National Walkability Index

The release of the 2.0 version of the SLD, multiple variables were used to create a National Walkability Index. Walkability is a composition of the built environment that influences the walking conditions and likelihood of walking. The National Walkability Index was intended to help address the issue of walking and walking conditions to enable users to use walking as a mode of transportation. (Ramsay & Bell, 2014) To create a walkability index, multiple variables were used and combined into an index as follows:

Employment and Household Entropy [D2A_EPHHM],
Static eight-tier Employment Entropy [D2b_E8MIXA],
Street intersection density (weighted, auto-oriented intersections eliminated) [D3b],
Distance to nearest transit stop [D4b]
These variables contribute to built environment characteristics that support and enhance walking conditions. All Census block groups are assigned values from 1 (lowest walkability) and 20 (highest walkability). (Ramsay & Bell, 2014). The walkability scores are categorized as below:

1.0 – 5.75	Least Walkable
5.76 – 10.50	Below Average Walkable
10.51 – 15.25	Above Average Walkable
15.25 – 20.00	Most Walkable

Figure 21 shows the walkability index in Boston City. It is observed that Boston is walkable primarily in the majority of the areas. Some areas in Jamaica Plan and West Roxbury could be better walkable even though most neighborhoods and tracts along the Fairmount corridor seem walkable. It is difficult to determine whether they are used for work or longer commutes. It is also possible that infrastructure is available for walking, and people use it to reach railway stations, or bus stops for further commutes.

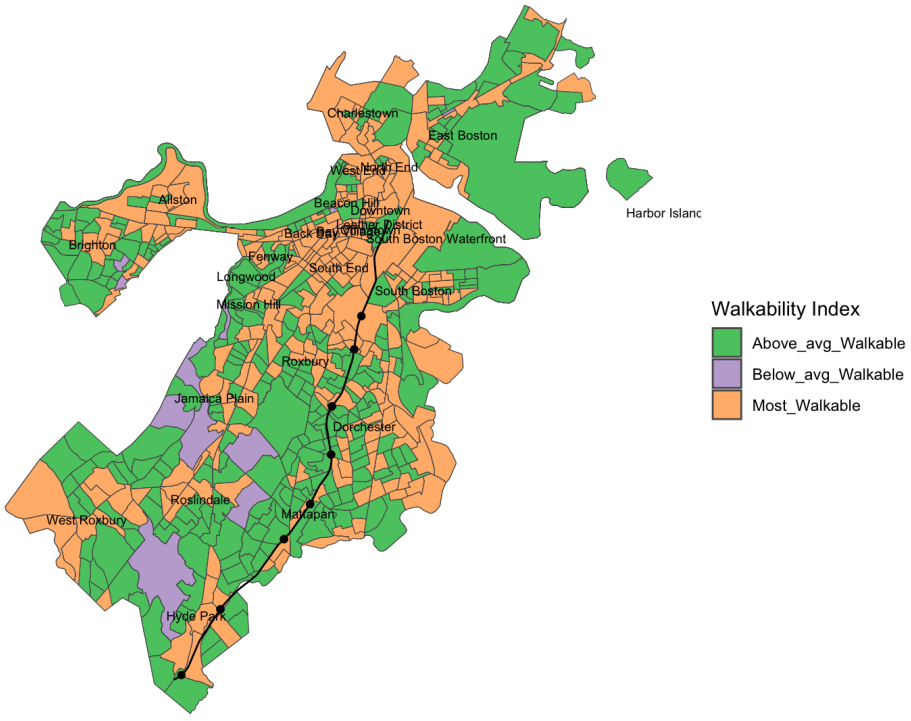


Figure 21: Walkability Index in Boston (Source: EPA's Smart Location Database)

Jobs within a 45 minute Transit Commute

There is uneven distribution and investment in Boston's transit system across many neighborhoods. Uneven distribution of the transportation system results in uneven distribution to specific communities. Infrastructure improvements are needed in neighborhoods with poor transit access and high housing prices. Neighborhoods like Dorchester, Hyde Park, and Mattapan cannot access transit. Daily bus and train trips are expected to increase by a third, from approximately 500,000 to 675,000. (Go Boston, 2030) The South Boston Waterfront Sustainable Transportation Plan shows an increased need for transit capacity in the Seaport and Downtown's transit hubs. Residents in neighborhoods like Mattapan, Hyde Park, and Dorchester prefer public transit for work. Adding new rail, rapid bus lines, and even local bus networks is important to increase public transit usage and achieve last-mile connectivity. Figure 22 below shows many jobs within a 45-minute transit commute. This data is extracted from EPA's Smart Loation Database. As observed in the figure below, You can see that the majority number of jobs are located in downtown, so there is a need to have robust connectivity to downtown or areas with the highest number of jobs.

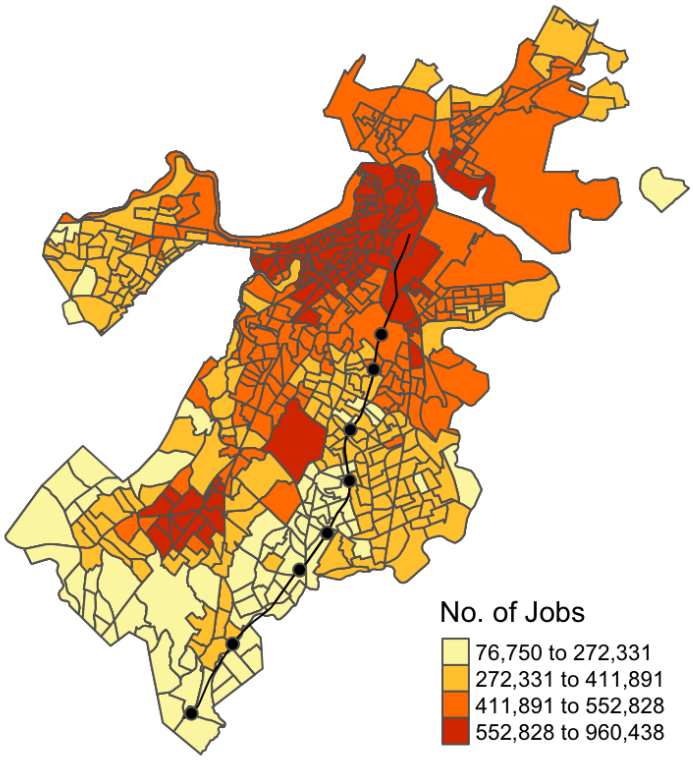


Figure 22: Jobs within a 45 minute Transit Commute in Boston (Source: EPA's Smart Location Database)

Buffer Analysis for Transit Commute

Figure 23 & 24 illustrates the transit coverage in Boston provided by three public transportation systems: MBTA Bus, MBTA Rapid Transit and MBTA Commuter Rail Corridor. The affordability of Boston's transit system for intra-city travel is notable. The commuter rail appears well-connected in various areas, including Back Bay, Fenway, Beacon Hill, and West End. However, specific neighborhoods, such as Dorchester, Roxbury, and Mattapan, characterized by a predominantly Black population, have bus service but lack a railway system.

Boston's urban layout is characterized by shorter blocks, parks, and walkable streets, contributing to a high Walk Score, particularly downtown. Nevertheless, some distant neighborhoods lack sufficient infrastructure, discouraging residents from relying on walking. Figure 25 depicts Boston's main transit routes and stops, incorporating buffer analysis using QGIS software. The analysis considers 5-minute and 10-minute walking

buffers around bus stops and commuter railway stations. It becomes evident that residents in certain areas like Hyde Park, Mattapan, Jamaica Plain, Dorchester, and South Boston face the challenge of walking considerable distances to reach transit stops, leading to extended travel times.

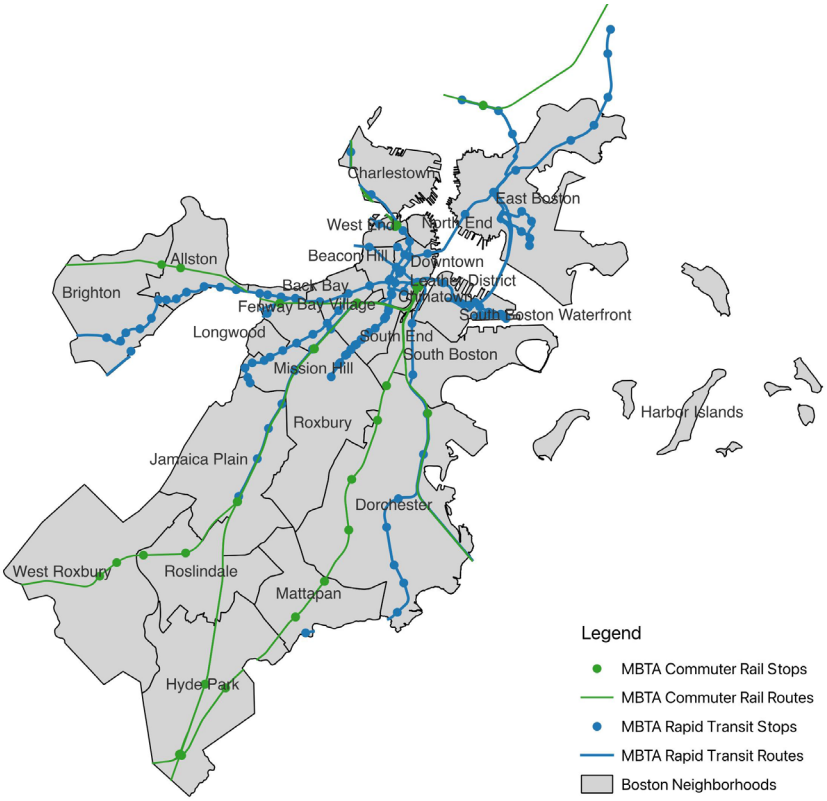


Figure 23: Coverage by Public Transit in Boston (Source: MassGIS) (Produced by Author))

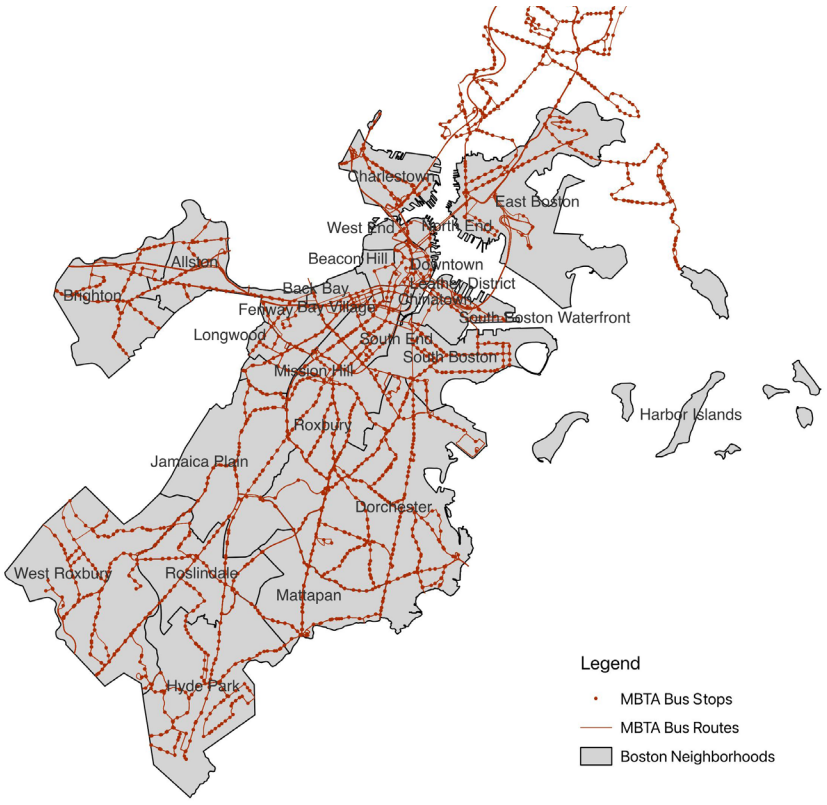


Figure 24: Coverage by Bus routes in Boston (Source: MassGIS) (Produced by Author))

Travel Behavior in Boston

A walkability buffer around train stations is typically defined as the area within a 10-minute walking distance of the station, roughly equivalent to a half-mile radius or approximately 800 meters. However, the exact size of the buffer may vary depending on various factors such as the specific station, the surrounding neighborhood, and the level of pedestrian infrastructure in the area.
A walkability buffer around train stations is important because it can influence the number of people who use public transportation. Studies have shown that people are more likely to use transit within walking distance and when there are safe and convenient pedestrian routes to the station. As a result, cities often prioritize improving pedestrian infrastructure within walking distance of transit stations to encourage more people to use public transportation and reduce reliance on cars.

A biking buffer along train stations is typically defined as the area within a 1-2 mile radius, or about a 15-30 minute bike ride, depending on the specific station, the surrounding neighborhood, and the level of biking infrastructure in the area.
A biking buffer around train stations is important because it can provide an alternative mode of transportation for people who live or work in the surrounding area. By providing safe and convenient biking routes to and from train stations, cities can encourage more people to use public transportation and reduce reliance on cars. Additionally, biking can be a faster and more affordable way to commute for some people, especially if they are traveling short distances or if traffic is congested.
Cities often prioritize improving biking infrastructure within biking distance of transit stations by creating dedicated bike lanes, shared use paths, and bike parking facilities near train stations to encourage more people to bike as a mode of transportation. This can help create a more connected and sustainable transportation system within a city.

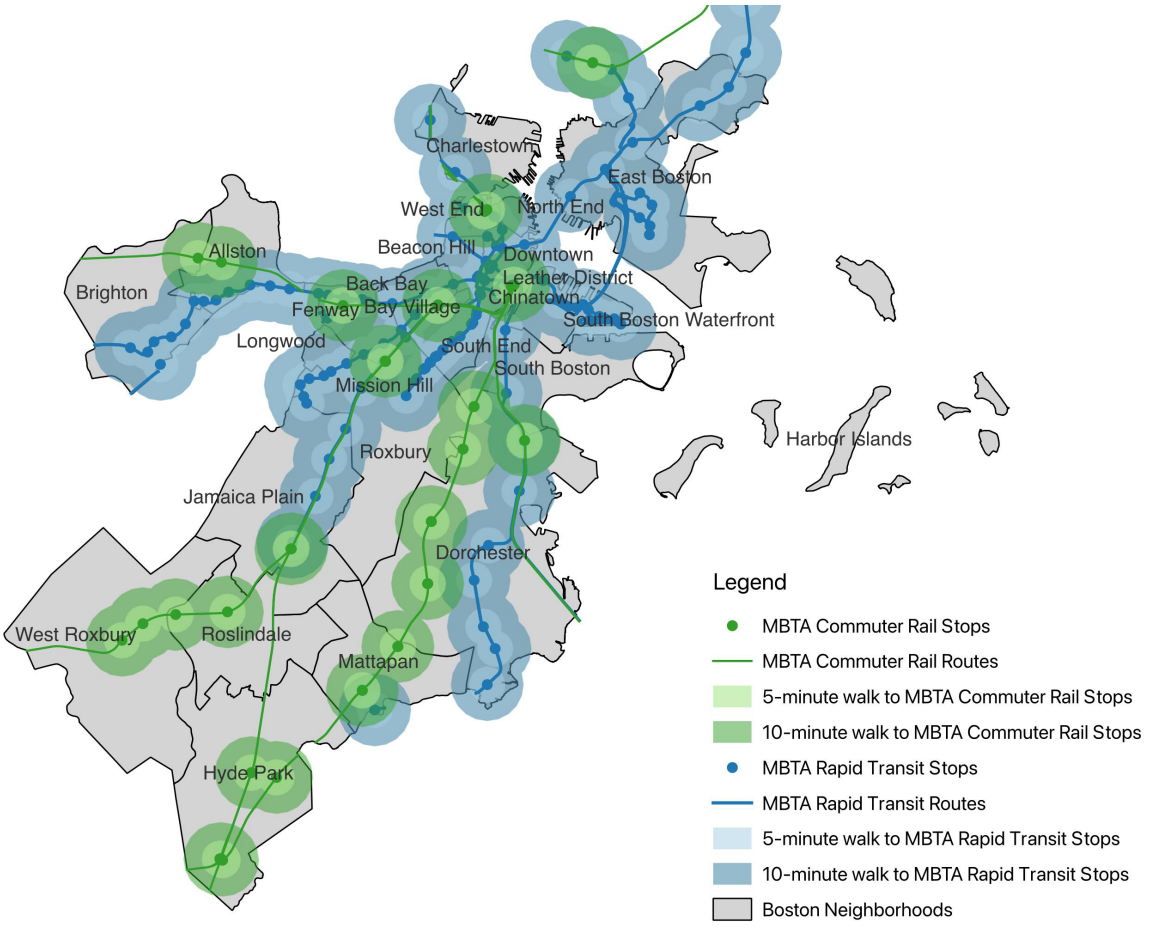


Figure 25: 5 and 10 minute walk shed from Bus stops and Commuter Rail in Boston
(Source: MassGIS) (Produced by Author)

Transit Equity Analysis

Transit Equity Score

The Transit Equity Score, derived through the Replica dataset methodology, serves as a critical tool in assessing and understanding the accessibility and fairness of transit services in Boston. By amalgamating various socio-economic factors, this index provides a nuanced evaluation of transit stops, assigning scores reflecting the service's degree to disadvantaged communities. This methodology is indispensable for discerning areas where transit services may be inadequate or where significant disparities exist. The Transit Equity Score thus emerges as a vital metric for informing decision-makers, urban planners, and transit authorities, guiding them toward targeted interventions. The score is influenced by factors such as Median Household Income, Race, Industry of Employment, Commute Time, and Zero-Vehicle Households. Each variable is scored from 1 to 5 based on specific criteria:

Median Household Income - Transit stops serving high-income populations receive a score of 5, while those serving low-income populations receive a score of 1.
Race – The consideration of Race in the analysis focuses on minority populations, encompassing African-American, Asian, American Indian, Hispanic, and other non-white communities. By excluding the majority demographic (white population) from this analysis, the scoring system ensures a targeted evaluation of transit equity, acknowledging historical disparities.
Industry of employment – The industry is based on a particular industry requiring travel or work from home. The score for each stop is determined as five if the highest proportion of workers working in these industries.
Commute time – A crucial factor in transit equity, is assessed with longer commute times garnering a higher score of 5, while shorter commute times receive a score of 1. This acknowledges the challenges those with lengthier commutes face and emphasizes the need for efficient and accessible transit options.
Zero-vehicle households – This is determined by filtering households with only zero-vehicles to understand transit dependency.

A score of five is allotted if a transit stop serves more people from zero-vehicle households. Then, these scores are summed up and assigned a range between 0 to 100. Figure 26 below shows the Transit Equity Score in Boston, where the score is categorized into five classes for better visualization: 0-20, 20-35, 35-60, 50-70, and 70-100. The analysis of the Transit Equity Score map reveals disparities in service quality. While some parts of Roxbury, Dorchester, and Mattapan exhibit higher transit equity scores, indicating more equitable access, downtown areas, South End, and Beacon register lower scores, signaling potential areas for improvement. This nuanced examination underscores the importance of targeted interventions to enhance transit equity in specific locales, contributing to a more inclusive and accessible urban transportation landscape.

However, in pursuing sustainable, resilient, and inclusive cities, the Transit Equity Score emerges as a crucial catalyst for driving transformative policies and interventions. Its role extends beyond merely revealing current disparities; it is a powerful force for instigating positive transformations by encouraging specific actions to improve accessibility and equity in urban transportation. Incorporating such a scoring system into the planning processes empowers cities to make significant strides toward developing transportation systems that cater to the varied requirements of their communities, thereby promoting social unity and creating economic opportunities for all.

Transit Equity Analysis

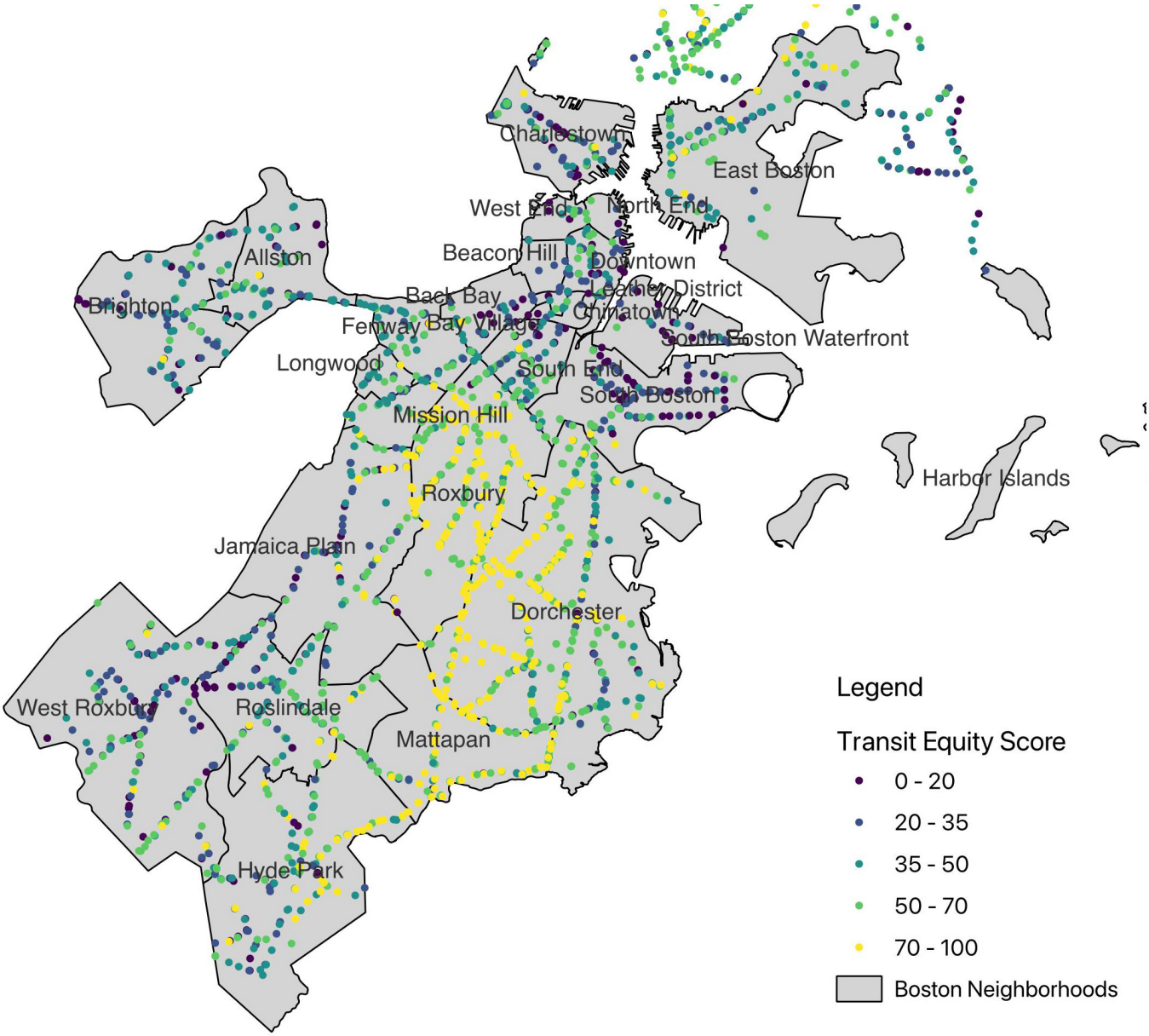


Figure 26: Transit Equity Scores in Boston (Produced by Author)

Analyzing commute patterns unveils a range of transportation preferences influenced by geographic, demographic, and infrastructural factors. Evidently, public transportation holds a significant role, with 44.4% of Boston workers opting for this mode. However, variations exist, such as East Boston favoring public transit and West Roxbury showing a preference for individual car commuting. Challenges in specific neighborhoods, particularly those with lower incomes, include limited and unreliable bus routes, impacting the accessibility of essential services. Prolonged commute times in areas like Dorchester, Mattapan, and Roxbury underscore transportation equity issues, emphasizing the need for improved access to reliable public transportation and increased job opportunities. The Transit Equity Score emerges as a crucial metric, considering factors like income, race, and commute time to identify and address disparities in urban transportation. This scoring system is a valuable tool for guiding interventions and promoting a more inclusive urban transportation landscape. Understanding and responding to these transportation dynamics are essential for fostering equitable and sustainable urban development.

Policy Recommendations

Policy Framework

This section also discusses various policy frameworks around transportation equity in Boston and other cities. One of the critical goals in Boston region's MPO is transportation equity, which focuses on delivering and ensuring transit access to all, especially Transportation Equity (TE) populations. These TE populations include people who are a minority (other races than white), people with disability, people with limited English Proficiency (LEP), people with low income, or people with zero-vehicle vehicles. There is a need to address and serve these populations through multiple initiatives and programs. Boston's MPO does have many existing programs focusing on regional transit service planning, improving bicycle and pedestrian connections, and the complete streets. It is crucial that upcoming programs and strategies toward equitable transportation, as well as fair public transportation planning, should address the TE mentioned above populations and other factors such as affordability, inclusivity, and accessibility for those who choose active mode transportation. Following is a list of different aspects that need to be considered for equity in transportation for further plans and the equity toolkit prepared by MPOs:

Migrated Population
Gender
Transgender people
Homelessness
Education
Some populations are not covered under census data, so there needs to be a framework that addresses regional needs and changes and forecasts further transit demand.

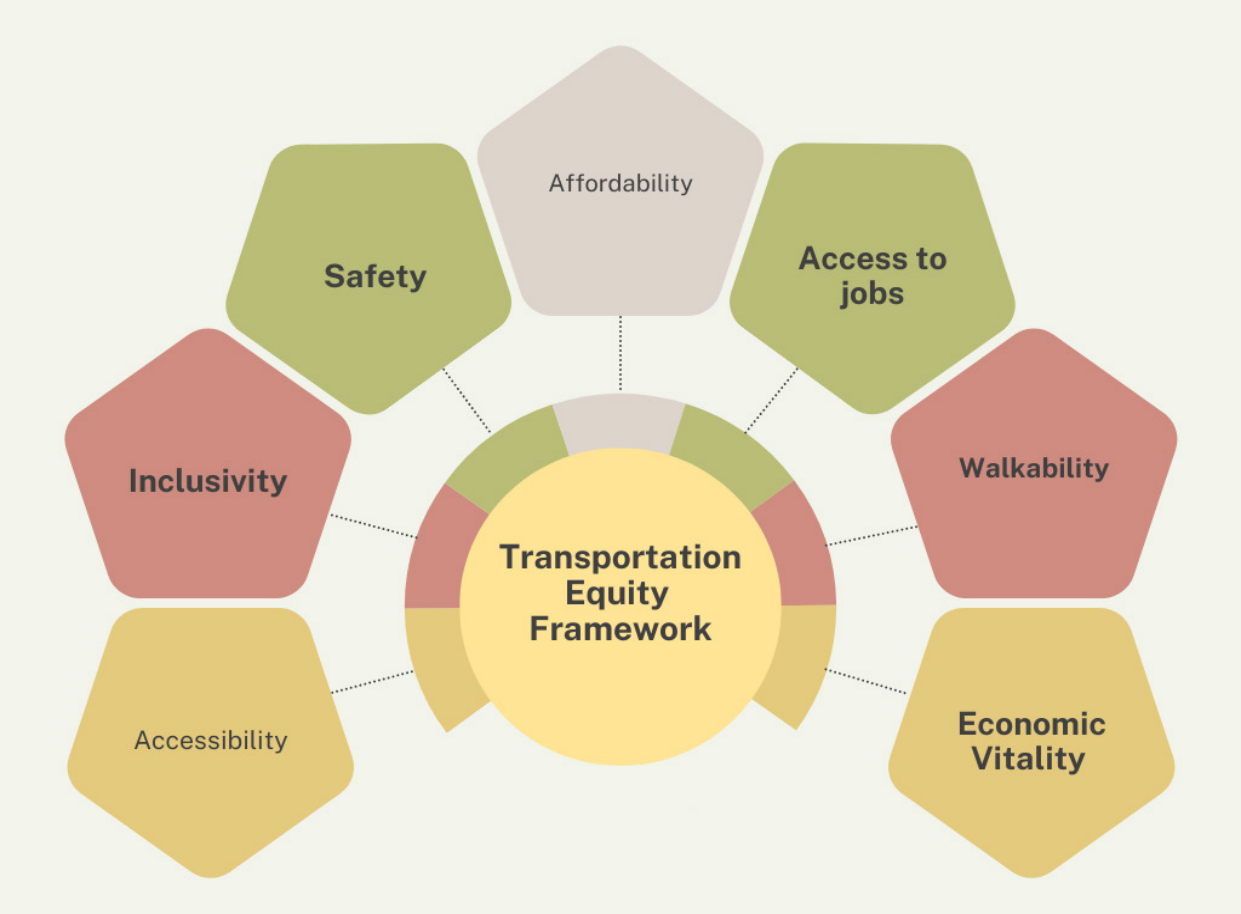


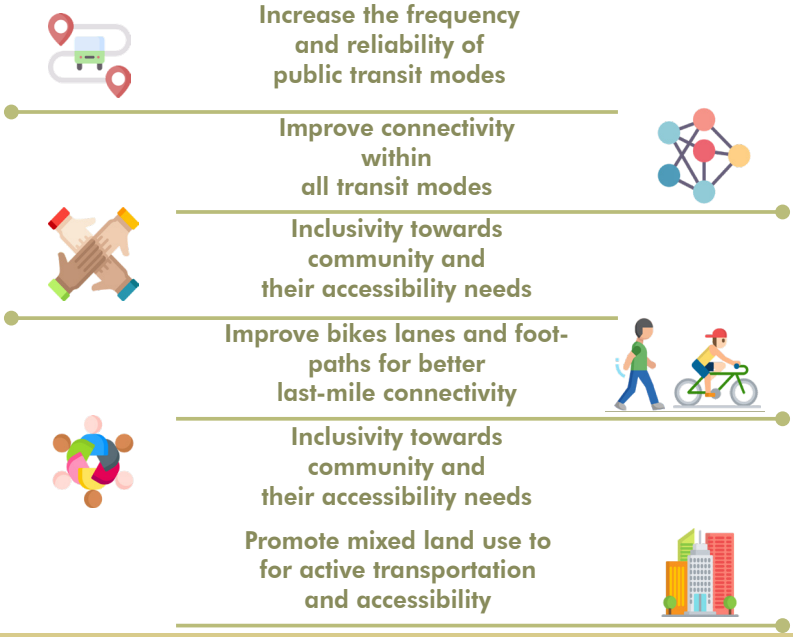
Figure 27: Policy Framework (Produced by Author) (Reference: SDOT TEF Dashboard)

Policy Recommendations

The Fairmount Corridor in Boston presents challenges and opportunities related to housing, economic development, and transit. The City's Imagine Boston 2030 plan recognizes this and aims to improve the quality of life in the corridor's neighborhoods. The Boston Foundation has been a critical partner in this effort by funding various activities such as arts and placemaking, workforce development, youth activities, environmental greening, and urban agriculture. Despite this, the integration of local transit with the Fairmount Commuter Line needs improvement, which increases costs for some riders. Moreover, the Fairmount Line has historically been viewed as a mode of transportation for middle-class suburbanites, leading to a need for more attention to low-income riders. However, the MBTA has taken steps to address this by partnering with community organizations and stakeholders to increase ridership on the line and improve access to jobs and other opportunities for residents of the Fairmount Corridor. If Massachusetts invests in higher frequency, fare integration, and marketing, the Fairmount Line could serve as a national example for similar commuter rail lines. Such investments would make the service more appealing to low-income riders and lead to economic growth within the corridor.

Overall, it is crucial to focus on increasing ridership, improving safety, providing walking and bike facilities, and better connections to jobs and services nearby. This will result in infrastructure development, new investments, and more stakeholders. Cities and transit agencies need to address the disparate impact that commuter rail operations have on low-income city neighborhoods and make commuter rail more useful for all riders. As the Fairmount corridor has a significant population of low-income and minority residents, improving accessibility to neighborhoods along this corridor can help to promote equity and access to economic opportunities. There is a subsequent need for understanding equity from a broader perspective and addressing it in a way that is accessible and equitable across many other aspects than considered above. Other factors include access to schools, healthcare, parks, and open spaces. Here are some policy recommendations:

1. Prioritize community engagement and community-driven decision-making process to ensure that feedback is incorporated from Fairmount Line Neighborhoods.
2. Implementing more detail-oriented and technology-driven solutions with the help of real-time tracking, mobile apps, and digital platforms for seamless communication and accessibility for commuters.
3. Addressing and implementing last mile connectivity, such as introducing more frequency or ride-sharing programs to ensure better connectivity from transit stops to final destinations such as users' houses or work locations.
4. Encouragement for job creation for communities within Fairmount Corridor, which reduces longer travel times, encourages the use of public transit and increases accessibility to jobs and education.



Conclusion

Boston's transportation system is a crucial component of the city's economy and daily life for its residents. Boston has been taking initiatives to improve its transportation infrastructure and increase accessibility to public transportation for all its residents. In examining Boston's transportation landscape, it becomes evident that the Fairmount Line, traversing through Dorchester, Mattapan, and Roxbury neighborhoods, is a focal point for addressing transportation equity. Ongoing efforts, such as the Fairmount Indigo Planning Initiative and the Fairmount Line Improvement Coalition, aim to improve economic opportunities in these areas. However, transportation equity remains a challenge for these neighborhoods, as they have lower accessibility to bus stops and fewer reliable bus routes than other parts of Boston. This transportation equity gap creates difficulties for residents to access essential services such as healthcare, education, and employment. Initiatives such as the Complete Streets program and the Better Bus Project aim to improve accessibility to bus stops by adding new bus lanes, sidewalks, pedestrian crossings, and signals. Neighborhood-specific plans, such as the Upham's Corner TOD Plan, also seek to improve access to transit in the area.

Despite the challenges, public transportation remains a vital mode of commuting for many workers in Boston, with 34% of workers in the city using it to commute to work. The percentage of workers who use public transportation is higher than the national average, indicating the importance of public transportation in the city. However, the average commute time in neighborhoods along the Fairmount Line, such as Dorchester and Mattapan, is longer than the citywide average, indicating a need for continued efforts to improve transportation equity in these areas.

In conclusion, Boston's transportation system continues to be a crucial component of the city's economy and daily life for its residents. The city has taken initiatives to improve its transportation infrastructure and increase accessibility to public transportation. However, transportation equity remains a challenge in neighborhoods along the Fairmount Line, highlighting the need to improve the quality of life in the corridor's neighborhoods.

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