

The Value of Transit in San Francisco:

How Muni Improves City & Regional Quality of Life

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A Report Prepared by the MIT Mobility Initiative's
Transit Research Consortium

Lucien Wallace, James Aloisi, and Bhuvan Atluri

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1 - Introduction

Public transit provides significant value to urban areas by giving residents access to opportunities, services, and resources; increasing the productivity of the city; reducing harmful pollutants; and providing affordable transportation and economic mobility - especially to low-income residents. In the post-pandemic world of changed journey patterns, and with the increasing prevalence of private and for-hire electric vehicles, some may question the role transit plays in supporting urban and regional mobility, and in helping reduce harmful pollutants. This report is designed in part to reaffirm transit's powerful role as a public good supporting efficient, affordable, and sustainable urban access.

This research was conducted to emphasize the vital role that Muni's public transit services plays in San Francisco, and its value to the Bay Area as a whole. Muni's public transit services are uniquely valuable to the region. They strengthen San Francisco's economy while also lowering the cost of living for and improving the quality of life of its residents while simultaneously reducing emissions from the transportation sector, all in a way that no other transportation mode can provide.

The benefits generated by Muni also extend to those who never or rarely take transit, as those travelers benefit from reduced traffic congestion, reduced greenhouse gas and particulate matter air pollution, economic growth through agglomeration effects, and reduced traffic fatalities. This research seeks to identify and describe these benefits to residents of San Francisco and the Bay Area.

2 - Motivation and Background

2.1 - Ridership Trends and Pandemic Disruption

The COVID-19 pandemic had a devastating impact on public transit ridership across the United States from its onset in 2020. Transit agencies throughout the country have since sought to recover their lost ridership, as seen in Figure 1. This lower ridership has caused a subsequent reduction in fare revenues for large transit agencies like Muni that still rely on fares to fund a substantial portion of their operating budget. This challenge is not unique to Muni; as highlighted by Figure 1, all of the major transit systems in the country faced similar, or worse, ridership recovery issues following 2020. Muni's recovery from 2021 until present has been steady and has outpaced a majority of other major American agencies¹.

¹ "November Complete Monthly Ridership (with Adjustments and Estimates)."

US Transit Ridership Recovery Since 2019

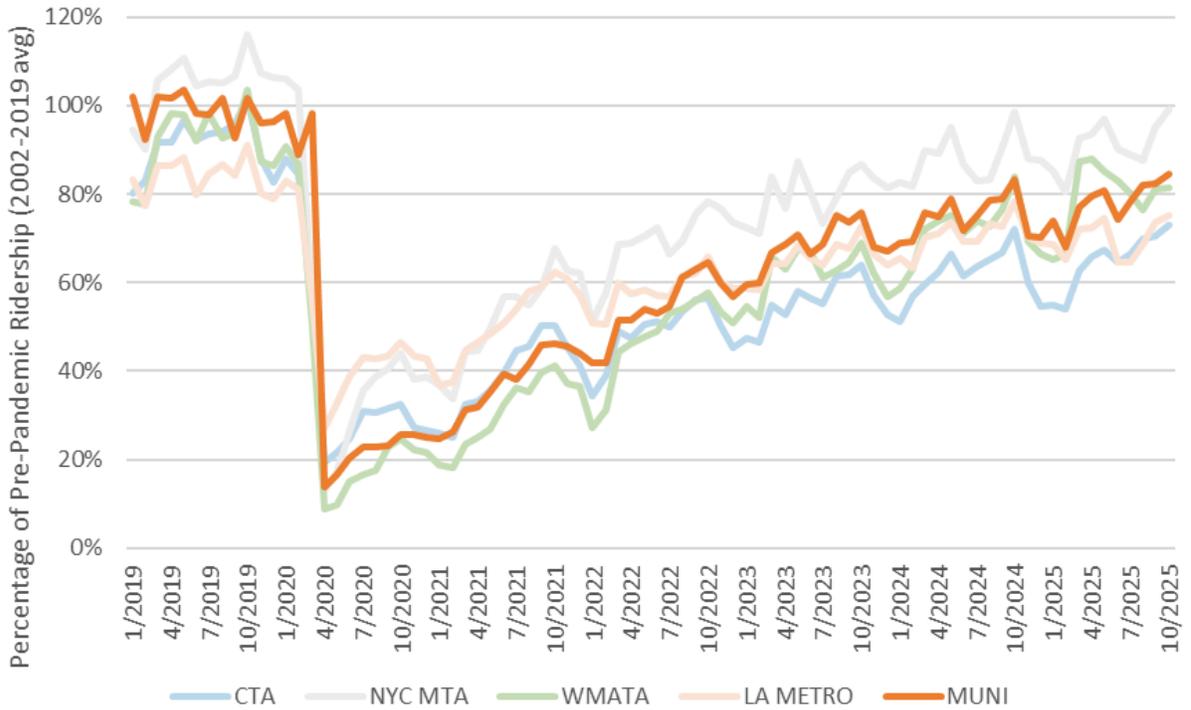


Figure 1: Muni Ridership Recovery Compared to Peer Agencies²

Looking at Muni’s ridership statistics over a wider timeframe (Figure 2) shows its consistency despite major events like the 2008 financial crisis. Figures 1 and 2 both show the immediate and rapid progress towards ridership recovery since the pandemic. These observations affirm the resiliency of the transit agency and the impressive results that Muni’s leadership has been able to achieve despite its current funding levels. By increasing funding support for the system, further ridership gains can be realized.

² “November Complete Monthly Ridership (with Adjustments and Estimates).”

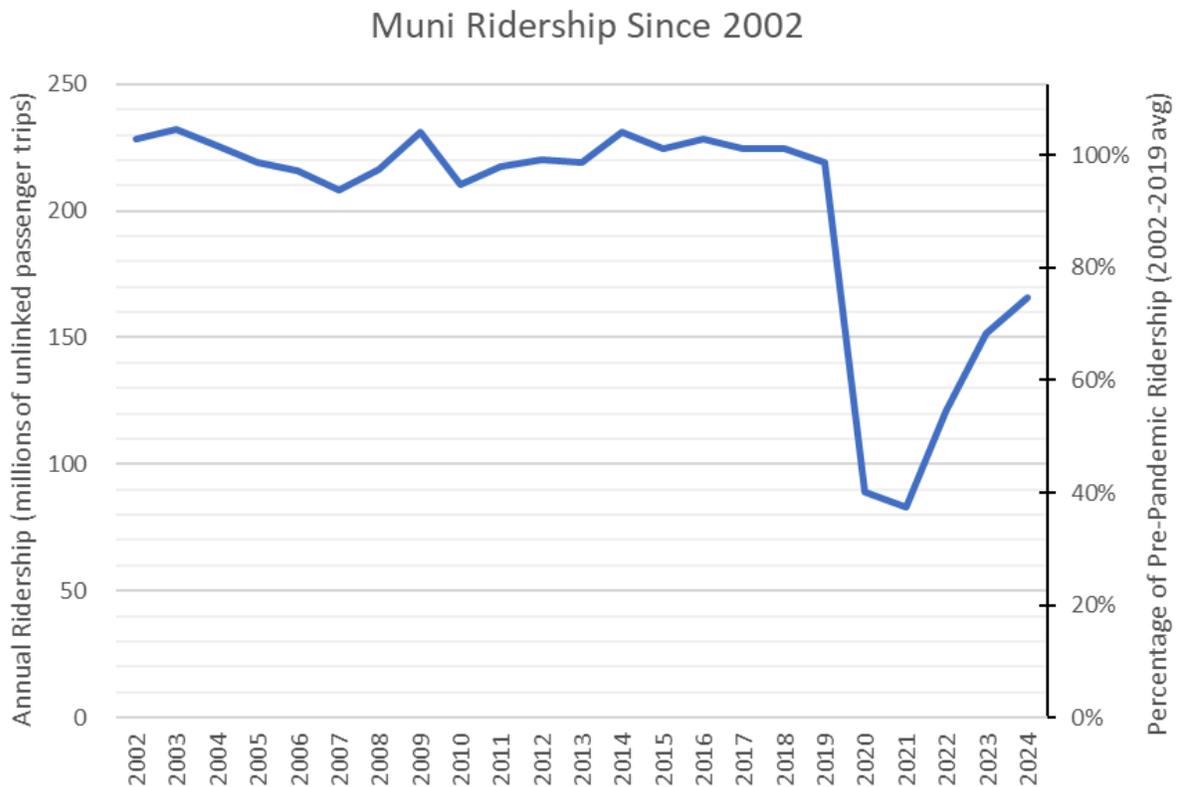


Figure 2 Muni Ridership Since 2002³

The pandemic caused lasting impacts on riders, altering their behaviors in many ways. A larger percentage of workers now opt for a hybrid or remote work environment, meaning that predictable commuter ridership decreased heavily and mobility habits shifted overall. As a result, the pre-COVID disparity between weekday and weekend ridership has now diminished. Likewise, morning and evening commuting peaks have become less prominent. In place of commuting trips, more flexible work schedules allow for additional recreational and errand trips during the day⁴. Transit agencies must respond to these shifts in journey patterns in order to continue providing the myriad benefits to riders.

2.2 - Research Objectives

The goal of this research is to inspect the societal benefits of Muni’s public transit system, focusing specifically on mobility of care, equity and reduced cost of living, and public health.

³ “November Complete Monthly Ridership (with Adjustments and Estimates).”

⁴ Office of Budget and Policy and Federal Transit Administration, *Effects of the COVID-19 Pandemic on Transit Ridership and Accessibility*.

2.3 - Transit Use Reduces Emissions — But What About Electric Cars?

California has legislated aggressive zero-emission vehicle (ZEV) adoption targets, which are largely focused on electric vehicles. The state sought to have 1.5 million ZEVs on the road by 2025 (which it has succeeded in doing), plans to have 5 million by 2030, and in 2035 will require 100% of all in-state sales of cars and trucks to be ZEVs⁵.

If one focuses solely on tailpipe carbon emissions as a gauge of environmental policy success, ZEVs may seem like the ideal solution, thus diminishing the importance of transit in the public eye. However, many other negative externalities result from an automobile-centric mobility system (hereafter referred to as “automobility”) and when these are taken into account, public transit’s unique ability to mitigate these downsides demonstrates its value. The following is a list of the negative impacts of automobility (including ZEVs) that use of public transit helps address⁶:

- Traffic congestion
- PM2.5 exposure from tire, road and brake wear
- Decreased traffic safety
- Road damage and maintenance
- High travel costs
- Inefficient land use
- Reduced physical activity from active mobility
- Noise pollution⁷

3 - Mobility of Care: How Transit Supports Life Quality

3.1 - What Is Mobility of Care and Why Is It Important to Understand?

Only about 22% of all trips nationally are for the purpose of commuting for work⁸. Despite this, when evaluating public transportation systems, many people focus on the ability of a transit system to get workers to and from their place of occupation. Indeed, many public transit systems in the US were largely built in the last century with the singular goal of transporting workers with 9-5 workdays⁹. This section of the report investigates the reasons why people take transit in the 21st century and sheds light on an extremely important category of trip purpose: Mobility of Care (MoC)¹⁰.

⁵ Commission, “Electric Vehicles & Charging Infrastructure.”

⁶ *The Value of Transit in Chicago and the Chicago Region*.

⁷ Mouratidis, “Automobility, Planet, and Humans”; Greer et al., “Pavement Resurfacing and Supply Chains Are Significant Contributors to PM_{2.5} Exposure from Road Transportation”; Lewis, “These Charts Explain Why Public Transit Is Safer Than Driving”; Green, “The Importance of Public Transportation in Reducing Urban Air Pollution.”

⁸ Bricka et al., *Summary of Travel Trends 2022 National Household Travel Survey*.

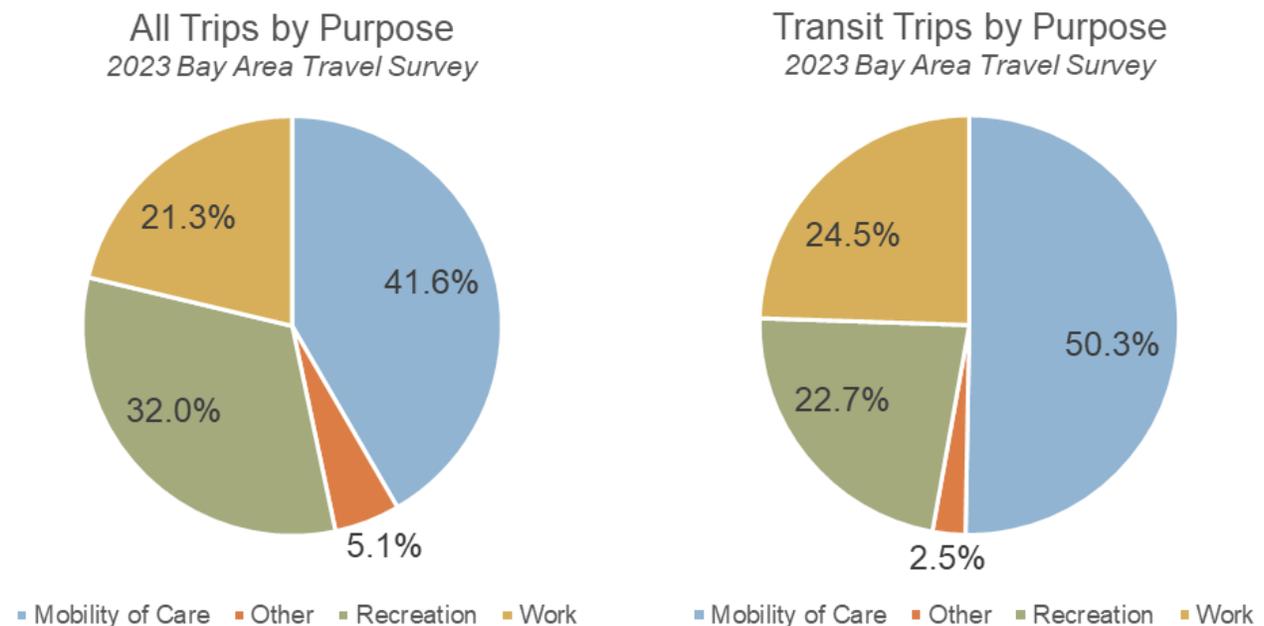
⁹ Blumgart, “Taking the ‘Commuter’ Out of America’s Rail Systems.”

¹⁰ Sánchez de Madariaga, “Mobility of Care: Introducing New Concepts in Urban Transport.”

MoC trips are almost always essential to ensure a high quality of life. Many necessary trips such as dropping off a child at school or daycare, getting groceries, visiting the doctor, or taking a relative to the doctor, are considered here as MoC. These trips, which comprise nearly half of all trips taken in the country (47%)¹¹, are vitally important for the daily lives of residents and therefore should be closely investigated under a holistic review of any public transportation system.

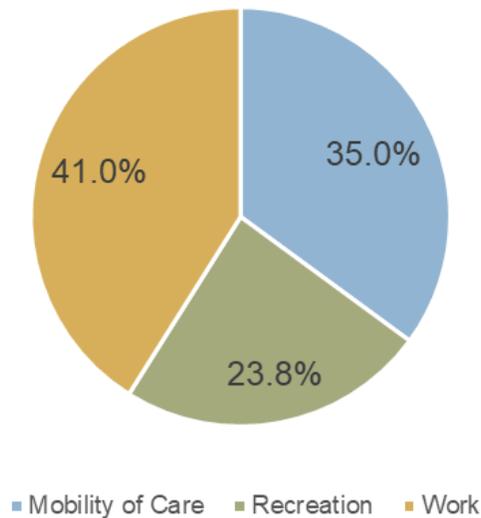
3.2 - Analyzing MoC and Travel Patterns in San Francisco

Using data from the 2023 Bay Area Travel Survey (filtered to only include trips originating and/or ending in San Francisco) and the 2024 SFMTA Onboard Origin-Destination Survey, it is possible to analyze the travel patterns of San Franciscans. Details about the methodology and classifications for trip purposes (including definitions for “Recreation” and “Other” trips) can be found in Appendices 1 and 2. The results from this investigation help clarify the exact role that Muni plays in passengers’ lives.



¹¹ Bricka et al., *Summary of Travel Trends 2022 National Household Travel Survey*.

Muni Trips by Purpose 2024 SFMTA Onboard Survey



Figures 3 - 5 Trip Purpose for All Weekday Trips, Weekday Transit Trips¹², and Weekday Trips on Muni¹³

As can be seen above in Figures 3 - 5, MoC trips account for over 40% of all weekday trips taken by people traveling in San Francisco. When we restrict to only trips that use transit as a mode, over half of all trips are taken for MoC purposes. Perhaps unintuitively, this trend reverses slightly when the results of the Muni onboard survey are examined, which only factors in the travel behavior of Muni passengers, and not Caltrain or BART. This trend may be explained by the difference in methodology between the two surveys¹⁴.

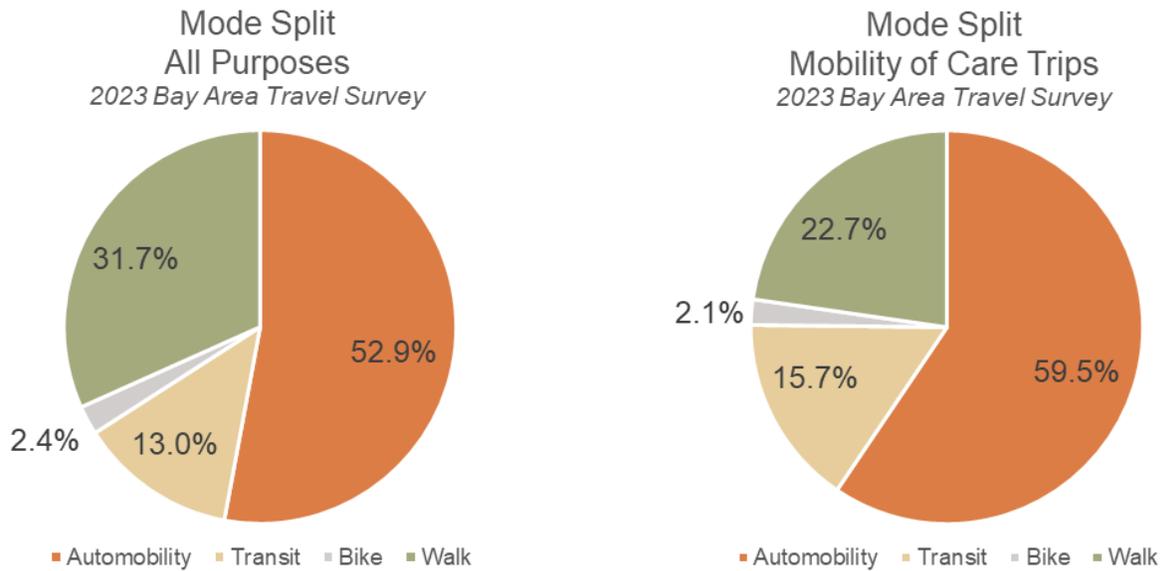
MoC trips still comprise over a third of all Muni trips and represent vital daily tasks that cannot be canceled without significantly hindering residents' quality of life. Without transit service, many residents wouldn't be able to go to the grocery store as often, medical appointments may be pushed back or missed, and people may not be able to visit and care for elderly relatives as often as they would like. Others might be forced to take a form of automobility, increasing their personal travel costs while also increasing urban congestion and harmful externalities (as described in Section 5). Transit service in these contexts is not a mere convenience, but rather a lifeline that enables access to childcare, essential groceries, timely healthcare, and vital

¹² Metropolitan Transportation Commission, "Bay Area Travel Study."

¹³ San Francisco Municipal Transportation Agency, "Onboard Origin-Destination Survey."

¹⁴ While the Bay Area Travel Survey was conducted using a travel journal in which participants logged every trip that they made in a day (therefore separately counting MoC trips), the SFMTA Onboard Survey was conducted using an onboard survey in which participants selected a single origin and destination. Many MoC trips are linked together by short walks or trips (e.g. walking to the grocery store after a visit to the doctor), but the onboard survey would only be able to count the initial destination (the doctor's office), but not the secondary trip to the grocery store.

face-to-face connections with friends and family¹⁵. The existence of public transit enables all of these important trips for thousands of San Francisco residents every day. Additionally, the impact of transit availability is not evenly spread across different demographic groups and geographic areas. The importance of public transit as a tool for promoting equity is explored in the following subsections and in Section 4.



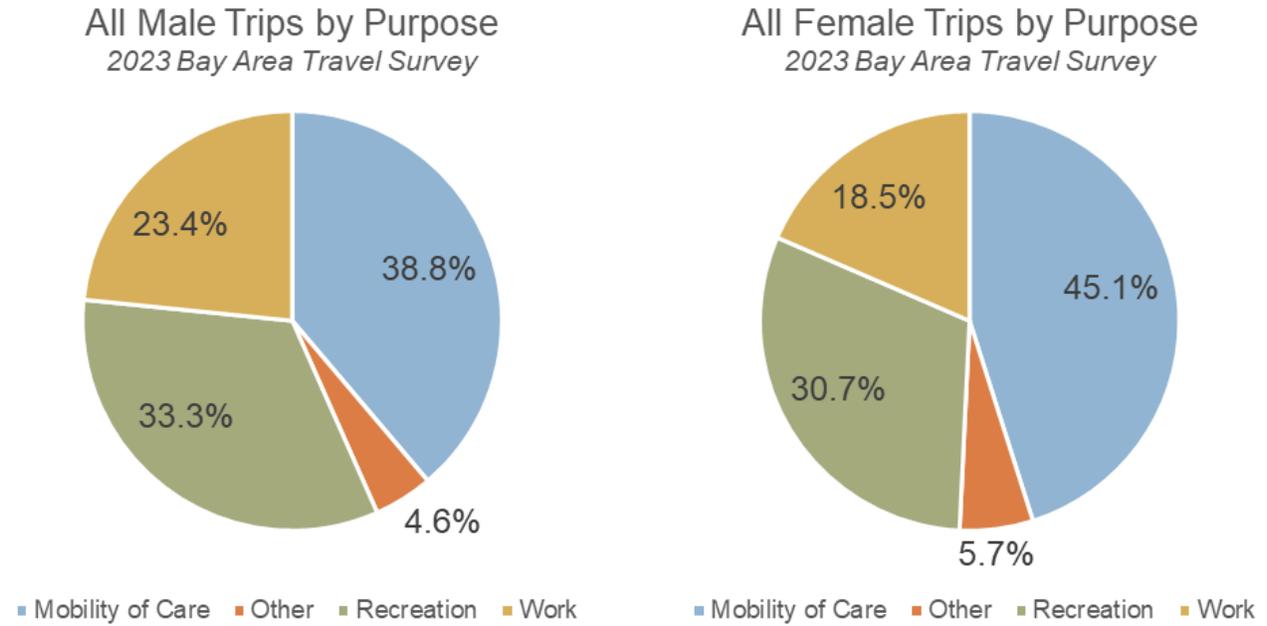
Figures 6 & 7 Mode Split for All Weekday Trip Purposes and Weekday MoC Trips¹⁶

As Figure 6 shows, public transit represents a significant number of trips within San Francisco. These percentages represent an average of roughly 250,000 trips out of 1.9 million *per weekday*. When only MoC trips are analyzed (Figure 7), an even larger percentage of trips are taken via transit, indicating that public transit specifically enables many of these essential MoC trips and plays a crucial role in supporting important routine tasks.

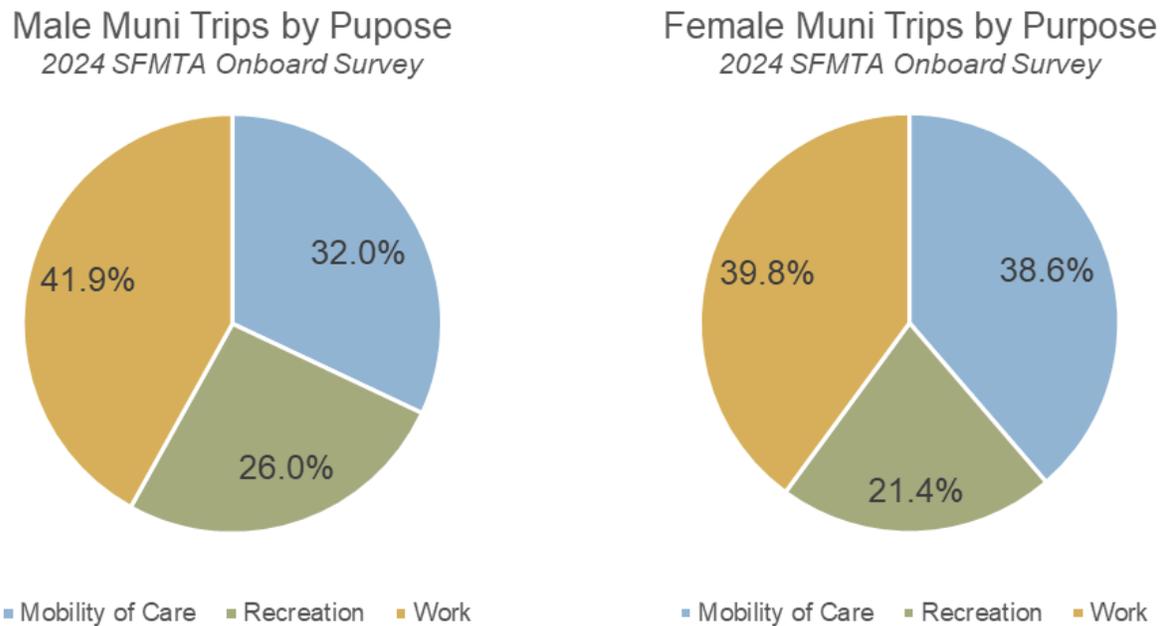
¹⁵ Simone et al., “The Importance of Face-to-Face Contact and Reciprocal Relationships and Their Associations with Depressive Symptoms and Life Satisfaction.”

¹⁶ Metropolitan Transportation Commission, “Bay Area Travel Study.”

3.3 - Gendered MoC Patterns in San Francisco



Figures 8 & 9 Trip Purpose by Gender for All Weekday Trips¹⁷



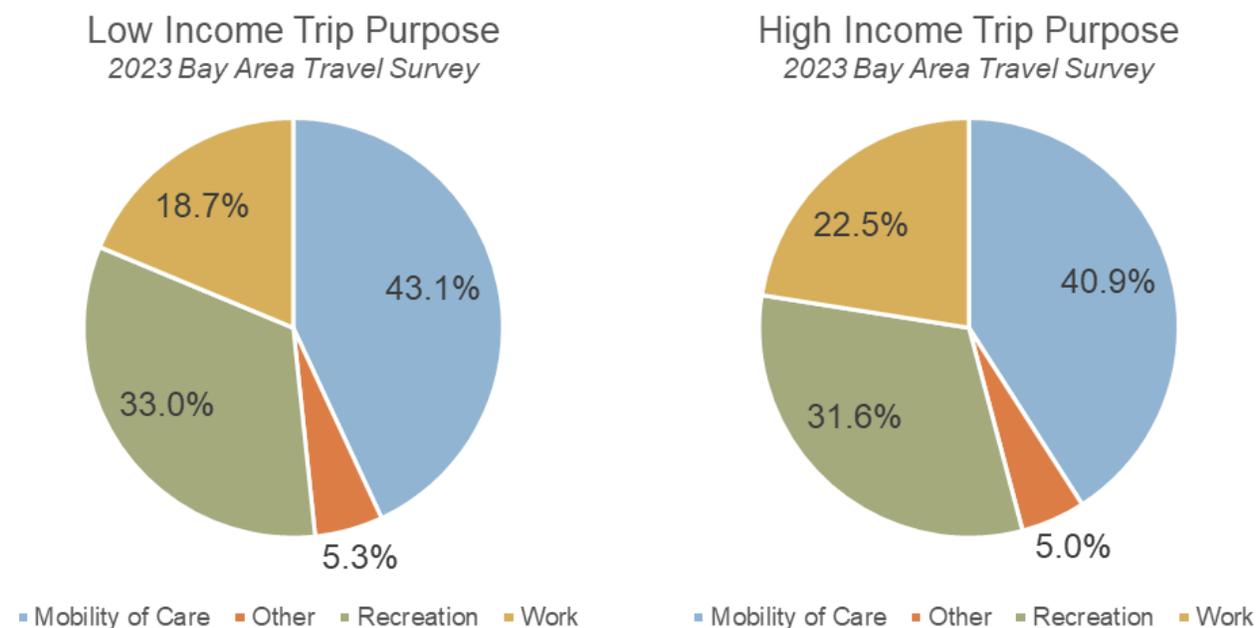
Figures 10 & 11 Trip Purpose by Gender for Weekday Muni Trips¹⁸

¹⁷ Metropolitan Transportation Commission, "Bay Area Travel Study."

¹⁸ San Francisco Municipal Transportation Agency, "Onboard Origin-Destination Survey."

Figures 8 - 11 show a prominent trend in trip purposes between different genders. For all trips in San Francisco, both male and female residents showed MoC as the largest trip category; but MoC trips made up over 6% more of total trips for women than for men (Figures 8 & 9). A similar trend is present for Muni trips specifically, where MoC trips account for 39% of total trips for female riders, compared to 32% of trips for male riders (Figures 10 & 11). These results underscore how public transit enables different types of mobility for different demographic groups. If the value of a transit system is only assessed based on how well it can transport workers to their jobs, it is likely to miss these important trips.

3.4 - Income-Level MoC and Travel Patterns in San Francisco



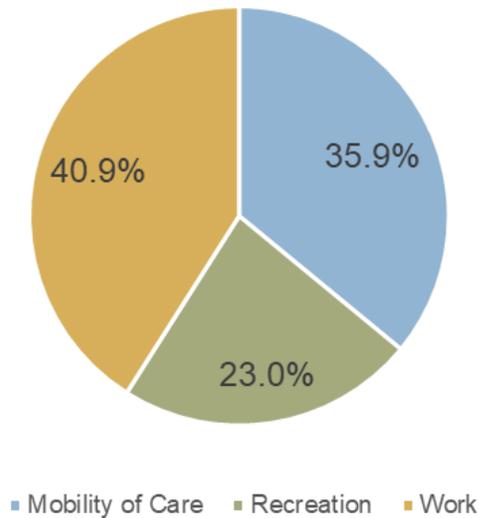
Figures 12 & 13 Weekday Trip Purpose by Income Level (Income Cutoff is \$100,000)¹⁹

Figures 12 & 13 display the increased prevalence of MoC trips for lower income groups. Lower income groups show a higher percentage of MoC trips, lower percentage of recreation trips, and lower percentage of work trips.

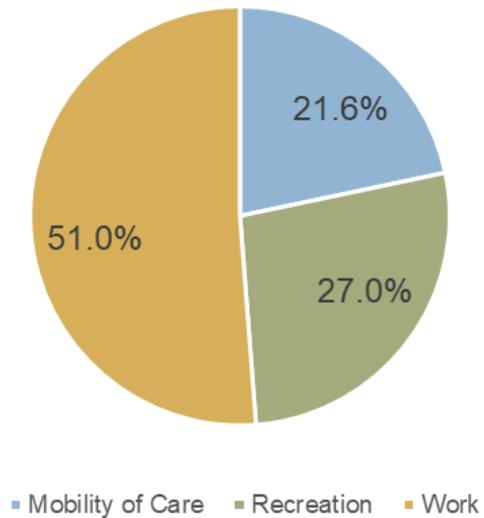
When the scope is narrowed to only include Muni trips, this trend is even more pronounced (Figures 14 & 15). For high-income individuals, a majority of trips are taken to and from work, followed by recreation and then MoC. These journeys differ from those made by low-income people, which have a significantly higher percentage (14% higher) of MoC trips, and lower recreation and work. MoC makes up more than a third of trips for low income individuals on Muni transit, demonstrating how important the service is for promoting these essential trips.

¹⁹ Metropolitan Transportation Commission, "Bay Area Travel Study."

Low Income Muni Trip Purpose
2024 SFMTA Onboard Survey



High Income Muni Trip Purpose
2024 SFMTA Onboard Survey

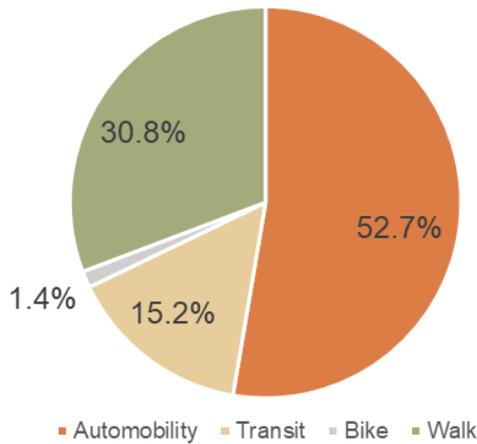


Figures 14 & 15 Weekday Trip Purpose by Income Level for Muni Services²⁰

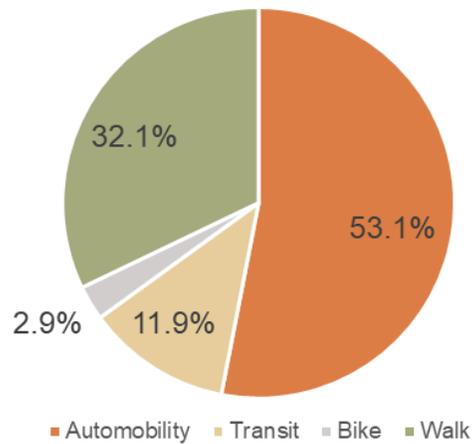
We note that a majority of Muni riders fall into the low-income category, which is consistent with Figures 16 - 19 showing that low income individuals utilize public transit more than their high-income counterparts, especially for MoC trips. Since, by definition, MoC trips are made not as part of a job nor for monetary gain but due to household responsibilities or quality of life needs, there is a disproportionate financial burden on low-income residents; these residents must dedicate a larger portion of their time to trips that do not lead to monetary compensation. As such, when completing these trips, lower-income residents are much more likely to choose more affordable, non-automobile modes. These trends impress the overall importance of Muni’s public transit services for enabling low-income residents’ access to necessary destinations and activities.

²⁰ San Francisco Municipal Transportation Agency, “Onboard Origin-Destination Survey.”

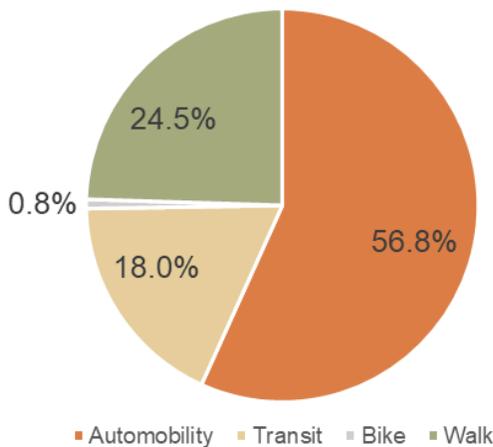
Low Income Household Mode Split
All Purposes
2023 Bay Area Travel Survey



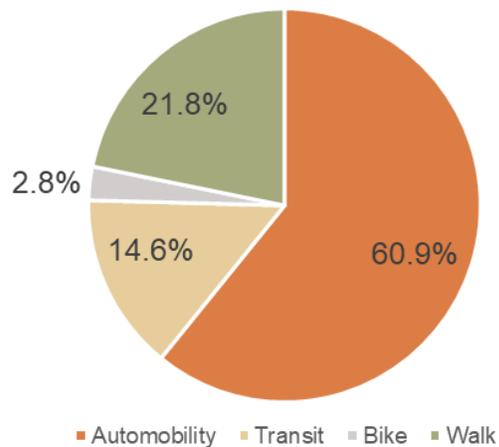
High Income Household Mode Split
All Purposes
2023 Bay Area Travel Survey



Low Income Household Mode Split
Mobility of Care Trips
2023 Bay Area Travel Survey



High Income Household Mode Split
Mobility of Care Trips
2023 Bay Area Travel Survey



Figures 16 - 19 Weekday General and MoC Trip Mode Split by Income Level²¹

Exploring Figures 16 - 19 further reveals additional trends about income level, trip purpose, and transit usage. It appears that low-income individuals use public transportation more than high-income residents, and that public transit is utilized more for MoC trips. The latter point is especially interesting because in both income groups, when the trip purpose is restricted to only MoC, public transit and automobility usage increases while active mobility decreases, indicating that these trips are easier to complete with an externally-powered vehicle than through active transport (walking or biking). That said, the decrease in active transport from all trips to just MoC

²¹ Metropolitan Transportation Commission, "Bay Area Travel Study."

trips for wealthier individuals (10.3%) is higher than the corresponding decrease for low-income individuals (6.3%). This finding reflects how automobility is significantly more expensive than the other mode choices (as detailed in the Section 4), and therefore may be inaccessible to low-income individuals. The totality of these data indicates that public transit service in San Francisco provides crucial mobility for those who need it most.

3.5 - Recreation Trips in San Francisco

A high number of recreation trips are enabled by Muni's public transit services. The goal of public transit is not only to provide people access to their basic necessities, but also to encourage and facilitate a healthy and fulfilling lifestyle. For residents, this means late night service that allows them to get home after late shows or games. For tourists, this means high levels of service to San Francisco's main attractions and tourist sites. Muni is also in the unique position where some of the transit services are actually tourist sites themselves, with historic streetcars and cable cars still serving popular routes. This is especially important given San Francisco's status as a top 5 destination for international tourism to the US²². Not only does Muni's transit service provide the opportunity for these recreational trips, but it also decreases the car traffic that would otherwise be caused by tourists and residents alike (as discussed further in Section 5).

3.6 - Conclusion

This analysis of trip purpose demonstrates the important role that Muni's public transit services play in enabling a variety of trip types, including mobility of care and recreation trips. Enabling these trips is necessary to ensure residents' quality of life, especially for those demographics that tend to complete more MoC trips, such as women and low-income individuals. Mobility of care trips, due to their dispersed nature, require comprehensive public transit design, as opposed to traditional commuter schedules. While this design requires adequate funding to be successful, investments in public transit have been shown to have a return of between 4 and 13 times the initial investment²³. Given this context, continued investment into Muni's comprehensive public transit network is a sound economic and social policy decision.

4 - Equity and Cost of Living

4.1 - The Cost of Automobility

Car ownership is expensive, with the American Automobile Association estimating the average annual cost of owning a car in 2024 to be \$11,577²⁴. Even with San Francisco's high median household income of \$139,801²⁵, the cost of owning one car alone is over 8% of the income for

²² Price, "America's Most Visited Cities."

²³ Chic. Transit Auth., "Argonne-Led Research Shows Robust Investment in Transit Benefits Both Transit and Non-Transit Users"; "Public Transportation Gets Us There – Public Transportation."

²⁴ *How Much Does It Really Cost to Own a New Car?*

²⁵ U. S. Census, "San Francisco County, California - Census Bureau Profile."

the entire household earning at this level, representing a significant financial burden to enable the mobility of a single member of the household. California's high fuel costs would likely push the cost of car ownership above the national average, making car ownership even more financially burdensome.

This figure is just for the median income in San Francisco, which is a city that struggles with wealth disparity²⁶. This income disparity can be seen in Figure 20. While the household incomes in the city fluctuate wildly, the cost of owning a car remains relatively constant, representing a much higher barrier to low-income residents when compared to their higher-income counterparts. In addition to the face-value price of a new car, low-income residents are also more likely to have low credit scores²⁷, meaning that they face higher interest rates, lease rates, and insurance premiums (which is also influenced by location²⁸). Even if these residents purchase a low-priced car, they are still saddled with a large financial burden. For the low-income neighborhoods in and around Downtown San Francisco (Figure 20), the cost of owning one car can be as high as 18% to 66% of residents' total household income²⁹. This also means that for those low-income residents who are forced to own a car to access work or other necessities, one car breakdown can push them into poverty³⁰. Hence it is critical that the mobility needs of residents are addressed via public transit, to eradicate the need to own a car.

²⁶ Rezal, "Even the Richest San Franciscans Think Economic Inequality Is out of Control. Here's How Bad It Is."

²⁷ Crowe, "The Relationship Between Income and Credit Score."

²⁸ "Auto Insurers Often Charge Identical Neighbors Considerably Higher Premiums Because of ZIP Code Differences · Consumer Federation of America."

²⁹ U.S. Census Bureau, "Median Income in the Past 12 Months (in 2023 Inflation-Adjusted Dollars)."

³⁰ Hanzlik, *The State of Transportation and Health Equity*.

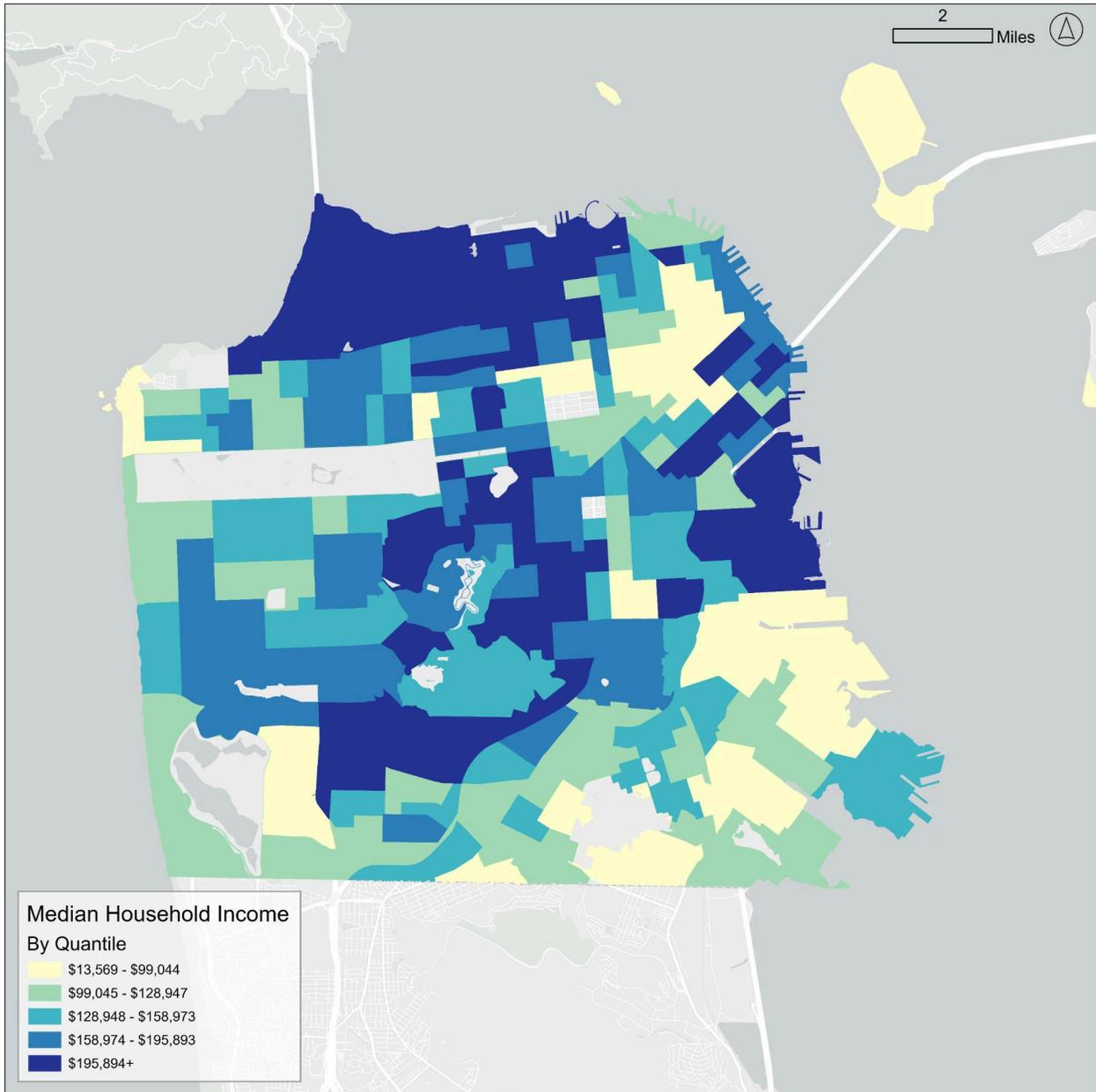


Figure 20: Household Income in San Francisco³¹

If every carless household were forced to buy a used car (at the state average price of \$35,759³²) due to a lack or reduction of transit service, an additional nearly \$4 billion would be spent on purchasing vehicles³³. Since carless households are often prevalent in low-income neighborhoods, this additional cost would fall largely upon low-income households who are least able to afford it. This figure also doesn't consider the many one-car households (which make up

³¹ "Recreation and Parks Properties | DataSF"; U.S. Census Bureau, "Median Income in the Past 12 Months (in 2023 Inflation-Adjusted Dollars)"; *Light Gray Canvas Map*.

³² Blackley, "This Is the Average Price of a Used Car in Each State - iSeeCars.Com."

³³ U. S. Census, "San Francisco County, California - Census Bureau Profile."

the largest percentage of San Francisco residents as seen in Appendix 3) that would likely have to purchase another vehicle in order to allow multiple adults in the household independent mobility.

4.2 - Public Transit Reduces Cost of Living

Figure 21 compares the costs of transportation and housing (two of the highest contributors to overall cost of living) of 22 different major American metro areas. San Francisco is shown to be the sixth most expensive city by this metric, with the most expensive housing market in the nation, when taken as a percentage share of local average annual expenditures. Given San Francisco's high wealth disparity (as shown above in Figure 20), there are many neighborhoods that experience even more severe relative housing costs than the average for the city.

Major U.S. Cities Ordered by Least Total Housing + Transportation Cost



Figure 21 Major U.S. Metro Areas Ordered by Least Total Housing + Transportation Cost³⁴

The only reason that SF is not the most expensive city overall is its very low average transportation costs, as can be seen on the right side of Figure 21. Of the major metropolitan areas in the US, San Francisco is the sixth lowest in transportation costs as a percentage share of average annual expenditures. The only metro areas in the nation that have smaller percentages are New York, Philadelphia, Chicago, Boston, and Seattle³⁵, all of which have high public transit ridership, like San Francisco. Muni's public transportation services are a large contributor to this low cost of transportation, as Muni has the eighth highest ridership of any

³⁴ Bur. Labor Stat., "Consumer Expenditures in the San Francisco Metropolitan Area — 2022–23."

³⁵ Bur. Labor Stat., "Consumer Expenditures in the San Francisco Metropolitan Area — 2022–23."

transit agency in the nation, and the San Francisco metropolitan area has the second highest percentage of public transit commuters in the nation (as seen in Figure 22)³⁶. The national average for the percentage of household budget spent on transportation is 16.9%, while the average for San Francisco is just 14.4%³⁷. While the low transportation costs in San Francisco do not fully offset the high housing expenses in the area, San Francisco’s expansive public transit system is a critical factor keeping the metro area from being the most expensive in the nation.

PERCENTAGE OF PUBLIC TRANSIT COMMUTERS BY METRO AREA

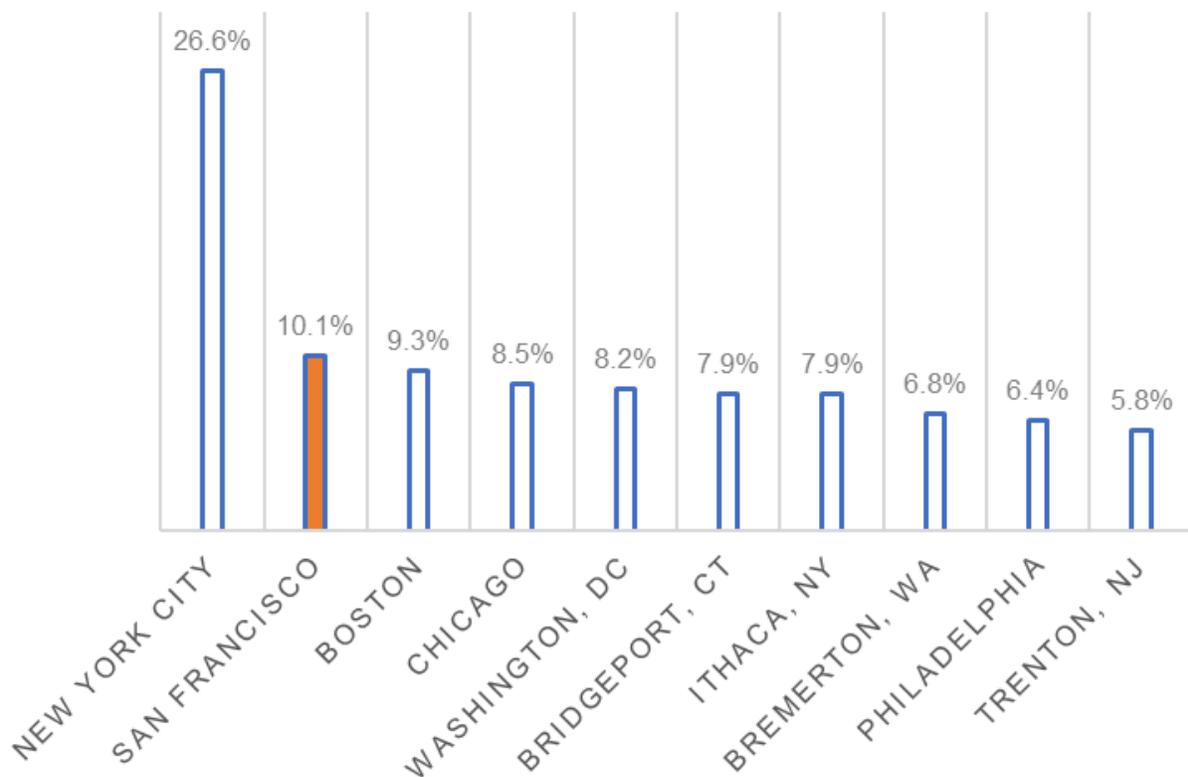


Figure 22 U.S. Metro Areas Ordered by Percentage of Commuters Using Public Transit³⁸

A huge percentage of the transportation expenditures for the average American is spent purchasing and maintaining private vehicles (92.3%), while in San Francisco, likely due its functional transit design, the percentage is significantly lower (85.8%). This is also true for other major cities with high transit ridership, such as New York (81.2%), and Chicago (88.8%)³⁹,

³⁶ 2025 PUBLIC TRANSPORTATION FACT BOOK.

³⁷ Bur. Labor Stat., “Consumer Expenditures in the San Francisco Metropolitan Area — 2022–23.”

³⁸ 2025 PUBLIC TRANSPORTATION FACT BOOK.

³⁹ Bur. Labor Stat., “Consumer Expenditures in the San Francisco Metropolitan Area — 2022–23.”

indicating that a functional transit system reduces the cost of transportation by reducing people's dependence on private vehicles. It also represents another area of freedom that public transit can afford to San Francisco residents. Further investments into Muni's public transit services would enable more people to sell their car(s), thereby significantly reducing their transportation costs. By enabling this choice, Muni vastly increases the economic accessibility of San Francisco and reduces the cost of living for users of the system.

In order to holistically analyze cost of living, it is important to look at the spatial patterns of housing and transportation costs. Figure 23 shows a map of the annual average transit trips next to a map of annual transportation cost in San Francisco. The areas with the highest transit ridership surround downtown and adjacent dense residential areas, and these areas also have some of the lowest transportation costs.

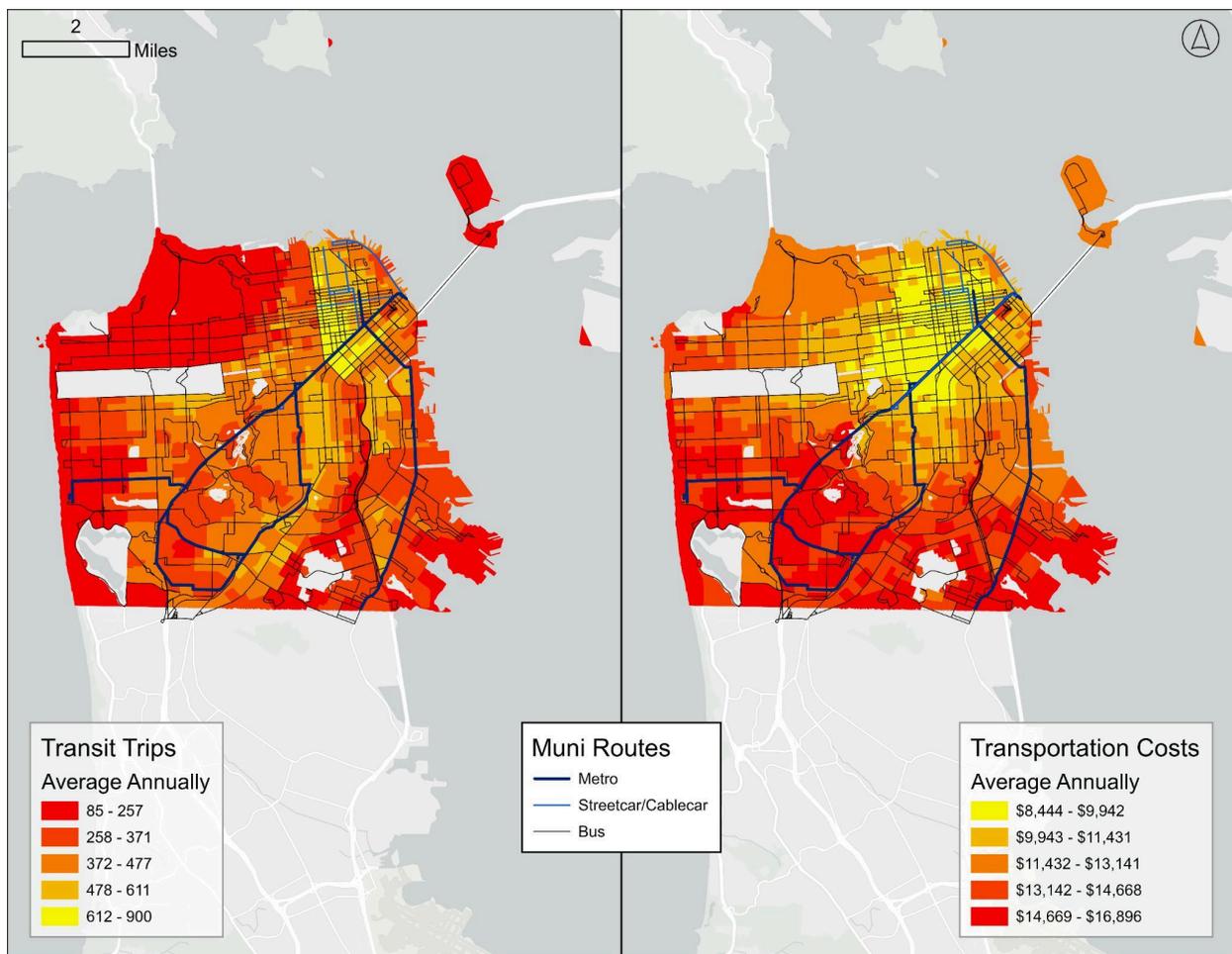


Figure 23 Annual Household Transit Ridership vs Annual Cost of Transportation in San Francisco⁴⁰

⁴⁰ “The Center for Neighborhood Technology’s Housing and Transportation (H+T®) Affordability Index”; *Light Gray Canvas Map*; “Recreation and Parks Properties | DataSF.”

The Housing + Transportation Affordability Index map of San Francisco (Figure 24) shows that many of the most affordable neighborhoods in the city are in areas with dense Muni services, especially around downtown and clustered in the Tenderloin district. Continued investment into public transit in the area is vital for retaining the affordability of these neighborhoods.

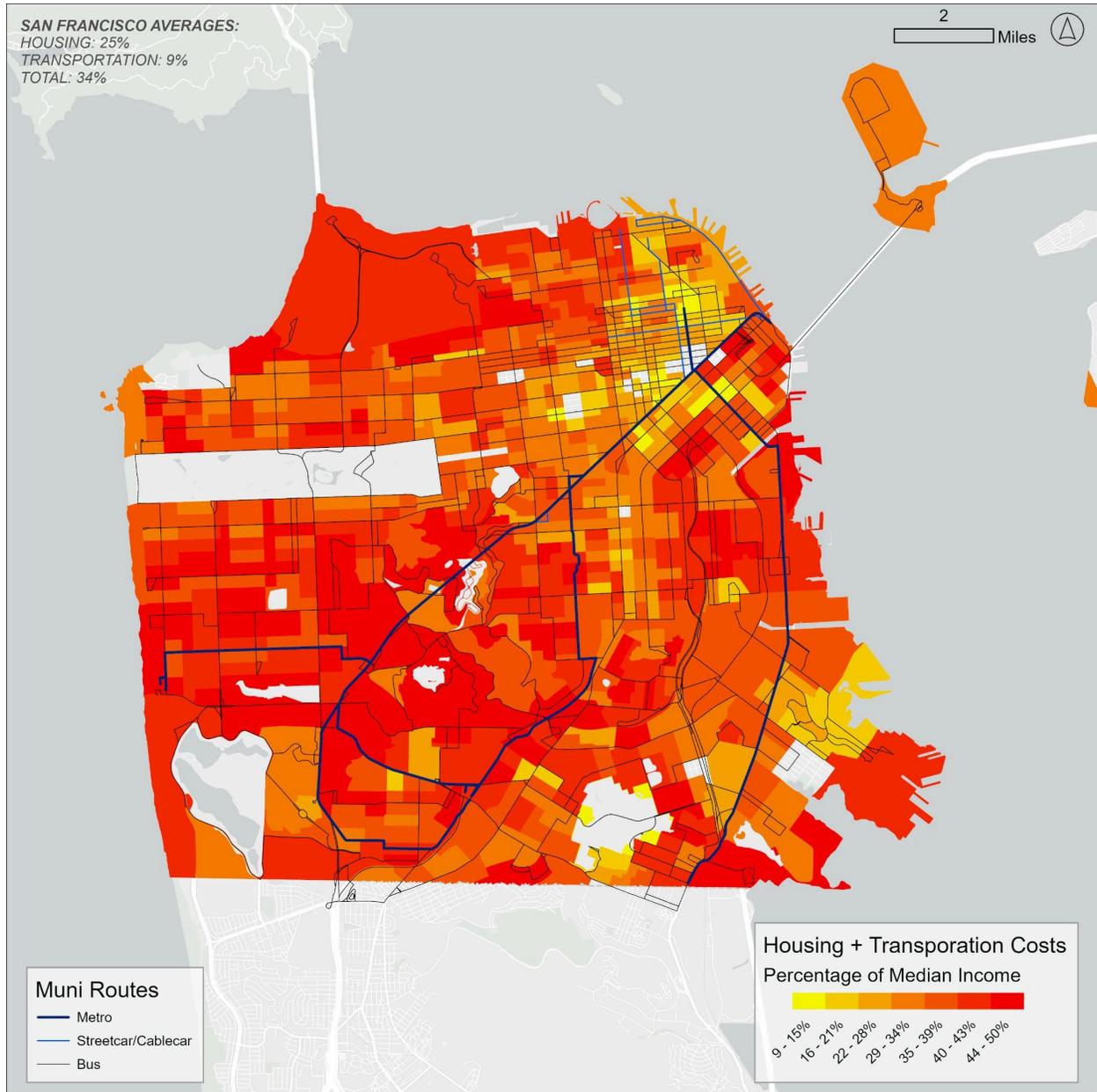


Figure 24 Housing + Transportation Affordability Index Map of San Francisco⁴¹

⁴¹ “The Center for Neighborhood Technology’s Housing and Transportation (H+T®) Affordability Index”; *Light Gray Canvas Map*; “Recreation and Parks Properties | DataSF.”

4.3 - Freedom of Movement for All

There are many other barriers to automobility in addition to its massive financial burden. Many people may not be able to acquire a driver’s license for a variety of reasons, ranging from age to physical ability. Figure 25 shows the driver’s license ownership distribution across different age groups in California. Because driver’s licenses are only made available to residents aged 16 and older, no residents under 16 years old have a license in California, but there are other age groups with low ownership rates as well. A majority of the residents aged 16 - 19 and over 85 years old are non-license-holders. In recent years, Americans have also been getting their licenses later in life⁴², meaning that these patterns are likely to become more pronounced over time. San Francisco is likely to have an even higher non-licensed population given its significantly lower car ownership rate compared to California a whole⁴³.

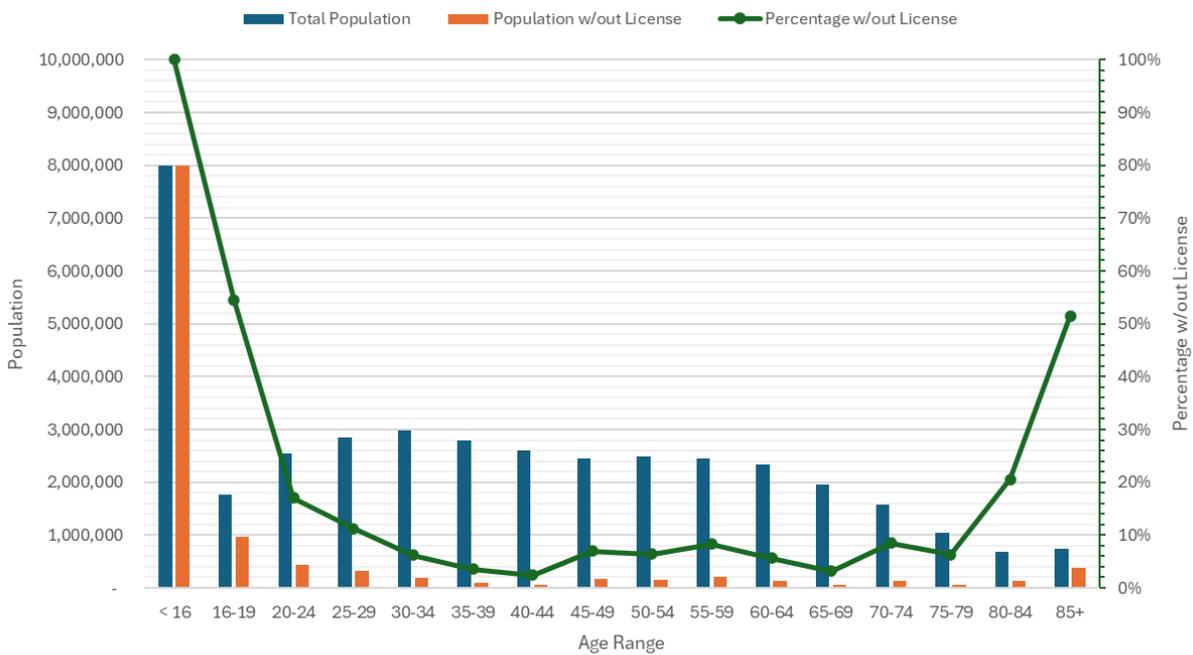


Figure 25: California Residents Without a Driver’s License by Age (2023)⁴⁴

Because of these significant populations without the ability to drive a car, the added mobility that Muni provides San Francisco residents is very impactful. For teenagers, limited transit access would likely mean that their parents or guardians would need to transport them everywhere, which not only reduces the independence of the children, but also cuts into the parents’ time. Muni’s extensive service — coupled with its free transit program for youth — spares parents a significant expense in both time and money, and provides freedom of movement to thousands of

⁴² Buchholz, “Infographic.”

⁴³ Caporal, “How Many Cars Are in the U.S.?”

⁴⁴ U.S. Census Bureau, “Age and Sex”; Office of Highway Policy Information, “Licensed Drivers by State, Sex, and Age Group, 1994 - 2023 (DL-22).”

teenagers⁴⁵. Similar free fare programs in other states have been shown to improve student attendance and performance, while also encouraging a more positive perception of public transit as a whole⁴⁶. For older age residents, limited transit access may lead to feelings of isolation or may force elderly adults to continue driving when they no longer feel comfortable. Muni's free fare program for low and moderate income seniors expands transit access to many San Francisco residents who don't have licenses⁴⁷.

In auto-centric environments, people without licenses need to rely on a family member or friend to take them where they need to go. While many have looked to TNCs like Uber or Lyft to fulfill this role, it is often prohibitively expensive and unfeasible⁴⁸. In transit-oriented cities, people are given a variety of low-cost, sustainable choices. This not only includes public transit, but also forms of active transportation like walking or biking. Car usage is still an option for residents in these environments, it just isn't the *only* option. By expanding the selection of feasible modes of travel for residents, investing further in Muni's public transit services offers a uniquely effective chance to enhance city residents' freedoms.

4.4 - Economic Mobility and Job Access

As mentioned in the previous section, investments in public transit infrastructure have been shown to have an extremely high return⁴⁹. Transit infrastructure has also been shown to increase property values surrounding improvements, and provide stability during times of economic uncertainty⁵⁰. Through various value capture strategies, such as joint development between agencies and developers, this additional value can be channeled to further support future transit improvements⁵¹. These improvements, while proven to boost the local economy, have even more positive impacts at an individual level.

The average San Francisco resident gets access to nearly 600,000 jobs within a 30-minute public transit ride due to the city's comprehensive transit network, providing meaningful low-cost commuting options⁵². Studies in other American cities have found that neighborhoods in high transit service areas are likely to experience lower rates of unemployment⁵³. As discussed above, many low-income individuals in San Francisco are unable to, or choose not to, own a car. This means that Muni's public transit services play a crucial role in providing these people access to jobs. By increasing access to employment opportunities, Muni is also a catalyst for increased economic mobility in San Francisco.

⁴⁵ "Free Muni for All Youth (18 Years and Younger) | SFMTA."

⁴⁶ Fan and Das, *Assessing the Impacts of Student Transportation on Public Transit*.

⁴⁷ "Free Muni for Seniors (Ages 65+) | SFMTA."

⁴⁸ Edmonds, "AAA: Ride-Hailing Twice the Cost of Car Ownership – AAA Newsroom."

⁴⁹ "Public Transportation Gets Us There – Public Transportation"; Chic. Transit Auth., "Argonne-Led Research Shows Robust Investment in Transit Benefits Both Transit and Non-Transit Users."

⁵⁰ Becker et al., *The New Real Estate Mantra Location Near Public Transportation*.

⁵¹ "Value Capture | FTA."

⁵² "Custom Comparison | H+T Index."

⁵³ Kaufman et al., "Mobility, Economic Opportunity and New York City Neighborhoods."

4.5 - Conclusion

This section has analyzed the critical role that Muni's transit services play in reducing the cost of living in San Francisco. Muni's service is especially important for low-income and no-vehicle households who may depend more heavily on public transit for mobility. Further investments into public transit therefore not only have a positive impact on the local economy, but also on the economic mobility of the residents. This is due to the expanded access to jobs and education that Muni allows. Taken as a whole, the economic and social-equity benefits of Muni's public transit services warrant serious consideration as funding to support the system is discussed.

5 - Public Health

5.1 - How Does Public Transit Service Impact Public Health?

Public health is impacted in many ways by the transportation sector. In the United States, car crashes are a leading cause of death and injury⁵⁴, while both rail and bus transit are shown to be significantly safer than automobility⁵⁵. Therefore, encouraging transit ridership and lowering automobile Vehicle Miles Traveled (VMT) can have a direct impact on lowering injury and fatality rates. Additionally, negative externalities from automobility are abundant, including many types of pollution. These externalities can be significantly decreased by lowering automobile VMT and switching trips to public transit⁵⁶. Public transit is a very successful tool for promoting public health, and the specific public health benefits that Muni's services provide are discussed below.

5.2 - Airborne Particulate Matter Pollution

While most discussions of private vehicle emissions focus solely on the greenhouse gases produced through combustion, there is another classification of air pollution caused or exacerbated by the transportation sector that is very important to consider: airborne Particulate Matter (PM) emissions. PM emissions refer to tiny particles of solids or liquids; they can naturally occur or be manmade. The most dangerous form of PM is 2.5 micrometers or less in size and it is commonly referred to as PM2.5. Studies have shown that exposure to PM2.5 increases the likelihood of many different health issues including cardiovascular diseases and lung cancer⁵⁷. Additionally, exposure to PM pollution from car traffic is unevenly borne by low-income and minority groups in California and thus presents a significant equity concern⁵⁸. For these reasons, it is extremely important, from a public health perspective, to reduce resident exposure to PM2.5 in our cities, and to study the disparate impact that this has on the population.

⁵⁴ Transp. Saf., "About Transportation Safety."

⁵⁵ Lewis, "These Charts Explain Why Public Transit Is Safer Than Driving."

⁵⁶ *GHG Intensity of Passenger Transport Modes, 2019*.

⁵⁷ Wu et al., "Air Pollution and COVID-19 Mortality in the United States."

⁵⁸ Koolik et al., "PM2.5 Exposure Disparities Persist despite Strict Vehicle Emissions Controls in California."

Primary PM pollution comes from a variety of sources (e.g. combustion, road dust), but In addition to these sources, a large amount of PM pollution (called secondary PM pollution) forms through reactions between chemicals in the atmosphere. Because of the complex nature of these reactions, it is difficult to accurately attribute sources of secondary PM pollution. However, it is known that common sources include industrial activities, power generation, and automobiles⁵⁹. In the US, roughly a quarter of the total PM2.5 pollution comes from traffic as primary emissions, with an unknown additional amount resulting from secondary emissions caused by automobiles⁶⁰. In a UC Berkeley study of PM2.5 pollution in Chicago, it was found that light-duty vehicles caused roughly 50% of PM2.5 damages, reinforcing the harmful nature of automobile externalities⁶¹. Traffic is an even larger emitter for PM10 (particles 10 micrometers or smaller) which, while less lethal, is still a significant hazard.

Airborne PM pollution is especially important to discuss when considering the unique value of public transit service. Because electric vehicles have not been proven to emit less PM2.5 than gas-powered vehicles, transitioning the fleet to EVs does nothing to address the issues of PM air pollution. A majority of PM2.5 emissions from automobility actually comes from brake and tire friction as well as road wear. While EVs do not produce tailpipe PM2.5 emissions like their gas-powered counterparts, they have been found to produce an equal or larger amount of PM2.5 overall due to their heavier weight, which increases tire wear, and road wear⁶², not to mention PM2.5 generated through different methods of electricity generation⁶³.

A powerful way to reduce the amount of PM2.5 being generated by the transportation sector is to invest in a functional transit system. Since transit consolidates many personal trips onto a relatively small number of vehicles and given that metal on metal (rail) has much less friction and wear compared to rubber on tarmac (cars), it greatly reduces the amount of PM2.5 being emitted per trip⁶⁴.

5.3 - The Bay Area Suffers from Long-term Particulate Exposure

Half of the ten metropolitan areas in the US experiencing the worst long-term PM exposure are in the State of California, according to the American Lung Association's 2025 State of the Air report. The San Jose-San Francisco-Oakland metro area ranks number 6 due to high long-term particle exposure⁶⁵, making the issue of PM exposure of particular importance to the city of San Francisco. Figure 26 displays the average PM2.5 levels in the region (from 2021 to 2023) as well as the surface level wind directions for different months (averaged over 2000-2024). It can

⁵⁹ "Particulate Matter (PM) Basics."

⁶⁰ Karagulian et al., "Contributions to Cities' Ambient Particulate Matter (PM)."

⁶¹ Bin Thaneya and Horvath, "Exploring Regional Reduction Pathways for Human Exposure to Fine Particulate Matter (PM2.5) Using a Traffic Assignment Model."

⁶² Robbins, "Road Hazard"; Woo et al., "Comparison of Total PM Emissions Emitted from Electric and Internal Combustion Engine Vehicles."

⁶³ Bin Thaneya and Horvath, "Exploring Regional Reduction Pathways for Human Exposure to Fine Particulate Matter (PM2.5) Using a Traffic Assignment Model."

⁶⁴ Green, "The Importance of Public Transportation in Reducing Urban Air Pollution"; Steel Interstate Coalit., "Steel Wheels or Rubber Tires? | Steel Interstate Coalition."

⁶⁵ Am. Lung Assoc. State Air, "San Jose-San Francisco-Oakland, CA."

clearly be seen that while the wind patterns in San Francisco do experience changes from month to month, the area exhibits relatively consistent winds from the west to east for ten months out of the year (February to November). During these months, wind passes through the city of San Francisco before reaching East Bay cities like Oakland or San Leandro. Importantly, these cities experience high concentrations of PM_{2.5} pollution. One potential cause of this trend is that PM pollution produced in San Francisco is carried by the wind and lands in these areas for a majority of the year. This means that PM_{2.5} pollution caused in San Francisco is not just a problem for the city, but the entire region. Since many East Bay communities have higher proportions of both minority and low-income populations⁶⁶, while also experiencing higher levels of pollution than most areas in San Francisco, it presents a clear environmental justice issue. In order for San Francisco to address these equity issues, it must be able to lower the amount of PM_{2.5} pollution that it produces, and one clear way to do that is to further invest in Muni's public transit services.

⁶⁶ Ángel Mendiola Ross, "Mapping Racial and Economic Segregation across the Nine-County Bay Area."

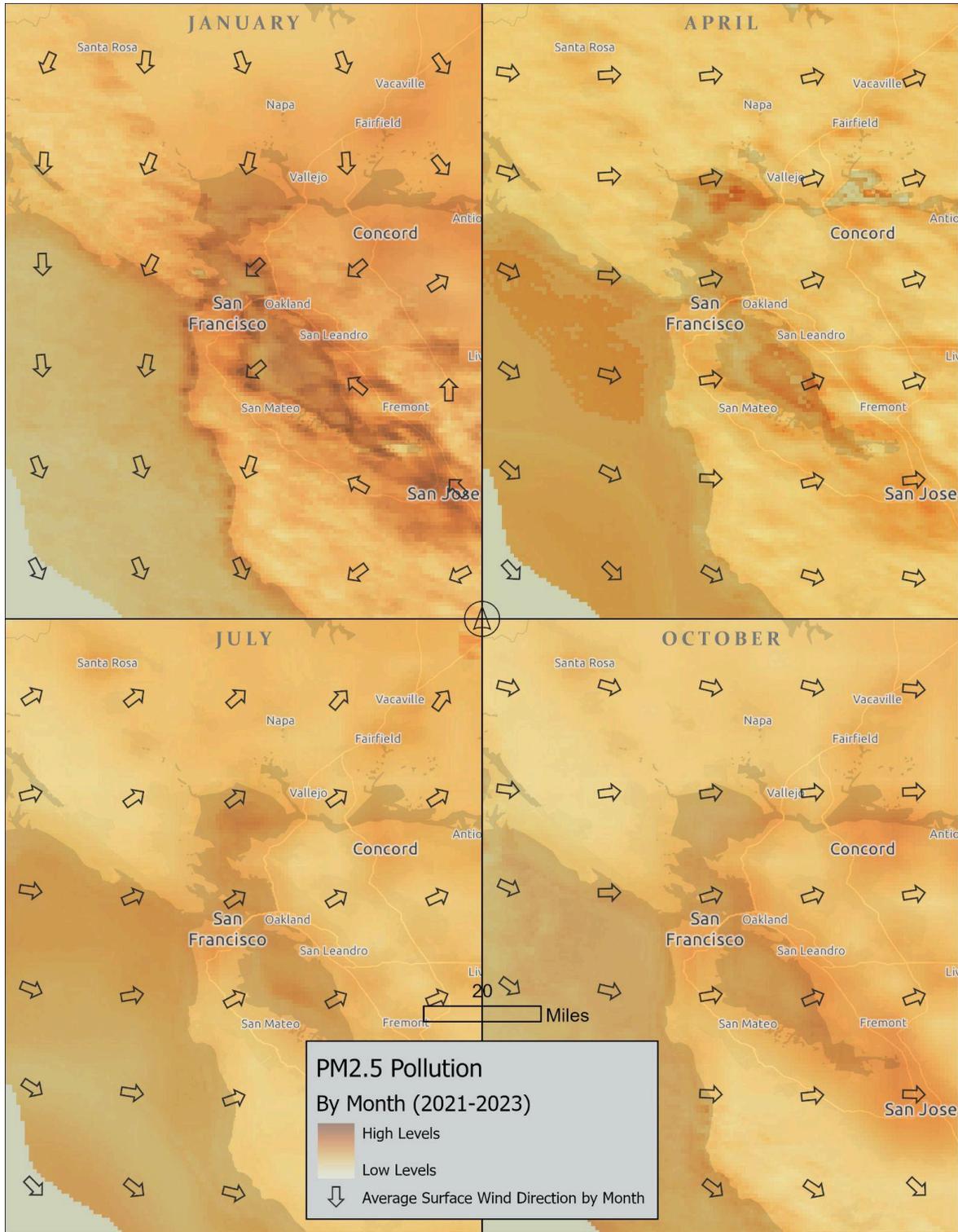


Figure 26 Monthly Particulate Matter Pollution and Wind Direction in Bay Area⁶⁷

⁶⁷ “Annual and Monthly Mean PM2.5 [Ug/M3] at 0.01° × 0.01°”; *Light Gray Canvas Map*; Copernicus Climate Change and Atmosphere Monitoring Services, ECMWF, Esri, “Global Average Wind Speeds by Month and Altitude.”

A recent study found that in 2021, PM2.5 pollution in Chicago was estimated to cause a 6% increase in death across the city⁶⁸, and PM2.5 has been shown to cause respiratory illnesses. On top of the social costs from these deaths and illnesses, the increased hospitalizations caused by PM2.5 cost the city of Chicago well over a million dollars a year. If San Francisco is to learn from the study of its peer city, it is that the reduction of PM2.5 pollution should be a top priority for economic, social, and equity reasons. By providing comprehensive public transit services, Muni already contributes to this reduction by giving residents alternatives to automobility. Increased investment into the system would further improve its impact and encourage residents to choose less polluting modes of transportation.

5.4 Vehicle Miles Traveled and Collision Reductions through Public Transit

Currently, an estimated 468 million annual Vehicle Miles Traveled (VMT) in San Francisco are traveled using public transportation rather than personal vehicles⁶⁹. Based on a recent research paper studying transportation mode switch in the Bay Area, given a hypothetical 10% decrease in transit travel time (based on more efficient transit service), an increase of transit use of nearly 25% can be expected⁷⁰. This equates to a reduction of roughly 81 million VMT from automobiles on San Francisco's roads⁷¹. Since time reductions are more likely to influence people taking longer trips than shorter ones, this value is likely an underestimation.

Applying the average crash rates from previous years in San Francisco, we can estimate the reduction in crashes that would result from 81 million fewer VMT. Roughly 423 property-damage-only crashes, 98 crashes involving injury, and 1 crash with a fatality would likely be prevented given this reduction in traffic. It is difficult to overstate the accompanying social and emotional costs that these auto-related deaths and injuries would have caused, and the prevention of these tragedies represents yet another invaluable aspect of public transit.

5.5 Conclusion

This section has centered on the often-underemphasized externalities of automobility. While it has been clearly shown that increases in VMT directly lead to additional air pollution (both greenhouse gases and PM) and increased crashes, there are many externalities that remain difficult to quantify. Included in this category is noise pollution, which has an extremely local impact and is associated with mental and physical health issues⁷². Additionally, road damage and subsequent maintenance are difficult to attribute to specific vehicles, but the maintenance process and related supply chain contribute a significant amount to the pollution caused by the transportation sector⁷³. With this background, it is clear that San Francisco should seek to limit

⁶⁸ *The Value of Transit in Chicago and the Chicago Region.*

⁶⁹ Replica, "Network Link Volumes."

⁷⁰ Boarnet et al., "Monetary Cost, Time Cost, and Mode Choice."

⁷¹ State of California et al., *Statistical Information Derived from the Highway Performance Monitoring System.*

⁷² Biddle, "How Noise Quietly Affects Your Health."

⁷³ Greer et al., "Pavement Resurfacing and Supply Chains Are Significant Contributors to PM_{2.5} Exposure from Road Transportation."

the VMT in the city; investing further in Muni's transit services represents an effective way to do so.

6 - Conclusion

Muni's comprehensive public transportation services provide important benefits to the residents of San Francisco. By enabling mobility of care trips, Muni increases residents' access to healthcare, fresh food, childcare, and vital face-to-face connections. These benefits are especially important for female riders and low-income residents, who take a higher proportion of MoC trips.

Additionally, with nearly three quarters of San Francisco's households having one car or less, and almost one third not owning a car at all, Muni provides access to car-free living for a significant portion of the population. Areas in San Francisco with low car ownership rates often coincide with low-income communities, meaning that Muni's services significantly reduce transportation costs for the populations that need it most. With the most expensive housing market of any major metro area in the nation, San Francisco's expansive public transit resources are a key factor keeping it from being the most expensive city overall.

Muni's public transit also helps reduce the total vehicle miles traveled on San Francisco roads, and therefore significantly ameliorates negative externalities resulting from automobility. These services save taxpayers tens of millions of dollars of costs that would result from additional crashes and emissions if VMT rates were higher. By reducing on-road VMT, public transit in San Francisco also reduces PM2.5 production, making the air cleaner not only in San Francisco, but also in neighboring communities like Oakland and San Leandro. These impacts, coupled with Muni's services providing reliable access to healthcare, help make San Francisco a healthier city.

Not only do Muni's public transit services contribute to social equity and public health in the city of San Francisco, it is also a sound financial investment. The return on investment for public transit is thought to be anywhere between 4 and 13 times the initial investment⁷⁴, with transit service encouraging increased business activity and higher property values while also expanding residents' access to jobs. Additionally, Muni's ridership saw great consistency pre-pandemic and has exhibited a stable recovery since. This shows that the people of San Francisco receive considerable benefits from the system despite post-pandemic travel pattern changes. Continued and expanded investment into Muni's public transit services is one of the best ways to ensure an equitable and economically successful future for San Francisco.

⁷⁴ Chic. Transit Auth., "Argonne-Led Research Shows Robust Investment in Transit Benefits Both Transit and Non-Transit Users"; "Public Transportation Gets Us There – Public Transportation."

Appendix 1: Classification of Trip Purposes in the Bay Area Travel Survey

In order to make sure that the two data sources were comparable, the data from the Bay Area Travel Survey was filtered to only include trips that originated or ended within San Francisco. Then, all origins and destinations that were marked as “home” were ignored to isolate important trip generators. The trips were then sorted into four categories: Mobility of Care (necessary non-work trips including many common errands), Work (commuting and traveling for work), Recreation (trips purely for personal enjoyment), and Other (trip purposes that were unable to be sorted into the three specific categories). The exact classifications for trip types are recorded below:

Mobility of Care:

- Volunteering
- Attend K-12 school
- Attend college/university
- Attend other type of class (e.g., cooking class)
- Attend other education-related activity (e.g., field trip)
- Attend vocational education class
- Attend daycare or preschool
- Attended school/class
- Grocery shopping
- Other routine shopping (e.g., pharmacy)
- Errand without appointment (e.g., post office)
- Medical visit (e.g., doctor, dentist)
- Shopping for major item (e.g., furniture, car)
- Errand with appointment (e.g., haircut)
- Appointment, shopping, or errands (e.g., gas)
- Pick someone up
- Drop someone off
- BOTH pick up AND drop off
- Dropped off, picked up, or accompanied another person
- Religious/civic/volunteer activity
- Family activity (e.g., watch child's game)
- Other errand

Work:

- Went to primary workplace
- Went to work-related activity (e.g., meeting, delivery, worksite)
- Other work-related
- Went to work, work-related, volunteer-related

Recreation:

- Went to temporary lodging (e.g., hotel, vacation rental)
- Dined out, got coffee, or take-out

Exercise or recreation (e.g., gym, jog, bike, walk dog)

Social activity (e.g., visit friends/relatives)

Leisure/entertainment/cultural (e.g., cinema, museum, park)

Other social

Social, leisure, religious, entertainment activity

Other:

Went to another residence (e.g., someone else's home, second home)

Got gas

Other activity only (e.g., attend meeting, pick-up or drop-off item)

Accompany someone only (e.g., go along for the ride)

Changed or transferred mode (e.g., waited for bus or exited bus)

Other reason

Excluded:

Not imputable

Went home

Appendix 2: Classification of Trip Purposes in the SFMTA On-board Survey

The data from the SFMTA On-board Survey only include trips on the Muni system, which is almost entirely within San Francisco, so it can be compared to the filtered version of the above survey. All origins and destinations labeled “home” were removed to isolate important trip generators. Like the survey above, trips were then sorted into four categories: Mobility of Care (necessary non-work trips including many common errands), Work (commuting and traveling for work), Recreation (trips purely for personal enjoyment), and Other (trip purposes that were unable to be sorted into the three specific categories). This survey included close to 0% “Other” trips, so they were not included in the respective charts. The exact classifications for trip types are recorded below:

Mobility of Care:

- College / University (students only)
- Groceries
- K-12 school (students only)
- Medical/Hospital Services
- Personal Business (Social Services, bank, post office)
- Retail Shopping
- Pick up/drop off someone (daycare/school/medical appointment)

Work:

- Other work-related place
- Your usual Workplace/Place of Employment

Recreation:

- Hotel/Convention Center/Sightseeing (visitor)
- Nightlife/Dining
- Recreation/Social Visit/Sporting Event

Other:

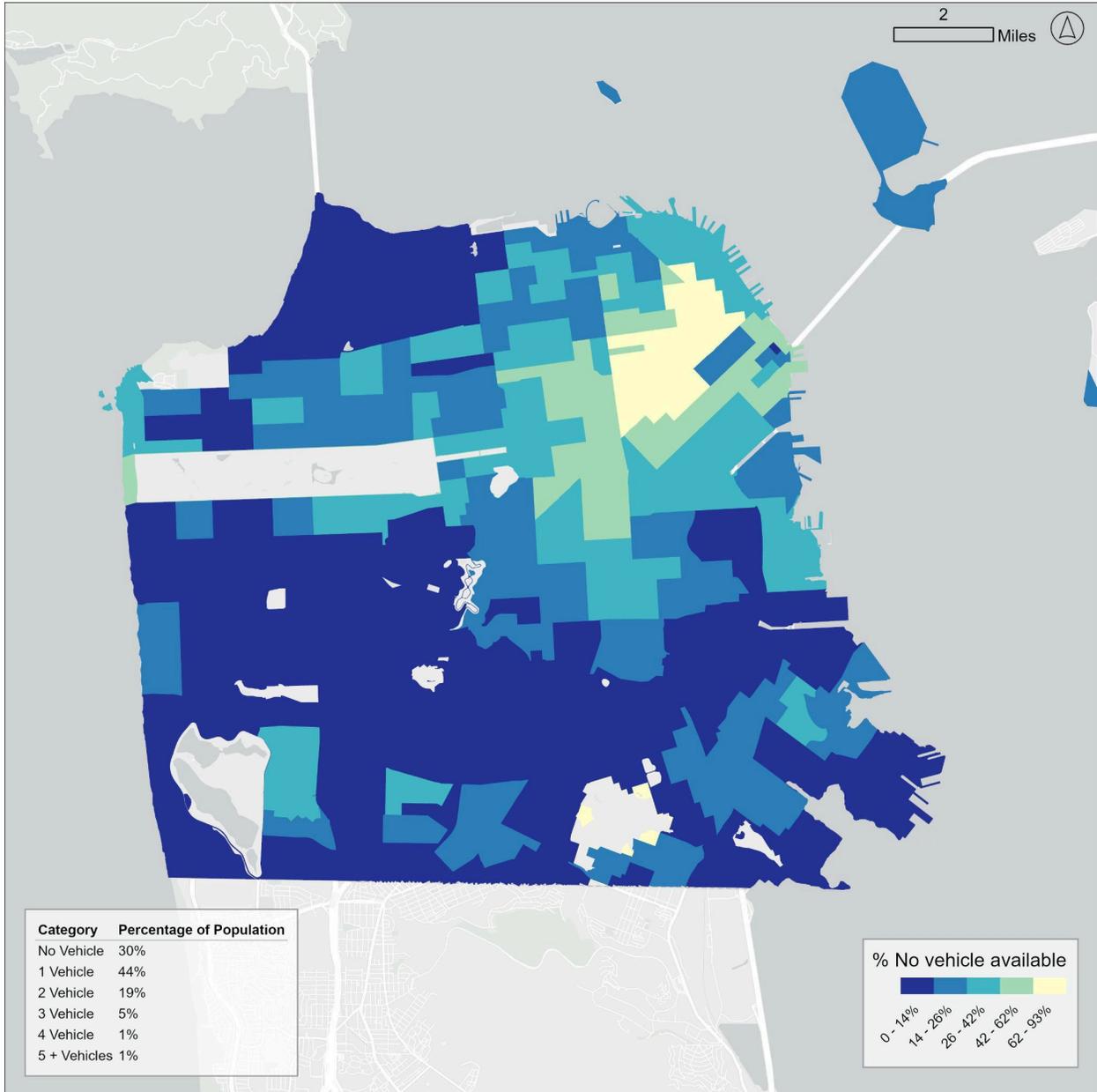
- Airport (passengers only)
- Other

Excluded:

- Your HOME

Appendix 3: No-car Households in San Francisco

A majority of San Francisco Residents (74%) have either one or zero cars per household. In many neighborhoods surrounding downtown, a majority of households have no cars available, relying instead on transit usage and active transportation.⁷⁵



⁷⁵ "Recreation and Parks Properties | DataSF"; U.S. Census Bureau, "Tenure by Vehicles Available"; *Light Gray Canvas Map*.

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