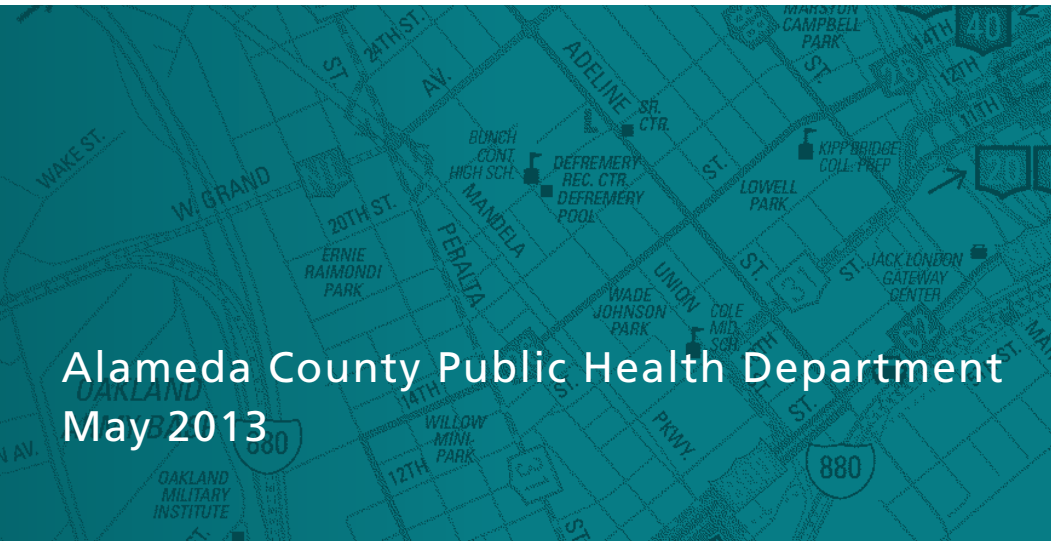
Getting on Board for Health

A Health Impact Assessment of Bus Funding and Access



Alameda County Public Health Department
May 2013

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A Health Impact Assessment of Bus Funding and Access

A Study to Inform the San Francisco Bay Area Regional Transportation Plan

Alameda County Public Health Department

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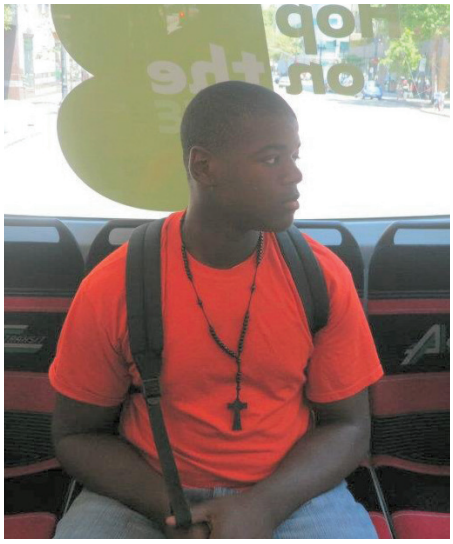




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All analytical conclusions and recommendations are made by the report's authors, not by key advisors.

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Executive Summary

Getting on Board for Health:
A Health Impact Assessment of Bus Funding and Access

Public Transportation Is Essential for Healthy Communities

Everyone needs affordable and reliable means of transportation. For the 2.2 million transit-dependent Bay Area residents who do not own or have access to a car,[1] public transportation is a lifeline to jobs, education, family and friends, healthy, affordable food, recreation, and medical care, all of which are essential for individual health and wellbeing.

Buses are particularly important for many of the Bay Area's most vulnerable riders. In the Bay Area, low-income residents and people of color rely heavily on buses,[2] populations who also face disproportionate health burdens and are more likely to live in neighborhoods where health-promoting resources are few and far between.[3] Many bus riders are also people with disabilities, seniors, and youth who rely on the bus every day to get to places essential for their health. For transit-dependent residents living in neighborhoods farther from urban centers, buses are also crucial connectors to rail transit that carries people to important destinations throughout the region.

Bus Funding, Bus Access, and Health

Historically, buses receive the least amount of government funding of all transit forms.[4] In addition, funding for public transportation, including buses, has been declining at all levels of government. In recent years, declining funding and the rising cost of operations have forced many local transit operators across the country to cut service and raise fares.[5]

Between 2006 and 2011, nearly all bus operators throughout the San Francisco Bay Area cut service and/or raised fares, resulting in an 8% cut in bus service across the region.[6] Local bus operator AC Transit cut approximately 15% of its service between 2009 and 2011 alone,[7] and passed a policy to increase fares, including the cost of the monthly youth and senior/disabled passes, over several years.[8]

Between 2012 and 2013, the Alameda County Public Health Department (ACPHD) partnered with 16 non-profit organizations and public agencies to explore the health implications of these recent bus service cuts and fare increases on AC Transit's transit-dependent riders, with the goal of informing a key transportation decision—the Regional Transportation Plan (RTP).

The RTP is the transportation component of Plan Bay Area, a document guiding future growth for the nine-county bay area that will be adopted by the Metropolitan Transportation Commission (MTC) and Association of Bay Area Governments (ABAG) in July 2013. The RTP shapes how $289 billion in transportation funding from federal, state, and local sources will be distributed throughout the region over the next 25 to 30 years.[9] While the RTP does not dictate how every dollar in funding is spent, it shapes a significant portion of local transit operators' funding supply, and for many local operators, it will be a major determining factor of future service levels—including whether operators have to cut service or increase fares again.

In this study, we conducted surveys and focus groups with 477 transit-dependent bus riders to investigate

how recent bus service cuts and fare increases affected riders' quality of trip experience, affordability, and access to destinations essential for good health. To develop recommendations for MTC, we used data on experiences in the past, combined with secondary public health literature and an analysis of funding scenarios being considered for the upcoming RTP.

Our recommendations focus on how funding for public transit, including buses, may affect the health and well-being of transit-dependent riders. While this study focuses on transit-dependent populations in particular areas of Alameda County, it also reveals the potential health benefits of transit service for all riders across the region when it is affordable, reliable and accessible.

Key Findings

Stressful Commutes: Long Waits, Long Hauls, and Fear of Crime

The vast majority (88%) of surveyed riders were affected by service cuts in recent years. As a result, riders have experienced the following impacts on their daily life and health:

- **Longer waits, increased stress, and safety concerns.** A majority (61%) of surveyed riders report experiencing longer bus wait times as a result of service cuts. Focus group participants also report that longer waits have increased stress and fear of exposure to crime at bus stops.

"Safety is huge. Because with the cuts you have to wait longer, you can easily become a target." – Senior

- **Crowded buses, no place to sit, and getting passed by the bus.** More than one-third (37%) of surveyed riders report more crowding on buses after service cuts. Focus group participants noted that crowded buses can mean no place to sit and even longer waits if there is no space to board—which can lead to reduced bus access (especially for people in wheelchairs) and risk of pain or injury for seniors and people with disabilities.

- **Longer commutes associated with frequent stress.** Almost one-third (31%) of surveyed riders report experiencing longer commutes after service cuts. Longer commutes can mean more stress and additional transfer costs. Riders experiencing longer travel times after service cuts, compared to riders with no impact on travel time, were almost twice as likely to report frequent stress and anxiety (28% vs. 15%).

- **Reduced bus use, more driving, and more vehicle miles traveled.** While most surveyed riders report being completely transit-dependent, a small proportion (6%) said they managed to drive or get a ride to their destinations after service cuts. This means more vehicle miles traveled by car and more greenhouse gas emissions. Greenhouse gas emissions contribute to climate change, which may introduce multiple health and environmental stresses on communities throughout the region.

Unhealthy Trade-offs: Balancing Bus Fare with Basic Needs

- **Trade-offs.** Over the past decade, housing and transportation costs in the Bay Area have increased while average income has not—and these costs have been particularly burdensome for low-income households.[10] Surveyed riders report having to make difficult budget trade-offs when they don't have enough money to cover monthly expenses.

- **Cutting back.** To cope with the rising cost of bus fare, many focus group participants say they have to cut back on food,

"I'm already limiting how many times I go to the doctor, because I don't have the money to go do it…I can't afford additional transit costs. I just can't do it." – Adult bus rider with disabilities

social activities, and trips to the doctor, all important factors for good health.

Service Cuts Directly Affect Access to Destinations Essential for Good Health

The vast majority (83%) of surveyed bus riders report that service cuts directly affected their ability to get to important destinations. When asked to choose one destination, surveyed riders say they were most affected in their ability to get to: job/work (31%), school (20%), social and community activities (11%), and healthcare places (6%).

Missing Work and Wages

Nearly one-third (31%) of surveyed riders said work was the destination most affected by bus service cuts. Findings among these riders:

- **Longer commute times.** Over one-quarter (28%) report an increase of 30 minutes or more to their commutes.
- **Fewer hours worked, job loss, and job relocation.** Focus group participants report that longer commutes can mean arriving late and losing wages for time missed at work. Nearly one quarter (23%) report that they don't go to work as often or at all after service cuts, and a few riders report having to relocate to a different workplace altogether. Missed work days or reduced work hours can translate into lost wages, which make it harder to afford basic needs that support good health.[11]

> "Service changes affect me because it takes me longer to get to work. And if I come 30 minutes late to work, I don't get paid for that half hour, so I'm losing money." – Adult rider

Arriving Late and Falling Behind: Unhealthy Disruptions to School Attendance

Two in ten (20%) surveyed riders report that bus service cuts have most affected their ability to get to school. Findings among these riders:

- **Longer commute times to school.** Over one in four (27%) report that their school commute increased by 30 minutes or more after bus service cuts. Youth focus group participants report that longer commutes can mean lateness to school. Studies have found that long commutes are linked to increased stress and less time for activities that support good health, like sleep and exercise.[12,13]
- **Missed school days.** Less than two in ten (18%) say they don't go to school as often or at all after bus service cuts, and a few riders reporting changing schools. Tardiness and absences have been linked to lower academic performance and school graduation rates.[14] Higher levels of educational attainment have also been linked to higher incomes, which correlates with better health and more positive health behaviors.[15]

Staying In, Losing Out: Social Isolation and Mental Health

Over one in ten (11%) surveyed riders report that bus service cuts most affected their ability to meet up with friends or family. Findings among these riders:

- **Less social activity.** Over one-quarter (28%) report that they go out to meet family and friends less often after bus service cuts.
- **Fear of social isolation.** In focus groups, youth and seniors express concern about social isolation from

> "Without the bus, I would not have a life, a social life. I'd be isolated." – Senior, primarily Chinese speaking

future bus service cuts. Seniors already report being isolated—with nearly half (47%) of all surveyed seniors relying on the bus to get to social activities most or every time they go, and 59% reporting no friends or family within walking distance. Social isolation can have profound impacts on mental and physical health, especially in older adulthood.[16]

Reduced Access to Health Care Appointments

A small group (6%), predominantly composed of senior riders and riders with disabilities, report that bus service cuts most affected their ability to get to healthcare appointments. Findings among these riders:

- **Longer travel times and missed appointments.** Most (63%) say they experience longer travel times to reach healthcare services, which can result in late and/or missed appointments.

> "I have two doctors' appointments Monday, Wednesday, and Friday, I take public transportation to get there. These cuts have affected where I go, when I go, and even if I go. I wouldn't dare think of doing these things on the weekends, because you can't depend on the schedule."
> – Senior focus group participant

- **Fewer trips to health care.** A few report going to healthcare appointments less often or not at all. Regular, preventive health care is important for sustaining good health.[17]

Recommendations

The Metropolitan Transportation Commission (MTC) is considering a number of funding scenarios for the current Regional Transportation Plan (RTP)—each of which would either fund the maintenance of existing levels of transit service, or increase levels of transit service to restore or exceed past levels. MTC's Preferred scenario, which is currently incorporated into the draft RTP, would fund all transit operators at a level necessary to maintain existing levels of service.

Based on the findings of this study, we recommend that MTC do the following:

1. Increase funding for transit service, particularly bus service, in the RTP to support the health and wellbeing of transit-dependent riders and their communities and increase public transit ridership.

Without funding to enhance bus service and restore cuts made in recent years, the impacts reported by riders in our study will continue—if not worsen. MTC predicts that the number and share of transit riders, and elderly and other transit-dependent riders in particular, will grow substantially over the next 25 to 30 years.[18] In order to provide adequate service to current and future transit riders, MTC should devote more discretionary funding to transit in the RTP, using an investment strategy based on transit service restoration and expansion rather than maintenance.

Two scenarios under consideration by MTC direct more funding to transit for enhanced service levels—the Transit Priority scenario and the Equity, Environment, and Jobs (EEJ) scenario. While the Transit Priority scenario boosts service levels in urban core areas of the East Bay and San Francisco, the EEJ invests more funding into transit service, including bus service, across the region.

Based on our study, we predict that the EEJ scenario would result in the best mobility-related health benefits for transit-dependent riders across the region—including improved access to essential destinations and less travel-related stress and safety concerns. MTC's draft Environmental Impact Report (EIR) also found that the EEJ scenario would result in the best environmental benefits, including the lowest vehicle miles traveled and the most public transit trips made per day.[19]

MTC can also work with other transportation agencies to identify additional sources of funding for bus transit operations at the local, state, and federal level—including new or renewed county sales tax measures like Measure B in Alameda County, revenue from highway projects, and state-level cap and trade revenue.

2. Complete a study with the goal of facilitating the development of a regional discounted transit pass program for low-income riders.

A discounted transit pass for low-income riders has the potential to increase trips to essential destinations, improve health for transit-dependent riders, and increase the number of people using public transit.[20] While a couple of local transit operators (including MTA and VTA) offer discounts to low-income passengers, most transit operators do not currently offer such discounts as federal law only requires discounts for seniors and disabled passengers.

MTC has already recognized the need for greater transportation affordability in the Bay Area by committing to evaluate a means-based fare program.[21] MTC should complete this study in order to 1) identify funding sources (both currently eligible sources and potential new revenue streams) to subsidize low-income transit riders throughout the region by keeping fares affordable, reducing transfer costs between operators, and where possible, combining multiple fares; and 2) examine best practices from existing programs and policies nationally. MTC should utilize study results to convene local operators throughout the region to explore how to facilitate discounts for low-income riders while limiting financial and administrative barriers to eligibility.

3. Incorporate quality of trip experience and service conditions into existing data collection and health analyses.

MTC can build on their existing commitment to health by analyzing quality of trip experience and actual service conditions on the ground as critical mobility-related health issues. Collecting data about these issues will not only strengthen understanding of existing service quality throughout the region; it could also directly inform future planning efforts and save costs to operators by more accurately identifying transit service needs.

MTC should encourage local operators to build on their existing data collection practices by providing a standard set of metrics for field-based observation that include wait time, crowding and skipped passengers, and travel time. MTC can also work with local operators to develop a standard set of questions for on-board rider surveys that address actual transit spending, transfers and travel time, wait time, and feelings of personal safety and stress on and while waiting for the bus. In order to maximize existing resources, these questions and metrics could be built into the data collection practices in MTC's Short Range Transit Planning Program as well as MTC's Transit Performance Initiative. Once collected, this data could be compiled into a centralized database and shared publicly.

This study uncovered a number of significant public health impacts facing transit-dependent riders when bus access is reduced. Additional research is needed to provide more nuanced analyses of funding, service levels, and health. MTC should consider partnering with local health departments to develop metrics and tools as outlined above and to pursue future analyses of transportation and health impacts.

Introduction

Healthy Places Promote Healthy People

The environment that surrounds us can help or hinder good health. For example, affordable and health-supportive housing, high-quality schools, good local employment opportunities, and accessible markets selling healthy food are important components of a healthy community.

Unfortunately, resources and opportunities that enable good health are not distributed equally. In very high-poverty neighborhoods of Alameda County, unemployment and home foreclosure rates are over two times those of affluent neighborhoods; levels of higher educational attainment are one third that of more affluent neighborhoods; and the homicide rate is nearly eight times as high. In addition, there are fewer supermarkets and more liquor outlets per person.[22]

Health equity is achieved when all members of a population are able to live healthy, productive, and fulfilling lives. Health equity involves working to ensure that everyone has access to the conditions necessary for good health, especially for those who experience additional socioeconomic burdens or have experienced historic injustice.

These unequal neighborhood conditions have led to stark differences in health outcomes and life chances in Alameda County. Residents of high-poverty areas face an all-cause mortality rate that is over 1.5 times that of affluent neighborhoods, and an overall difference in average life expectancy of seven years.[23]

These differences in health outcomes are, in part, due to a combination of historic and current policies and practices, which have disproportionately affected people of color and led to over-representation of people of color in high-poverty neighborhoods. While people of color make up 65% of the population in Alameda County, they comprise 91% of residents in high-poverty neighborhoods.[24] A range of factors have contributed to racial residential segregation and disinvestment in low-income communities of color, patterns which have negative health implications.[25]

These disparities in neighborhood conditions and health make the presence of affordable, reliable and extensive public transportation essential to promote greater health equity. Public transportation can be a lifeline to high-quality jobs, schools, medical clinics, and other important destinations, particularly for those who live in neighborhoods with fewer health-promoting resources and opportunities. For those without cars, accessible public transportation is also critical to basic mobility—or the ability to move easily within and across one's own neighborhood, city, and beyond to reach essential places and opportunities. Accessible public transit has also been shown to increase the number of trips made per day among transit-dependent people.[26]

Transportation and Mobility: The Link to Health

Many studies have explored connections between transportation and health, including the impacts of transportation projects on physical activity levels, traffic safety, and air quality. To our knowledge, no study of this scale has explored the health impacts of transportation funding decisions with bus access and mobility at the center of analysis. In this report, we

assess the potential health impacts of future transit service levels in the upcoming San Francisco Bay Area Regional Transportation Plan (RTP). The RTP is the transportation component of Plan Bay Area, the long-term plan guiding investment and growth in the nine-county Bay Area over the next 25 to 30 years. The RTP includes $289 billion in funding from federal, state, and local sources and is a critical planning document affecting how much funding is received by different transit operators in the region.[27]

Transit dependent describes anyone who relies on public transportation for basic mobility. In this study, we define transit-dependent as anyone who does not own or have access to a car, as well as anyone who is unable to drive.

In this study, we assess how access to essential destinations, quality of trip experience, and affordability for transit-dependent bus riders may affect health. By exploring the critical connections between mobility and health, and by collecting information directly from those most affected, we hope to bring a missing perspective to regional transportation discussions. While this study focuses on transit-dependent populations in particular areas of Alameda County, it also reveals the potential health benefits of transit service for all riders across the region when it is affordable, reliable and accessible.

Study Partners

Many organizations and individuals shaped and contributed to this study. Starting in the spring of 2012, ACPHD formed an advisory committee comprised of individuals, organizations, and agencies working on public health, environmental health, transportation policy, and transit equity issues. Transit equity refers to efforts to achieve fairness in mobility and transportation access across race, class, age, gender, and disability. The advisory committee was formed to ensure that our study was grounded in the experience of affected communities and connected to ongoing transportation policy discussions. Advisory committee members made contributions to our research scope and methods, research tools, key findings, and recommendations. In addition, the primary data for this study was collected by six community-based organizations with direct connections to transit-dependent bus riders.

Advisory committee members include: ACCE Riders for Transit Justice,* Alameda County Developmental Disabilities Planning and Advisory Council, Amalgamated Transit Union (ATU) Local 192, Bay Area Healthy 880 Communities, Bay Area Regional Health Inequities Initiative (BARHII), Community Resources for Independent Living (CRIL)/Disability Action Network (DAN),* DataCenter,† Genesis,* HOPE Collaborative, Public Advocates, Rose Foundation for Communities and the Environment/New Voices are Rising,* Saint Mary's Center,* Sierra Club, TransForm, Urban Habitat,† and Youth UpRising.* Human Impact Partners (HIP) provided technical assistance on HIA methods and best practices. We also appreciate the insights, data, and comments provided by Alameda County Supervisor Keith Carson, sponsor of the Alameda County Place Matters initiative; Alameda County Supervisor Scott Haggerty; staff at Metropolitan Transportation Commission (MTC); staff at AC Transit; and staff at Alameda County Transportation Commission (ACTC). However, all analytical conclusions and recommendations are from the study authors and advisory committee members, not the above agencies and policymakers. *This project was made possible by a grant from the Health Impact Project, a collaboration of the Robert Wood Johnson Foundation and The Pew Charitable Trusts, with funding from The California Endowment. The views expressed are those of the authors and do not necessarily reflect the views of The Pew Charitable Trusts, the Robert Wood Johnson Foundation, or The California Endowment.* This study was conducted as part of ACPHD's Place Matters initiative, which is focused on policy change to address the root causes of health inequity.

* Indicates community research partners.
† Indicates organizations that provided additional technical assistance.

Background

Why Buses?

This study focuses on buses, because populations who experience the greatest health burdens, including low-income people and people of color, rely heavily on buses.[28] At all levels of government investment, buses also receive lower subsidies than highway or rail, and bus operators are facing declining sources of revenue.[29] Furthermore, buses provide essential service to transit-dependent people living in neighborhoods isolated from other forms of transit.

Buses Are Lifelines for Many Transit-Dependent Riders

In the United States, low-income households, seniors, African Americans/Blacks, and Hispanics/Latinos are less likely than others to own a car. On average, 9% of all U.S. households do not own a car.[30] In comparison, 27% of households living below the federal poverty level, 16% of elderly (65 years or more) households, 20% of African American/Black households, and 12% of Hispanic/Latino households don't own a car.[31]

Many transit riders are low-income, African American/Black, Hispanic/Latino, and/or seniors. Nationwide, as of 2004, the average income of a transit rider was lower than the average income for the entire U.S. population ($39,000 vs. $44,000).[32] African Americans/Blacks are almost six times more likely to use public transit than Whites, and Hispanics/Latinos three times more likely.[33] Many transit-dependent riders are also people with disabilities, youth, and seniors. Among those who rely on public transportation for basic mobility, also known as the transit dependent, almost half are made up of adults 65 years or more.[34]

Buses transport a large share of low-income riders and people of color. Nationally, buses transport the lowest income riders of all transit forms.[35] Locally, low-income people and people of color rely heavily on buses. In the Bay Area, the largest two bus operators are AC Transit and SamTrans, and the largest rail operators are BART and Caltrain. AC Transit and SamTrans buses carry higher proportions of riders from households making less than $25,000 in 2006 dollars (38% for AC Transit and 36% for SamTrans vs. 13% for BART and 16% for Caltrain).[36] AC Transit and SamTrans also carry higher proportions of riders of color, compared to BART and Caltrain (77% for AC Transit and 69% for SamTrans vs. 53% for BART and 49% for Caltrain).[37]

Buses provide extensive service to a range of destinations. Bus networks provide dense service coverage within and between neighborhoods and are designed to connect riders with all of their possible destinations, while rail tends to focus on getting people to job centers and is more limited in its coverage. In the AC Transit district for example, there are 21 BART stations while there are approximately 3,000 pairs of AC Transit bus stops.[38] Thus, buses provide critical access to all kinds of destinations and are particularly important for people living in neighborhoods isolated from other forms of transit. In addition, when service is cut and/

or fares increase, bus riders are likely to be affected in their ability to get to all kinds of destinations, including but not limited to work.

Buses Receives Lower Subsidies than Other Transit

Since the mid 20th century, transportation investments in the United States have prioritized cars and car owners over transit and transit riders, resulting in a highly extensive and well-funded highway system.[39] Since the mid 1980s, roughly 80% of all federal transportation funds go to highways and roads while 20% go to transit.[40] After highways, rail systems have historically received more public funding than bus transit—in large part because this transit funding is often limited to capital investments. Buses tend to have much greater operations funding needs relative to capital needs, so when capital funding is available, it usually benefits rail over buses.[41] In addition, as their riders are lower income, bus operators generally cannot charge as much for fares, resulting in more limited revenue generated for operations (as fares constitute a significant source of operating funds for most operators).[42]

Not only does bus service receive less funding relative to rail service and road and highway construction, its federal and state funding sources have either shrunk or remained the same. According to a 2009 survey of transit operators nationwide, almost 80% have faced declining sources of funding from local, regional, and state sources.[43] As a result, transit operators have been forced to take drastic measures to lower costs and raise revenues. Ninety percent of these operators have responded by cutting service or increasing fares.[44]

Declining Funding, Declining Service

Many bus operators in the Bay Area have had to make drastic service cuts as a result of these dynamics. Between 2006 and 2011, when state transit operations funding hit all-time lows, nearly every bus operator in the Bay Area either cut service or raised fares, with most doing a combination of both. In that time, 8% of all Bay Area bus service was eliminated, with some of the smaller, suburban and rural bus operators cutting as much as one quarter to one half of their service. For example, LAVTA (Wheels) cut 20% of its service, Vallejo Transit cut 25% of its service, County Connection cut 26% of its service, and Benecia Breeze cut 54% of its service.[45]

In Alameda County, the Bay Area's largest bus operator, AC Transit, has faced similar financial challenges and has had to make painful cuts to service as well as major increases to fares during this time. Between 2009 and 2011, because of cuts to state transit operations funding and a drop in sales and property tax revenues combined with rising operations costs, AC Transit was forced to cut 15% of its service.[46]

In 2011, it also passed a fare policy that would, over the course of eight years, triple the cost of the monthly youth bus pass (from $15 to $45) and more than double the cost of the monthly senior and disabled passes (from $20 to $45).[47] This was a particularly dramatic change as the price of the youth and senior passes had been lowered to $15 in 2002 and not raised in the succeeding nine years, and youth pass rates were among the lowest in the country. The fare policy also increased adult local and Transbay fares, and set out a long-term schedule of increases for these fares and pass prices.*

Why the Regional Transportation Plan?

In the Bay Area, the Regional Transportation Plan (RTP) is the transportation component of Plan Bay Area, a long-term plan guiding investment and growth over the next 25 to 30 years (through 2040) for the nine-county Bay Area. It covers how billions of dollars

*At the time of release of this report, the AC Transit Board had recently voted to defer the scheduled 2013 fare increase to allow consideration of changes in fare structure.

in federal, state, regional, and local transportation funding sources will be distributed throughout the region, and is updated every four years by the Metropolitan Transportation Commission (MTC). The current RTP, to be adopted in July 2013, will cover how $289 billion is spent on highway and road, transit, and bike and pedestrian projects and programs.[48] While the RTP does not dictate how every transportation funding source is spent,* it shapes a large portion of the funding that goes to public transit, the relative investments in different transit agencies and modes, and how much goes to capital versus operations expenses.

In the case of AC Transit and other local transit operators, the RTP will be a critical factor in determining whether there are enough funds to maintain existing levels of service, restore cuts and expand service, or whether they have to cut service again. In the last RTP (in 2009), unmet operating needs correlated with service cuts in succeeding years. For example, there were $8 billion of unmet transit operating needs, with most major operators, including AC Transit, receiving less operating funds than needed to run existing service levels.[49] Over the next two years, AC Transit reduced its service by 15%.[50]

In the current RTP, MTC has made a distinct shift by fully funding all transit operators at a level needed to maintain existing service. Despite this commitment, funding adequate transit service for riders may be challenging because current service levels have recently been reduced for many operators, and thus may not represent the level of service needed for current and future riders to meet their daily needs. Furthermore, the current RTP anticipates funding from an extended and increased Measure B. If those additional revenues are not approved by voters, it will have significant funding implications for AC Transit. Therefore, it is crucial to evaluate the potential impacts of future service cuts that may result, in part, from the funding allocated within the RTP.

This study was only able to assess the effects of changes in bus access in limited parts of Alameda County, because of financial and practical constraints. Alameda County has the second-largest number of zero-vehicle households, compared with other counties in the region, making it a logical area in which to explore impacts on transit-dependent riders.[51] In addition, the geographic locations for survey collection were chosen based on several criteria related to transit dependence and health burden, explained in more detail in the Appendix. However, there are many transit-dependent residents relying on bus service throughout the region, with 78% of all zero-vehicle households in the Bay Area residing outside of Alameda County.[52] We believe that many of the findings uncovered in this study will be relevant to transit-dependent bus riders in other parts of the region, and we hope that this study will inform decisions that improve transit access within the Bay Area and beyond.

* The funding included within the RTP includes both committed revenue—which has pre-existing limitations on how it can be spent due to legal or other constraints—as well as discretionary revenue that MTC has authority to allocate.

Why a Health Impact Assessment?

A Health Impact Assessment (HIA) is a tool and a framework to evaluate the potential health impacts of a proposed policy, plan, or project. HIA incorporates a broad definition of health—to include the various social, environmental, and economic conditions that affect health. HIA evaluates the potential impacts of different decision alternatives on the table, and they make recommendations to decision-makers about how their decision can best support health, including ways to mitigate potential negative health impacts.

HIA is an important tool to bring missing health perspectives to the decision-making table. In this case, MTC has made a commitment to health as a key target for their Plan, including increasing physical activity, reducing injuries and fatalities from collisions, and reducing exposure to particulate matter.[53] In addition, MTC has analyzed equity and environmental health issues through their Draft Equity Analysis and Draft Environmental Impact Report (EIR). The Draft Equity Analysis outlines the potential for disproportionate impacts of the RTP on vulnerable populations (identified through Communities of Concern*), including impacts on affordability as well as access to work and non-work destinations.[54] The Draft EIR is a legally required document that outlines potential impacts on environmental quality throughout the region, and within this document MTC has included an analysis of vehicle miles traveled, particulate exposure, and travel/commute time.[55]

MTC's targets and impact analyses examine health, mobility, and affordability as equity concerns, and we admire their leadership in tackling these issues within their planning efforts. Regional transportation agencies, including MTC, have not, however, focused on health in terms of quality of trip experience for transit-dependent riders, or the health impacts of changes in access to essential destinations. Quality of trip experience and access to essential destinations are not easily predicted in model-based analyses, a method that MTC must use in its predictions. This HIA was designed to supplement existing analyses through qualitative primary data collection. It highlights these issues as they have been experienced by bus riders themselves, and the potential health consequences of those experiences.

This HIA investigates the impact of bus service cuts and fare increases made by AC Transit between 2009 and 2011 to understand how these changes have affected riders' daily lives and health. Through surveys and focus groups, we asked riders about the effects of recent service cuts and fare increases in order to understand how their ability to use the bus was affected. We then asked how this change in bus access, in turn, affected their ability to reach essential destinations, their experience of financial burden and budgeting decisions, and the quality of their trip experience. We consulted public health literature to understand how all of these factors may affect physical and mental health—as pictured in the pathway diagram that follows.

Using data about experiences of service reductions and fare increases in the past, this HIA suggests how funding for transit service in the upcoming RTP may affect health and well-being for transit-dependent bus riders in the future. This HIA also seeks to inform transportation analyses and decisions beyond the Bay Area by highlighting the critical connections between bus access, mobility, and health for those who are dependent on public transportation.

* Communities of Concern are geographic areas designated by MTC as areas with the potential to experience disproportionate burdens from future land use and development patterns. According to MTC's Draft Plan Bay Area, Communities of Concern were identified as areas with high concentrations of at least four out of eight "potential disadvantage factors," including minority population, low-income population, limited English proficiency population, zero-vehicle households, seniors 75 years or more, populations with a disability, single-parent families, and rent-burdened households.

Research Scope and Design

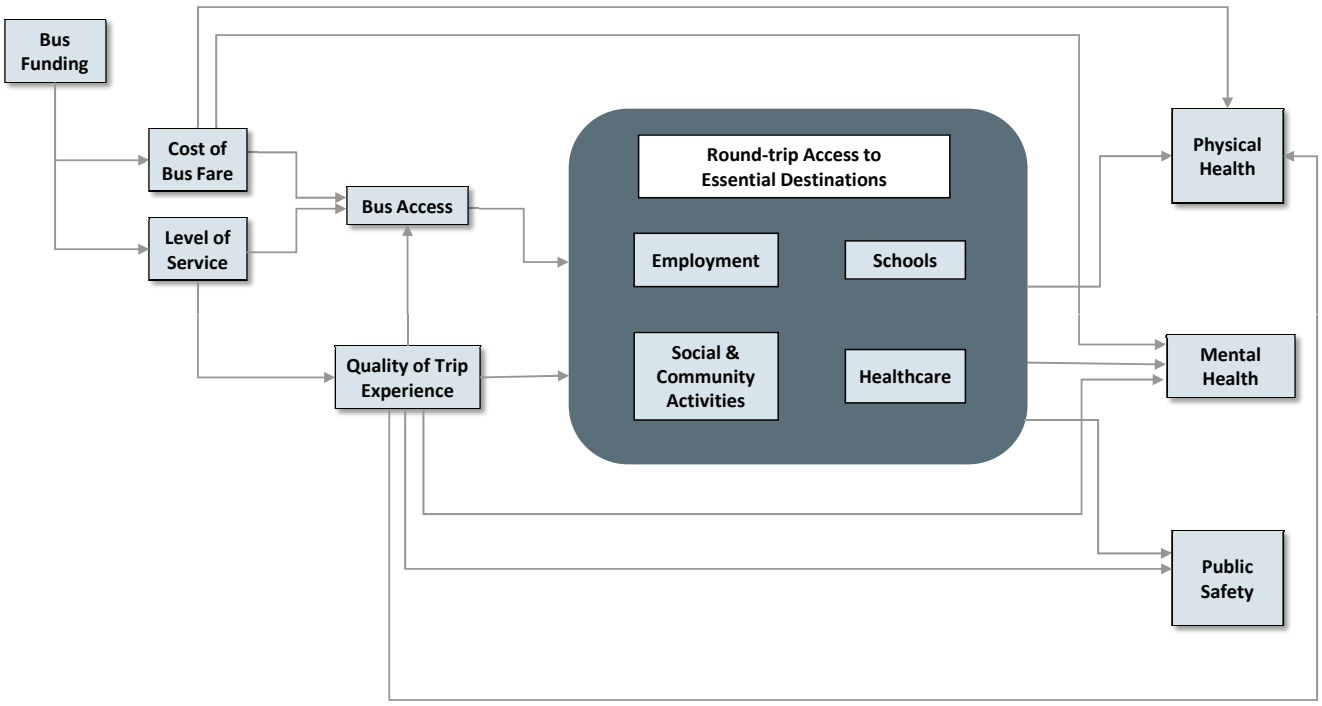
This HIA focuses on how quality of trip experience, affordability, and access to essential destinations might be impacted by bus service and fare changes. Exploring these pathways allows us to highlight the health impacts of changes in mobility among the transit dependent—an important but under-examined health equity issue. In particular, we examine:

1. **Quality of trip experience.** Changes in bus service levels (e.g., reductions in service frequency) can affect the quality of riders' trip experience on buses. Factors like bus wait times or crowdedness can have impacts on people's physical health (e.g., risk of injury), mental well-being (e.g., stress levels), or public safety (e.g., exposure to crime and violence while waiting at bus stops).

2. **Affordability and cost burden.** Increased bus fares can cause stress and anxiety that affect physical and mental health. Especially during times of rising living costs and declining or stagnant wages, higher bus fares may force households to make difficult choices that have direct and indirect health consequences, like choosing between paying for transportation or food, health care, or housing.

3. **Access to essential, health-promoting destinations.** Bus service availability and affordability affect transit-dependent riders' ability to access goods and services that are essential for good health and public safety. The specific destinations we explored in this HIA include places of employment, schools, social and community activities, and healthcare facilities.

Figure 1: Pathway Diagram



Who Are the Transit Dependent?

This HIA focuses on how populations who are most dependent on public transit are impacted by changes in bus service and fares. For the purposes of this study, we chose to define transit-dependent as anyone who does not own or have access to a car, as well as anyone who is unable to drive. Within the general population of transit-dependent riders, we chose to focus this HIA on a number of specific populations among the transit-dependent who face additional health burdens or barriers to mobility that make them particularly vulnerable to service cuts. These populations include: low-income people, people of color, people with disabilities, youth, and seniors. Additional rationale for focusing on these populations is below.

Both low-income people and people of color are more likely to be transit-dependent than higher-income people and white people. Nationally, over a quarter of households living below the poverty line are transit-dependent, due in large part to the high costs associated with buying and maintaining a car. In Alameda County, over one-fifth (21%) of African American/Black households do not have a car compared to 8% of White households—suggesting a nearly three-fold difference in the level of transit dependence.[56] Furthermore, low-income people and people of color are more likely to live in neighborhoods that have fewer resources and conditions essential for good health—such as full-service grocery stores, high-quality schools, high-paying jobs, and clean air.[57] This makes any changes in transit service levels and affordability particularly burdensome for low-income people and people of color, as many must travel out of their own neighborhoods in order to reach important opportunities and services. Low-income people and people of color also face the greatest health burdens countywide.[58]

People with disabilities can have physical mobility constraints and/or mental health conditions that interfere with driving. For many, public transportation is the only way of getting to essential destinations, including to social activities and health care places. In addition, many people with disabilities rely on paratransit, a legally required van service that provides qualified people with disabilities transportation within the same hours and geographic areas as "fixed route," regular bus service.[59] Thus, bus service cuts not only affect those who depend on buses, but they also affect when and where people with disabilities are able to use paratransit to get to basic needs.

Youth depend heavily on public transportation to get to essential destinations like school or jobs. In Alameda County, youth are particularly dependent on buses, with youth under 18 years making up 23% of AC Transit's ridership.[60] Many youth are transit dependent because they lack a driver's license or are unable to drive. Among those who are old enough to drive, costs of car ownership and maintenance can be prohibitive, particularly among low-income households.

Nationally, seniors 65 years or older make up over half of all transit-dependent people.[61] Seniors may face mobility constraints related to aging that prevent them from driving safely, and many rely on a fixed income which can prohibit owning a car. Seniors are particularly vulnerable to changes in transportation availability. Many are not able to leave their house or neighborhood without public transportation, and the

physical health impacts of social isolation are strongest in older adulthood.

All of these populations are vulnerable to the impacts of service changes and fare increases as they have the least alternatives to public transportation and may face significant health risks if mobility is reduced.

Profile of Surveyed Riders

Over 140,000 people rely on AC Transit to get around each weekday because they lack access to a car, are unable to drive, or don't have a driver's license.[62]

The vast majority of transit-dependent riders in Alameda County are low-income people and people of color. Almost all (94%) of transit-dependent riders of AC Transit in Alameda County live in households that earn 80% or less of the area median income. The vast majority (79%) of transit-dependent riders are African American/Black, Hispanic/Latino, Asian, American Indian/Alaska Native, multiracial, or some other non-White racial/ethnic group.[63]

Many of the transit dependent already face multiple stressors and challenges to good health in their daily lives. Among riders participating in our survey:

- **One in seven (14%) employed riders work more than five days per week.**
- **Over 30% are unemployed.**
- **Over half (53%) have no usual place for health care** or rely on the hospital/ER for basic healthcare needs.
- **Six in ten (60%) report having no or only a few friends/family within walking distance** of their homes, indicating potential risk of social isolation.
- **Six in ten (60%) report experiencing stress or anxiety sometimes to very often** in their lives, and one-fifth report frequent or very frequent stress.

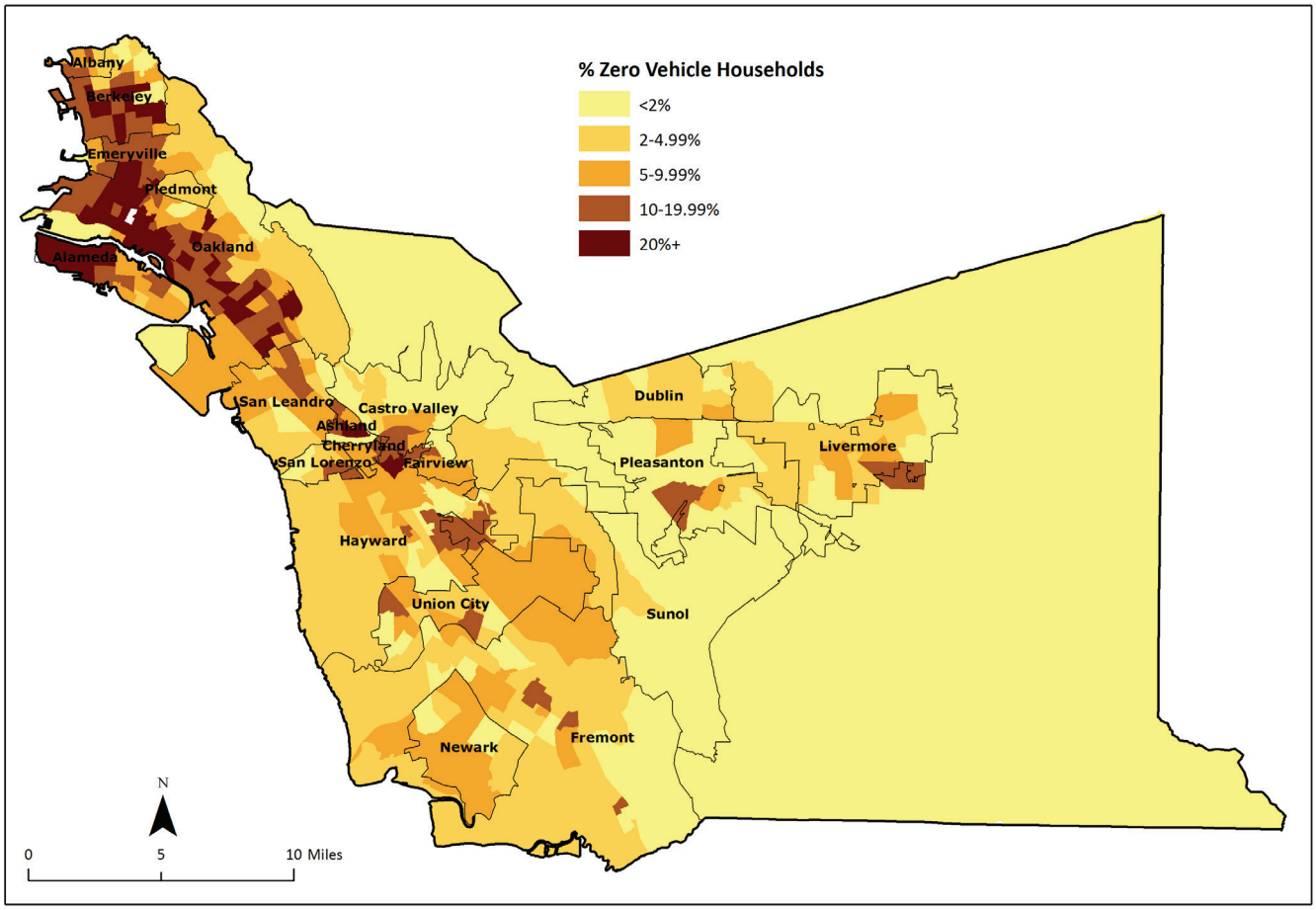
The map that follows shows areas with the highest levels of transit dependence (as measured by the percentage of households with zero vehicles) in Alameda County (Figure 2 on next page).

Many of these high transit-dependent neighborhoods are low-income communities of color that have poorer access to resources that are essential for good health. For our survey, 35 census tracts were selected (29 in Oakland, and six from Alameda, Ashland/Cherryland, and Hayward) based on an index of the percentage of zero-vehicle households, people below 200% of poverty, residents of color, and the presence of one or more AC Transit bus lines that experienced service reductions from 2009 to 2011. Health outcomes tend to be poorest in the transit-dependent communities where we surveyed, where the average life expectancy is 78 years compared to 82 years in other parts of the County (Table 1 on the next page).[64]

Transit-dependent riders are already living in communities that are burdened by multiple health and social risks. In the communities where we surveyed:

- **Over one in four residents (or 27%) are living in poverty**—2.7 times higher than in the rest of the county (where 10% live in poverty). In addition, the average household income ($46,543) is half that of the rest of the county ($95,234).[65]
- **Unemployment is 1.7 times that of the rest of the county,** and working residents are 5.5 times more likely to be employed in occupations that pay less than the income needed to meet basic needs ($27,456 for an individual in Alameda County).[66]
- **The proportion of residents with less than a high school degree/GED (32%) is 2.5 times that of** the rest of the county (13%).[67]
- **Risk of death from cancer, heart disease, stroke, homicide, chronic lower respiratory disease, and unintentional injuries (largely motor vehicle accidents) is between 1.2 and 3.6 times** that of the rest of the county (Table 1).[68]

Figure 2: Percentage of Households with Zero Vehicles



Source: American Community Survey 2007-2011.

The rate of death due to all causes is 1.3 times that of the rest of the county, and **people can expect, on average, to live four years fewer** than the rest of the county population.[69]

Table 1: Measures of Mortality in High Transit-Dependent Surveyed Census Tracts vs. Rest of County

	Life Expectancy	All-Cause Death Rate	Cancer Death Rate	Heart Disease Death Rate	Stroke Death Rate	Homicide Death Rate	Chronic Lower Respiratory Disease Death Rate	Unintentional Injury Death Rate
Target Census Tracts	77.6	786	191	168	50	25	42	35
Other Parts of Alameda County	82.0	603	149	137	38	7	30	21
Relative Rate of Death	N/A	1.3	1.3	1.2	1.3	3.6	1.4	1.7

Source: Alameda County Vital Statistics files, 2008-2010.

Study Methods

Community-based participatory research (CBPR) was a main research approach used in this HIA. According to the Kellogg Foundation Community Health Scholars Program, CBPR is "a collaborative approach to research that equitably involves all partners in the research process and recognizes the unique strengths that each brings. CBPR begins with a research topic of importance to the community and has the aim of combining knowledge with action and achieving social change to improve health outcomes and eliminate health disparities."[70]

This HIA utilized CBPR methods with an emphasis on 1) engaging a broad range of community stakeholders who are affected by or connected to issues of bus funding and access throughout the research process; 2) working directly with community organizations to collect data from bus riders; and 3) using research findings to recommend actions that benefit the health and well-being of bus riders and transit-dependent communities. ACPHD partnered with six community-based organizations who are connected to transit-dependent bus riders in Alameda County to conduct over 400 surveys and six focus groups. Primary data was supplemented by a literature review and secondary analysis of local data.

ACPHD also worked with our community-based partners to host three workshops, where we shared our primary data with bus riders who were seniors, youth, and people with disabilities. These workshops were critical to our process of "ground-truthing"* the data we had found and uncovering more nuanced findings. For a detailed discussion of our methodology, see Appendix.

A total of 417 bus riders responded to the survey. It is important to note that survey respondents were recruited on buses through a convenience sample, at bus stops, and at local venues frequented by transit-dependent riders. The nonrandom nature of this recruitment could affect generalizability of findings from the survey sample to transit-dependent riders of AC Transit in Alameda County. However, we intentionally recruited (via proportional quotas) a sample that represents this population well in terms of age, gender, race/ethnicity, disability status, and income status.

Table 2 on the next page describes the distribution of the survey sample in terms of these demographic characteristics. The survey sample is closely proportional to the population of transit-dependent AC Transit riders in Alameda County in terms of age (although seniors were somewhat underrepresented), gender, and disability status. In terms of racial/ethnic distribution, Hispanics/Latinos, Whites, and Asians/Pacific Islanders were slightly under-represented and African Americans/Blacks were somewhat overrepresented. At least 70% of the sample is low-income and potentially up to 96% (26% of respondents did not provide household income data)—which is in general alignment with population estimates (94% of transit-dependent riders of AC Transit in Alameda County are low income).

* "Ground-truthing" refers to a process of verifying data and information with those who experience the issues first-hand, and it is often part of community-based participatory research processes.

Focus groups were conducted to supplement and deepen research findings, with particular emphasis on gathering the perspectives of smaller population sub-groups that might not have been adequately reached by the survey. A total of 60 bus riders participated in the six focus groups including youth, parents, seniors, people with disabilities, and limited English speakers (primary Spanish and Chinese speakers).

Table 2: Sample Characteristics

	Age	Gender	Race/Ethnicity	Disability Status	Income Status
Survey (n=417)	Youth (27%) Adults (68%) Seniors (5%)	Female (50%) Male (45%) Transgender (1%) Unknown (4%)	African American/Black (49%) Hispanic/Latino (15%) White (13%) Asian/Pacific Islander (13%) Other (6%) Unknown (11%)	Disabled (9%)	Low income (70%) Not low income (4%) Unknown (26%)
Focus Groups (n=60)	Youth (15%) Adults (50%) Seniors (35%)	Female (60%) Male (37%) Unknown (3%)	Asian (33%) Hispanic/Latino (30%) African American/Black (20%) White (18%) Pacific Islander (7%) American Indian/Alaska Native (3%)	Disabled (11%)	N/A

Assessment

Findings: Quality of Trip Experience

Whether boarding crowded buses with no space to sit or waiting for a long time at bus stops late at night, bus trip experiences can have direct effects on riders' wellbeing and quality of life. A 2003 study in New York City found that longer, disconnected, and less predictable routes were all associated with increased stress among riders.[71] Stress causes the body to release hormones that, over the long term, can cause premature aging and lead to a broad range of health problems, including cardiovascular disease, obesity, diabetes, poor immune function, and cognitive decline.[72] Stress has also been linked to poor birth outcomes, such as preterm birth and low birth weight.[73] Many low-income transit-dependent riders already deal with exposure to daily stress before additional stressors like crowded buses are added to the mix. Studies have also found that long commutes translate to less time available for activities that promote good health, like sleep, healthy eating, and exercise.[74,75]

Research Findings

More than two-thirds of surveyed transit-dependent riders (71% of 385 riders) take the bus at least once per day, on average. Almost half (47%) take the bus between seven and 13 times per week, 19% between 14 and 20 times per week, and 5% over 21 times per week.

Travel times tend to be longer on public transit than other modes of transit. In Alameda County, workers who take public transit have the longest average commute time (46 minutes) compared to workers who drive (26 minutes), take taxis (14 minutes), bike (19 minutes), or walk (15 minutes).[76] Among surveyed bus riders, the average commute time was 45 minutes.

Bus service cuts have impacted the vast majority of surveyed riders who have been riding the bus for two years or more* (88% of 289 riders). Only 12% of riders say they have not been affected by service changes.

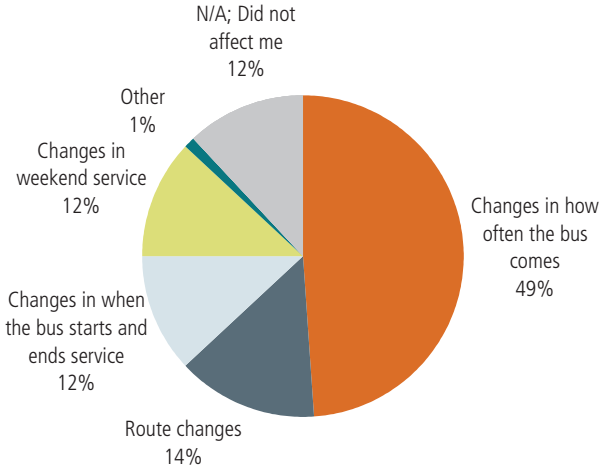
Almost half (49%) of surveyed riders who have been riding the bus for two years or more report that reductions in service frequency have most impacted their daily lives. Riders also reported impacts from route changes, bus start and end times, and weekend service.

Among seniors and people with disabilities, weekend service cuts affected their daily lives as much as bus frequency reductions.

Among those affected by service cuts (254 riders):

- **A majority (61%) report experiencing longer wait times because of service cuts. Riders in all focus**

Figure 3: Type of Service Change that Has Most Impacted People's Daily Lives



* Survey respondents were asked whether they had been riding the bus for two years or more to identify those with a long enough perspective to comment on the impacts of service cuts between 2009 and 2012.

groups report that longer wait times have led to fear of exposure to crime at bus stops. One senior explained: "Safety is huge. Because with the cuts you have to wait longer, you can easily become a target."

Riders in focus groups also underscored that long wait times increase stress and anxiety. One adult shared: "Sometimes we come back so irritated, we begin arguing with our family members. And then you realize [it's] because you [were] out waiting for the bus…. Then, your family is the one who suffers the consequences."

> "At times, you're out late at night…waiting for a bus, and I'm feeling unsafe, I'm feeling cold, and it's very scary."
> – Adult rider with disabilities

To deal with this unpredictability, riders with disabilities in our focus group, who have conditional Paratransit eligibility, report choosing to use Paratransit instead of fixed route bus service. Paratransit providers can charge twice the amount of fixed route adult bus fare, whereas a discount fare on fixed route bus service is often 50% less than an adult fare. Therefore, choosing Paratransit can be nearly four times as expensive as taking the bus,[77] so this presents an additional financial burden.

- **Over one-third (37%) report more crowding on buses as a result of service cuts. Focus group respondents explain that this can lead to having no place to sit or getting skipped by the bus.**

People with wheelchairs are especially likely to report getting skipped by buses. One focus group participant explains: "When it's really crowded, they see you in a [wheel]chair and they pass you by."

Crowded buses can also cause physical discomfort for passengers, particularly for seniors and people with disabilities. A senior rider describes: "We have to stand when it's crowded…. I have arthritis in both of my knees and if I can't get a seat it hurts, it's painful."

- **Almost one-third (31%) report an increase in overall travel time to their destinations as a result of service cuts.** As one youth explains, "The [bus] I take is a combination of [two routes] and it takes [longer] to get to places, so when it used to take me 20 minutes it now takes me an hour and a half."

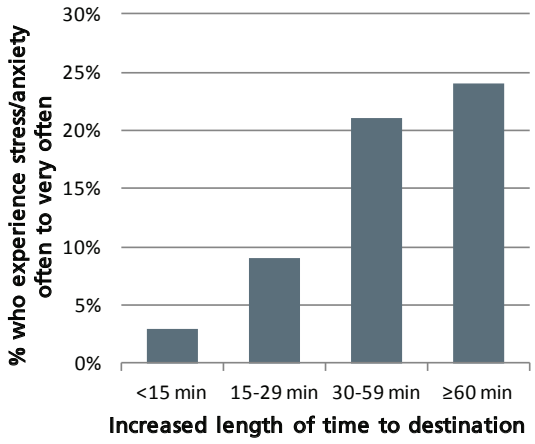
Among riders who experienced increased travel times to destinations (130 riders), almost half (45%) reported that their travel time increased by 30 minutes or more.

- **Longer travel times are associated with stress and anxiety.** Riders reporting an increase in travel time after service cuts were almost *twice as likely* to experience frequent stress and anxiety as riders whose travel time did not increase (28% of riders experiencing increased travel time vs. 15% of riders with no increased travel time).

The longer the increase in travel time, the greater the reported frequency of stress and anxiety (Figure 4).

- **Focus group participants also report that longer travel times can lead to more transfers and higher costs.** As one participant recounts, "Because our rides on the buses are long, by the time you get off the bus, do your things, and try to catch the other bus, the

Figure 4: Relationship Between Increase in Travel Time and Reports Levels of Stress/Anxiety



transfer is expired." Another adds, "The 50 doesn't go to Bayfair [anymore] so I have to take three buses to get there."

Health implications: Chronic stress can lead to a number of serious health consequences, such as cardiovascular disease, obesity, diabetes, and premature birth.[78,79] In addition, previous studies have found that lack of time was a major reason for people not exercising or adopting healthy eating habits.[80] Long public transit commutes have also been linked to sleep deprivation.[81,82,83] Finally, crowding can raise safety concerns—a recent study in San Francisco found that crowding and getting passed by buses led to conflict between passengers.[84]

• **Reduced bus ridership, more driving.** While most surveyed riders report being completely transit-dependent, a small proportion (6%) said they managed to drive or get a ride to their destinations after service cuts. This means more vehicle miles traveled by car and more greenhouse gas emissions.

Health implications: If service conditions worsen, more riders may turn to cars to get to their destinations, resulting in increased vehicle miles traveled and more greenhouse gas emissions. Greenhouse gas emissions contribute to climate change, which may introduce multiple health and environmental stresses on communities throughout the region.

Findings: Bus Fare Affordability

Every day, low-income families across the country make difficult spending decisions in order to stretch limited resources to cover basic needs. A report by the Kaiser Family Foundation found low-income families face a number of financial burdens, including fewer job opportunities, medical expenses that are not covered by insurance, and increasing debt.[85] To deal with financial strain, many families resort to cost-cutting strategies and trade-offs that can hinder good health, such as reducing physical activity,[86] limiting healthy food purchases,[87,88,89] delaying or skipping health care,[90,91] and living in poor quality housing. Additionally, financial strain can lead to depression, reduced emotional functioning, and poor health.[92]

When funding is limited and costs are high, bus operators are often forced to raise fares in order to maintain service. High transportation costs can worsen financial strain for low-income households. When someone spends a large portion of their income on transportation, they may be forced to cut back on other goods and services that support good health.[93]

Research Findings

Surveyed riders face difficult budget trade-offs to cope with financial burden. Surveyed bus riders report they would cut back on basic needs if they could not cover monthly expenses.

- Almost two in ten (18%) say they would limit spending on **transportation** to cope with high living expenses. Youth, seniors, and people with disabilities are especially likely to say they would limit their use of buses.

- More than a quarter (27%) of survey respondents report limiting spending on **food** when they don't have enough to cover monthly expenses. Seniors and people with disabilities are especially likely to limit food (40%) in order to cover expenses.

- Over one in ten (11%) of riders would limit spending on **health care, insurance, or medications** to cope with high living expenses. Seniors and people with disabilities are particularly likely to say they would limit healthcare spending.

Focus group respondents are making trade-offs to pay for increases in bus fare, and they expect to make more trade-offs in the future if scheduled fare increases take place. For those on a fixed income, "The smallest increase in bus fares adds up." Riders report making a number of trade-offs when faced with unaffordable fares, including reducing bus use, sacrificing health care and medications, cutting back on food, decreasing social time and reducing physical activity, and changing schools.

> "Higher bus fares mean less money for other needs."
> – Senior

- **Reducing Bus Use**

One rider with disabilities explained, "Regularly, I roll in my chair rather than taking the bus. I pay for it in pain and everything else, but I'd rather roll [than pay for a bus pass]." These trends are true nationally as well. Research shows that a 10% increase in fares is associated with a 4% decrease in ridership.[94]

Health implications: Reduced bus use affects people's mobility and ability to access goods and services necessary for good health. Long distances, unsafe conditions like high-traffic streets or high-crime areas, and mobility limitations can make walking a painful and even dangerous alternative. In Alameda County, pedestrian injuries and deaths are six times as common in high-poverty areas compared to low-poverty areas.[95]

- **Sacrificing Health Care and Medications**

As a senior focus group participant describes, "I cancelled all my [medical] appointments because I

could not afford a bus pass…. You juggle; you make a decision of what you can afford." A parent mentions similar experiences: "Sometimes the bus is so expensive and I have a doctor's appointment at the clinic but I have no money so I will not go."

> "I'm already limiting how many times I go to the doctor, because I don't have the money to go do it…. I can't afford additional transit costs. I just can't do it." – Rider with disabilities

Health implications: Regular access to health care contributes to longer, healthier lives by preventing and treating illnesses and other health problems early.[96]

- **Difficulty Accessing Food, and Cutting Back on Food**

A senior mentions that with rising costs of fares, "going grocery shopping would be a problem." Another adult rider speaks of a friend of his who "has to use the bus in order to get his food. He is dependent on free food—food banks—to survive. So if this bus pass goes up, he will not be able to eat, it is that simple." Another participant explains, "When bus fares go up, I have to adjust my other living expenses—like skipping meals."

Health implications: Low-income people are more likely to live far away from full-service grocery stores, and may depend on buses to access these sources of fresh and healthy food.[97] If bus access is reduced, they may have to buy less healthy food from nearby corner and liquor stores. When highly cost-burdened families try to cut costs through cheaper food, they may end up buying high-calorie foods of low nutritional quality,[98] which can in turn lead to obesity, and, ultimately, heart disease, diabetes, and other related diseases.[99] Similarly, food insufficiency (when one or more members of a family go hungry for lack of food) is associated with poor physical and mental health.[100]

- **Increased Social Isolation and Reduced Physical Activity**

Social interaction and physical activity are important for health and well-being, but fare increases may make people more isolated and sedentary. Speaking of bus pass increases, one youth says, "It makes me sad because if you can't afford to go anywhere, you'll just stay home and become a coach potato."

Seniors express particular concern about social isolation and immobility if bus fares increase. One senior focus group participant mentions that they would continue to go to their nearby community center and practice dance, "but the financial burden would reduce my willingness to perform, causing unhappiness and ultimately affecting my physical and mental health." Another senior says that they would stop buying a pass if fares doubled and "then I would not be able to go exercise."

> "As an [elderly] couple having to pay double for a monthly pass, we would definitely stop buying it…. [the bus] took us to attend a variety of activities, but without the bus passes, we would stay in all the time." – Senior

Health implications: Reduced physical activity is linked to poorer health.[101] Strong social ties are also important, acting as a buffer against stress and protecting against health risks like pregnancy complications, depression, and chronic diseases.[102] Social isolation has particularly strong effects in older adulthood, reducing immune function and worsening physical health conditions.[103] A recent study found direct connections between bus fare affordability and mental health—a free bus program for seniors in England was shown to improve well-being, reduce loneliness and isolation, and enhance social interactions among users.[104]

- **Changing Schools**

Participants in both the youth and parent focus groups raised concerns about the potential need to change schools if bus fares increase. As one youth says, "I would have to transfer to another school, a school I can walk to." Similarly, a parent explains "I would have to change my child to a school close to this area; it's too much money. I wouldn't be able to pay."

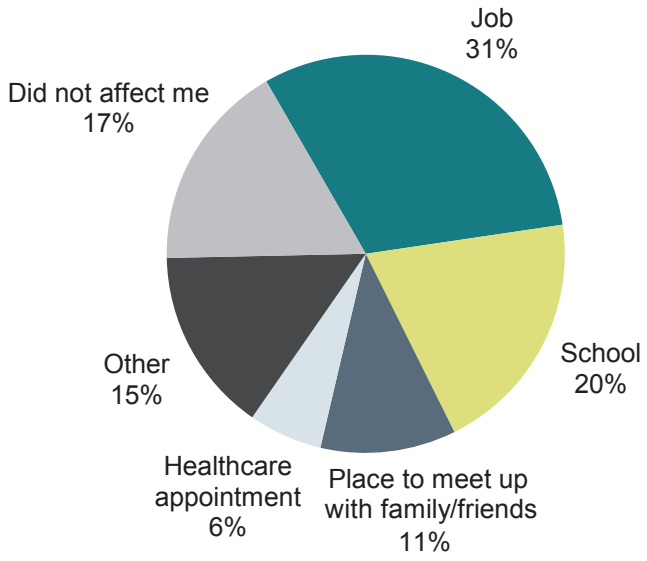
Health implications: Currently, students within school districts like Oakland Unified School District can apply to any school in the district—an open enrollment practice to ensure that all families, regardless of where they live, have opportunity to attend high-performing schools across the city. If increased bus fares force some students to leave schools of choice and attend lower-performing neighborhood schools, academic outcomes—along with income, job, and health trajectories—could be negatively impacted. In addition, research shows that school transfers can be disruptive to academic performance and social networks.[105,106]

Findings: Access to Destinations Essential for Good Health

Among surveyed riders who have been riding the bus for two years or more,* the vast majority (83%) report that bus service cuts affected their ability to get to destinations that matter for their health and well-being.

Surveyed riders were asked if bus service changes have especially affected their ability to reach several destinations. They were then asked a series of questions regarding their most-affected location. The most affected destinations include: 1) Job/work (31%); 2) School (20%); 3) Places to meet up with friends/family (11%); and 4) Healthcare appointments (6%) (Figure 5).

Figure 5: Which of the Following Destinations Has Been Most Affected by Service Cuts?



* Survey respondents were asked whether they had been riding the bus for two years or more to identify those with the appropriate time perspective to comment on the impacts of service cuts made between 2009 and 2012.

Getting to Work

Employment is closely linked to both individual and community health. A review of 33 studies found clear links between employment and better physical and mental health.[107] Unemployment is linked to higher mortality rates, cardiovascular disease, and mental health issues like anxiety, depression, and substance abuse.[108,109] High unemployment also weakens social networks and civic engagement[110] and is associated with increased crime.[111]

Public transit creates jobs for bus drivers, mechanics, and support staff, and brings economic benefits to entire neighborhoods.[112] Investing in bus transit also boosts local economies. One study found that $10 million invested in transit operations produces $30 million in increased business sales.[113]

Research Findings

Over half of surveyed adult riders (59% of 272 riders) are employed. Substantial percentages of youth (33% of 82 riders), seniors (28% of 18 riders), and people with disabilities (18% of 33 riders) are working.

Among all surveyed working riders (196 riders), six in ten (60%) work five or more days each week. Almost half (46%) of working riders go to their jobs five days per week, and 14% work six or seven days per week.

The vast majority (83%) of surveyed working riders rely on the bus every day to get to work.

As one focus group participant said, "I have to go to work. If I don't take the bus, I have no way to get there." Another respondent explained, "I use the bus to get to and from work pretty much every day, and I work six days of the week. So I rely on the bus all the time."

Over three-quarters (76%) of all surveyed working riders report commute times of 30 minutes or more, with almost two in ten (17%) reporting commute times of one to two hours.

Three quarters of bus riders who are not working (75% of 182 riders) report that they are actively looking for work by going to job interviews or job training/career centers, and over half (52%) of this group relies on the bus most of the time (22%) or every time (30%) they go.

> "I have to go to work. If I don't take the bus, I have no way to get there." – Adult rider

Almost one-third (31% or 89 respondents) of surveyed riders identified work as the destination that has been most affected by recent bus service cuts.

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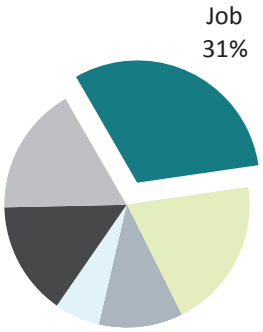


Among these riders (89 riders):

Seven in ten (70%) report that it takes them longer to get to work after service cuts.

Almost three in ten (28%) report an increase in commute time of 30 minutes or more.

Health implications: Long commutes are associated with increased stress and less time for healthful activities like sleep, healthy eating, and exercise.[114,115,116]

Several focus group participants report arriving late and losing wages for time missed at work. One adult rider explained: "Service changes affect me because it takes me longer to get to work. And if I come 30 minutes late to work, I don't get paid for that half hour, so I'm losing money."

Other studies have found similar impacts from transit service issues. A recent study focused on San Francisco bus riders found that riders were concerned about getting fired due to unreliable transit and had to compensate by leaving early for work. This cuts into time they would otherwise spend taking care of themselves and their families.[117]

Health implications: Money provides access to resources like health insurance, healthy food, and good housing.[118] Conversely, loss of wages can compromise

Herb Hastings: Gaining Independence through Buses

Herb Hastings has lived in the East Bay for most of his life. He has uncontrolled seizures as a result of his epilepsy, and until 15 years ago, was afraid to ride the fixed route bus system in Livermore (called Wheels) because he didn't know how he would manage a seizure while on the bus. He rode only on a Paratransit shuttle, which would pick him up and drop him off wherever he needed to go, but was significantly more expensive than buses.

When he got a job in Oakland 15 years ago, a coworker and an independent living instructor helped him learn how to safely ride Wheels to BART, so he could confidently travel to and from work. Now he uses Wheels every day to go shopping and to travel around Livermore, where he grew up.

Herb lived in Livermore from 1972 until seven years ago, when an excessive commute time forced him to move. He had to travel on a bus for an hour before even getting to BART. Herb ended up moving to an apartment 200 feet from a BART station. He was able to eliminate two hours of commuting from each day, but he had to move to do it.

An advocate for better transportation, Herb thinks it would be better if buses were designed for more wheelchairs, so they were easier for passengers to get on. He also wishes that bus service frequency would improve in Livermore, especially on weekends. "We could use better weekend service—we can't really go out because [many] services were cut during weekends." He hopes that, through expanded service, bus companies can help developmentally disabled individuals to be able to travel to critical destinations. He says "I don't believe that disabled individuals should live in isolation. I teach the newer generation how to live with developmental disabilities."

health by forcing people to choose between paying for various basic needs like healthcare, housing, or food.[119] In addition, frequent lateness to work can threaten job performance and job stability. Chronic job instability can lead to a host of health problems down the road, including increased stress, high blood pressure, and greater risk of heart disease, stroke, and mental health issues.[120]

Almost one in six (16%) report that they don't go to work as often as a result of service cuts, and several report that they don't go to work at all. Some additional riders report that they have had to switch to a difference workplace.

Health implications: Missed work days or reduced work hours translate into substantial loss of wages, which make it harder to afford basic needs that support good health, like food, housing, and health care.[121]

Getting to School

Education is a powerful determinant of both wealth and health. Each additional year of education is associated with better health outcomes and an increase in life expectancy.[122] Education leads to higher earnings and increased access to critical determinants of health, like quality housing, safe neighborhoods, healthy food, and good medical care. Education also increases the likelihood of positive health behaviors and outcomes by supporting access to health information and resources as well as social support and health-promoting environments.[123]

Research Findings

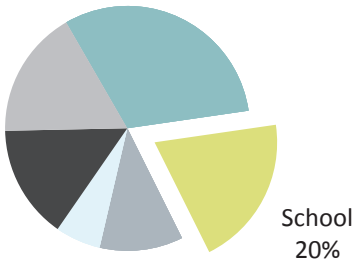
Over half (54%) of all surveyed riders report being enrolled in school. While most student riders are youth, over one-fourth (28%) are adults 24 years or more. Over two-thirds (68%) of student riders go to school five days per week and over one-fifth (22%) attend school three or four days per week.

The vast majority of student riders (89% of 190 riders) take the bus every day they go to school.

Over four in ten youth who are involved in after-school or summer activities (43% of 47 riders) ride the bus to these activities most of the time or every time they go.

Two in ten (20% or 57 respondents) of surveyed riders report that service cuts have most affected their ability to get to school.

One-fifth (20%, or 57 respondents) of surveyed riders report that service cuts have most affected their ability to get to school.



Among these riders (57 riders):

- **Nearly three-quarters (74%) report that it takes them longer to get to school as a result of service cuts.**
- Over one in four (27%) say they have seen their school commute increase by at least 30 minutes. As one student describes, "The bus comes, but it takes forever getting place to place before school and after school hours."

Health implications: Long commutes are associated with increased stress and less time for healthful activities like sleep, exercise, and healthy eating.[124,125,126]

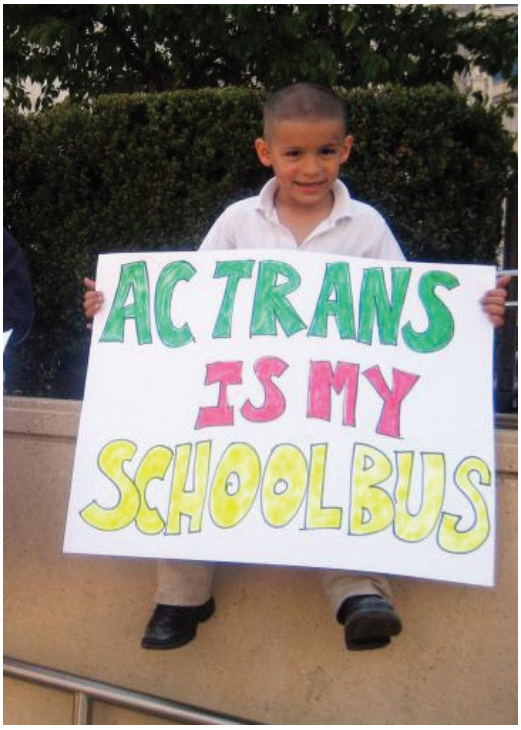
"[After bus service cuts, buses have been] getting me to school late." – Youth rider

Since service cuts took effect, some riders report that they go to school less often; in a couple of cases, students stopped attending school altogether. Several

Almost 9 in 10 student riders take the bus every time they go to school.

students also report arriving late to school as a result of longer commutes to school.

Health implications: Arriving late and missing school days can increase chances of truancy and chronic absenteeism. Truancy (three or more unexcused absences from or tardies to school) and chronic absenteeism (missing 10% or more of the school year) can have profound impacts on academic performance and school graduation. Students who do not complete high school cannot access the benefits associated with higher levels of education, such as increased and better paying employment and more positive health behaviors.[127] Truancy reduces the likelihood of college enrollment, increases risk of involvement in the criminal justice system, and is associated with poor physical and mental health in adulthood.[128,129,130]



Jazmine Caldwell: Balancing Schoolwork and Long Commutes

Jazmine Caldwell is a 23-year-old East Oakland resident who has depended on AC Transit for as long as she can remember. She praises the affordability of the bus, saying "it's great for people who are on a strict budget or fixed income."

When Jazmine was 18, she attended Chabot College in Hayward. On her way to school, Jazmine had to transfer between three different AC Transit lines; a one-way trip in no traffic took 1.5 hours. With a round-trip three-hour commute between home and school, she would have to stay up late to do her homework, sometimes pulling "all nighters" to get the work done before her early bus ride the next day. Her performance in school was affected by her lack of sleep and time, and some days she didn't have the energy to travel for such a long time to school and stayed home instead. Every five episodes of lateness equaled one absence, and Jazmine eventually registered four absences—one more and she would have been dropped from the class.

Given the link between educational success and long-term health, buses play an important role in providing critical opportunities to students like Jazmine. She hopes that, in the future, transportation decisions will be made considering the impact of travel time on health.

Getting to Social and Community Activities

Social support is essential for good health. Strong social ties can act as a buffer against stress and protect against a number of health risks, resulting in better health outcomes. Social support is associated with lower blood pressure in everyday life, reduced risk for cardiovascular disease, and improved immune function.[131]

Social support is particularly important for health in older adulthood. A number of studies have found that social participation and social support improve life expectancy for seniors.[132] Conversely, social isolation has been found to increase the risk of disease and death among older adults. Loneliness has been associated with higher blood pressure and lower-quality sleep among seniors.[133]

Research Findings

Surveyed riders depend on the bus for many kinds of social activities.

- Almost one-quarter (24%) take the bus every time they **meet up with friends or family.**
- Almost one-quarter (24%) take the bus every time they go to **community centers or volunteer activities**
- Two in ten (20%) take the bus every time they go to **city council, school, or neighborhood meetings.**
- Over one-quarter (26%) take the bus every time they go to **places of worship.**

Seniors are especially dependent on the bus to access social activities. Nearly half of surveyed seniors (44% of 18 riders) take the bus most of the time to every time to they go out to meet up with friends or family.

Many surveyed riders, and especially seniors, already experience some degree of social isolation in their daily lives. Six in ten (60%) of all surveyed riders report having few or no friends or family within walking distance of their homes. Seniors were particularly isolated—59% report having *no* friends and family within walking distance of their homes. Overall, these riders were more than twice as likely to report experiencing frequent stress and anxiety in their daily lives compared to riders with most or all of their friends and family within walking distance.

When asked to choose one destination, 11% of riders (32 riders) report that service cuts most affected their ability to meet up with friends or family.

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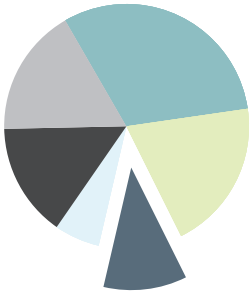


Place to meet up with family/friends 11%

Among these riders (32 riders):

- **More than one-quarter (28%) report that they don't go to places to meet up with friends and family as often as a result of service cuts.** As one senior describes in a focus group, "I've had to cut some of my activities. I used to go the library, to meet some of my friends where we could use the computer and do some research. That's cut, so we don't go anymore."

- **Focus group participants, especially youth, report that service cuts have impeded their social life.** As one youth explains, "I live in West Oakland and both of the buses near me stop running early. I'm 23 and try to have a vital social life, but it's impossible with [limited bus service]."

- *Health implications:* As noted, research has shown that social isolation can have negative effects on both mental and physical health. Affordable bus transit can help to address this. A free bus program for youth and seniors in England was shown to improve well-being, reduce loneliness and isolation, and enhance social interactions.[134]

Ho You Wen (Myra) Chang—Using Local Bus Service to Stay Connected

Ho You Wen, an Oakland resident, has been using local buses to get around since she moved to the Bay Area in 1982. Eleven years ago, a stroke disabled the left side of her body; she now uses a wheelchair, which can complicate her transit experiences. She is grateful for AC transit's superb drivers, saying "most of the drivers are very nice—they are so courteous and kind." Ho You Wen is an active senior citizen, and the bus helps her stay connected to the things that make her happy.

The bus allows Ho You Wen to access many community resources. She participates in the senior lunch programs at the Oakland Veterans' Center and the South Berkeley Senior Center, where she meets her friends who are there for the dancing classes, trips around Oakland, and art programs. She loves going to the museums and parks around Oakland, and the bus helps her get to them easily. She also loves practicing the craft of Chinese macramé, and she uses the bus to go buy materials for her crafts at Michaels.

Ho You Wen lives on a fixed social security income, which does not increase with rising bus fares. She says that a rise in bus fares would result in her and her senior friends leaving their homes less often, saying "we don't want to stay home all the time—it's like torture." She also worries that, with her disability and a rise in bus fares, she will be less able to do things that her peers can do: "Even if I am handicapped, I want to enjoy my life."

Getting to Health Care

Regular access to health care helps people to live long, healthy lives by preventing and treating health problems early. Preventive care can improve health by protecting and immunizing against disease, detecting and treating illnesses before they progress, and by rehabilitating patients after their illness.[135] Preventive care can also promote and maintain mental well-being.[136]

Research Findings

Nearly half (45%) of surveyed riders say they take the bus most times or every time they go to their place of health care. One focus group participant says, "I rely on the bus every single day to go to doctors." Another depends on the bus to get to prenatal visits, noting, "I use the bus…since I'm pregnant, and I have to go to the clinic all the time."

Seniors and people with disabilities are especially dependent on the bus for health care. Almost two-thirds (65% of 48 riders) take the bus every single time they go to their usual place of health care. One elderly participant with disabilities describes how the bus improves access to health care, saying, "I absolutely cannot live without the bus. I rely on the bus to get to my medical appointments at the hospital." Other seniors report they rely on the bus to get medication: "We have to take the bus to go pick up our prescriptions."

Access to Healthcare Places Decreased After Service Cuts

A small group (6% or 16 riders) report that service cuts have most affected their ability to get to healthcare appointments. Among seniors and people with disabilities, healthcare facilities were the primary destination that has been impacted by service cuts.

A small group (6% or 16 respondents) report that service cuts have most affected their ability to get to healthcare appointments.

Among these riders (16 riders):

- **Over half (63%) report having longer travel times to healthcare appointments** as a result of service cuts. Focus group participants describe how late buses can lead to missed appointments. "I have experiences where I wait up to an hour and the bus just doesn't come. So I have been late to the clinic. And right now at the clinics, if you are 15 minutes late, they will cancel your appointment."

Health implications: Transportation problems can be a barrier to regular and preventive care as well as medical treatment. Research shows that lack of transportation poses a particularly difficult barrier for low-income people, people of color, single parents, and parents of young children in accessing health care.[137,138,139,140] Studies from Texas and Massachusetts found that transportation was a main reason that both adults and children failed to receive needed treatment and checkups.[141] A local study in Contra Costa County found that transportation problems were responsible for nearly one-quarter of all missed appointments at Contra Costa Health Services Extended Evening Clinics.[142] Missed appointments are also financially detrimental to the clinic.[143] Regular preventive health care helps people avoid and treat illnesses.[144]

- **A few riders report going to healthcare appointments less often as a result of service cuts, and one no longer goes at all.** One focus group participant explains having to limit when they go to health care appointments (translated): "Weekend service terminates on Broadway now. [It's] too far to walk so [I don't] book weekend doctor's appointments."

Health implications: As noted, regular preventive health care improves health outcomes.

- **A survey respondent and a focus group participant each mention changing where they go to receive healthcare services as a result of service cuts.**

Health implications: When people have a consistent place of care, they have shorter hospital stays, are more likely to receive preventive health services and are less likely to depend on the emergency department.[145]

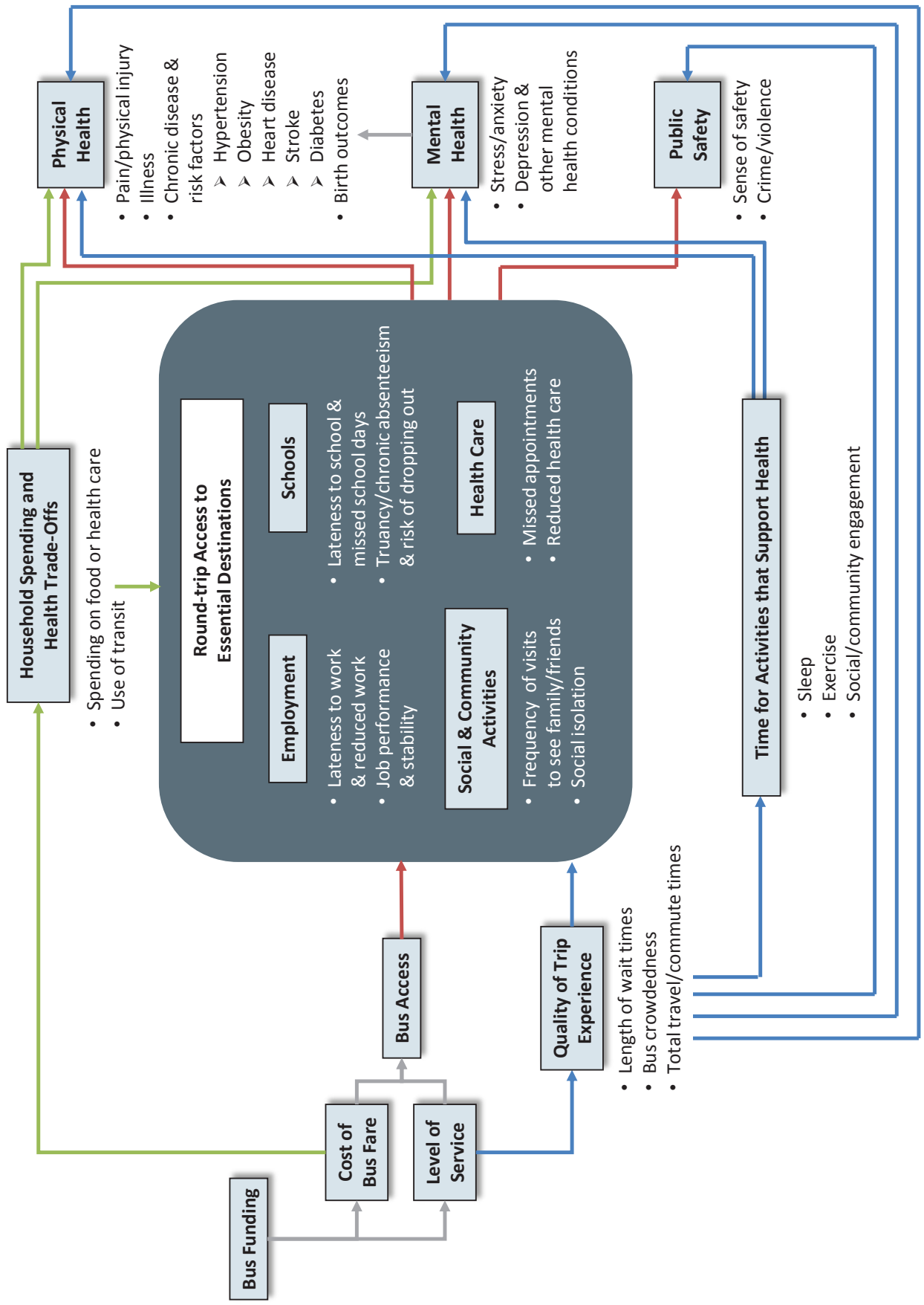
Makayla Major: Using Buses to Access Health Care

Makayla Major is a 29-year-old resident of the Fruitvale district in Oakland, and has been riding the bus for the last four years since her car broke down. She buys a bus pass every month for emergencies, saying "if I have to take one of my children to the hospital in the middle of the night, I have to take the bus." For Makayla, the bus is an essential connector to medical care and educational opportunities for her and her children.

Before service cuts, Makayla used a direct bus route to take her four children to the same doctor she had as a child. After service cuts, the bus was changed to a less direct route which only runs every hour, and is often late, making it harder for her to take the children to her preferred doctor without taking them out of school for long periods of time. Before the cuts, she would pick her second-oldest daughter up an hour or two before school ended for her appointments.

But after service changes, all of the transfers and walking meant she needed to leave at 11 a.m. for a 3 p.m. appointment. Makayla ended up changing to a doctor who was more easily accessible with the new routes, but the new doctor has an overcrowded office and has wait times of up to an hour. With four children, she struggles to keep them all busy while waiting to see the doctor, and she misses her old pediatrician's connection to her family. Despite her past experiences, Makayla has a great deal of hope and is working as a community organizer to ensure better bus services for other families with young children.

Figure 6: Pathway Diagram Summarizing Connections between Bus Access and Health



Health Impact Predictions

The Metropolitan Transportation Commission (MTC) is considering five different scenarios for the current Plan Bay Area. Each of these scenarios includes a land use policy component and a transportation investment component (which constitutes the Regional Transportation Plan), providing a framework for regional growth between 2012 and 2040. For the transportation component, each scenario allocates the same amount of total funding ($289 billion) from federal, state, regional, and local sources in different ways—including how much will go towards different transit agencies for operations, capital expenses, and expansion and improvement projects.

This HIA focuses on the potential health impacts of the level of transit service, including bus service, supported by the various funding scenarios under consideration by MTC. Regional funding for bus service has the potential to affect a large number of riders, many of whom are highly transit dependent.

This study was designed to provide a qualitative portrait of the health impacts of changes in bus service and fares as experienced by riders on the ground. As such, it does not rely on statistical modeling and does not estimate impacts to riders in quantitative terms. In addition, this HIA did not analyze potential health impacts of land use policies under each scenario considered within the Plan Bay Area. We focused specifically on transit-dependent bus riders in order to capture impacts to populations that are most vulnerable to changes in transportation access based on existing health burdens and transit dependence.

Background

Our predictions are based on demographic forecasts and service level assumptions included within MTC's Draft Plan Bay Area and Draft Equity Analysis. MTC predicts that the number and share of transit riders, and transit-dependent riders in particular, will grow substantially over the next 25 to 30 years. This growth includes a near-doubling in the share of people ages 65 and over in the region (from 12% or 900,000 in 2012 to 22% or 2.1 million in 2040), a 25% growth in the number of youth under 24 years (over 550,000), and an additional 3% growth (or roughly half a million) in the share of low- and very low-income households—populations which are likely to be transit dependent.[146]

MTC's scenario calculations assume that the funding that MTC has allocated for transit operators within the scenarios under consideration will translate into service levels via a direct, positive relationship. Our predictions make this same assumption.*

Predictions

Based on our primary data findings, existing secondary literature, and data on service level changes and ridership, we can predict broad patterns and associated health impacts that may result from the level of transit service, including bus service, supported within the different RTP funding scenarios.

* While the relationship between regional funding for bus transit operations and service levels has varied over the years, we are basing our predictions on the level of service that MTC has calculated within the various funding scenarios considered for this RTP.

The scenarios under consideration by MTC include the Preferred scenario, which is outlined in the Draft Plan Bay Area, as well as three alternative scenarios analyzed in the Draft Environmental Impact Report (EIR).* Each of these scenarios falls into two broad categories—one group which would maintain existing levels of transit service (including bus service), and another group which would increase levels of transit service (including bus service).

Scenarios That Maintain Existing Levels of Bus Service

The **Jobs-Housing Connection** scenario, also known as the Preferred scenario, was approved by MTC and the Association of Bay Area Governments (ABAG) in May 2012 for incorporation into the Draft Plan Bay Area. The scenario is based on MTC's vision of connecting new housing development to existing job centers and placing the majority of growth in priority development areas (PDAs), areas which are identified by cities and counties as offering potential for future transit-oriented, infill development. This scenario would allocate funding for all Bay Area transit operators—including bus operators—at an amount calculated to maintain existing service levels over the next 25 to 30 years.

The **Enhanced Network of Communities** scenario also provides funding for maintenance of existing service levels. This alternative is based on input from the regional business community and is based on more dispersed growth patterns and a focus on housing all people employed within the San Francisco Bay Area.

Under both of these scenarios, we predict the following broad patterns and associated health impacts for transit-dependent bus riders.

*We did not make predictions about the No Project scenario since we understand from stakeholders that this is not a likely outcome.

Quality of Trip Experience Likely To Worsen

Service levels for most bus operators have already been cut in the last five years. Furthermore, growing demand for public transit means that more riders will be depending on the same level of service. While funding in this scenario is calculated to maintain existing service levels, we predict that quality of trip experience is likely to worsen. Specifically, we predict:

- **Longer wait times, longer travel times, and crowded buses.** Surveyed riders already report long wait and travel times and frequently crowded buses. With more riders depending on the same level of service, crowding is likely to increase.† When buses are crowded, riders may have to wait longer than scheduled frequency before being able to board, contributing to even longer wait times and increases in travel time (including total time from home to destination). Our survey indicated a direct relationship between increased travel time and frequency of experienced stress and anxiety. If travel times increase, travel-related stress levels are likely to increase as well. The transit-dependent already face multiple stressors in their lives, and additional stress has cumulative impacts. Stress can take a toll on both mental and physical health through multiple mechanisms, including reduced immune function and increased risk of hypertension.

- **Less time for health-promoting activities.** As wait times and overall travel times increase, riders will have less time to do other things like sleep, exercise, and spend quality time with family and friends, all of which are necessary for good physical and mental health.

† While the draft EIR predicts that average commute times to work and non-work destinations will not differ significantly across scenarios, our study found that experiences of existing service levels already differ from scheduled service – including wait times, crowding, and resulting travel times. Given the forecasted increase in ridership on public transit, increased crowding is very likely if existing service levels are maintained. Crowding can lead to skipped passengers, longer waits, and longer overall travel times – impacts that are not easily predicted in model-based analyses.

- **Continued safety concerns at bus stops.** As wait times increase at bus stops where crime is frequent, riders are likely to continue experiencing feelings of fear due to unpredictable waits and exposure to crime and violence.

- **Continued risk of physical discomfort or injury, particularly for seniors and disabled riders.** As riders face crowded buses, risk of pain or injury from falling, standing on crowded buses, or standing for long waits is likely to continue.

Limited Access to Essential Destinations

Riders are likely to continue taking the bus to work, school, social activities, and health care, but declining quality of trip experience will limit where riders can go and when riders can get to those destinations. Riders may take even fewer trips to essential destinations, and a few may stop going to certain destinations at all. Specifically, we predict:

- **Continued or increased lateness and related stress.** Our surveys revealed that bus riders experience more stress as travel times increase, and riders report being late when buses are crowded and there is no room to board. With worsening quality of trip experience, riders are likely to continue experiencing lateness to essential destinations and related stress.

- **Missed work hours and days.** Working riders report being late and going to work less often as a result of service cuts. If quality of trip experience worsens, some riders may miss work days or reduce work hours. Fewer days worked has the potential to result in lost wages and job instability, which can increase risk of hypertension, heart disease, stroke, and mental health disorders.

- **Missed and late school days.** Some student riders report going to school less often as a result of previous service cuts. If quality of trip experience worsens, some student riders may arrive late more often or miss more school days, decreasing academic performance and increasing chances of truancy and chronic absenteeism. Truancy and chronic absenteeism have a number of long-term health consequences including increased risk of high school dropout, involvement in the criminal justice system, and substance abuse—each of which is linked to negative physical and mental health outcomes.

- **Continued or increased social isolation.** Riders report making fewer trips to see friends and family as a result of service cuts. If quality of trip experience worsens, some riders may make fewer social outings, increasing feelings of isolation—particularly among seniors and those who live far from friends and family. Social isolation can result in a number of negative health impacts including increased stress and greater risk of depression, hypertension, chronic disease, and overall mortality.

- **Missed and foregone health care.** Riders report making fewer trips to doctors and missing medical appointments as a result of service cuts. If quality of trip experience worsens, riders may arrive late to clinics and take fewer trips to the doctor, resulting in missed appointments and postponed care. Postponed or foregone health care can result in worsening health conditions and increased stress.

- **Reduced bus ridership, more vehicle miles travelled, and more greenhouse gas emissions.** Among bus riders affected by service cuts, 6% report getting a ride or driving instead. If service conditions worsen, more riders may turn to cars to get to their destinations, resulting in increased vehicle miles traveled and greenhouse gas emissions.

Scenarios That Increase Levels of Bus Service

The **Transit Priority** scenario includes a transportation investment strategy that differs slightly from the Preferred scenario, primarily through less investment in highway projects and additional investment in BART and AC Transit service in urban core areas. This scenario would expand service in the inner East Bay,

with overall service levels (measured in daily transit seat miles) that are 4% higher than the Preferred scenario—including 3% more local bus service, 1% more express bus service, and 7% more heavy rail service.[147]

The **Equity, Environment, and Jobs (EEJ)** scenario was developed based on input from regional transit equity, affordable housing, and environmental justice organizations. It emphasizes robust local transit service for Communities of Concern. This scenario would provide about $8 billion in additional operating funds to most transit operators throughout the region.* This scenario also includes a regional free youth bus pass. Compared to the Preferred scenario, the EEJ scenario results in overall service levels (measured in daily transit seat miles) that are 8% higher than the Preferred scenario—including 11% more local bus service, 13% more express bus service, 19% more light rail service, and 7% more heavy rail service. Based on MTC's analysis, this scenario also generates 165,000 more transit trips each day.[148]

We predict the following broad patterns and associated health impacts would be experienced for the inner East Bay specifically for the Transit Priority scenario, and across the region for the Equity, Environment, and Jobs (EEJ) scenario:

Improved Quality of Trip Experience

If adequate funding is allocated to restore past service cuts and if local bus operators focus funding on restoring past cuts and improving service frequency, quality of trip experience is likely to improve. Specifically, we predict:

- **Shorter wait times, shorter travel times, and fewer crowded buses.** If service frequency improves, buses are likely to come more often, resulting in shorter wait times and overall travel times and less crowding on buses. If crowding and wait times decrease, stress related to unpredictable schedules is likely to decrease as well. Stress has been linked to reduced immune function, hypertension, poor birth outcomes.

- **More time for activities that support good health.** If wait times and overall travel times decrease, riders will have more time to do other things like sleep, exercise, and spend quality time with family and friends, which support good physical and mental health.

- **Less time experiencing fear at bus stops.** While safety conditions are not directly affected by service changes, shorter wait times and more reliable service may reduce the length of time that riders experience fear due to exposure to crime at bus stops in high-crime areas.

- **Decreased physical discomfort, particularly for seniors and disabled riders, due to crowded buses.** If buses are less crowded, risk of pain or injury from falling, standing on crowded buses, or standing during long waits will likely decrease as well.

Improved Access to Essential Destinations

With restored service, riders are likely to experience more reliable and predictable access to essential destinations, allowing them to take more trips to work, school, social activities, and health care. Specifically, we predict:

- **Better attendance at work, more hours/shifts worked.** While many factors affect work attendance, more reliable service (particularly through improved frequency and expanded hours of operation) would provide many transit-dependent riders with easier access to and from work, possibly allowing those with hourly jobs to work more shifts. More reliable attendance at work can improve job performance, job stability, and income stability in the long term. Job stability can reduce risk of hypertension, heart disease, and mental disorders.

* Operators receiving enhanced funding for service frequency improvements under the EEJ include AC Transit, BART, VTA, SamTrans, Marin Transit, LAVTA, County Connection, Golden Gate Transit, Santa Rosa County Bus, Golden Gate Transit, and Sonoma County Connection.

- **Better attendance at school, fewer missed school days.** While many factors affect school attendance, more reliable service (particularly through improved frequency and expanded hours of operation) may provide transit-dependent student riders easier access to and from school, reducing risk of truancy and associated health impacts.

- **More social activity.** With improved service, riders are likely to have easier access to friends and family, improving social support and sense of community. Social cohesion and social activity have strong effects on health, including improving immune function and reducing risk of depression and other mental health conditions.

- **Better access to health care.** With improved service, riders are likely to have more regular and reliable access to health care, resulting in fewer missed appointments and more timely care. Regular access to healthcare can improve health conditions and prevent the onset and worsening of chronic disease.

- **Increased bus ridership, fewer vehicle miles traveled, and less greenhouse gas emissions.** With improved service, fewer riders are likely to turn to cars over buses. This would reduce the amount of vehicle miles traveled and greenhouse gas emissions from cars on the road.*

* While the draft EIR found that all scenarios would increase vehicle miles traveled from 2010 levels, the number of daily trips on public transit would be 5% higher (or 165,000 additional transit trips) in the EEJ scenario. In addition, compared to the Preferred scenario, total vehicle miles traveled was found to be 1% lower in the Transit Priority scenario, and 2% lower in the EEJ.

Recommendations

The Regional Transportation Plan (RTP), as the transportation component of Plan Bay Area, is a critical opportunity to ensure that adequate transportation options will be available for both existing and new riders over the next 25 to 30 years. The RTP is not the only avenue through which funding is channeled to local operators, and it is only one of many factors affecting service levels on the ground. Indeed, local operators are ultimately responsible for service decisions that directly affect riders, and this study reveals a number of impacts to riders that should be considered by operators when making future service and fare decisions. In addition, a number of other transportation agencies have discretion over specific sources of funding that affect service levels for riders, and this study should inform funding decisions for transportation at all levels of government.

However, the RTP will be critical to the larger funding context in which local operators must make difficult decisions about how to best use limited resources. As MTC weighs the relative benefits and costs of the funding scenarios on the table, it is essential that health impacts, including the mobility-related impacts highlighted in this study, are taken into account.

This HIA focused on transit-dependent bus riders as a population that has the potential to experience disproportionate health burdens if their access to buses is reduced. Based on the findings in this study, we recommend that MTC increase funding for transit service within the RTP, study and develop a regional discounted transit pass program for low-income riders, and expand future data collection efforts to address mobility-related health equity issues.

Increase Funding for Transit Service in the RTP

Our first recommendation is that MTC increase funding for transit service, particularly bus service, in the RTP to support health for transit-dependent riders and their communities and increase ridership on public transit.

Over the next 25 to 30 years, the share of transit-dependent riders is almost certain to increase,[149] adding to the number of riders who depend on public transit, and particularly buses, for their daily needs. The Metropolitan Transportation Commission's Preferred scenario for the RTP allocates funding to bus and other transit operators at a level necessary to maintain existing service levels. While MTC's commitment to maintaining existing service levels is admirable, we found that current bus service levels are not adequate to support the needs of the most vulnerable riders in our system, and neither are they likely to support the demands of new riders in the future.

In order to provide adequate service to the growing population of transit-dependent riders and attract new riders to public transit, MTC should devote additional discretionary funding to transit in the RTP, using an investment strategy based on transit service restoration and expansion rather than maintenance. Improving and expanding bus service for transit-dependent riders throughout the region should be central to this vision. This strategy could result in individual, community, and environmental health benefits by improving access to essential destinations, contributing to healthy and productive schools, workplaces, and households; and attracting more riders to public transit, thus limiting vehicle miles traveled and greenhouse gas emissions.

Two funding scenarios under consideration by MTC direct more funding to transit for enhanced service

levels—the Transit Priority scenario and the Equity, Environment, and Jobs (EEJ) scenario. While the Transit Priority significantly boosts service levels in urban core areas of the East Bay and San Francisco, the EEJ invests more funding to increase transit service, including bus service, across the region.

Based on our study, we predict that the EEJ scenario would result in the best mobility-related health benefits for transit-dependent riders across the region—including improved access to essential destinations and less travel-related stress and safety concerns. MTC's Draft Environmental Impact Report (EIR) also found that the EEJ scenario would result in the best environmental benefits, including the lowest vehicle miles traveled and the most public transit trips made per day.*

MTC can also work with other transportation agencies to identify additional funding sources for bus transit operations at the local, state, and federal level, such as new or renewed county sales tax measures like Measure B in Alameda County—which is currently a critical source of operations funding for AC Transit—as well as revenue from new highway projects and future cap and trade revenue at the state level.

Develop a Regional Discounted Transit Pass Program for Low-Income Riders

Our second recommendation is that MTC complete a study with the goal of facilitating the development of a regional discounted transit pass program for low-income riders.

The San Francisco Bay Area is among the most expensive places to live in the country. As MTC has noted in their own draft Equity Analysis, low-income households already spend, on average, more than a quarter of income on transportation costs alone, and nearly three quarters of income on transportation and housing costs combined, beyond the standard threshold of affordability. Furthermore, MTC has forecasted that low-income households will experience increasing (and disproportionate) financial burden due to the combined cost of housing and transportation over the next 25 to 30 years, compared with higher income households—and that costs are likely to increase under all scenarios under consideration for the RTP.[150]

Transit-dependent bus riders in our survey report cutting back on their use of the bus when living expenses are high, and focus group participants report making trade-offs to cope with the rising costs of bus fare, including skipping trips to the doctor and cutting back on food. A discounted transit pass for low-income riders has the potential to increase trips to essential destinations, improve health for transit-dependent riders, and increase the number of people using public transit.[151,152]

Most transit operators do not currently offer discounts to low-income passengers, as federal law only requires discounts for seniors and disabled passengers. A number of local transit agencies go beyond required discount thresholds for seniors and disabled riders, and a few agencies have implemented pilot programs offering free or reduced fares to low-income riders—including MTA's Lifeline Pass Program for low-income adults, their new Free Muni for Youth program, as well as VTA's UPLIFT program for homeless, case managed individuals. In addition, a free student bus pass was built into the last Measure B presented to Alameda County voters in November 2012, which would benefit low-income transit-dependent youth.

* According to MTC's Target Analysis of EIR alternatives in the draft Plan Bay Area, the EEJ scenario results in the highest percentage of non-auto mode share (21%), which represents the proportion of commuters using public transit, walking, or biking, over cars. According to the draft EIR, the EEJ also results in the most daily transit boardings (or trips made per day on transit)—165,000 more than the Preferred scenario. The draft EIR also found that the EEJ was the "environmentally superior" alternative—with better performance than all other alternatives on most indicators relating to air quality and vehicle miles traveled by car.

Both MTA and VTA have requested regional funds from MTC for the implementation of their low-income discount programs.[153] Without dedicated regional support, it is unlikely that other transit operators will be able to provide the same discounts to their low-income passengers. Furthermore, a transit pass that is transferable to multiple agencies throughout the region could provide significant mobility benefits to transit-dependent people who rely on buses to reach rail transit.

MTC has already recognized the need for greater transportation affordability in the Bay Area by committing to evaluate a means-based fare program.[154] MTC should complete this study in order to 1) identify funding sources (both currently eligible sources and potential new revenue streams) to subsidize low-income transit riders throughout the region by keeping fares affordable, reducing transfer costs between operators, and where possible, combining multiple fares; and 2) examine best practices from existing programs and policies nationally. MTC should utilize study results to convene local operators throughout the region to explore how to facilitate discounts for low-income riders while limiting financial and administrative barriers to eligibility.

Include Quality of Trip Experience and Service Conditions in Future Analyses

Our third recommendation is that MTC incorporate quality of trip experience and service conditions into existing data collection and future health analyses.

Bus riders in our HIA survey experienced direct impacts on health and quality of life as a result of recent service cuts—primarily through increased stress, lost time for health-promoting opportunities, and decreased sense of safety. Our survey also revealed that scheduled frequency often does not reflect actual frequency as experienced by riders. Quality of trip experience and service conditions not only affect quality of life for riders; they are also critical factors affecting that ability of riders to use public transit at all.

MTC has already set health related targets for the RTP and analyzed potential health impacts in terms of air quality, pedestrian and bicycle safety, and physical activity.* MTC can build on their existing commitment to health by analyzing quality of trip experience and service conditions as critical mobility-related health issues. Collecting data about these issues will not only strengthen understanding of existing service quality throughout the region; it could also inform future planning efforts and potentially save costs to operators by more accurately identifying transit service needs.

Local operators are already required by the Federal Transportation Administration to collect data on service performance every three years. MTC should encourage local operators to build on their existing data collection practices by providing a standard set of metrics for field-based observation that capture actual service conditions—including wait time, crowding and skipped passengers, and total travel time.

MTC can also work with local operators to develop a standard set of questions for on-board rider surveys that address quality of trip experience issues like actual transit spending per trip, transfers and travel time, wait time, and feelings of personal safety and stress on and while waiting for the bus. To maximize existing resources, these questions and metrics could be built into MTC's data collection efforts for the Short Range Transit Planning Program and MTC's Transit Performance Initiative as critical health-related service quality indicators. Once collected, this data should be

* While MTC has analyzed existing service conditions and transit access in Communities of Concern, this analysis is primarily based on recorded schedules. In addition, in the last "Snapshot Development Report," MTC staff recommended identifying a new method to measure transit reliability that would more accurately capture conditions on the ground.

compiled into a centralized database and shared publicly to inform transportation decisions throughout the region.

This study uncovered a number of significant public health impacts facing transit-dependent riders when bus access is reduced. Additional research is needed to provide more nuanced analyses of funding, service levels, and health, as well as to evaluate transit needs and impacts for different areas of the region. MTC should consider partnering with local health departments to develop metrics and tools as outlined above and to pursue opportunities for future analyses of transportation and health impacts.

Conclusion

Across the San Francisco Bay Area, more than 2 million transit-dependent residents build their daily lives around when, where, and if public transportation is available and affordable. For those without alternative options, waiting for the bus—however long it may take and whatever the conditions may be—is a necessity rather than a choice. Buses transport many riders who are most vulnerable to service cuts and health burdens in our system, and they also provide key connections to other forms of transit. This study focused on the experiences of transit-dependent bus riders to uncover the on-the-ground costs of reduced bus access for those who need it most.

Through surveys and focus groups, we learned that transit-dependent bus riders pay for service cuts and fare increases through missed time at work and school, fewer trips to social activities and health care, increased stress and safety concerns, lost time for activities like sleep, exercise, and community participation, as well as trade-offs between riding the bus and meeting other basic needs.

When people can't get to the places they need to go, and when the trip itself is long and unpredictable, the public health consequences can be significant—including the development of chronic stress and increased risk of cardiovascular disease; direct safety concerns due to exposure to crime at bus stops; depression and mental health challenges due to social isolation; lower chances of obtaining high-paying work essential for long-term health and prosperity; less physical activity due to hours of sitting on the bus or staying home; and compromises in daily needs like healthy food and trips to the doctor. In the end, the message is simple: mobility matters for health and well-being, and for most without cars, public transportation is the only means of mobility.

This study contributes to the transportation and public health fields in both its methods and its scope. By incorporating community voices via primary data collected directly by and from bus riders, and by focusing on bus access and mobility as health issues, we hope this study will inform future transportation decision-making and planning efforts. This study also uncovered a number of issues that merit more analyses, including service quality and transportation needs in specific areas of the region, the specific impacts of different kinds of service changes, quantitative impacts related to the costs described above, as well as the relationship between funding and service levels on the ground.

Health impacts are increasingly being considered within transportation planning processes. As MTC and other regional planning and transportation agencies consider the health benefits of public transportation for physical activity, traffic safety, and air quality, it is essential that bus access for transit-dependent riders—including access to essential destinations, affordability, and quality of trip experience—is central to this conversation.

Appendix

Detailed Study Methodology

Instruments

A semi-structured survey was developed by the research subcommittee of the HIA advisory committee, including representatives from Rose Foundation, Urban Habitat, Youth Uprising, Alliance of Californians for Community Empowerment, Human Impact Partners, DataCenter, and ACPHD. Adult and youth versions of the survey were developed, including questions about:

- Bus ridership patterns.
- Dependence on bus to access goods and services (including employment, school, health/social services, social/community opportunities, and food/groceries).
- Experience riding buses that had service reductions from 2009 to 2010.
- Impacts of bus service reductions on people's daily lives.
- Self-reported health status.
- Bus costs and resulting trade-offs.
- Demographic characteristics of respondents.

The focus group discussion guide was developed by ACPHD with partners from Youth Uprising, the Rose Foundation, Community Resources for Independent Living, Genesis, and St. Mary's Center. Focus groups included questions about:

- Bus ridership patterns.
- Dependence on bus to access goods and services (like employment, school, and health services).
- Experience riding buses that had service reductions in 2009 and 2010.
- Impacts of bus service reductions on people's lives.
- Bus costs and impacts of proposed fare increases.
- Relationships between bus service/cost and health and well-being.

Sampling, Recruitment, and Administration Protocols

The target population for surveying was transit-dependent riders of AC Transit who live in Alameda County. Assuming that AC Transit's weekday ridership is about 236,000 passengers; that about 85% of its riders are Alameda County residents; and about 67% of Alameda County riders, including youth under 18 years, are transit dependent (based on data from the 2008-2009 AC Transit On-Board Rider Survey), the target population size was estimated to be just under 150,000. Based on this population size estimate, 400 was deemed to be an appropriate target sample size. Within the target population, key vulnerable subpopulations were specifically identified for recruitment, including: 1) low-income people; 2) people of color; 3) youth; 4) seniors; and 5) people with disabilities.

Given constraints on time, resources, and surveyor capacity, it was not feasible to conduct a census of all bus riders or to survey a randomly selected subset. Survey participants were conveniently and purposively selected who met certain criteria, including: 1) residence in Alameda County; 2) transit dependence due to not having a car or access to a car, not having a driver's license, or being unable to drive; 3) ridership on AC Transit at least four times per week; 4) aged 18 years or more for adult survey and 13 to 17 years for youth survey; and 5) 15- to 20-minute availability to take the survey.

Proportional quota sampling was used to ensure that the survey sample is representative of the population

of transit-dependent AC Transit riders in Alameda County. Target quotas were established to achieve a sample closely proportional to this population based on key characteristics, including age, gender, race/ethnicity, and disability status. These quotas or proportions were informed by the distribution of respondents (specifically transit-dependent respondents who live in Alameda County) in the AC Transit 2008-2009 On-Board Rider Survey, which has been deemed to be a representative random sample of AC Transit riders. In addition, a target quota was established for income status with focus on recruiting low-income respondents.

Table A1: Target Quotas for Survey Sample

Age	Gender	Race/Ethnicity	Disability Status	Income Status
Youth (25%) Adults (60-65%) Seniors (10-15%)	Female (55%) Male (45%)	African American/Black (38%) Hispanic/Latino (19%) White (19%) Asian/Pacific Islander (19%) Other (6%)	Disabled (10-15%)	Low income (95-100%)

Surveys were conducted in selected Census tracts within MTC's Communities of Concern in Alameda County. In order to reach out to populations who might be especially vulnerable to reduced bus access and associated health impacts, Census tracts were prioritized based on key variables that predict transit dependence, disproportionate ill health burdens, and exposure to recent bus service changes, including:

- Percentage of households with zero vehicles.
- Percentage of people who are below 200% of the federal poverty level.
- Percentage of residents who are people of color.
- Presence of one or more AC Transit bus lines that experienced service reductions in 2009 and 2010.

Based on an index of these variables, 35 target Census tracts were selected for surveying, including 29 Census tracts in Oakland and two Census tracts in each of the other areas of Alameda County (Alameda, Ashland/Cherryland, and Hayward) with relatively high transit dependence, and high proportions of people of color and poverty.

Surveys were conducted by three local community-based organizations, including Alliance of Californians for Community Empowerment (adult surveys), Genesis (adult surveys) and Youth Uprising (youth surveys). Survey respondents were recruited in three major ways within target Census tracts, including:

1. Recruitment on bus lines that had experienced service reductions from 2009 to 2010.
2. Recruitment at stops for bus lines that had experienced 2009 and 2010 service reductions.
3. Recruitment at local venues frequented by bus riders who represent key subpopulations and geographies of interest.

Because local venues were deemed to be a less random source of respondents, efforts were made to recruit at least 75% of survey respondents on buses and at bus stops. In the end, 82% of surveys were conducted on buses and at bus stops and 14% were conducted at local venues. Survey location data was not available for 4% of the surveys.

Surveys were primarily verbally administered to respondents to ensure that all questions were covered, that possible literacy barriers were addressed, and that surveys were understood and completed as fully as possible. Written response cards were provided for multi-option and sensitive questions to promote ease of survey administration, help with respondent recall

of response options, and maintain confidentiality of responses when needed. Surveyors had the option of having respondents self-administer the survey when very necessary (e.g., bus too crowded for the person to feel comfortable answering the survey out loud).

All surveyors received training from ACPHD to ensure that they understood the purpose of the survey and the overall HIA, the target population for recruitment, the sampling and recruitment plans, strategies for reducing bias and increasing research validity, the survey instrument, and survey administration protocols.

A total of 417 bus riders responded to the survey. Key characteristics of the survey sample based on age, gender, race/ethnicity, disability status, and income status are shown below. The survey sample is closely proportional to the population of transit-dependent AC Transit riders in Alameda County in terms of age (although seniors were somewhat underrepresented), gender, and disability status. In terms of the racial/ethnic distribution, African Americans/Blacks were somewhat overrepresented and Hispanics/Latinos, Whites, and Asian/Pacific Islanders were slightly underrepresented. A large number of respondents elected to not respond to the income question, but it's evident that at least 70% of the sample is low income.

A subset of the survey sample (n=299) was used to assess impacts of bus service changes. This includes riders who: 1) Have been riding AC Transit bus lines that were known to have service changes from 2009 to 2011 and 2) Have been riding these bus lines (that are still in service) for two or more years. Thus, analyses of service change impacts were limited to riders who had experienced service changes and who would be able to report on any subsequent impacts.

Focus groups were conducted to amplify the voices of key subpopulations that are relatively small or underrepresented in the survey, including seniors, youth/parents, limited English speakers (specifically primary Spanish and Chinese speakers), and people with disabilities. Focus groups were facilitated by five local community-based organizations who work with these subgroups, including St. Mary's Center, Rose Foundation, Youth Uprising, Community Resources for Independent Living, and Genesis. Focus group participants were purposively and conveniently recruited by the CBOs with the aim of achieving a heterogeneous mix of participants to engage in group discussion. A total of 60 participants took part in the six focus groups.

Table A2: Survey Sample Characteristics (n=417)

Age	Gender	Race/Ethnicity	Disability Status	Income Status
Youth (27%)	Female (50%)	African American/Black (49%)	Disabled (9%)	Low income (70%)
Adults (68%)	Male (45%)	Hispanic/Latino (15%)		Not low income (4%)
Seniors (5%)	Transgender (1%)	White (13%)		Unknown (26%)
	Unknown (4%)	Asian/Pacific Islander (13%)		
		Other (6%)		
		Unknown (11%)		

Table A3: Focus Groups (n=60)

Subgroup Focus	# of Participants
Seniors	10
Youth	14
Parents	7
Disabled/Paratransit	7
Primarily Chinese speakers	12
Primarily Spanish speakers	10

All focus group facilitators received training from ACPHD to ensure that they understood the purpose of the focus groups and the overall HIA, were comfortable with the focus group guide, and aware of focus group administration protocols to ensure confidentiality and increase validity. Key demographic characteristics of the focus group sample are shown in Table A4.

Table A4: Focus Groups Sample Characteristics (n=60)

Age	Gender	Race/Ethnicity	Disability Status
Youth (15%)	Female (60%)	Asian (33%)	Disabled (11%)
Adults (50%)	Male (37%)	Hispanic/Latino (30%)	
Seniors (35%)	Unknown (3%)	African American/Black (20%)	
		White (18%)	
		Pacific Islander (7%)	
		American Indian/Alaska Native (3%)	

Technical Notes

This study examines the health impacts associated with bus service cuts and fare increases among transit-dependent bus riders. The non-experimental design and research methods (survey, focus groups, literature review, secondary local data) used in this study do not establish causality, but rather identify associations and probable pathways by which bus funding/access can impact health based on the reported experience of transit-dependent bus riders who were exposed to bus service changes on AC Transit from 2009 to 2011.

Due to constraints on time, resources, and surveyor capacity and the absence of a sampling frame (i.e., list of all individuals in the focus population of transit-dependent riders of AC Transit in Alameda County), it was not feasible to survey the entire population of transit-dependent riders of AC Transit in Alameda County or to randomly select survey participants. Because survey respondents were conveniently and purposively recruited, there is some potential for selection bias in who responded to the survey (e.g., bus riders who experienced impacts from bus service changes may have been more motivated to respond to the survey than riders who experienced no impacts). This could impact the generalizability of research findings. However, the use of proportional quota sampling in this study bolsters the extent to which the survey sample is representative of the population in terms of important characteristics like age, race/ethnicity, gender, and income status. This increases the likelihood that research findings are generalizable to the broader population.

The overall survey sample size (n=417) is fairly robust, but some subgroup analyses involved smaller numbers of respondents that could reduce reliability of findings. A subset of the sample (i.e., 299 respondents who reported riding bus lines that faced service cuts from 2009 to 2011 and who had experience riding AC Transit for two or more years) was used in the analysis of impacts of service cuts and subjected to further subgroup analyses.

Because respondents were asked to retrospectively report on the ways in which they were impacted by bus service changes over the past three years, there is potential for recall bias and the validity of their responses depends on the accuracy of what they recall. In addition, there is some risk of response bias, if respondents felt they should answer certain questions in particular ways; although efforts were taken in terms of how questions were worded and asked to minimize likelihood of this type of bias.

Analysis of survey data included descriptive statistics and chi-square testing with a significance threshold of $p<.05$ to examine relationships and differences among variables under investigation. Analysis of focus group data involved multi-person coding of key themes and subcategories that emerged within and across focus groups.

References

1. TransForm. Strategic Investments for a Better Bay Area. 2011. Available at: www.efficiencycities.org/wp-content/uploads/resources/ECC/scs-transportation-platform.pdf.

2. Metropolitan Transportation Commission. 2006 Transit Passenger Demographic Survey. Available at: www.mtc.ca.gov/maps_and_data/datamart/survey/TPDS/Phase_2_Report.pdf.

3. Alameda County Public Health Department. August 2008. Life and Death from Unnatural Causes: Health and Social Equity in Alameda County. August 2008.

4. Sanchez TW, Stolz R, and Date JS. Moving to Equity: Addressing Inequitable Effects of Transportation Policies on Minorities. June 2003. Available at: http://civilrightsproject.ucla.edu/research/metro-and-regional-inequalities/transportation/moving-to-equity-addressing-inequitable-effects-of-transportation-policies-on-minorities.

5. American Public Transportation Association. Challenge of State and Local Funding Constraints on Transit Systems: Effects on Service, Fares, Employment, and Ridership: Survey Results, June 2009. Available at: www.apta.com/resources/reportsandpublications/Documents/constraints_09.pdf.

6. Multiple sources: National Transit Database, the Metropolitan Transportation Commission's Statistical Summary of Bay Area Operators (2006-2011), and transit operators.

7. AC Transit. Personal communication.

8. AC Transit. Board Policy No. 328. Fare Policy: Fares, Fare Structure, and Fare Increases. June 2011. Available at: www.actransit.org/wp-content/uploads/board_policies/BP%20328%20-%20Fare%20Policy.pdf.

9. Association of Bay Area Governments and Metropolitan Transportation Commission. Draft Plan Bay Area: Strategy for a Sustainable Region. March 2013. Available at: http://onebayarea.org/pdf/Draft_Plan_Bay_Area_3-22-13.pdf.

10. Association of Bay Area Governments and Metropolitan Transportation Commission. Draft Equity Analysis Report including Title VI, Environmental Justice and Equity Analysis for Plan Bay Area. March 2013. Available at: http://onebayarea.org/pdf/Draft_Plan_Bay_Area/Draft_Equity_Analysis_Report.pdf.

11. Wener RE, Evans GW, Phillips D, and Nadler N. Running for the 7:45: the effects of public transit improvements on commuter stress. Transportation. Kluwer Academic Publishers, Netherlands. 2003; 30:203-220.

12. Walsleben JA, Norman RG, Novak RD, O'Malley EB, Rapoport DM, and Strohl KP. Sleep habits of Long Island Rail Road commuters. Sleep. 1999;22(6).13.

13. Strazdins L and Loughrey B. Too busy: why time is a health and environmental problem. NSW Public Health Bulletin. 2007;18(11-12):219-221.

14. Alameda County Public Health Department. August 2008.

15. Halfors D, Vevea JL, Iritani B, Cho H, Khatapoush S, and Saxe L. Truancy, grade point average, and sexual activity: a meta-analysis of risk indicators for youth substance use.Journal of School Health. 9 October 2009;72(5).

16. Hawkley LC, Cacioppo JT. Aging and loneliness: Downhill quickly? Current Directions in Psychological Science. 2007;16:187–191.

17. Prevention Institute. Prevention is Primary: Strategies for Community Well-Being. San Francisco: Jossey-Bass, 2010.

18. Association of Bay Area Governments and Metropolitan Transportation Commission. March 2013.

19. Dyett and Bhatia in association with Environmental Science Associates and AECOM. Draft Environmental Impact Report on Plan Bay Area. Prepared for Metropolitan Transportation Commission and Association of Bay Area Governments. April 2013. Available at: http://onebayarea.org/pdf/Draft_Plan_Bay_Area/Draft_EIR.pdf.

20. Metropolitan Transportation Commission. Memorandum to Programming and Allocations Committee Re: Funding for Low-Income Transit Pass Pilot Programs. May 9, 2012.

21. Ibid.

22. Alameda County Public Health Department with data from American Community Survey, 2007-2011; Urban Strategies Council, 2006-2009; and Alameda County Vital Statistics files, 2008-2010.

23. Alameda County Public Health Department with Alameda County Vital Statistics files, 2008-2010.

24. Ibid.

25. Williams DR and Collins C. Racial Residential Segregation: A Fundamental Cause of Racial Disparities in Health. Public Health Reports. 2001;116:404-416. Available at: www.publichealthreports.org/issueopen.cfm?articleID=1121.

26. Transportation Research Board, National Research Council. Transportation Cooperative Research Program (TCRP) Report 49: Using Public Transportation to Reduce the Economic, Social, and Human Costs of Personal Immobility. Washington D.C.: National Academy Press,1999. Available at: http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_49.pdf.

27. Association of Bay Area Governments and Metropolitan Transportation Commission. DraftyMarch 2013.

28. Sanchez et al. 2003.

29. Ibid.

30. U.S. Department of Housing and Urban Development and U.S. Department of Commerce, U.S. Census Bureau, American Housing Survey for the United States, H150 (via U.S. Bureau of Transportation Statistics, Transportation Statistics Annual Report, 2006).

31. Ibid.

32. American Public Transportation Association. A Profile of Public Transportation Passenger Demographics and Travel Characteristics. May 2007. Available at www.apta.com/resources/statistics/Documents/transit_passenger_characteristics_text_5_29_2007.pdf. Accessed 2 May 2013.

33. Pucher J and Renne JL. Socioeconomics of urban travel: evidence from the 2001 NHTS. Transportation Quarterly. 2003;57(3):49-77.

34. Transportation Research Board, National Research Council. 1999.

35. Ibid.

36. Metropolitan Transportation Commission. 2006 Transit Passenger Demographic Survey.

37. Ibid.

38. AC Transit. Personal communication.

39. Sanchez TW et al. 2003

40. Freemark Y. "Congress Passes Major Transportation Bill, Preserving the Status Quo." The Transport Politic. July 1, 2012. Available at: www.thetransportpolitic.com/2012/07/01/congress-passes-major-transportation-bill-preserving-the-status-quo/. Accessed May 2013.

41. Sanchez et al. 2003.

42. Metropolitan Transportation Commission. Statistical Summary of Bay Area Transit Operators, Fiscal Years 2002-03 through 2006-07. March 2008. Available at: www.mtc.ca.gov/library/statsum/StatSummary07.pdf.

43. American Public Transportation Association. Challenge of State and Local Funding Constraints on Transit Systems: Effects on Service, Fares, Employment, and Ridership: Survey Results, June 2009. Available at: www.apta.com/resources/reportsandpublications/Documents/constraints_09.pdf.

44. Ibid.

45. Multiple sources: National Transit Database, the Metropolitan Transportation Commission's Statistical Summary of Bay Area Operators (2006-2011), and transit operators.

46. AC Transit. Personal communication.

47. AC Transit. Board Policy No. 328. Fare Policy: Fares, Fare Structure, and Fare Increases. June 2011. Available at: www.actransit.org/wp-content/uploads/board_policies/BP%20328%20-%20Fare%20Policy.pdf.

48. Association of Bay Area Governments and Metropolitan Transportation Commission. March 2013.

49. Metropolitan Transportation Commission. Regional Transportation Plan 2035: Change in Motion. April 2009. Available at: http://www.mtc.ca.gov/planning/2035_plan/FINAL/T2035_Plan-Final.pdf.

50. AC Transit. Personal communication.

51. Alameda County Public Health Department, with data from American Community Survey 2011.

52. Ibid.

53. Association of Bay Area Governments and Metropolitan Transportation Commission. Draft Plan Bay Area. March 2013.

54. Association of Bay Area Governments and Metropolitan Transportation Commission. Draft Equity Analysis Report. March 2013.

55. Dyett and Bhatia. April 2013.

56. Alameda County Public Health Department with data from American Community Survey, 2006-2010.

57. Alameda County Public Health Department. August 2008.

58. Ibid.

59. East Bay Paratransit. Home page. Available at: www.eastbayparatransit.org.

60. Alameda County Public Health Department with data from AC Transit On-Board Rider Survey, 2008-2009.

61. Transportation Research Board, National Research Council. 1999.

62. Alameda County Public Health Department with data from AC Transit On-Board Rider Survey, 2008-2009.

63. Ibid.

64. Alameda County Public Health Department, with data from American Community Survey 2007-2011 and Alameda County Vital Statistics Files 2008-2010.

65. Alameda County Public Health Department with data from American Community Survey, 2006-2009.

66. Alameda County Public Health Department with data from American Community Survey, 2006-2009 and INSIGHT Center for Community Economic Development, 2011.

67. Alameda County Public Health Department with data from American Community Survey, 2006-2009.

68. Alameda County Public Health Department, with data from Alameda County Vital Statistics files, 2008-2010.

69. Ibid.

70. University of Washington. Community-Campus Partnerships for Health. "Community-Based Participatory Research." Available at: http://depts.washington.edu/ccph/commbas.html. Accessed 13 May 2013.

71. Wener et al. 2003.

72. McEwan B and Seeman T. Research: allostatic load notebook. August 2009. Available at www.macses.ucsf.edu/Research/allostatic/allostatic.php. Accessed 17 April 2013.

73. Lu MC and Halfon N. Racial and ethnic disparities in birth outcomes: a life-course perspective. Maternal and Child Health Journal. March 2003;7(1).

74. Walsleben et al. 1999.

75. Strazdins and Loughrey 2007.

76. Alameda County Public Health Department with data from American Community Survey, 2011.

77. Paratransit Advisory and Planning Committee (PAPCO). Personal communication.

78. McEwan & Seeman 2009.

79. Lu & Halfon 2003.

80. Strazdins & Loughrey 2007.

81. Rosen IM, Gimotty PA, Shea JA and Bellini LM. Evolution of sleep quality, sleep deprivation, mood disturbances, empathy, and burnout among interns. Academic Medicine. January 2006;81(1):82-55.

82. Irwin M, McClintock J, Costlow C, Fortner M, White J, and Gillin JC. Partial night sleep deprivation reduces natural killer and cellular immune responses in humans. The Journal of the Federation of American Societies for Experimental Biology. April 1996;10:643-53.

83. Walsleben et al. 1999.

84. POWER, DataCenter, and Urban Habitat. Next Stop: Justice. December 2012. Available at www.peopleorganized.org/wp-content/uploads/2012/12/POWER_NextStop_Eng_midrez.pdf. Accessed 2 May 2013.

85. Williams C, Hudman J, and O'Malley M. Challenges and tradeoffs in low-income family budgets: Implications for health coverage. The Kaiser Commission on Medicaid and the Uninsured. Kaiser Family Foundation. April 2004.

86. Litman T. Evaluating public transportation health benefits. Victoria Transport Policy Institute for the American Public Transportation Association. 26 July 2010. Available at www.apta.com/resources/reportsandpublications/Documents/APTA_Health_Benefits_Litman.pdf. Accessed 2 May 2013.

87. Glanz, K., Basil, M., Maibach, E., Goldberg, J. & Snyder, D. Why Americans eat what they do: taste, nutrition, cost, convenience, and weight control concerns as influences on food consumption. Journal of the American Dietetic Association. 1998;98:1118–1126.

88. Drewnowski, A. & others. Obesity and the food environment: dietary energy density and diet costs. American Journal of Preventive Medicine. 2004;27:154-162.

89. Siefert, K., Heflin, C.M., Corcoran, M.E. & Williams, D.R. Food insufficiency and the physical and mental health of low-income women. Women & Health. 2001;32:159–177.

90. Kelly, S.E., Binkley, C.J., Neace, W.P. & Gale, B.S. Barriers to care-seeking for children's oral health among low-income caregivers. Journal Information. 2005; 95.

91. Galbraith, A.A., Wong, S.T., Kim, S.E. & Newacheck, P.W. Out-of-pocket financial burden for low-income families with children: socioeconomic disparities and effects of insurance. Health Services Research. 2005;40:1722–1736.

92. Price, RH, Choi, JN, & Vinokar AD. Links in the chain of adversity following job loss: how financial strain and loss of personal control lead to depression, impaired functioning, and poor health. Journal of Occupational Health Psychology. 2002;7(4):302-312.

93. Lipman B. A heavy load: the combined housing and transportation burdens of working families. Center for Housing Policy. October, 2006.

94. American Public Transportation Association. Effects of fare changes on bus ridership. May 1991. Available at www.apta.com/resources/reportsandpublications/Documents/effects_of_fare_changes.pdf. Accessed 2 May 2013.

95. Prevention Institute. "Prevention is Primary: Strategies for Community Well-Being." San Francisco: Jossey-Bass, 2010.

96. Ibid.

97. Alameda County Public Health Department. August 2008.

98. Drewnowski et al. 2004.

99. Centers for Disease Control and Prevention. "Obesity: Halting the epidemic by making health easier. At a Glance 2011." Obesity: At a Glance. 26 May 2011. Available at www.cdc.gov/chronicdisease/resources/publications/aag/obesity.htm. Accessed 16 April 2013.

100. Siefert et al. 2001.

101. Litman 2010.

102. Alameda County Public Health Department. August 2008.

103. Uchino BN. Social support and health: a review of physiological processes potentially underlying links to disease outcomes. Journal of Behavioral Medicine. 2006;29(4). Available at www.pinniped.net/uchino2006.pdf. Accessed 30 April 2013.

104. Green J, Jones A, and Roberts H. More than A to B: the role of free bus travel for the mobility and wellbeing of older citizens in London. Ageing and Society. January 2013. Available at http://journals.cambridge.org/abstract_S0144686X12001110. Accessed 30 April 2013.

105. Lovell P and Isaacs J. The impact of the mortgage crisis on children and their education. First Focus. April 2008. Available at www.brookings.edu/research/papers/2008/05/04-mortgage-crisis-isaacs. Accessed 22 April 2013.

106. Rumberger RW. The causes and consequences of student mobility. The Journal of Negro Education. 2003;72(1):6-21.

107. Hartman E. A literature review of the relationship between employment and health: how this relationship may influence managed long-term care. University of Wisconsis-Stout Vocational Rehabilitation Institute. n.d.

108. Ibid.

109. Alameda County Public Health Department. August 2008.

110. Ibid.

111. Ibid.

112. POWER. December 2012.

113. Ibid.

114. Wener et al. 2003.

115. Walsleben et al. 1999.

116. Strazdins & Loughrey 2007.

117. POWER. December 2012.

118. Alameda County Public Health Department. August 2008.

119. Kushel MB, Gupta R, Gee L, and Hass JS. Housing instability and food insecurity as barriers to health care among low-income Americans. Journal of General Internal Medicine.

January 2006;21(1)71-74.

120. Ferrie JE, Shipley MJ, Stansfeld SA, Marmot MG. Effects of chronic job insecurity and change in job security on self-reported health, minor psychiatric morbidity, physiological measures, and health related behaviours in British civil servants: the Whitehall II study. Journal of Epidemiology and Community Health.2002;56:450-454.

121. Alameda County Public Health Department. August 2008.

122. Ibid.

123. Freudenberg N, Ruglis J. Reframing school dropout as a public health issue. Preventing Chronic Disease 2007; 4(4). Available at: www.cdc.gov/pcd/issues/2007/oct/07_0063.htm. Accessed 16 April 2013.

124. Wener et al. 2003.

125. Walsleben et al. 1999.

126. Strazdins & Loughrey 2007.

127. Alameda County Public Health Department. August 2008.

128. Halfors et al. 2009.

129. Merline A, Jager J, Schulenberg JE. Adolescent risk factors for adult alcohol use and abuse: stability and change of predictive value across early and middle adulthood. Addiction. 17 April 2008;103(s1).

130. Alameda County Public Health Department. August 2008.

131. Uchino 2006.

132. Ibid.

133. Hawkley and Cacioppo 2007.

134. Green et al. 2013.

135. Cohen et al. 2010.

136. Durlak JA and Wells AM. Primary prevention mental health programs for children and adolescents: a meta-analytic review. American Journal of Community Psychology. 1997;25(2).

137. Alameda County Public Health Department. August 2008.

138. Hobson et al. 2002.

139. Yang S, Zarr RL, Kass-Hout TA, Kourosh A. Transportation barriers to accessing health care for urban children. Journal of Health Care for the Poor and Underserved. Johns Hopkins University Press. November 2003;17(4): 928-943.

140. Litman T. Community cohesion as a transport planning objective. Victoria Transport Policy Institute. 22 February 2012. Available at http://www.vtpi.org/cohesion.pdf. Accessed 2 May 2013.

141. Hobson et al. 2002.

142. Ibid.

143. Moore CG, Wilson-Witherspoon P, and Probst JC. Time and money: effects of no-shows at a family practice residency clinic. Family Medicine July 2011;33(7): 522-7.

144. Cohen et al. 2010.

145. DeVoe JE, Fryer GE, Phillips R, and Green L. Receipt of preventive care among adults: insurance status and usual source of care. American Journal of Public Health. May 2003;93(5):786-791.

146. Association of Bay Area Governments and Metropolitan Transportation Commission. Draft Plan Bay Area. March 2013.

147. Dyett and Bhatia. April 2013.

148. Ibid.

149. Association of Bay Area Governments and Metropolitan Transportation Commission. Draft Plan Bay Area. March 2013.

150. Association of Bay Area Governments and Metropolitan Transportation Commission. Draft Equity Analysis Report. March 2013.

151. American Public Transportation Association. May 1991.

152. Green et al. 2013.

153. Metropolitan Transportation Commission. Memorandum to Programming and Allocations Committee. Funding for Low-Income Transit Pass Pilot Programs. May 9, 2012.

154. Ibid.

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