Title

Travel of TOD Residents in the San Francisco Bay Area: Examining the Impact of Affordable Housing

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Examining the Impact of Affordable Housing

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Executive Summary

Introduction

Legislation and public policies in California incentivize housing development near high-quality transit nodes to meet climate change and affordability goals. In general, transit-oriented development (TOD) encourages transit ridership and active travel while reducing the number and distance of car trips. BART has been active in encouraging affordable TOD in the region; the agency adopted a TOD policy in 2016 that aims to build 20,000 housing units on land it owns, 35 percent of which must be affordable to low and very low income households. As of July 2019, 2,555 total housing units were in BART's TOD portfolio, 29 percent of which were affordable units.

BART and the Great Communities Collaborative commissioned a study of how residents in TOD housing travel compared to residents of other housing developments located more than a mile away from BART stations. BART has relied on the results of similar studies in the past to provide the data used in models that estimate ridership for TOD projects on BART property. In this study, the research team expanded the work to evaluate both the impact of TOD on BART ridership and to determine variations by income and time of day. A particular focus of this research was to understand the travel patterns of affordable housing residents in both location types—including how living in a TOD might change their access to opportunity—and the differences from market-rate households. In addition, the study explored change in travel over time in a subset of housing developments also studied in 1992 and 2003.

The research team surveyed 613 residents who lived in one of 62 market-rate or affordable housing developments containing at least 50 housing units. Developments were located either within a quarter mile of a BART station (TOD) or between one and two miles of a BART station (non-TOD). Questionnaires solicited data on the three main trips[1] on a travel day, household car use, employment and commuting, BART travel, and reasons for residential location. The researchers compared results across both housing location (TOD or non-TOD) and affordability (market-rate or affordable). They also conducted focus groups with 61 low-income residents at six affordable housing developments to contextualize survey findings and to understand how living in a TOD affects their access to opportunity.

Study results indicate that the travel of TOD residents is generally consistent with the goals of BART's TOD program: they drive less and take transit more frequently. Affordable housing residents shift some of their transit travel from bus to BART, though factors such as expensive nearby amenities, high travel costs, and inaccessible employment sites create regional accessibility

[1] The survey defined a trip as "going from one place to another, like from home to work, from work to the grocery, or from a restaurant to home."

challenges. The remainder of this executive summary identifies key takeaways from the study results and the policy implications that follow.

Key Findings

Transit-Oriented Development is Meeting BART's Goals of Encouraging Non-Auto Transportation Choices and Increasing Ridership

TOD is making strides toward climate and congestion mitigation goals by reducing the number of trips made by driving alone (Figure ES-1). TOD residents drove alone for 37% of their trips while non-TOD residents drove for half of all their trips. TOD residents walked nearly three times as often as non-TOD residents. TOD residents were also more likely to take public transit: just over one third of their trips were on BART or the bus combined, while only about a quarter of trips were transit trips for non-TOD residents. On average, BART use was more prevalent in TODs. The difference in BART use was more pronounced when examining the trends by affordability. Market-rate TOD residents took 37% of their trips on BART, significantly more than any other resident type. Car ownership in TODs was lower than non-TODs as well. Market-rate TOD residents owned an average of 0.5 vehicles per household adult, affordable TOD residents had 0.7 vehicles per household adult, and non-TOD residents had a combined average of 0.8 cars per adult.

The difference in travel between TOD and non-TOD was most pronounced for work trips (Figure ES-2). TOD residents made nearly half of their commute trips by transit on the recorded travel day, compared to about a quarter of non-TOD residents. Half of non-TOD commutes were drive alone trips compared to 31% of TOD commutes. Most of the transit trips were on BART: TOD residents commuted by BART 43% of the time, while non-TOD residents commuted by BART about half as frequently (22%). About half of market-rate TOD residents usually commuted by transit (49%, not shown in charts).

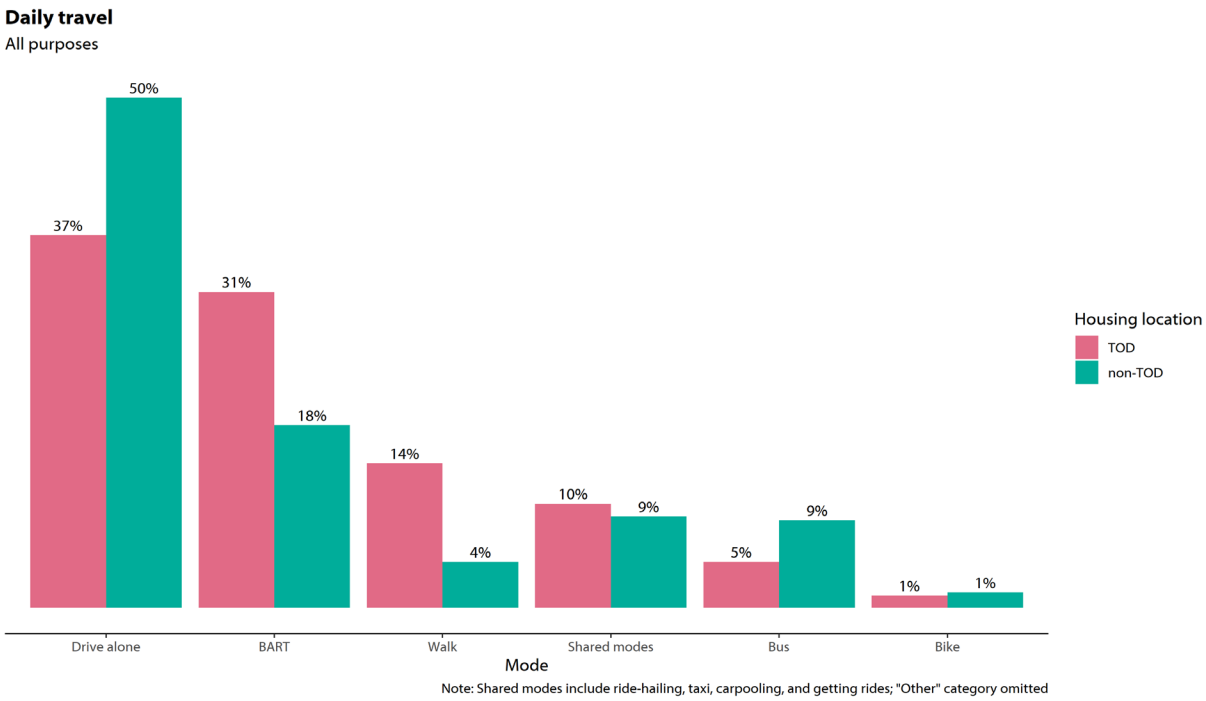

Figure ES-1: Proportion of trips by mode and housing location

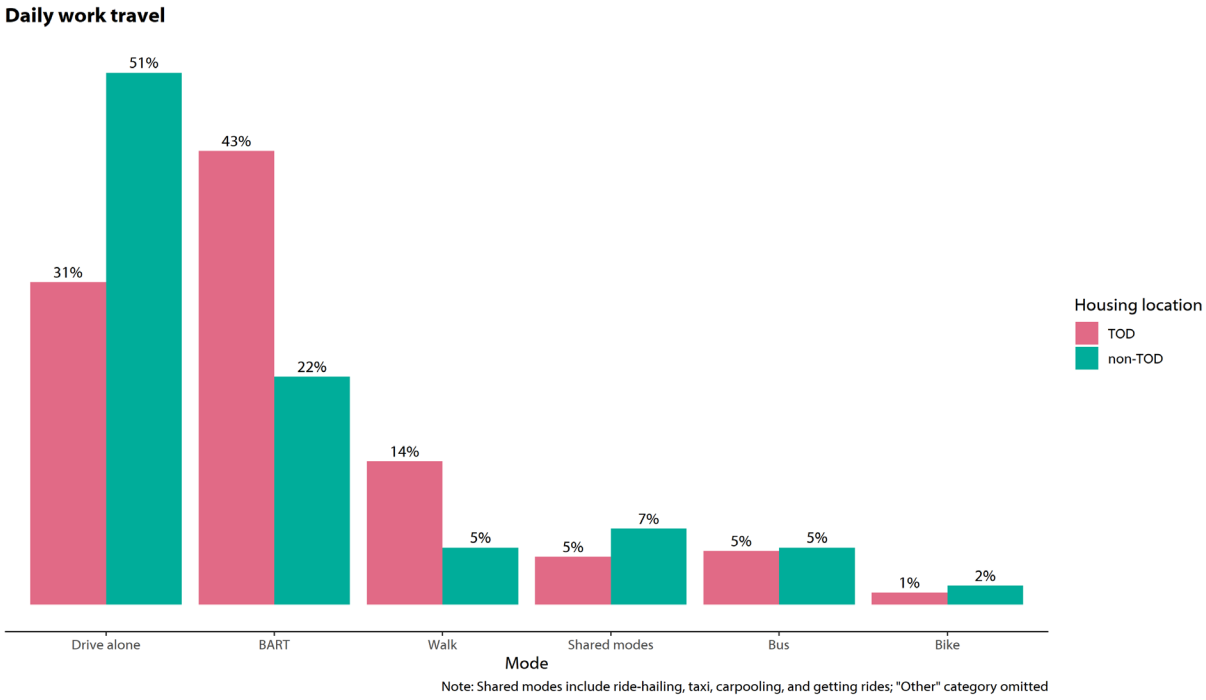

Figure ES-2: Proportion of work trips by mode and housing type

Over the past three decades, car use has declined in TODs. Where the survey provided comparable data in Pleasant Hill and southern Alameda County, the share of auto travel in TODs decreased from about two-thirds to half of trips or less. BART increases were modest between

1992 and 2019, rising from 31% to 38% of travel in Pleasant Hill and from 20% to 24% in southern Alameda County. Walking increases were more dramatic over the same time period, rising from 2% of trips to 14% of trips in Pleasant Hill, and from 7% to 13% of trips in southern Alameda County.

Building Affordable TOD at BART Stations Gives Viable Transportation Choices to a Diversity of Residents

Residents of affordable TODs take BART and walk more than residents of affordable housing elsewhere. Affordable TOD residents used BART about 22% of the time and walked about 16%, while other affordable housing residents used BART 16% of the time and walked only 3%. Note that overall transit use for both affordable housing groups was roughly equal at about 30% of trips, but TOD residents used BART more often while non-TOD residents were more likely to use the bus (Figure ES-3). When affordable housing residents do take BART, they are much more likely to make their trips in off-peak periods: TOD residents made 43% of their BART trips during midday periods, and non-TOD residents made 49% of their BART trips during midday. About 35% of affordable TOD residents took their trips during the peak, compared to 57% of market-rate TOD residents (Figure ES-4).

Affordable housing brings racial and income diversity to BART TODs (Table ES-1). Whereas 40% of market-rate TOD residents are white, half that share is white in affordable TODs. About 25% of affordable TOD residents are Black or African American compared to 8% in market-rate TOD housing. Nearly 70% of affordable TOD residents earn $35,000 per year or less, while the median income for market-rate TOD households is between $100,000 and $150,000.

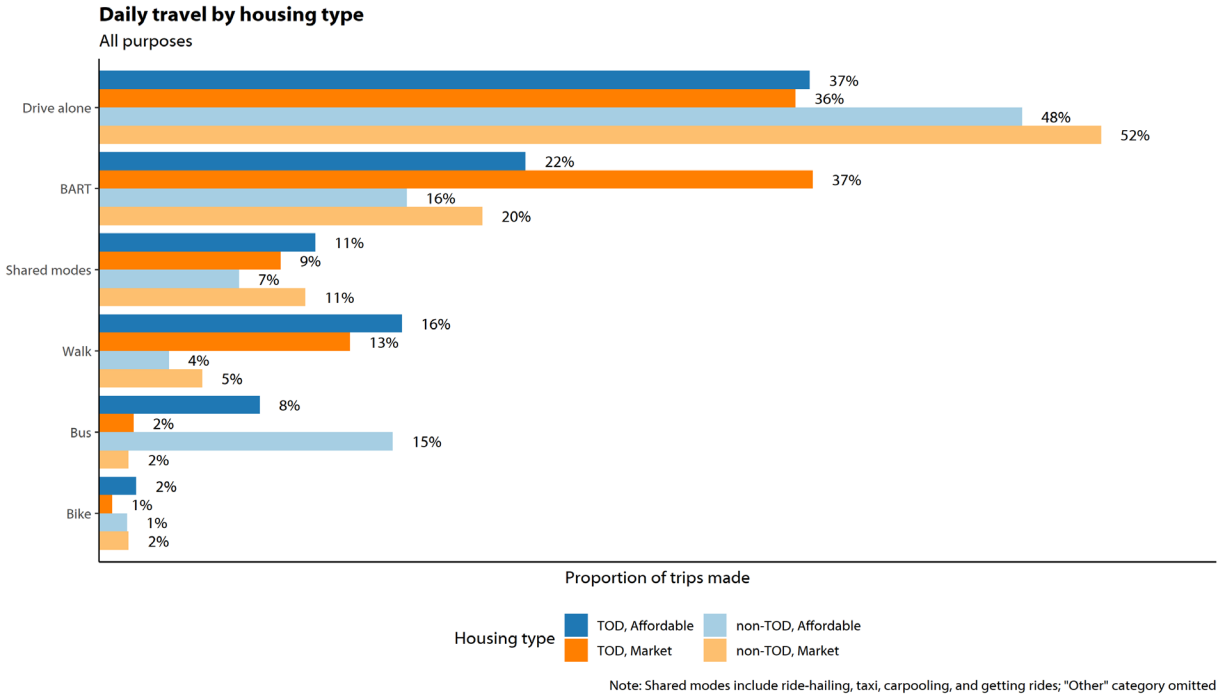

Figure ES-3: Mode share for trips by housing type

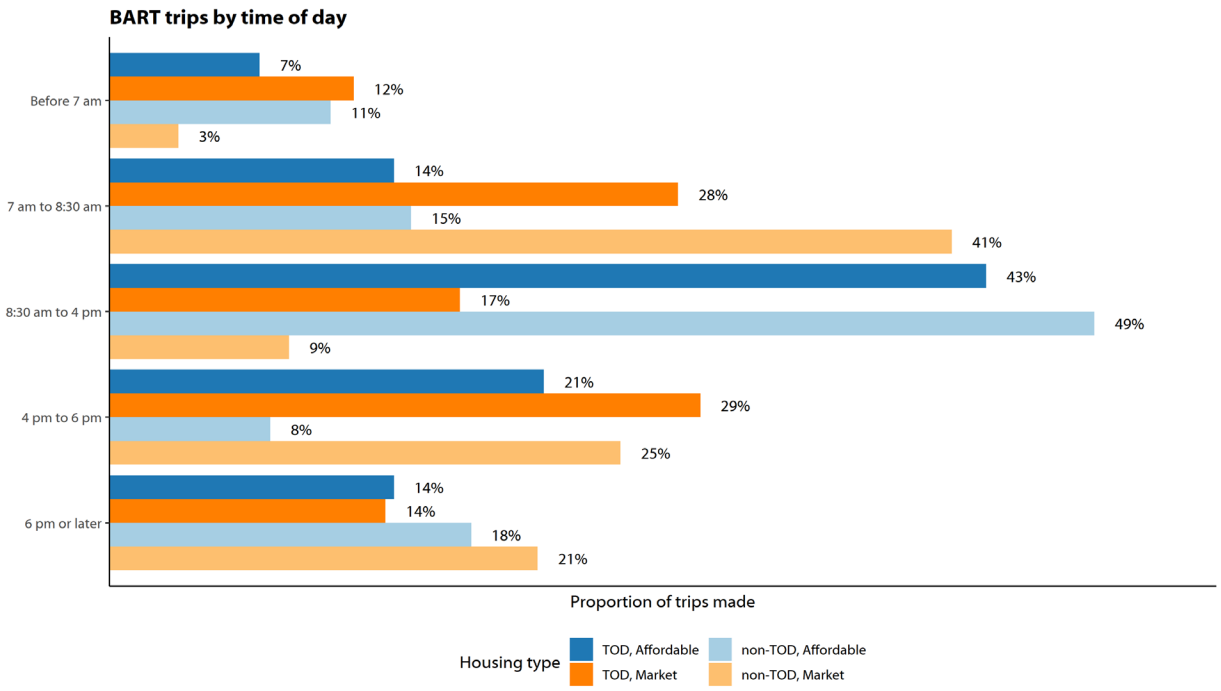

Figure ES-4: Proportion of weekday BART trips made by time of day

Residents Change Travel Behavior after Moving into TOD

For most TOD residents, their previous home was not located within a half mile of a BART station. More TOD residents (29%) reported driving less often after moving compared to non-TOD residents (22%), with similar shares across both affordable and market-rate housing types. Similarly, 25% of TOD residents took BART more often than before, compared to about 11% of non-TOD residents. This change was most pronounced for those who moved from non-TOD to TOD: just over half of respondents who moved into a TOD from a non-TOD location took BART more often than in their former homes.

Table ES-1: Sociodemographic characteristics of sample and comparable population

	Total (N = 613)	TOD, Affordable (n = 196)	TOD, Market (n = 256)	Non-TOD, Affordable (n = 95)	Non-TOD, Market (n = 66)	Population
Race						
Asian	25%	22%	28%	20%	29%	17%
Black/African American	18%	26%	8%	32%	9%	12%
Hispanic/Latino	11%	10%	8%	18%	17%	29%
Native Hawaiian/Pacific Islander	2%	2%	2%	0%	2%	7%
White	28%	19%	40%	16%	32%	30%
Multiple/other/unknown	16%	21%	14%	15%	12%	5%
Income						
$35,000 or less	36%	69%	7%	52%	18%	27%
$35,001-$60,000	14%	16%	8%	25%	15%	18%
$60,001-$100,000	19%	6%	30%	6%	33%	23%
$100,001-$150,000	12%	0%	25%	1%	18%	16%
$150,001 or more	12%	2%	25%	0%	11%	16%
Unknown	8%	7%	5%	16%	4%	0%

Note: Population totals refer to statistics for renters age 18 or older in Alameda, Contra Costa, and San Mateo Counties. Source: IPUMS

Housing Choice Motivations Differ Between Affordable and Market-Rate Residents

About two-thirds of survey respondents listed housing costs as one of the primary reasons for moving to a new location. But far more market-rate housing residents desired to live near transit: seven out of ten respondents reported transit proximity as a top reason for moving into their current home. On the other hand, the second-most selected reason for moving among affordable housing residents, regardless of location, was the availability of subsidized housing. Families seeking affordable housing are far more constrained in their location choices—they have the choice to apply to a housing development via lottery, for example, but not necessarily where they end up because of long wait lists. Affordable housing residents find value in their new homes because they generally provide safer environments than where they moved from and some amenities are nearby. Thus, affordable housing at transit has the potential to increase BART ridership and provide higher-quality neighborhood environments for a group of people who might not have otherwise have those options.

Lack of Transit Incentives and Accessible Destinations are Barriers for Affordable Housing Residents to use BART

As described earlier, affordable TOD residents took BART less than market-rate TOD residents. One potential explanation is the availability of employer benefits. About 25% of employed market-rate housing residents got transit passes at work compared to less than 10% of employed affordable housing residents. Distance to work may be another explanation, as many reported being too far from work to use BART. Many fewer affordable housing residents relocated to their current homes to be near work or near transit compared to market-rate residents. Affordable housing residents also commonly cited distant grocery stores and high costs as barriers to using BART more often, but would use BART when parking was expensive or difficult to find at destinations such as sporting events or visiting downtown San Francisco. Several focus group participants had mobility impairments and felt that both cities and transit operators needed to improve their responsiveness to disability issues, such as by improving first- and last-mile access to stations and ensuring stations themselves were fully compliant with the Americans with Disabilities Act (ADA) requirements.

Policy Recommendations

The findings suggest a number of recommendations for policy related to affordable TOD. The breadth of issues would have to be addressed across multiple stakeholders, including BART, local jurisdictions, MTC, other transit agencies, housing developers, and employers.

Promote Development of Full-Featured TODs

As TOD proliferates across the BART system, many new developments will be in wealthier suburban locations. Subsidized housing residents will need access to groceries and other daily goods and services at affordable prices. Policies that support creating local businesses and encourage relevant established businesses to stay in TOD areas may help with the affordability problem, in addition to producing co-benefits like increased physical activity, travel efficiencies with nearby services, and safety.

For services that cannot be located nearby, such as hospitals or large bulk retailers, last-mile connections from TOD sites to those facilities are critical. As technology and shared-transportation services mature, equitable mobility as a service at TODs may serve as a way to build those connections through car sharing (with free or discounted memberships for affordable housing residents), bike sharing, and autonomous vehicle hubs. On the destination side, many affordable housing residents do not take BART because their employers are not located near a transit station.

Ensuring developments have a mix of uses with the potential to attract employers that match the skills and prevailing wages of affordable housing residents may increase the likelihood that they could commute by BART. Taken together, these policy and technology suggestions would help BART achieve TOD policy goals aimed at building complete communities.

Increase Flexibility of Fare Options

BART fares are expensive for people with limited incomes. Some affordable housing residents qualify for discount BART fares because of age or disability status, while some are given developer-funded transit passes, but these options are not available for everyone. BART has already committed to piloting a means-based fare structure, which might encourage more frequent BART use for those who have accessible destinations. Another policy to consider is to require developers to provide Clipper Cash to low-income residents, which would load a monthly cash stipend onto the transit card to use on BART.

Deeper off-peak discounts may help meet the twin goals of spreading out peak volumes while accommodating low-income workers who often work outside traditional 9-to-5 hours. Other agencies that offer lower off-peak fares include Metro in Washington, DC, in addition to some commuter rail providers such as Metro North and Long Island Railroad. Family fare bundled packages, such as those offered by NJ Transit and the Chicago Transit Authority in which children who are not yet independent get a free or discounted fare with an adult purchase, would ease the burden for care providers who ordinarily have to pay full fare for their children.

A multi-lingual communication strategy should be developed to ensure that all those who may be eligible for new fare types have the opportunity to take advantage of them and that those who are eligible for discounted fares via other programs obtain those benefits. Sustained engagement and education for low-income riders generally, and affordable housing residents specifically, will require that a portion of funds available for transit subsidies be made available for outreach activities.

Work with Employers and Developers to Implement Travel Demand Management (TDM)

Survey results indicated a significant disparity in benefits available to employees; higher-income workers were about three times more likely than low-income employees to receive a transit benefit through their workplace. Working with businesses that employ a significant share of low-wage workers to find funding sources for transit benefits would lower the transportation cost burden for employed affordable housing residents. Encouraging TDM implementation at affordable developments may be a streamlined way to achieve similar goals. BART may consider requiring developers to offer Clipper Cash in lieu of transit passes as part of their Affordable Housing and Sustainable Communities (AHSC) grant obligations.

Incorporate Universal Design Principles in Station and Street Treatments

It is critically important that transit stations adjacent to affordable housing and the pathways that lead there be fully accessible and accommodate all types of mobility limitations because a significant fraction of affordable housing residents have a disability. For example, station elevators should be fit with call-button footplates so that people with limited upper mobility can use them. When elevators are out for maintenance—especially when unplanned—station agents should be proactive in helping limited-mobility passengers and the system should have alternate transportation arrangements so that passengers are not left stranded. BART or a designated

accessibility advocate should also work with developers to ensure that new construction in station areas is fully accessible. This could prevent circumstances where, for example, a blocked door in a parking garage traps a person in a wheelchair.

Municipalities should continue to create infrastructure in the public right of way that is universally accessible. This may require infrastructure investment, such as updating curb ramps to modern standards and installing additional pedestrian recall buttons at lower heights to allow pedestrians in wheelchairs to use them. It may also require rethinking policies if they are inadvertently excluding people with disabilities, though some of the tradeoffs may be difficult to reconcile. For example, if building owners are responsible for maintaining sidewalks adjacent to their properties, the municipality should identify effective ways to ensure the public right of way remains fully accessible.

Review Parking Policies Near Station Areas

While the evidence in this study does not support an *increase* in the amount of parking provided at BART stations, it does suggest that policies that regulate the supply of parking through permits and fees should also account for potential spillovers into residential lots and onto nearby streets. A common complaint that affordable housing residents shared in focus groups was around parking scarcity; at some developments, residents believed that BART customers were parking in residential areas and at the TOD nearby.

Some residents also shared that visitors did not have parking spaces and so were deterred from visiting in some locations. Municipalities may consider residential permit zones or other paid parking options in the vicinity of TODs; any fee-based programs should consider effects on affordable housing and other low-income residents. In addition, parking design should specifically consider non-assigned short-term parking spaces for both deliveries and visitors.

Continue Development of Affordable Housing at BART

As a public agency landowner in the Bay Area, BART has an important role to play in increasing housing supply and affordability in the region. BART TOD goals include not only increasing transit ridership, but also creating affordable and equitable complete communities and contributing to regional greenhouse gas reduction goals. Ridership returns per affordable housing resident living near a BART station are smaller than per market-rate housing resident, but affordable TOD residents make a greater share of their trips by BART than non-TOD residents. They also make more trips in off-peak periods, spreading system demand over a greater period of time, which has been a key interest of BART and transit agencies throughout the U.S. to increase system efficiency.

Significant challenges for affordable residents must be solved before substantially increasing their use of BART, however, including access to destinations such as jobs and significant retail sites. Nevertheless, study findings highlighted several co-benefits to living in TODs besides transit access, including a sense of community for residents and safer and healthier neighborhood environments.

Acknowledgments

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Chapter 1: Introduction

Several state and regional policies are driving the need to densify development around key transit nodes and corridors in the Bay Area. AB 32 (2006) was a legislative landmark to address climate change in California. The law requires the state to reduce its greenhouse gas emissions (GHG) to 1990 levels by 2020 and 80 percent below those levels by 2050, and follow-up legislation has set an interim reduction target of 40 percent below 1990 levels by 2030 (California Air Resources Board 2018). SB 375 (2008) requires MPOs in the state to develop sustainable community strategies (SCS) to help meet the state GHG targets through coordinated land use and transportation planning, measured through emissions and vehicle trip reductions (Institute for Local Government 2011). The California Air Resources Board sets GHG reduction targets for each region; as of 2018, the Bay Area has a target of a 10% reduction in emissions by 2020 and a 19 percent reduction by 2035 (California Air Resources Board 2019). The most recent SCS, Plan Bay Area 2040, has a goal of focusing regional growth in Priority Development Areas (PDA); that is, locations where dense development is appropriate as decided by cities (Metropolitan Transportation Commission and Association of Bay Area Governments 2017b). Most of these PDAs are centered near BART stations and other high-quality transit corridors.

California has also passed specific transportation planning legislation to further GHG reduction goals. SB 743 (2013) requires an alternative analysis be available to measure the transportation impacts of new development in the environmental review process (California Office of Planning and Research 2019). Historically, impacts have been measured through anticipated changes in congestion, or levels of service (LOS). Increasing the intensity of activity in a small area—adding density—will generally increase the number of people trying to get there across all modes, including by car, resulting in a worse LOS. Under the former guidelines, these types of developments would be difficult implement because they would require additional steps to pass environmental review. The changes under the law as implemented by the California Office of Planning and Research allow for an assessment of VMT changes to be used as the metric of transportation impact. Now, projects that reduce VMT will be easier to pass review. Furthermore, SB 743 exempts some TODs from review if they are consistent with a municipality's Specific Plan.

At the same time, the region has been facing an unprecedented housing deficit. The regional population has grown by over 1.5 million people in the last 25 years, the number of jobs has grown by roughly 800,000, but the number of newly permitted housing units per year has remained below 50,000—and far below that since the trough during the Great Recession. The shortage, with its commensurate high housing costs, is squeezing out middle income households and has widened the gap between the lowest and highest income groups in the region (Metropolitan Transportation Commission and Association of Bay Area Governments 2017a). In many respects, BART has been an important public partner in enabling the equitable construction of housing and development near its stations in response to the shortage. In 2016, the agency adopted a TOD policy that aims to build 20,000 housing units and 4.5 million square feet of office or commercial space on its property by 2040, and seeks an 84 percent increase in

housing units within a half-mile of stations over the same time period (Bay Area Rapid Transit District 2016). The policy also sets a goal that 20 percent of all housing at a station and 35 percent of housing across the BART portfolio must be affordable to low and very low income households (Bay Area Rapid Transit District 2019).

New legislation may help make these housing targets easier to achieve. In 2018, AB 2923 (2018) was signed into law, which requires cities and counties to adopt TOD zoning standards within a half mile of BART stations in the counties in which the agency already operates (*San Francisco Bay Area Rapid Transit District: Transit-Oriented Development* 2018). The zoning standards are based on previously existing guidelines in place at BART; they eliminate parking minimums and establish parking maximums, a minimum residential density, and a minimum height requirement based on the station area context. A more expansive bill proposed in the previous legislative session, SB 827, would have required upzoning around any transit stop or corridor in the state (*Planning and Zoning: Transit-Rich Housing Bonus* 2018). The bill ultimately did not pass, but it did generate discussion about the appropriateness of adding residential density to transit-rich neighborhoods.

With the focus on TOD as one of the solutions in meeting both market-rate and affordable housing needs, an important question is how intensifying uses around transit nodes will affect ridership. Two previous studies of the effects of TOD on travel behavior found that TOD residents in the Bay Area tended to take more of their trips by rail than did other TOD residents in California. In 1992, about 27 percent of main trips that Bay Area TOD residents took were by rail (Cervero 1993). This proportion did not meaningfully change when the area was resurveyed in 2003 (Lund, Cervero, and Willson 2004). However, given the substantial changes in the legislative context and type of development in the intervening years, including the increasing proportion of housing developed as affordable, it is an appropriate time to reexamine travel trends of TOD residents.

In this study, we ask three related research questions:

1. What is the travel behavior of affordable housing TOD residents, and how does that compare to the travel of market-rate and non-TOD residents?
2. How has travel in TODs changed over time?
3. How does living in affordable housing in a TOD influence access to opportunity?

We administered a travel survey to 437 TOD residents and 161 non-TOD residents to answer the first research question, and compared the results with two previous similar survey efforts (Cervero 1993; Lund, Cervero, and Willson 2004) to answer the second. For the third research question, we complemented quantitative findings by conducting six focus group interviews with 61 affordable housing residents.

The report continues next with a literature review of travel in transit-oriented development, the mobility of low-income households, and the few studies that have examined travel in affordable TODs. Chapter 3 describes the research methods. Chapters 4 and 5 focus on the results of the

survey, describing characteristics of TOD residents and analyzing their travel characteristics, respectively. Chapter 6 reports the analysis of the focus group interviews. The final chapter summarizes the study findings and shares the implications for transit and TOD policy.

Chapter 2: Literature Review

Travel in Transit-Oriented Development

The desire to build TODs and other dense development types follows from observations that the built environment has significant influence on the way people travel. Denser environments, a diverse mix of land uses, and urban design that promotes walking, known as the "3Ds," have significant associations with lower automobile use (e.g. Cervero and Kockelman 1997). Other "D" variables, including shorter distances to transit and improved accessibility to destinations, are also associated with both lower rates of driving (Ewing and Cervero 2010; Stevens 2017 and related commentary) and more trip-making by transit (Ewing et al. 2015).

Nevertheless, characteristics other than the "D" variables will influence mode choice, even when households are located near transit stations. For example, there is a difference between transit-*oriented* development and transit-*adjacent* development (TAD), distinguished by the lack of supportive land use characteristics. Residents of TADs do not have significantly higher transit use than other non-TOD environments (Kamruzzaman et al. 2015); abundant on- and off-site parking likely plays a role (Chatman 2013). Household income is another predictor of travel behavior in TODs. For example, in a study across TODs and non-TODs in both Baltimore and Washington, D.C., TOD residents made more transit trips than their non-TOD counterparts after controlling for the built environment and individual characteristics. TOD residents in lower-income neighborhoods made a significantly higher share of their trips by transit, although car ownership remained the strongest factor in explaining mode choice (Zamir et al. 2014). Households living near rail transit drive fewer miles, but low- and moderate-income households are less sensitive to transit proximity (Chatman et al. 2019). In other words, lower-income households will drive regardless of whether they can access transit easily for reasons we will describe in more detail below.

Mobility in Low-Income Households

Even in transit-rich areas, car ownership remains vitally important for low-income households. Across several studies that have examined the role of car access on employment outcomes for low-income households, evidence suggests that people with cars are more likely to gain employment than those who do not (Cervero, Sandoval, and Landis 2002; Ong 2002; Gurley and Bruce 2005; Sandoval, Cervero, and Landis 2011; Blumenberg and Pierce 2014, 2017). Two housing programs provided the opportunity to examine outcomes in an experimental design: the Welfare to Work Voucher (WtWV) program and the Moving to Opportunity (MTO) program administered by the US Department of Housing and Urban Development, both of which incentivized an experimental group of low-income households to move out of low-income neighborhoods. Because data about socioeconomic outcomes were collected longitudinally, the methods lend additional support the effects of car access were causal rather than merely associative. Car access has a stronger relationship with employment outcomes than does transit access, though the effects are mixed. In a study of participants in the MTO program in five major cities, researchers found that moving to a transit-rich neighborhood did not help individuals find

jobs, but it did substantially increase the odds of maintaining employment (Blumenberg and Pierce 2014). This is notable because even people who lost a car between the two study waves were more likely to maintain employment than those without a car to begin with, likely because of their better access to transit. However, in the WtWV program implemented in set of six metros more mixed in size, there was no significant association between improved public transit access and employment outcomes (Blumenberg and Pierce 2017). A smaller study of Alameda County residents in an older welfare program found that better access to low-wage employment by transit was a positive predictor of getting a job and leaving welfare (Cervero, Sandoval, and Landis 2002), while in a larger set of three California metro areas, transit access was not associated with job gains (Sandoval, Cervero, and Landis 2011).

Nevertheless, public transit access remains an important mobility option for low-income households, especially those who do not or cannot have a vehicle. The carless have a higher probability of having a job and working longer hours with increasing levels of job access by transit (Kawabata 2003; Yi 2006), and they are more likely to use transit for work purposes the more transit service is available to them (Ong and Houston 2002). Neighborhoods that have better access to transit have higher levels of employment—specifically among people of color in some contexts (Sanchez 1999). One reason for this is that better transit service is typically correlated with higher density, and higher density neighborhoods have the advantage of centrality. While lower-income residents of central city neighborhoods have better access to jobs and non-work destinations because of this property of space, they are still generally worse off when using transit as their main travel mode because destinations are dispersed (Grengs 2010, 2015). In the San Francisco Bay Area, a significant fraction of the growth in employment over the next several decades is projected to take place outside of the most transit-accessible areas in the region (Metropolitan Transportation Commission and Association of Bay Area Governments 2017a), suggesting that this modal mismatch will be a regional concern. While encouraging job centers for low-wage workers to locate near transit stations can improve transit accessibility relative to car accessibility, so too can improving first- and last-mile connections via faster modes like cycling or park-and-ride (Boarnet, Giuliano, et al. 2017).

TODs and Affordable Housing

Creating opportunities for low-income households to live near public transit is an important equity goal in public policy. While housing costs are often higher in transit-rich neighborhoods because of the accessibility premium, transportation costs tend to be lower in aggregate making the total cost of housing and transportation less than similar homes in transit-inaccessible neighborhoods. Because costs for subsidized housing are capped, households living in affordable housing units also have affordable housing-plus-transportation costs when they live in compact, transit-accessible neighborhoods (Hamidi, Ewing, and Renne 2016). However, given that low-income households rely on cars even when they live near transit, these idealized costs may not reflect true savings (Smart and Klein 2018), although some groups will save (Zhou and Zolnik 2013). The location of the current stock of affordable housing in the United States makes it difficult for families to realize even the idealized lower costs. The vast majority (71 percent) of

federally subsidized housing is located in unwalkable neighborhoods, and in some metropolitan areas, high walkability is compromised by residential segregation, crime, and environmental justice concerns (Talen and Koschinsky 2014). Once households find a location-efficient home, they tend to stay there; movers often have to trade down to less transit-accessible neighborhoods because of the lack of housing availability (Tremoulet, Dann, and Adkins 2016). The obvious solution—create more affordable housing in walkable neighborhoods—can be inadvertently discriminatory. When people of color get access to more walkable neighborhoods through public housing, project-based rental assistance, or housing choice vouchers, their neighborhood conditions tend to be worse than for seniors, people with disabilities, and Asian or white people (Koschinsky and Talen 2016). In many cities, location-efficient places are already correlated with higher concentrations of people of color because they are in central city locations. Policies that favor the development of affordable housing by giving preference to construction in dense, transit-accessible neighborhoods may increase housing segregation and concentrations of poverty in communities of color (Reina, Wegmann, and Guerra 2019).

A second reason to ensure adequate affordable housing stock in TOD areas is to mitigate potential effects from gentrification and displacement. Much of the public debate in California about building housing near transit corridors has been related to concerns that low-income families would be priced out of their current residences. The evidence for this is highly mixed. A Denver study found that housing prices and household income increased in transit-station areas after light-rail stations opened, but a Los Angeles study could not find evidence of displacement from new rail neighborhoods (Bardaka, Delgado, and Florax 2018; Boarnet, Giuliano, et al. 2017). A panel survey of movers over four-and-a-half decades found no evidence that low-income households were displaced by transit investment, although low-income households were more likely to move regardless of where they lived (Delmelle and Nilsson 2019). TOD station areas tend to have higher housing costs because of the value of accessibility (Renne et al. 2016) but rents may be less vulnerable to capitalization of this value (Deka 2017). Nevertheless, the fears of displacement are real, and several community groups have used grassroots organizing to protect themselves from the possibility of displacement (Zuk and Carlton 2015; Rayle 2015; Cho 2019).

A handful of studies have used general travel survey data to understand how TOD characteristics influence VMT and related trip-making metrics for low-income households as a proxy for families eligible for subsidized housing. Newmark and Haas (2015) developed an econometric model using California Household Travel Survey (CHTS) data to estimate whether affordable housing development in a location-efficient parcel would yield more VMT reductions than developing the same parcel as market-rate housing. They found that affordable housing development would yield reductions in driving, but not necessarily because the housing is in a walkable, transit-accessible neighborhood. Rather, they found that because lower-income households drive less than higher-income households no matter where they live, developing a site with affordable housing would result in lower aggregate VMT. They also argued that because lower-income groups consume less housing developers could build higher-density buildings resulting in even further VMT reductions. Using the same dataset for the Southern California

region, Boarnet, Bostic, et al. (2017) also found reductions in VMT associated with TODs in the range of 1.3 to 5.8 percent. However, moderate-income households reduce their driving more than low-income households. Low-income households located in TOD areas take transit more than other groups, but this difference is much greater for bus trips than for rail trips. Transit is not a perfect substitute for driving, even in TOD areas and even among low-income groups. Others have found that the reduction in the number of vehicle trips for households eligible for subsidized housing is sensitive to characteristics of the built environment. Howell et al. (2018) examined how place type affected home-based vehicle trips across HUD income categories. The less urban a place was, the fewer vehicle trips there were, but the absolute magnitude of change was less for lower-income households. For example, relative to a suburban moderate-income household in a single-family home, a suburban low-income household in a multifamily home would make 71 percent as many vehicle trips and an extremely low-income household would make 46 percent as many trips. Locating in the urban core halved the relative percentage of vehicle trips for both groups, which meant a 36 percentage point decline for the low-income household and a 23 percentage point decline for the extremely low-income household.

Findings are mixed in those studies that have directly examined the travel of affordable housing residents at TOD. A small survey of residents at five affordable housing developments in the Bay Area found that TOD residents used public transit more and drove less than their non-TOD counterparts, and they walked and cycled more if there were more amenities nearby (Association of Bay Area Governments and Resources for Community Development 2015). Bus use was comparable between TOD and non-TOD sites, though TOD residents used BART significantly more. The majority of residents at each of the TOD sites moved from the same city or a neighboring city, suggesting that housing at TODs can help stabilize communities when housing pressures cause people to look for housing wherever they can find it. The study examined developments across significantly different place types, so the TOD and non-TOD sites are not directly comparable but the results are suggestive. Lower-income residents do not prioritize access to transit when moving to TODs (Lund 2006), but are more likely to find housing through neighborhood social support networks (Skobba and Goetz 2013).

Two studies are more rigorous and directly comparable to this study. Zuk et al. (2019) examined VMT at 27 affordable developments in the Bay Area and Los Angeles. Sites were characterized as near transit if they were within a half-mile of a high quality transit node, or far if they were beyond that distance. Several of their study sites overlapped with this study. Across the study sites, they found that nearly half of all trips were made by driving alone, most frequently for work purposes. About 16 percent of trips were made by transit, including 12 percent by bus, and 17 percent were walk trips. In a multivariate analysis, they found that proximity to transit did not significantly predict household VMT or the share of trips made by driving, but it did predict a lower number of driving trips and a higher number of walking trips. Transit accessibility to the workplace was associated with a lower vehicle mode share. Focus group participants emphasized the importance of factors other than transit proximity in predicting their travel; for example, because some TODs in suburban areas had few other amenities nearby, residents felt that their

opportunities were still limited despite good transit access. Bardaka and Hersey (2019) conducted the only study to date that directly compared travel between market-rate and affordable housing units in TODs. They examined 21 developments in Denver, Colorado and found that affordable housing residents took transit at significantly higher rates than market-rate residents. About three-quarters of affordable residents usually took transit compared to less than one-fifth of market-rate residents. Market-rate residents were more likely than affordable housing residents to drive, though they were three times as likely to walk for longer distances. The fare structure is a key difference between Denver's rail system and the BART system that could influence travel behavior. Denver fares are based on travel between three zones, and only travel between all three zones requires a fare 75 percent higher than the base fare.[2] BART fares are station-based, and the difference in fares between the closest stations and the farthest stations could be four times or more.

[2] Except for travel to the airport.

Chapter 3: Methods

This report presents findings about travel behavior from surveys and focus groups in the San Francisco Bay Area. The goal of data collection was to examine the differences in travel between affordable housing residents and market-rate housing residents, and the differences across TOD and non-TOD locations. Sites were selected near BART stations, primarily where the agency has already worked with developers to build housing or has the potential to do so. Three questions guided the research design and analysis:

1. What is the travel behavior of affordable housing residents who live in TODs, and how does that compare to the travel of market-rate residents and non-TOD residents?
2. How has travel in TODs changed over time?
3. How does living in affordable housing in a TOD influence access to opportunity?

The data collected answer additional supplementary questions, such as the demographic characteristics of residents across housing types, the reasons residents moved into their current apartments, and perceptions of the neighborhood environment. The findings from this report provide evidence needed to assess the influence of the TOD policy BART passed in 2016, which aims to create complete and sustainable communities through housing development and job attraction, increase BART ridership and decrease VMT, and provide affordable places for residents to live.[3] The policy aims for 35% of the housing portfolio across the BART system to be affordable to low and very low income households, and for 20% of housing units at each station to be affordable. As of July 2019, BART has over 2500 housing units on its property, 29% of which are affordable. An additional 2300 units are under construction or planned and is estimated to yield over 1000 additional affordable units.

In the remainder of this section, we describe the research design. We begin by describing the site selection, and then describe the survey development and implementation, and finally present details about the focus group interviews.

Survey Site Selection

The development of the housing database to create the survey sample was an iterative process that relied on multiple data sources from both public agencies and provide providers. A constraint on the site selection criteria was to ensure consistency with previous surveys that examined the travel of TOD residents in California (Cervero 1993; Lund, Cervero, and Willson 2004) to allow for comparisons over time. The sampling frame consisted of all developments that contained 50 or more housing units, either within a quarter-mile radius of a BART station or in an area beyond one mile but within two miles of a BART station. We constructed the frame this way to allow for a stratified sample of TOD and non-TOD sites. The sampling frame generally excluded stations in San Francisco and Oakland where BART did not own land and excluded stations completed after

[3] https://www.bart.gov/about/business/tod

2016. However, we modified the frame slightly to include affordable housing buildings near the 19th Street station in Oakland to allow us to gather data on travel within one urban core. The TOD sites were defined as those within a quarter mile of a BART station, and thus each development could be associated with a particular station. Non-TOD sites were between one and two miles from all stations; in some cases these radii overlapped so the development was assigned to the closest station of the two or three. In the densest areas, three or more one-to-two mile radii overlapped and thus we could not select housing developments in those areas according to our selection criteria. Furthermore, not every station had both TOD and non-TOD nearby so we could not pair developments exactly.

The database of affordable housing developments came from the California Tax Credit Allocation Committee (TCAC),[4] which contained the list of projects developed under the California Low-Income Housing Tax Credit program, and the US Department of Housing and Urban Development Insured Multifamily Mortgages Database.[5] The databases also identified mixed-income developments where subsidized units were supported by the affordable housing programs. No similar comprehensive database or set of databases for multifamily market-rate housing exists. The list of market-rate developments was constructed from a mailing list developed by Marketing Systems Group (M-S-G). M-S-G identified the multifamily dwelling units by county parcel ID, assigning disparate postal addresses to a single development name. As a final check, the research team verified that the developments included all the proper buildings using satellite imagery, Google Street View, and the websites of the developments themselves. BART staff informed us of the existence of some of the newest developments that did not appear on either list.

The goal was to sample about half affordable housing units and half market-rate housing units for a balanced sample. TODs were selected deterministically based on two additional criteria: (1) Developments that were surveyed in the previous (2003) survey were preferred, as were (2) developments where BART had a pre-existing relationship with the developer or property manager. We also selected developments where BART had an interest in obtaining additional data for policy reasons. Finally, we worked to have broad representation across four BART station access types: Urban with parking, Balanced intermodal, Intermodal/auto reliant, and auto dependent.[6] Because there were many more market-rate units than we could survey, we sampled so that we obtained a roughly equivalent percentage of affordable and market-rate units at each BART station. This was not always possible because of differing numbers of housing units within nearby buildings or because not every BART station had large multifamily dwelling units nearby.

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[4] https://www.treasurer.ca.gov/ctcac/projects.asp

[5] https://www.hud.gov/program_offices/housing/comp/rpts/mfh/mf_f47

[6] See https://www.bart.gov/about/planning/station-access/policy for details about the BART station access policy and station definitions according to the typology.

For the non-TOD housing sample, we selected developments so that the proportion of affordable and market-rate units near each station was similar to the proportions of housing type in TOD units for a matched-pair comparison. Where the two-mile radius overlapped between stations, we assigned the housing development to the closest station and excluded developments that were closer than two miles to *any* BART station. To select affordable units, we relied on the TCAC and HUD databases as before but also supplemented them with county and city lists of affordable housing units. Where there were more affordable units than the proportion at at the matching BART station TOD, we randomly selected the family-housing developments (i.e. not senior or other specialized housing).

We sent surveys to 9,643 households in 62 different housing developments. We sampled all housing units within a development. Total numbers of surveys distributed by housing development type and distance are shown in Table 1. Totals by station are shown in Table 2.

Table 1: Total surveys distributed by distance and housing development type.

Distance	Affordable	Market	Mixed-income
TOD	2119 (22%)	2354 (24%)	1513 (16%)
Non-TOD	1865 (19%)	1396 (14%)	396 (4%)

Survey Administration

We distributed surveys in two waves. The first wave of surveys was distributed in October and November 2018, while the second wave was distributed in March and April 2019. In the first wave, we sent every household a packet that contained an introductory letter, a consent form, a survey, and a postage-paid return envelope. Households were randomly selected to receive either a survey asking them to report their weekday travel (5 out of every 7 households) or the weekend travel (2 out of every 7 households). Approximately three weeks later, we sent the same households a postcard reminding them to complete the survey. Respondents had the option of completing the paper version of the survey or an equivalent web-based survey hosted in Qualtrics. The only difference between the two versions is that the online survey only offered the ability to report weekday travel. We asked household members with the most recent birthday to complete the survey. Respondents received a $10 gift card to Target as an incentive to complete the survey.

We added a second wave of the survey administration because of the low initial response rate. In the second wave, we mailed a similar survey packet to the non-responding households in affordable housing developments, although in this instance all such households received the weekday travel version of the survey. We mailed a postcard inviting the rest of the non-responding households to take the survey online. We chose this mode of distribution to minimize mailing costs on the assumption that those living in affordable housing would be less likely to have internet access at home and would need a full survey packet. The participants in the second wave received the same $10 gift card for participation. However, we made two adjustments to increase the response rate. First, while in the first wave all packets and postcards were mailed to

"Current Resident," in the second wave we personalized all mailing with the names of the residents. Second, we added a new incentive: all participants (including those who responded in the first wave) would be entered into a drawing for one of three $100 gift cards.

Table 2: Total surveys distributed by station. Missing stations indicate no survey distributed.

BART Station	TOD, Affordable	TOD, Market or Mixed	Non-TOD, Affordable	Non-TOD, Market or Mixed	Total surveys
19th St. Oakland	234	130	0	0	364
Ashby	92	0	0	0	92
Castro Valley	96	0	108	123	327
Coliseum/Oakland Airport	465	0	252	0	717
Colma	119	155	0	396	670
Concord	0	0	91	50	141
El Cerrito del Norte	0	135	0	0	135
Dublin/Pleasanton	113	507	180	283	1083
Fremont	0	0	71	71	142
Fruitvale	68	71	72	52	263
Hayward	0	0	50	140	190
MacArthur	90	0	0	0	90
North Berkeley	71	0	0	0	71
Pleasant Hill/Contra Costa Centre	88	1302	408	172	1970
Pittsburg/Bay Point	105	0	0	0	105
Richmond	0	0	260	197	457
San Leandro	35	0	0	0	35
South Hayward	152	324	252	138	866
South San Francisco	0	359	0	0	359
Union City	157	525	121	170	973
West Dublin/Pleasanton	66	309	0	0	375
West Oakland	168	50	0	0	218

Finally, we supplemented the mail distribution with six on-site events to encourage residents to complete the survey. These events were held typically in common rooms where residents could fill out surveys on-site. Some of the events were standalone events, where the survey team provided snacks and had the electronic version of the survey to fill out immediately. Other events were held in conjunction with activities arranged by the housing management staff, such as food pantries or family fun nights. These coordinated events turned out to be more successful than the standalone events as they were much more visible to residents. Distributing the gift card incentives at these events also helped increase the response rates. All survey administration procedures were approved by the UC Berkeley Committee for Protection of Human Subjects. Survey materials can be found in Appendix B.

Focus Group Administration

Focus groups were conducted in July and August 2019. We conducted six focus groups with residents of affordable housing developments (Table 3). Focus groups averaged ten participants. We recruited in multiple ways. We first contacted individuals who indicated willingness to participate in the focus groups in their survey responses. We also asked those who responded affirmatively to invite neighbors in their building to participate. Finally, at several locations, we asked the resident managers to post flyers and alert residents of the opportunity to participate. Most of the resident managers were willing to work with us, and those locations were our most successful in terms of engagement. In four instances, we conducted the focus groups on site in a meeting room or common area; in two cases, we conducted focus groups at nearby publicly accessible locations. While we aimed to get geographic breadth to the residential locations, we were unable to conduct a focus group in northeastern Contra Costa County due to lack of participant interest.

Table 3: Focus group locations and participant numbers

Development name	Location	Participants
Mural	Oakland	15
Trestle Glen	Colma	13
Valor Crossing	Dublin	4
Station Center	Union City	11
Lion Creek Crossing	Oakland	8
Camellia Place	Dublin	10

Focus group interviews lasted about an hour. The first author moderated or co-moderated all the focus groups, and each session had a note taker and was recorded for later transcription. Each focus group followed a common topic guide, though the emphasis within the selected topics was dictated by the rhythm of the conversations. General topic areas included why people chose their residence or residential neighborhood, how they got around for their usual trips, travel costs, and perceptions of the most important transportation challenges in the Bay Area. We also administered a brief survey at the beginning of each focus group session that gathered information on length of time in residence, car ownership, transportation costs, and household income. We did not systematically collect demographic data, but participants were diverse in terms of race or ethnicity, country of origin, gender, age, physical ability, and developmental ability. Each participant received a $75 gift card as an incentive. Focus group materials can be found in Appendix C. To protect anonymity, we refer to all focus group participants by pseudonym in the text.

Chapter 4: Characteristics of TOD Residents

Survey Responses by Station

Out of the 9,643 total surveys distributed, we received 613 responses for an overall response rate of 6%. The primary goal of survey sampling was to understand the travel of TOD residents, and secondarily to compare the travel to nearby non-TOD residents as a type of control. Accordingly, the majority of responses (74%) came from TOD sites. The overall response rates were highest at affordable housing in TODs (9%) and higher in TODs than non-TODs (see Table 4). Many developments had too few responses to allow us to report statistics at the site level and create inferences within acceptable margins of error and to maintain respondent confidentiality. Thus, the smallest geographic aggregation we report by generally is the BART station access typology, although where possible we report by development to compare trends with surveys from previous years.

Personal and Household Attributes

Household and personal characteristics of all survey respondents and by housing type are shown in Table 5.[7] Household attributes vary across the housing types. Residents in market-rate housing are more likely to be White than other racial and ethnic groups, while affordable housing residents are most likely to be Black or African American. Hispanic or Latino people make up twice the share of residents in non-TODs compared to TODs. Asians make up similar proportions at all four housing types.

The household income distribution matches expectations. Over half of residents in affordable housing units earn less than $25,000 per year, and roughly two-thirds earn less than $35,000 per year.[8] There was little difference in the income distribution for affordable housing residents whether they lived in a TOD or not. By contrast, market-rate residents earned much more. The median household income for a market-rate TOD resident was $100,001–$150,000. However, the median income for a market-rate non-TOD resident was $60,001–$85,000. This suggests that market-rate housing in TODs commands a rent premium compared to housing built elsewhere.

[7] Note that summary statistics and percentages refer to survey respondents rather than household residents.

[8] As an example, the income limit for a family of three living in Section 8 housing in Alameda County in 2018 was $55,800. Almost all households living in affordable housing units were below this threshold.

Table 4: Response rate per development

BART station	Development name	Location	Housing type	Surveys mailed	Responses received	Response rate
19th St/ Oakland	Fox Courts	TOD	Affordable	82	8	10%
	Satellite First	TOD	Affordable	152	10	7%
	1801 Jefferson	TOD	Market	78	9	12%
	532 16th St	TOD	Market	52	2	4%
Ashby	Harriet Tubman Apartments (Senior)	TOD	Affordable	92	15	16%
Castro Valley	Strobridge	TOD	Affordable	96	8	8%
	Siena Pointe Apartments	non-TOD	Affordable	108	3	3%
	Alpine Vista Apartments	non-TOD	Market	57	2	4%
	Kelly Green Apartments	non-TOD	Market	66	7	11%
Coliseum	Lion Creek Crossing	TOD	Affordable	465	33	7%
	Brookfield Place Apartments	non-TOD	Affordable	60	1	2%
	Foothill Family Apartments	non-TOD	Affordable	71	3	4%
	Kenneth Henry Court	non-TOD	Affordable	52	2	4%
	Miley Gardens	non-TOD	Affordable	69	9	13%
Colma	Trestle Glen	TOD	Affordable	119	11	9%
	La Terrazza	TOD	Mixed	155	8	5%
Concord	Virginia Lane	non-TOD	Affordable	91	6	7%
	Courtyard Plaza	non-TOD	Market	50	1	2%
Daly City	Serramonte Ridge	non-TOD	Mixed	396	11	3%
Dublin/ Pleasanton	Camellia Place	TOD	Affordable	113	4	4%
	Avalon Dublin Station	TOD	Market	507	29	6%
	Wexford Way & Carlow Court at Emerald Vista	non-TOD	Affordable	180	9	5%
	Park Sierra at Iron Horse Trail	non-TOD	Market	283	11	4%
El Cerrito del Norte	Del Norte Place	TOD	Mixed	135	18	13%
Fremont	Glen View Apartments	non-TOD	Affordable	71	2	3%
	Glenmills Apartments	non-TOD	Market	71	3	4%
Fruitvale	Las Bougainvilleas	TOD	Affordable	68	2	3%
	Fruitvale Village	TOD	Market	71	6	8%
	Altenheim Senior Housing	non-TOD	Affordable	72	8	11%
	Happy Home Partners	non-TOD	Market	52	1	2%
Hayward	Glen Berry	non-TOD	Affordable	50	2	4%

	Cypress Glen	non-TOD	Market	54	2	4%
	Mosaic Hayward	non-TOD	Market	86	1	1%
MacArthur	Mural	TOD	Affordable	90	13	14%
North Berkeley	Acton Courtyard	TOD	Affordable	71	2	3%
Pleasant Hill/Contra Costa Centre	Coggins square	TOD	Affordable	88	15	17%
	Avalon Walnut Creek	TOD	Market	438	29	7%
	Park Regency	TOD	Mixed	864	54	6%
	Casa Montego Apartments	non-TOD	Affordable	80	4	5%
	Hidden Creek Townhomes	non-TOD	Affordable	130	3	2%
	Sunridge Apartments	non-TOD	Affordable	198	9	5%
	Mountain View Apartments	non-TOD	Market	72	4	6%
	Oak Grove Villa	non-TOD	Market	100	7	7%
Richmond	Easter Hill Apartments	non-TOD	Affordable	260	14	5%
	Villa Alvarado Apartments	non-TOD	Market	197	9	5%
San Leandro	Cornerstone/Marea Alta	TOD	Affordable	35	1	3%
South Hayward	Alta Mira Family Apartments	TOD	Affordable	152	6	4%
	Cadence	TOD	Market	136	14	10%
	Metro Six55 (fmr. Archstone Barrington Hills)	TOD	Market	188	7	4%
	Lord Tennyson Apartments	non-TOD	Affordable	252	11	4%
	Hillcrest Apartments	non-TOD	Market	138	5	4%
South San Francisco	South City Station Apartments	TOD	Mixed	359	16	4%
Union City	Station Center	TOD	Affordable	157	37	24%
	Union Flats	TOD	Market	243	31	13%
	Verandas	TOD	Market	282	17	6%
	Mission Gateway	non-TOD	Affordable	121	7	6%
	Marbaya Apartments	non-TOD	Market	170	4	2%
West Dublin/ Pleasanton	Valor Crossing	TOD	Affordable	66	9	14%
	Connoly Station	TOD	Market	309	23	7%
West Oakland	Mandela Gateway	TOD	Affordable	168	12	7%
	715 Peralta	TOD	Market	50	3	6%

About 80 percent of survey respondents had some post-secondary education. Nearly all of the market-rate residents had some college education and at least 70 percent had completed a bachelor's degree or more, though TOD residents were more likely to have attended graduate school than non-TOD residents. Affordable housing residents were less likely to have completed a four-year degree; roughly one-third had done so. Slightly fewer than three-quarters of respondents were employed either full-time or part-time, but this proportion was substantially different by housing type. In market-rate housing, over 80 percent of residents worked at least part-time. Slightly fewer than two-thirds of non-TOD affordable housing residents were employed, while less than half of TOD affordable housing residents had worked for pay. Higher than expected unemployment rates may result from survey bias in that people who do not work may have had more time to respond to the survey, but a more likely explanation is that affordable housing residents are more likely to have conditions that prevent them from working, such as health conditions or disability. We found this to be plausible after examining demographics of focus group sessions.

Women were more likely to respond to the survey; six out of every ten respondents identified as female. The difference was markedly smaller in the market-rate TOD units. Many survey respondents were multilingual. Four in ten reported speaking a language other than English at home. It was more likely that an affordable housing resident spoke another language than a market rate resident. In affordable housing units the split was closer to one-half, though even a third of market-rate residents spoke other languages at home. The most common additional languages were Spanish, Chinese languages (Cantonese and Mandarin), Farsi, and Tagalog.

Market-rate housing tended to draw younger couples and families. The average age of a market-rate resident was 36 in TODs and 40 in non-TODs, compared to about 50 in affordable housing units. Affordable housing units had slightly higher average household sizes and were more likely to have a child under 16 in the household, though in all cases the average household size was less than three people. Affordable housing residents were the longest tenured, having lived in their apartments an average of seven to eight years. Interviews with TOD affordable housing residents in focus groups suggest that many are likely to have moved in to their units not long after the buildings opened. Market-rate housing residents appear to be more mobile, with TOD residents living in their buildings less than two years and non-TOD residents having moved within the last five years. These lengths of stay also reflect the age of buildings, as many TOD residences have been more recently built than larger developments away from transit.

Table 5: Sociodemographic characteristics of sample and comparable population

	Total (N = 613)	TOD, Affordable (n = 196)	TOD, Market (n = 256)	Non-TOD, Affordable (n = 95)	Non-TOD, Market (n = 66)	Population
Race						
Asian	24.9%	22.4%	27.8%	20.0%	28.8%	16.8%
Black/African American	17.6%	25.5%	7.9%	31.6%	9.1%	11.9%
Hispanic/Latino	11.4%	10.2%	8.3%	17.9%	16.7%	29.1%
Native Hawaiian/ Pacific Islander	1.5%	1.5%	2.1%	0%	1.5%	7.1%
White	28.3%	18.9%	39.8%	15.8%	31.8%	30.4%
Other race	4.8%	8.7%	4.1%	1.1%	1.5%	0.4%
Multiple races	6.9%	8.2%	6.6%	3.2%	9.1%	4.3%
Unknown	4.7%	4.6%	3.3%	10.5%	1.5%	0%
Income						
$10,000 or less	14.2%	26.5%	3.3%	22.1%	6.1%	6.1%
$10,001-$25,000	14.0%	29.1%	1.2%	21.1%	6.1%	13.0%
$25,001-$35,000	7.4%	13.8%	2.1%	8.4%	6.1%	7.9%
$35,001-$45,000	6.5%	9.2%	2.1%	12.6%	6.1%	7.2%
$45,001-$60,000	7.5%	6.6%	5.8%	12.6%	9.1%	11.0%
$60,001-$85,000	10.9%	4.6%	16.2%	3.2%	21.2%	14.8%
$85,001-$100,000	7.9%	1.5%	13.7%	3.2%	12.1%	8.6%
$100,001-$150,000	12.4%	0%	25.3%	1.1%	18.2%	15.9%
$150,001-$200,000	5.9%	1.0%	12.0%	0%	6.1%	7.7%
$200,001 or more	5.9%	0.5%	12.9%	0%	4.5%	7.8%
Unknown	7.5%	7.1%	5.4%	15.8%	4.5%	0%
Educational attainment						
Less than high school	4.2%	7.1%	0.4%	9.5%	1.5%	14.8%
High school, GED, or equivalent	11.9%	20.4%	2.9%	23.2%	3.0%	21.1%
Some college or Associate's degree	23.6%	32.7%	13.3%	30.5%	24.2%	27.8%
Bachelor's degree	28.4%	23.0%	33.2%	17.9%	42.4%	22.6%
Graduate or professional school	26.6%	11.2%	46.5%	7.4%	27.3%	13.8%
Unknown	5.4%	5.6%	3.7%	11.6%	1.5%	0%
Employment status						
Full-time	58.7%	31.6%	85.1%	34.7%	77.3%	55.8%
Part-time	12.9%	14.8%	7.5%	27.4%	6.1%	13.8%
Not employed	27.4%	51.5%	7.1%	36.8%	16.7%	30.4%
Unknown	1.0%	2.0%	0.4%	1.1%	0%	0%

Gender						
Female	61.5%	65.3%	51.9%	68.4%	75.8%	51.9%
Male	32.4%	28.1%	44.4%	18.9%	21.2%	48.1%
Another gender or not reported	6.0%	6.6%	3.7%	12.6%	3.0%	0%
Home language other than English						
Yes	37.3%	43.4%	33.2%	40.0%	30.3%	49.6%
No	57.5%	50.0%	63.1%	51.6%	68.2%	50.4%
Unknown	5.2%	6.6%	3.7%	8.4%	1.5%	0.0%
Use a smartphone						
Yes	83.3%	75.5%	91.3%	75.8%	87.9%	92.3%
No	12.2%	19.9%	5.0%	17.9%	7.6%	7.7%
Unknown	4.5%	4.6%	3.7%	6.3%	4.5%	0%
Age						
Mean (SD)	43.4 (16.6)	51.4 (17.5)	36.4 (11.2)	48.2 (19.7)	39.9 (13.9)	41.3 (16.3)
Household size						
Mean (SD)	2.3 (1.8)	2.4 (1.5)	2.0 (0.9)	3.0 (3.4)	2.3 (1.3)	2.6 (1.5)
Children under 16 in household						
Mean (SD)	0.4 (0.8)	0.6 (1.0)	0.2 (0.5)	0.7 (1.0)	0.3 (0.7)	0.6 (1.0)
Years in residence						
Mean (SD)	4.6 (5.8)	6.5 (5.6)	1.7 (3.5)	7.7 (6.9)	4.8 (7.1)	3.1 (1.5)
Vehicles owned						
Mean (SD)	1.2 (1.0)	0.8 (0.8)	1.2 (0.7)	1.4 (1.6)	1.6 (0.8)	1.5 (1.0)
Vehicles per adult						
Mean (SD)	0.7 (0.7)	0.5 (0.5)	0.7 (0.4)	0.7 (1.5)	0.9 (0.4)	0.8 (0.5)

Note: Population totals refer to statistics for renters age 18 or older in Alameda, Contra Costa, and San Mateo Counties. Source: IPUMS

The survey was conducted in three Bay Area counties: Alameda, Contra Costa, and San Mateo. Summaries of the population variables for renters over the age of 18 in those counties are shown in the final column of Table 5. Although tests of comparison were statistically insignificant, the summary values suggest that the survey underrepresented Latinos and Native Hawaiians or Pacific Islanders compared to the population. However, African Americans in affordable housing were overrepresented relative to their proportion in the population. More survey respondents reported earning lower incomes that the comparable figure from census data. Educational attainment was generally higher in among survey respondents and they appeared to have lived a year-and-a-half longer in their residences than the average. Employment status of the survey respondents and population averages was similar.

TOD residents owned fewer cars than non-TOD residents and affordable housing residents owned fewer cars than market-rate residents, consistent with expectations about the relationships between car ownership, transit availability, and household income. Only affordable housing residents had fewer than one car per household. However, the average number of cars per adult for all households was less than one, indicating a net deficiency in auto ownership across surveyed sites. We cannot determine, however, whether this deficiency is a result of voluntary "car-lite" living or economic circumstances that restrict car ownership. Car ownership incidence and the number of cars per adult in a household were lower in TODs than the population average, but car ownership in non-TODs matched the average.

Motivations for Moving

Reasons for moving into the current resident differed across development location and housing affordability types. The summary of the top three reasons for moving that respondents selected, regardless of ranking, are shown in Figure 1. For all residents, the cost of housing was a significant factor for moving into their current residence. A majority cited cost as a significant factor in the reason to move; it was the most common factor for all except the market-rate TOD residents. Affordable housing residents had similar priorities in choosing their residence regardless of their current residential location. More than one-third cited the availability of a subsidized apartment as an important reason to move—the second-most commonly chosen reason. Other important reasons included neighborhood quality (roughly one-quarter) and safety and security (22%). Where affordable housing residents differed was on the importance of distance to transit. Proximity to transit was a top reason for 31% of TOD residents, why only 13% of non-TOD residents listed being near transit as important. This suggests a moderate rate of self-selection into BART-adjacent housing among affordable housing residents.

Market-rate residents had a wider variety of reasons for moving into their current residences. The most common reason market-rate TOD residents cited for moving was proximity to transit, uniquely among the four housing types. Seven in ten market-rate TOD residents thought being near transit was important, compared to only 12% of market-rate non-TOD residents. The gap between market-rate TOD residents and other groups was the largest for this option, suggesting a substantial degree of self-selection for this group. After cost, neighborhood quality was the next most commonly cited factor for market-rate TOD residents, followed by proximity to employment and safety and security. These three factors were also the next three for non-TOD residents, though neighborhood quality was selected less commonly than distance to work.

It is hard to overstate the important role that housing costs played in motivating respondents to select their current residents: 45% ranked housing cost as the most important reason for moving. Over half of respondents in all housing groups except market-rate TOD residents ranked housing costs first, while about one-third of market-rate TOD residents rated it as their top choice. An additional 17% of affordable housing residents ranked the availability of subsidized housing as the most important reason for moving, meaning that 70% of all affordable housing residents were most concerned with housing costs when selecting a new residence.

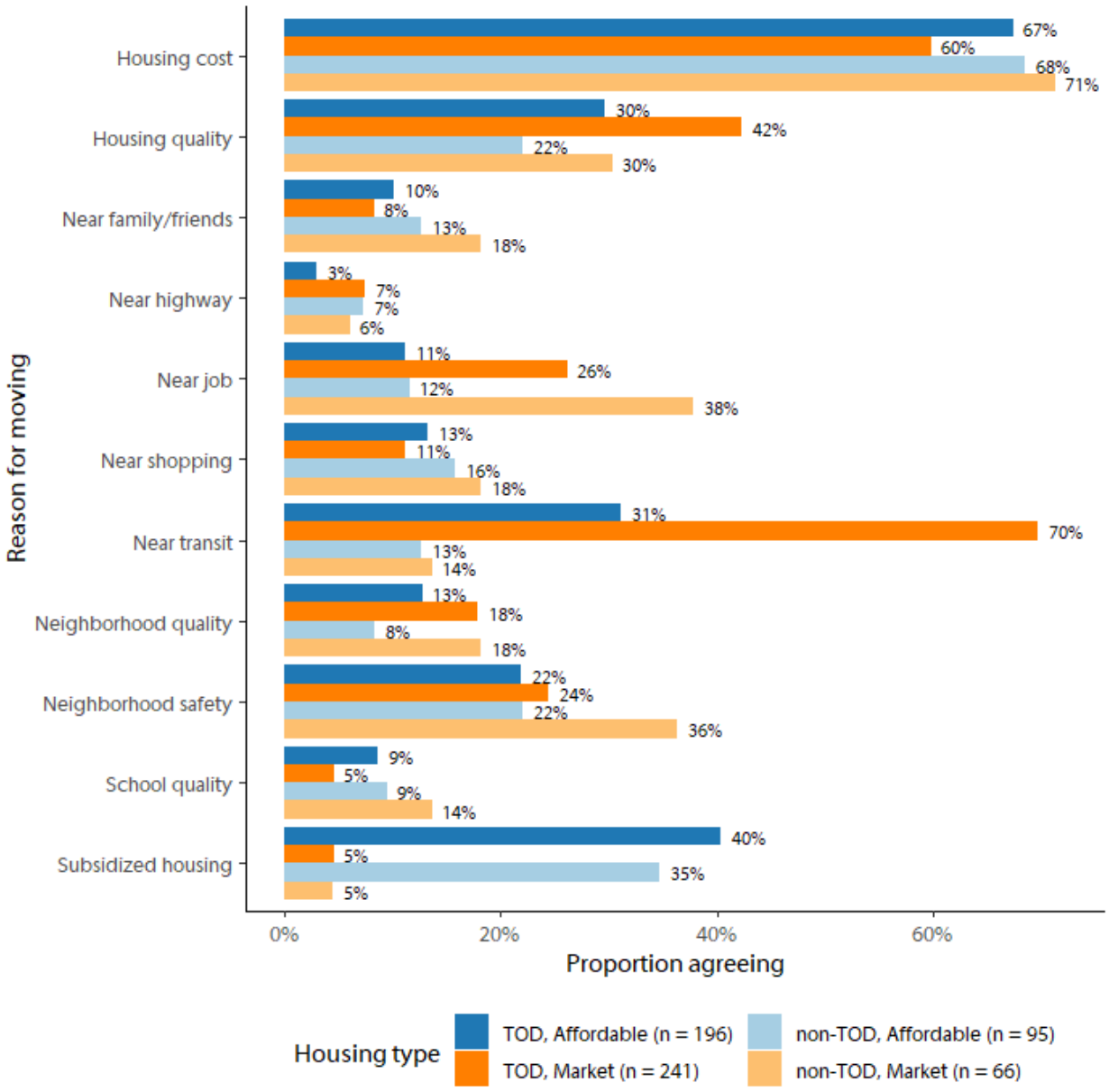

Figure 1: Reasons for moving into current residence

Chapter 5: Travel Characteristics

In this section, we cross-tabulate responses by housing affordability (affordable housing or market-rate housing) and location (TOD or non-TOD). Consistent with previous research on travel in TODs, we find lower shares of driving and higher shares of transit use at TODs compared to non-TODs. In many cases, BART TODs promote walking compared to other residential locations. Affordable TOD residents generally use BART less often than market-rate residents. But when they do take BART, they are more likely to travel off-peak, contributing less to crowding conditions than market-rate housing residents. Over the past 25 years, the share of vehicle trips at TODs has declined while the share of walking and cycling trips have significantly increased. We report on these findings in more detail below. We begin by describing mode choice characteristics for the main reported trips, then discuss commute trips and employment benefits that might contribute to travel behavior. We then move to more detailed findings about BART use and conclude with a description of how TOD travel trends have changed since 1993.

An important caveat to note is that sample sizes become very small when adding additional variables to the cross-tabulation. Because of this, differences will be statistically significant only at the largest differences in magnitude; we avoid most multidimensional cross-tabulations. We discuss this limitation further in Chapter 7.

Mode Choice

Main Trips

The survey used multiple questions to determine frequency of travel and mode share. As the previous surveys in 1992 and 2003 did, we asked respondents to list the three main trips they made on the previous day. Randomly-selected households reported weekday or weekend travel; 67% of respondents reported weekday travel, 23% reported weekend travel, and 9% were missing a travel date. Respondents reported an average of 1.7 trips on their travel days: Affordable housing residents reported an average of 1.6 trips, while market-rate residents reported 1.9 trips. This small difference was statistically significant but there were no differences across housing locations.

Mode share of all respondents is shown in Figure 2. Driving alone represented the largest share of travel, though less than half trips were private vehicle trips (including carpooling and ridesharing). Public transit use was 33% of all travel, with BART use making up about four-fifths of all transit trips.[9] The third most common mode of transportation was walking; respondents made 12% of trips on foot. Respondents used all other modes of transportation less than 10% of the time. The proportion of trips made by bicycle, taxi, or getting dropped off were small enough to be statistically indistinguishable from 0%.

[9] Respondents had the option to write in the modes they took for multimodal trips. Of the 91 multimodal trips, 91% included a BART trip as one leg. In the remainder of the report, trips listed as BART trips include these multimodal trips; those that did not include a BART leg are categorized as "Other."

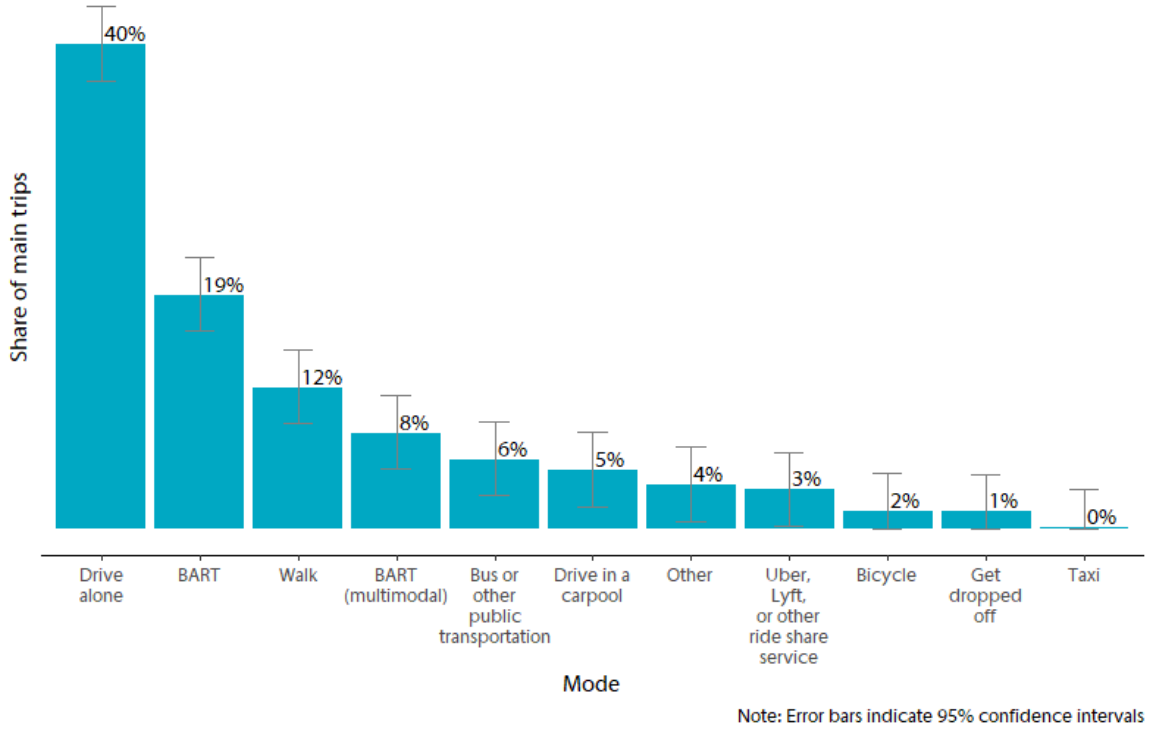

Figure 2: Mode share for all respondents

The most common main purposes were trips to work (28%), trips home or for home activities[10] (15%), and trips to go shopping (13%). For most trip types, it was more common to drive alone than take any other mode (Figure 3). This was especially true for discretionary trips, which includes dining out, shopping, recreation, and social events. In many such cases, the share of driving alone was twice or more the share of using BART. Respondents reported taking BART more for trips back home and for school-related trips. The difference between the share of work travel by driving alone and by BART was relatively small, but respondents drove for slightly fewer work trips (35%) than took BART (38%). Walking share remained relatively constant no matter the purpose: at least 10% of trips for all identified trip purposes (except picking up or dropping off) were pedestrian trips.

[10] Trips for home activities are generally return trips from work or other purposes.

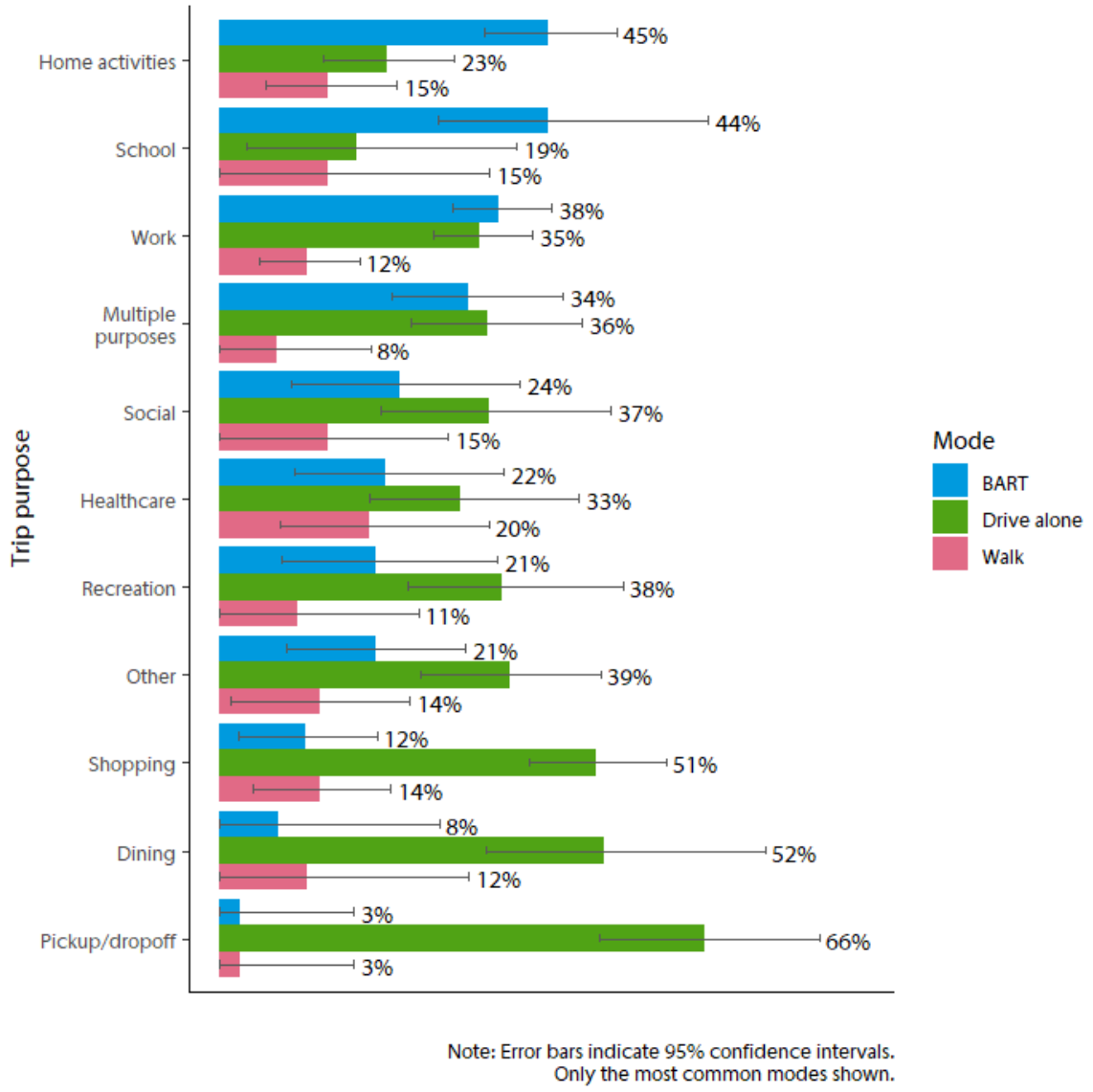

Figure 3: Mode share by trip purpose

In general, TOD residents walked and took BART significantly more while driving significantly less often than their counterparts in non-TOD residential units (Figure 4). Roughly 37% of trips by TOD residents were drive-alone trips, compared to about half of trips by non-TOD residents. Affordable and market-rate residents within each development type drove for about the same proportion of their trips. BART was the next most frequently used mode of transportation. TOD residents took a greater share of trips by BART; within TODs, market-rate residents used BART about 15 percentage points more often than affordable housing residents. Market-rate residents used BART for 37% of their trips, compared to 22% of affordable housing TOD residents and 16% of non-TOD residents. (There was minimal difference in the share of trips made by BART between affordable and market-rate residents in non-TODs.) TOD residents were also more likely to walk for trips: 14% of trips were walking trips, compared to 4% for non-TOD residents, again

without a difference between affordable and market-rate residents. However, affordable housing residents, regardless of development type, were more likely to take the bus than market-rate residents. Market-rate residents took the bus for only about 2% of their trips, whereas affordable TOD residents made 8% of their trips by bus. Affordable non-TOD residents had nearly double the share of bus trips (15%). Note that affordable housing residents took about 30% of their trips by any form of public transportation, that is both bus and BART, whether they lived in TODs or not. Residing closer to BART appears to pull some transit riders onto the rail system for trips that they might have otherwise taken by bus.

The proportion of trips made by all other modes of transportation made up a much smaller proportion of trips taken. Carpooling, ridesharing, bicycling, and getting rides did not exceed 7% of trips taken for any affordability or location type. There was no difference in mode share across housing affordability or distance to transit for these modes. Market-rate residents, however, were more likely to report taking multiple modes on a single trip compared to affordable housing residents.

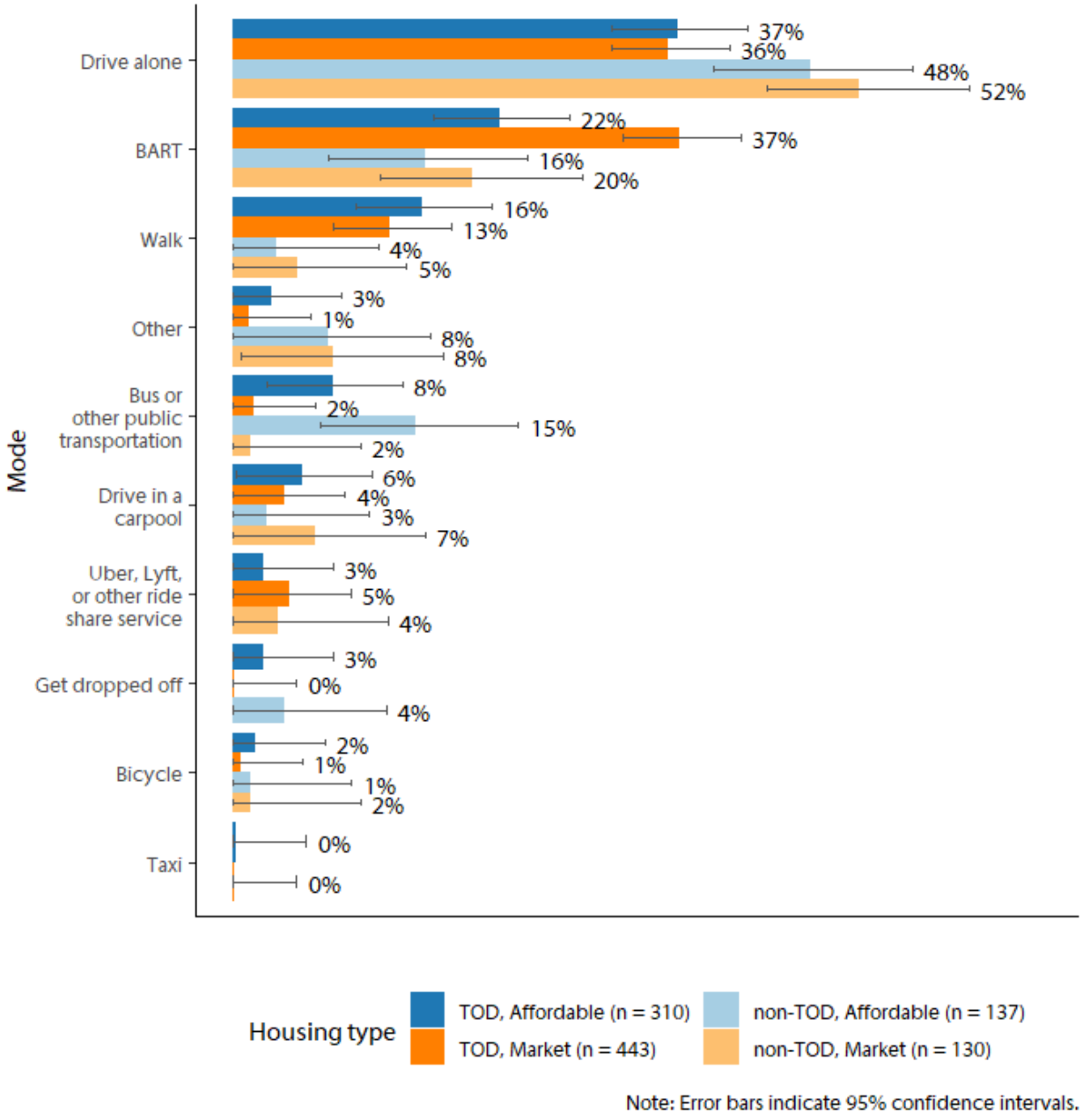

Figure 4: Mode share for main trips by housing type

Because a high proportion of affordable housing residents were unemployed (47%), we compared trip making between employed and unemployed residents for this group only (Figure 5). Employed respondents were more likely to drive alone compared to both their unemployed counterparts. They also drove more frequently than they took BART. At 43%, employed TOD residents in affordable housing took about three times as many trips by car as by BART, while their unemployed counterparts took about one-third of their trips by each mode. Non-TOD employed respondents take five times as many trips by car as by rail, while their unemployed counterparts take about a quarter of each of their trips by each mode. Transit makes up 25% of

trips for employed TOD residents but 40% of trips for unemployed TOD residents. The difference is slightly larger among non-TOD residents (22.0435428 percentage points). Just over half the respondents who did not work for pay were of retirement age (62 years or older) compared to only 12% of employed respondents, suggesting that some fraction of the unemployed may face mobility limitations associated with age.

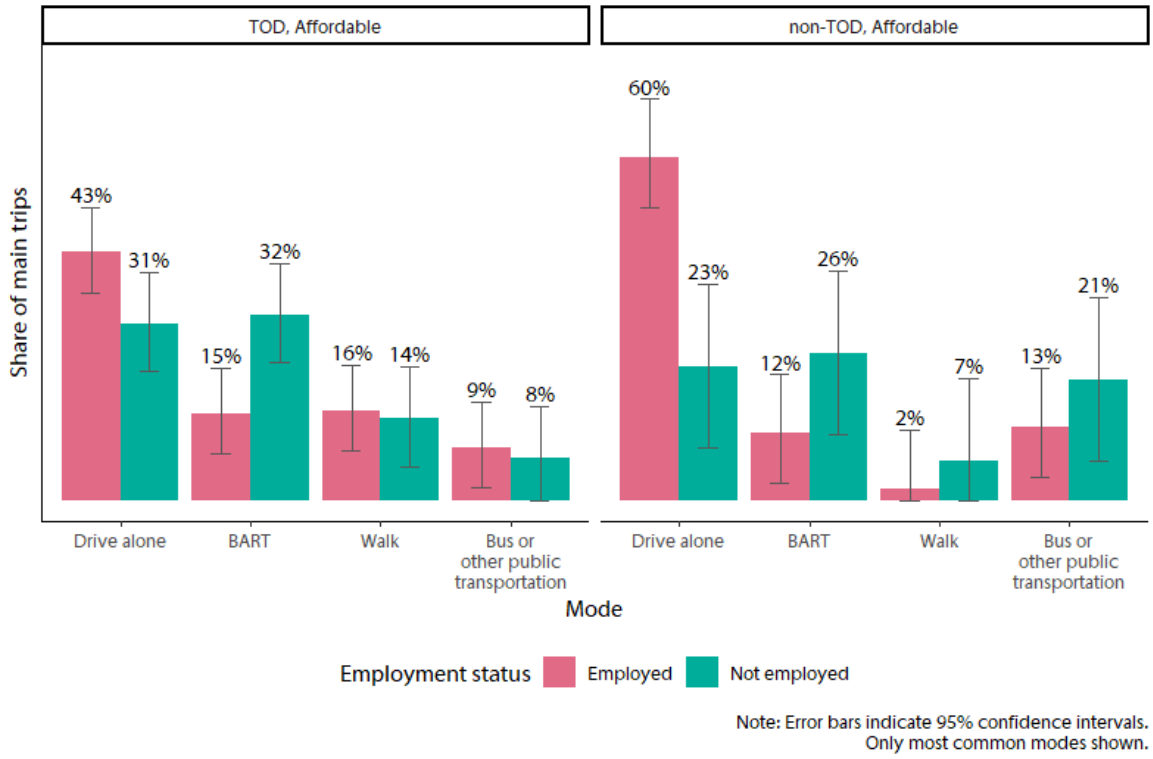

Figure 5: Mode share for affordable housing residents by employment status

Trip purpose by mode of travel across development types is shown in Figure 6. Market-rate TOD residents preferred BART for mandatory trips, which included work, returning home, school, and health care purposes. They made about half of these types of trips by BART, more frequently than they drove alone and unlike any of the other three groups. The highest share of BART uses for TOD residents living in affordable housing was for social and recreational trips, while they were most likely to walk for home trips. Compared to other groups, TOD residents living in affordable housing were more likely to take BART and walk for social or recreational purposes, such as dining out, visiting friends, or going shopping. The three other groups drove alone most commonly for these purposes. Non-TOD affordable housing residents were most likely to drive alone for all trip purposes except school and health-care trips.

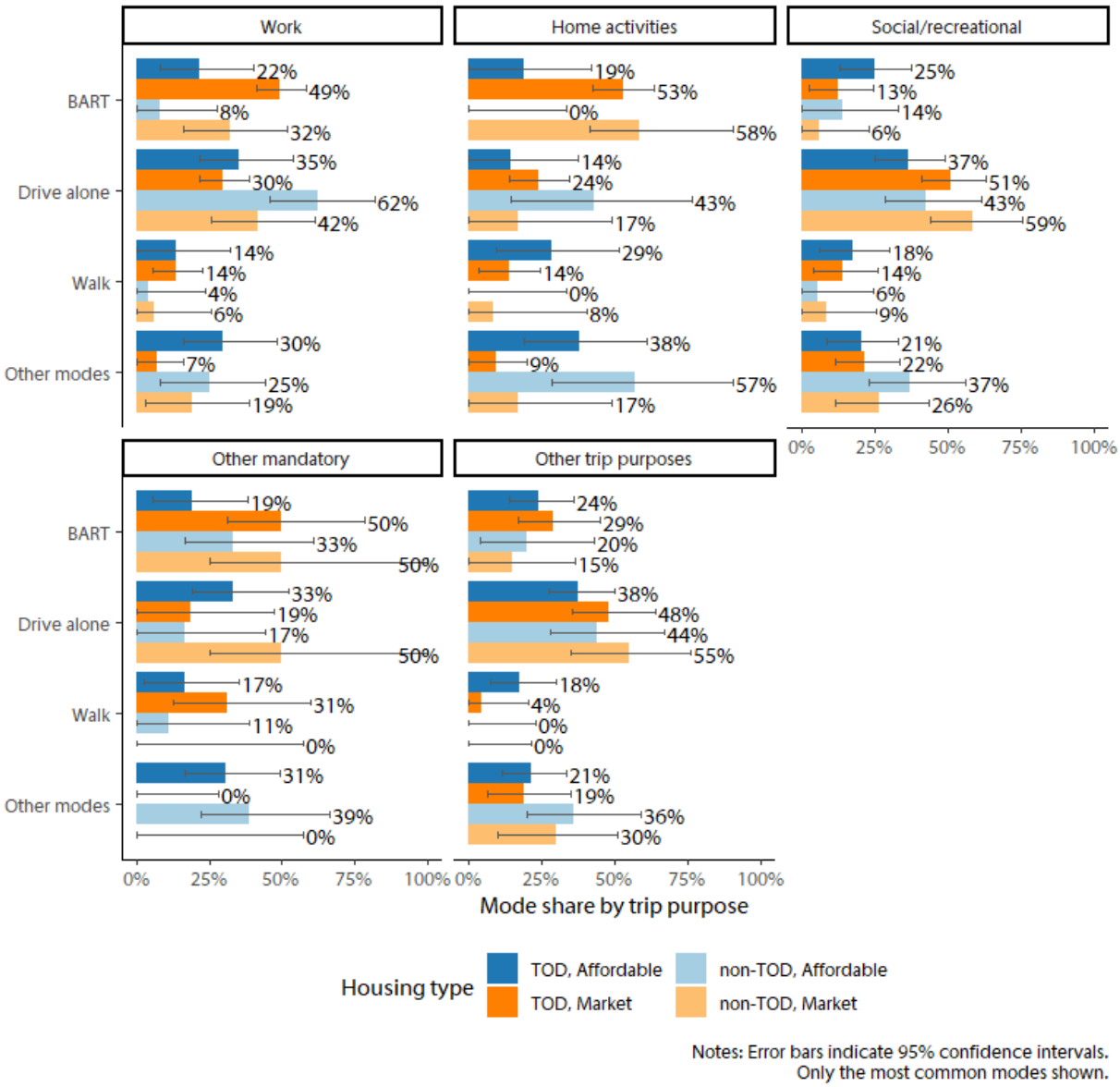

Figure 6: Mode share by trip purpose by housing type

Trip making for households with children is likely to be complex; this reality is reflected in mode choice decisions (Figure 7). Households with at least one child generally made more drive alone trips, with the curious exception of non-TOD market-rate households. Market-rate households with children located anywhere are about as likely to use BART as childless households. However, the share of walking trips are higher at TODs for households that have children compared to those without for both affordable and market-rate households, suggesting better walking environments or more child-friendly destinations nearby.

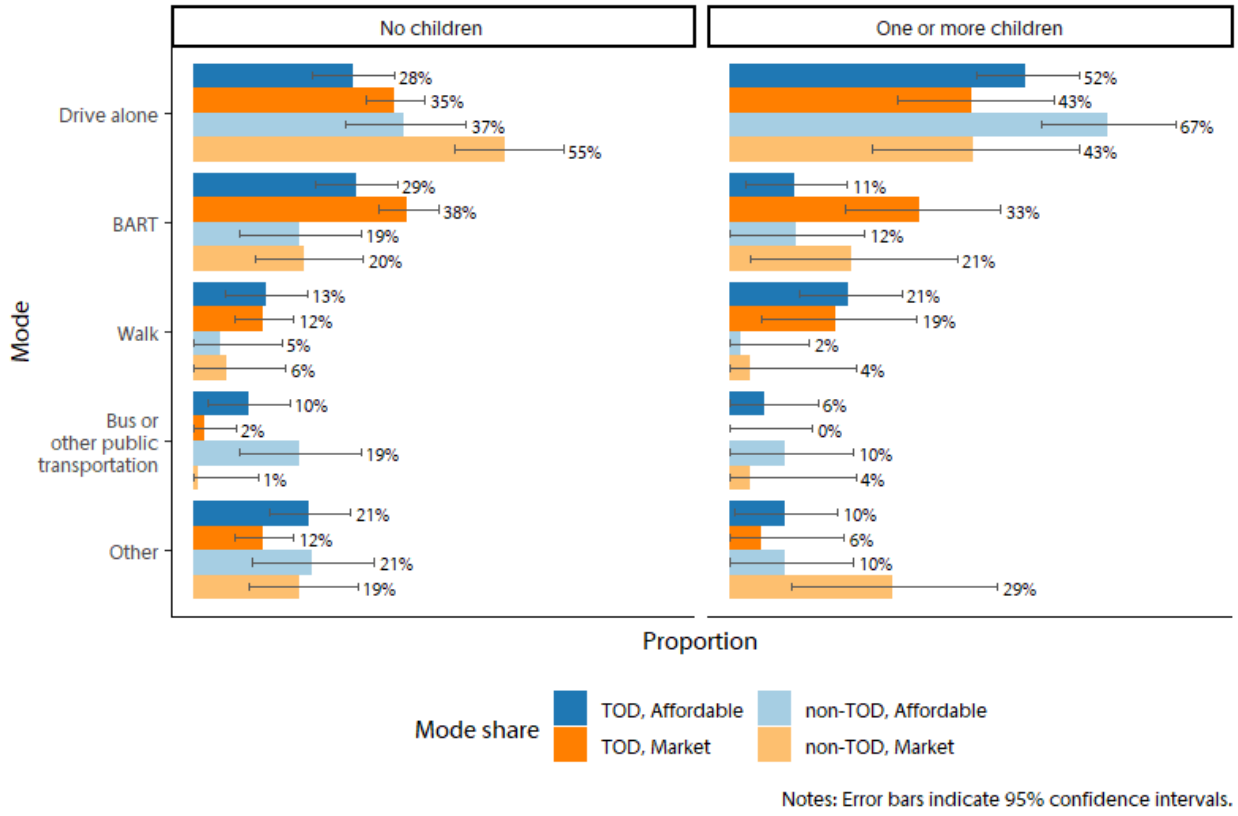

Figure 7: Mode choice by presence of children

Usual Commute Travel

A second mode choice question asked about usual commute mode. This was the first in a set of questions about usual travel. Results are shown in Figure 8; percentages in this chart represent usual travel mode per person rather than per trip. As with main trips, TOD residents were less likely to drive alone to work compared to their non-TOD counterparts. However, unlike the main trips that covered all trip purposes, usual work travel was more distinguished by housing affordability. Travel by car and BART made up three-quarters of all work travel; 43% usually drove alone to work and 34% took BART. Market-rate residents were more likely to commute by BART than affordable housing residents. About half of market-rate TOD residents and a quarter of market-rate non-TOD residents usually used BART for work. Less than 15% of affordable housing residents usually used BART; differences between housing locations were not significant. Affordable housing residents who did not live in TODs were most likely to drive alone to work; nearly two-thirds usually commuted by car. About half of affordable housing residents living in TODs also drove alone to work, still more than either of the market-rate groups. These results are consistent with research reviewed earlier that finds cars are a vital resource for low-income workers to maintain employment. Respondents rarely reported using other modes for their typical commutes. About 8% of non-TOD respondents usually took the bus and 8% of affordable housing residents in TODs walked, but neither of these proportions was statistically significantly greater than 0.

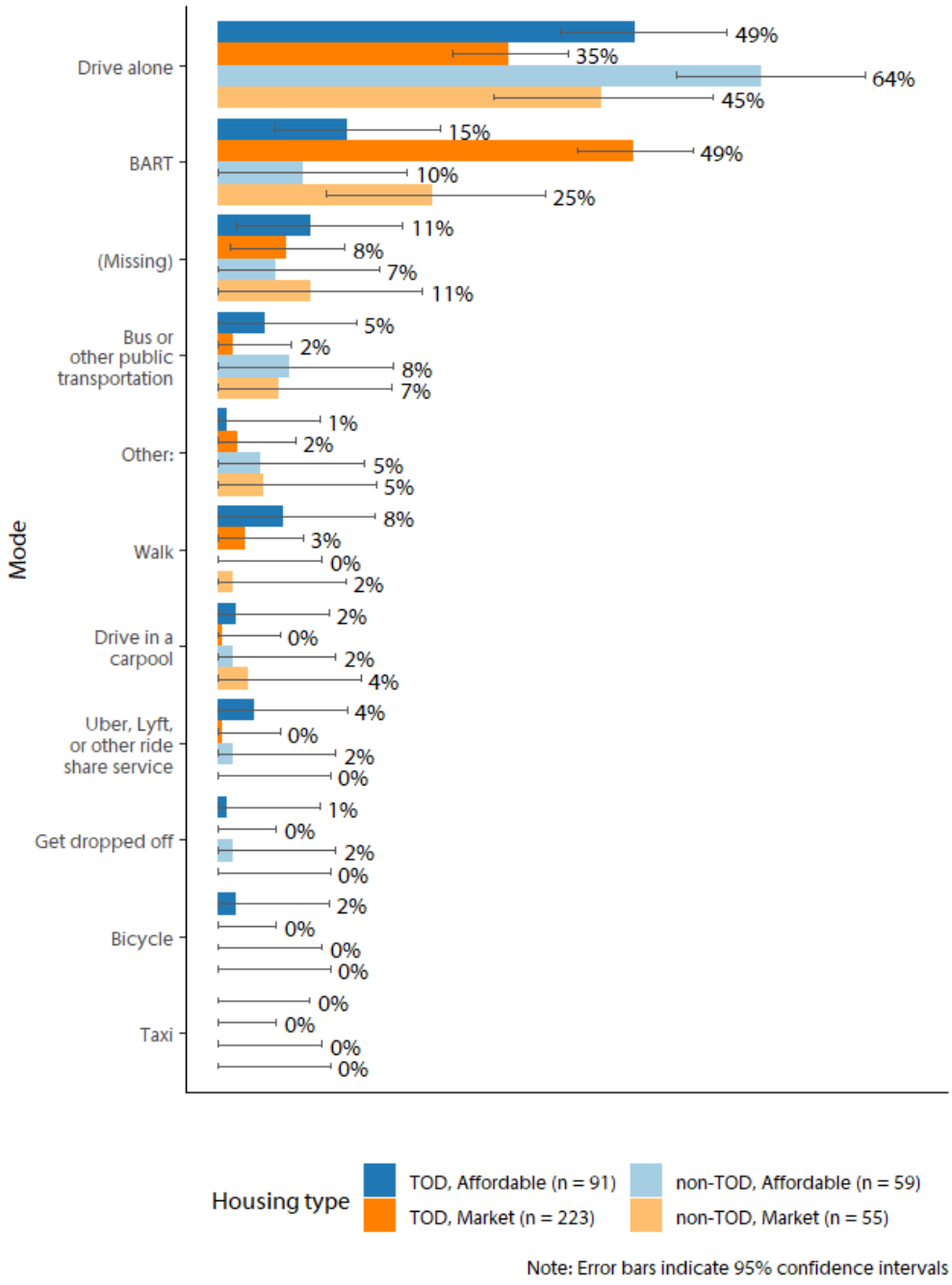

Figure 8: Usual commute mode by housing type

Travel to work by BART may have been facilitated by employment location for TOD residents. Not only did TOD residents live closer to BART by definition, but those who were employed also worked closer to BART. We were able to geocode 292 work locations (48% of the total). About half (51%) of market-rate TOD residents and nearly one-third (32%) of affordable housing TOD residents worked within a half-mile buffer of a BART station. It was about as common for market-rate non-TOD residents to work near BART (29%) but very few affordable housing non-

TOD residents did (7%). Affordable housing residents who do not live near a BART station faced the greatest first-mile and last-mile challenges with respect to employment access.

Transportation-related employment benefits came in greater proportions to market-rate residents than to affordable housing residents (Figure 9). A significantly greater proportion of market-rate residents had flexible working hours, had transit passes provided to them, and were able to work from home. Market rate residents were over three times as likely to have an employer-provided transit pass. Likewise, TOD residents were three-to-four times as likely to be able to work from home compared to affordable housing residents. The share of market-rate TOD residents who could work from home was about two-thirds greater than the share of market-rate non-TOD residents. Although a small share of employees had access to employer shuttles (8%), market-rate residents were more likely to have access regardless of TOD residence. Less than half of workers had free parking available to them. Responses suggest that non-TOD residents are more likely to have free parking at work, but the differences compared to TOD residents were not statistically significant. The most common employee benefit was flexible working hours, but affordable housing residents were less likely to have this option.

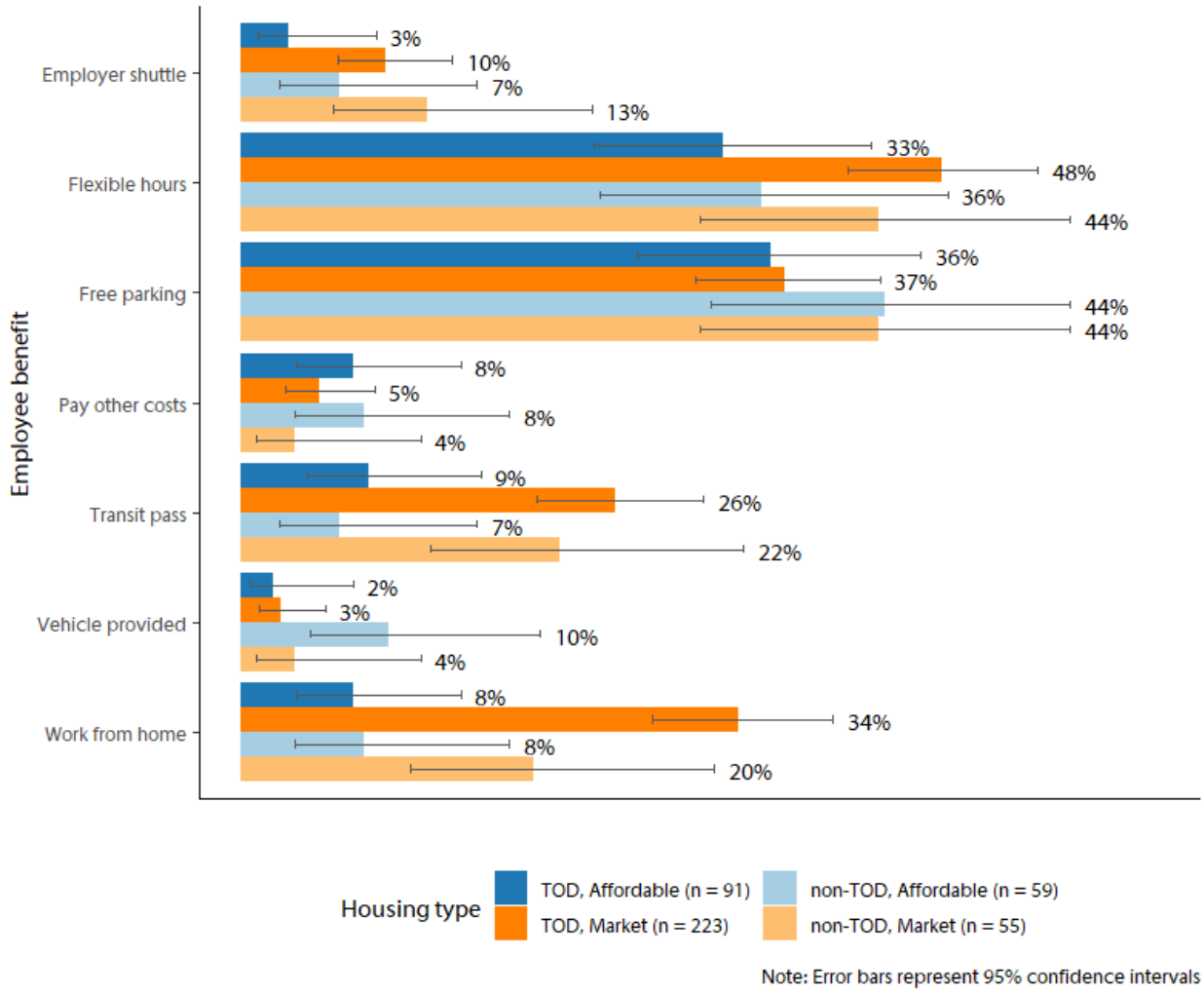

Figure 9: Benefits provided to employed survey respondents

BART Use

The second set of questions about usual travel asked respondents to report the frequency with which they took BART for work trips, non-work trips, and characteristics about those trips. In this section, we describe those usual trips and examine more closely at the BART trips respondents reported as one of their three main trips on the travel day.

Usual Commuting by BART

Respondents were more likely than not to report never taking BART to work as their usual commute mode; market-rate TOD residents were the exception (Figure 10). Four in ten market-rate TOD residents took BART to work every day, compared to less than half that proportion for all other housing types, a statistically significant difference. An additional 15% of market-rate TOD residents took BART three to four days per week, meaning that most market-rate TOD residents used BART for commuting most of the time. On the other hand, about 20% of other residents took BART three days per week or more. More than half of those employed who did not

live in market-rate TOD buildings never took BART to work; only one quarter of those who lived in market-rate TOD units never commute by BART. There was no significant difference between the other three housing types in the frequency with which respondents commuted by BART.

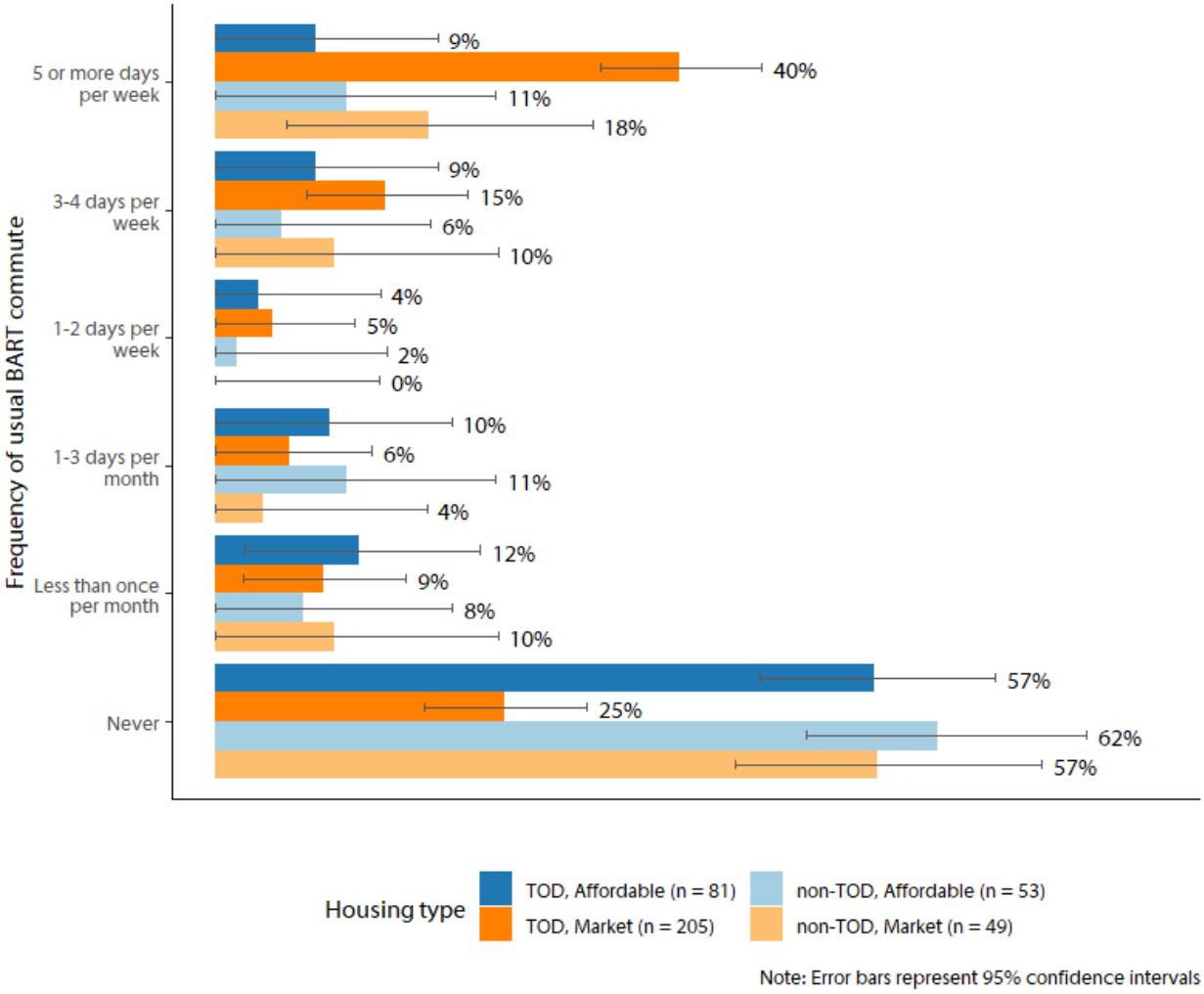

Figure 10: Frequency of BART use by distance and unit type

The most common reasons for not taking BART more were needing a car during the day and the distance between home or work and BART stations. But affordable housing residents appeared to be less sensitive to conditions that would encourage them to commute by BART more often (Figure 11). They were less likely than market-rate residents to report crowding, safety, and needing to use a car as barriers to taking BART to work. Concerns about cost, reliability, and distance between BART and home or work were not meaningfully different by housing type. Non-TOD market-rate residents were more likely than other groups to cite distance to or from BART, overcrowding, reliability problems, and safety concerns as barriers for commuting, suggesting substantial challenges for encouraging rail use among this group.

Nearly all TOD residents who used BART to commute to work walked to the BART station, with minimal difference between affordable housing residents and market-rate residents. Too few non-TOD residents reported how they accessed BART to provide a precise summary by mode except to say that fewer people in this group walked and more people drove, took the bus, got dropped off, or used rideshare. Only one respondent reported using a bicycle to get to the BART station; this person lived at a market-rate TOD housing unit. Most reported walking as their usual egress mode from BART to their workplace, though again, there were not enough responses from non-TOD residents to statistically analyze the differences across other modes. About one-third of affordable housing TOD residents and one-quarter of market-rate TOD residents did not walk from BART to work, instead usually relying on the bus or other form of public transportation.

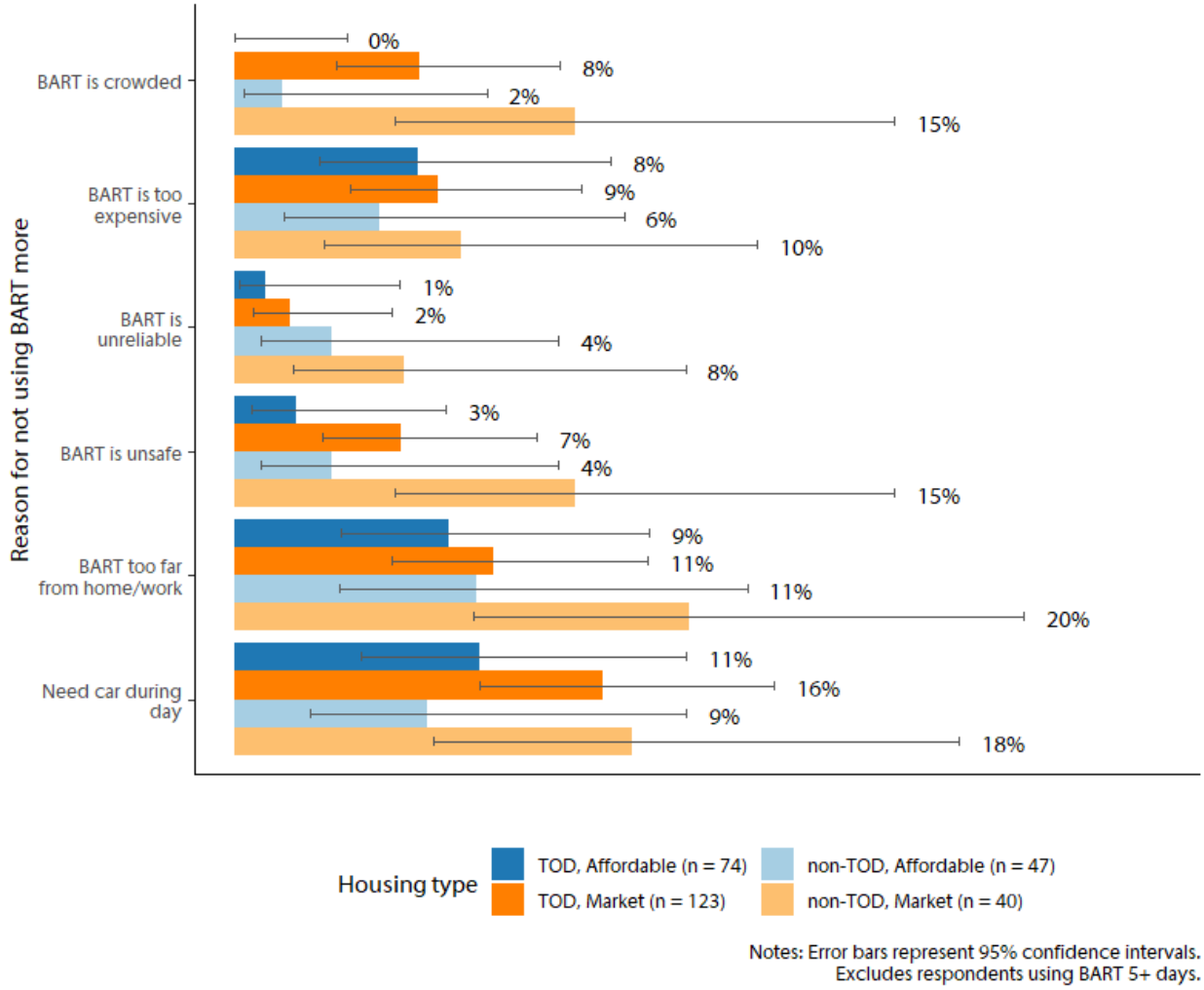

Figure 11: Reasons for not taking BART to work more often

Non-work BART Use

Respondents used BART for non-work purposes much less often, though a substantial fraction still rode BART at least occasionally (Figure 12). About one quarter of TOD residents in

affordable housing used BART for non-work travel at least once a week, compared to 16% of market-rate TOD residents and 10% of non-TOD residents. Market-rate TOD residents were most likely to use BART for non-work travel a few times per month. Compared to usual work travel, a smaller fraction of respondents reported never using BART for non-work travel. Market-rate residents traveled by BART more frequently than their affordable housing counterparts, and TOD residents took BART more often than their non-TOD counterparts.

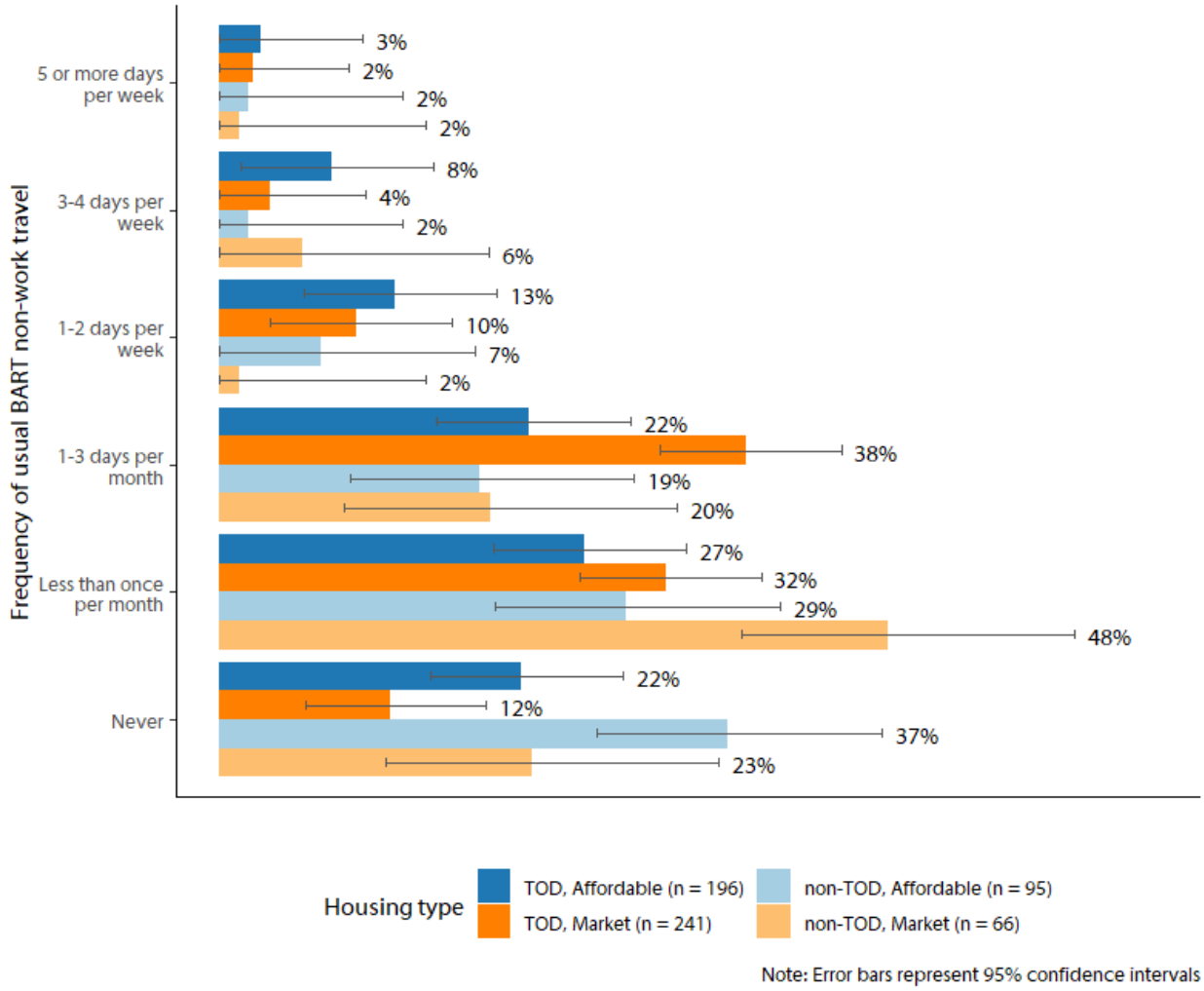

Figure 12: Frequency of BART use for non-work travel

Respondents had several reasons for not using BART more often for non-work purposes (Figure 13). Of the provided options provided in the survey questionnaire, travel time, safety, access, and cost ranked highest. Nearly half of market-rate TOD residents and a third of market-rate non-TOD residents reported that the travel time on BART compared to other travel options was too high, compared to less than 20% of all affordable housing residents. About 25% of respondents agreed that safety on BART was a barrier to using it more frequently, with a greater proportion of non-TOD residents reporting such than TOD residents. Market-rate TOD residents were most likely to report that distance between origin or destination and BART was too great, while

affordable TOD residents were least likely to report the same. About 22% of respondents thought that BART was too expensive; that proportion did not vary significantly among the housing types. Relatively few people thought that reliability was a problem that prevented them from taking BART more frequently for non-work travel.

"Some other option" was selected often, and respondents provided their own reasons for not using BART more frequently. The write-in responses covered a range of reasons, some of which included components of the provided response options. The most frequent response (21%) was that driving was more convenient, whether because destinations were too far from the BART service area, because people had to transport children or other family members, or because people had to carry bulky objects. About 20% reported that they had no need for BART. Only a few expanded upon this reason, but typical responses included that they could walk to nearby destinations or that they did not travel much for a variety of circumstances. Slightly more than one in ten people responded that BART was dirty or unsanitary; some responses specifically mentioned needles as a problem on train cars. Another 10% responded that even if BART did go in the vicinity of their intended destinations, the last mile was still too far to be practical. Another common reason for not taking BART was that either disability or age prevented respondents from safely using the system. Other write-in responses made by multiple people included complaints about the schedule—particularly that it was inconvenient to take for late-night social events—and that there were safety concerns. Some people reported positive experiences; about 6% responded that they already used BART so frequently that there was nothing that would encourage them to take it more often, and 5% responded that they would take BART to particular destinations, such as sporting events, concerts, and destinations in San Francisco and Oakland.

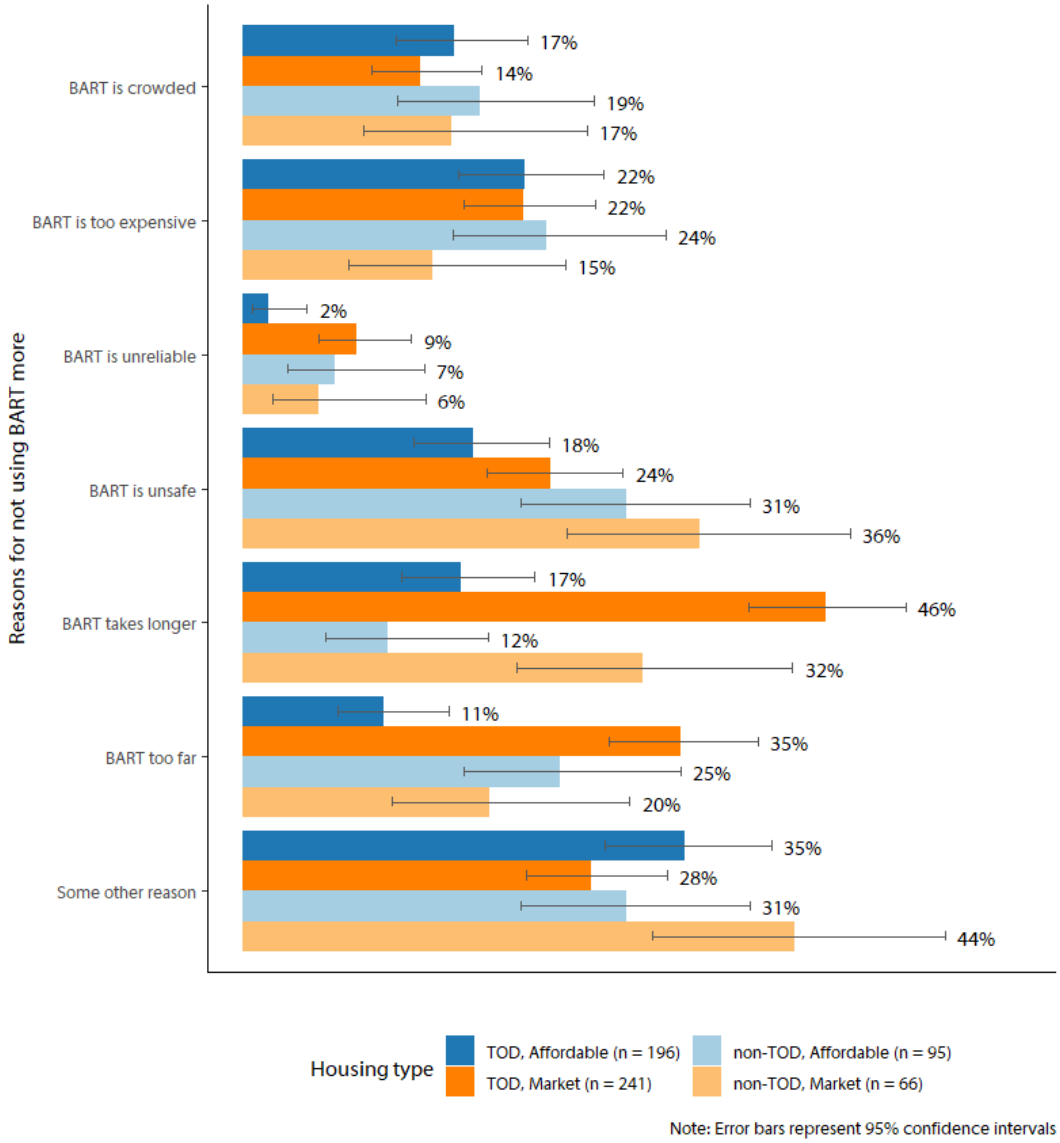

Figure 13: Reasons for not using BART more frequently for non-work purposes

Time of BART Travel

The survey asked respondents to identify how many trips they took on BART during the previous week and at what times. The number of trips by housing type is shown in Figure 14. Market-rate residents took the most number of trips, with TOD residents taking 4.8 trips during the previous week and non-TOD residents taking 2.3. There was little difference in the number of trips that affordable housing residents took across locations; the combined average was 1.4 trips in the previous week. Most of the trip making for market-rate residents was made during commute hours.[11] Market-rate TOD residents made an average of 1.3 trips in both the morning and

[11] The weekday morning peak is defined as 7 am to 8:30 am, while the evening peak is defined as 4 pm to 6 pm.

evening peaks, while non-TOD residents made 0.9 trips and 0.6 trips in the morning and evening peaks, respectively. Meanwhile, affordable housing residents made more of their trips during the middle of the weekdays, both making an average of about half a trip between 8:30 am and 4 pm. This was significantly more than non-TOD market-rate residents, and about the same as TOD market-rate residents. Market-rate TOD residents were the only group who made an appreciable number of trips in the early mornings; they made about 0.5 trips before 7 am on weekdays. Residents of all housing types made comparatively fewer trips on the weekends. Market-rate residents living outside of TODs made essentially no BART trips on the weekends, while the average for others was between 0.1 and 0.3 weekend trips. The average number of weekend trips was slightly higher before 4 pm than later in the evenings.

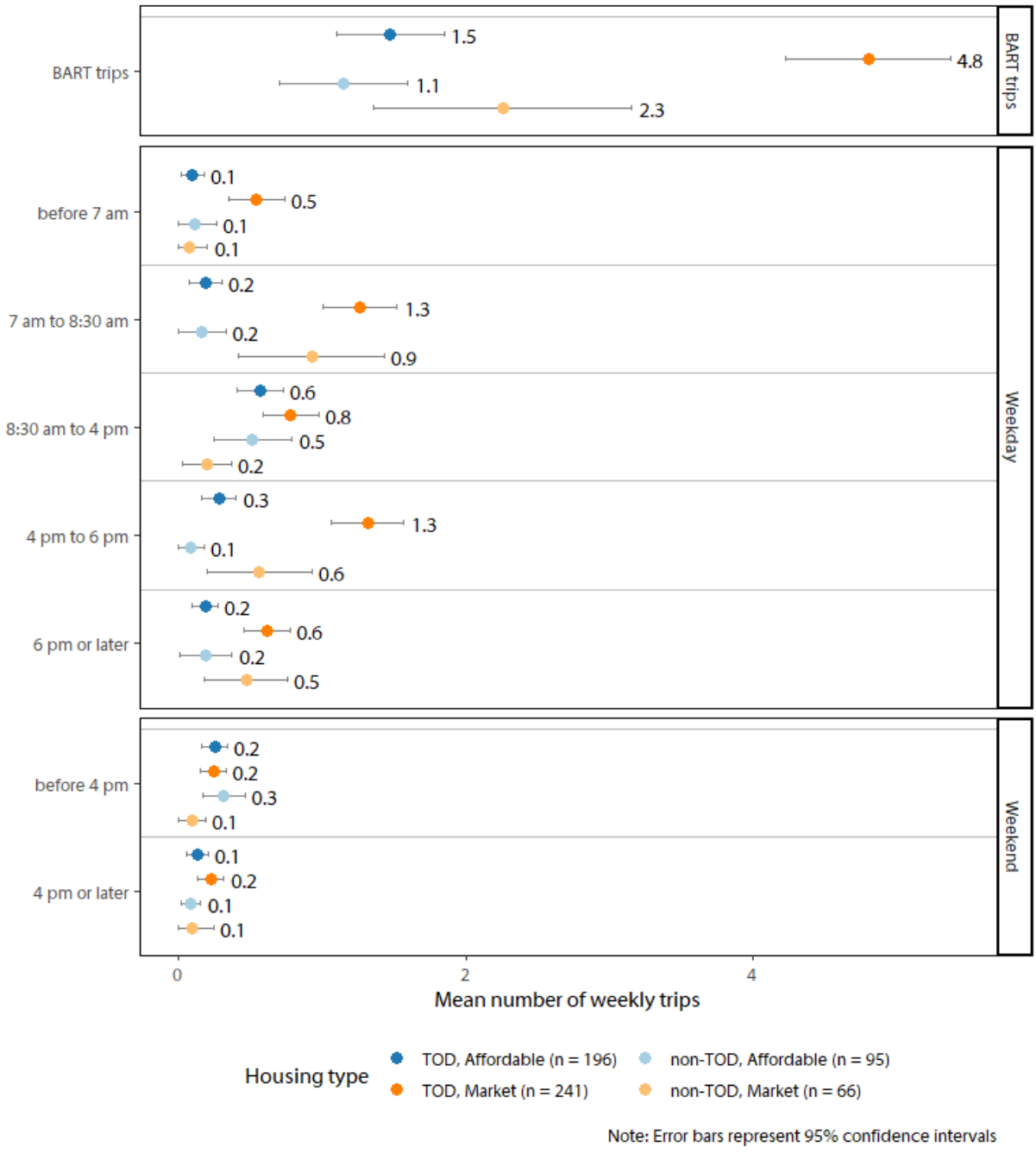

Figure 14: Mean frequency of BART travel by time period in the previous week

Figure 15 presents the same weekday frequency data normalized by number of trips per housing type to highlight patterns of peaking during commute hours. Travel by market-rate residents outside of TODs is most peaked: 67% of their travel occurs during the commute hours, most of which is during the morning peak. The majority of market-rate TOD resident travel also occurs during commute hours (57%), but is much more evenly distributed between morning and evening peak. Because TOD residents take more BART trips overall, we can expect they contribute in greater numbers to crowding on peak hour morning trains. In contrast, most

affordable housing residents use BART during off-peak times, much of it occurring during midday hours. Because the midday encompasses a large time period that borders the peak hours, it is not possible to tell whether this pattern reflects shoulder commute travel (e.g., taking place between 8:30 and 9 am) or travel completely outside of traditional 9-to-5 commute hours.

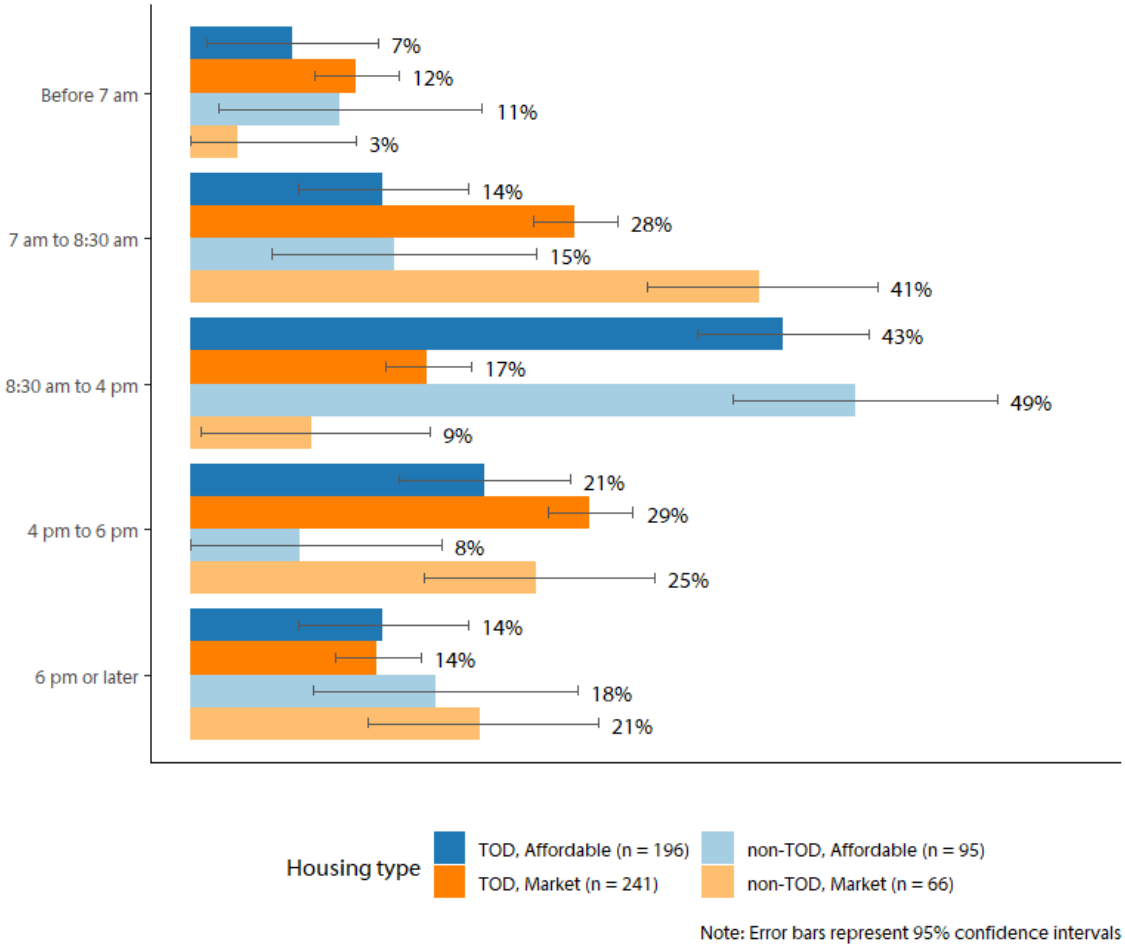

Figure 15: Proportion of weekday BART trips made by time of day

Changes in Travel from Previous Residence and Workplace

The questionnaire asked respondents to report how their travel patterns changed after moving into their current residences. Most people had not lived near a BART station previously, although a greater proportion of people who used to live within a half mile of BART moved into a TOD area than moved away (Table 6). The presumed change in built environments appeared to be associated with changes in travel behavior. Results for differences in driving before and after moving are shown in Figure 16. In total, 16% of respondents reported driving more after they had moved, 27% reported driving less, and 15% drove about the same amount before and after moving, with the remainder either not having driven in either location or failing to report their driving behavior. TOD residents were more likely to report that they drove less after moving compared to non-TOD residents; about 29% of TOD residents drove less after moving, compared

to 22% of non-TOD residents. Roughly equal proportions of respondents in each housing group drove the same amount after moving. Twice the proportion of market-rate non-TOD residents reported driving more after moving than market-rate TOD residents. There were no significant differences in driving changes between affordable and market-rate residents within the same housing type. Whether because of effects of the built environment, transit availability, or self-selection to be near transit, results are consistent with prior research that finds TOD residents drive less than non-TOD residents.

Table 6: Previous residence by current housing type.

Previous residence	TOD, Affordable	TOD, Market	non-TOD, Affordable	non-TOD, Market
Within half-mile of BART	16%	19%	10%	9%
Not near BART	60%	60%	74%	74%
Unknown	24%	21%	16%	16%

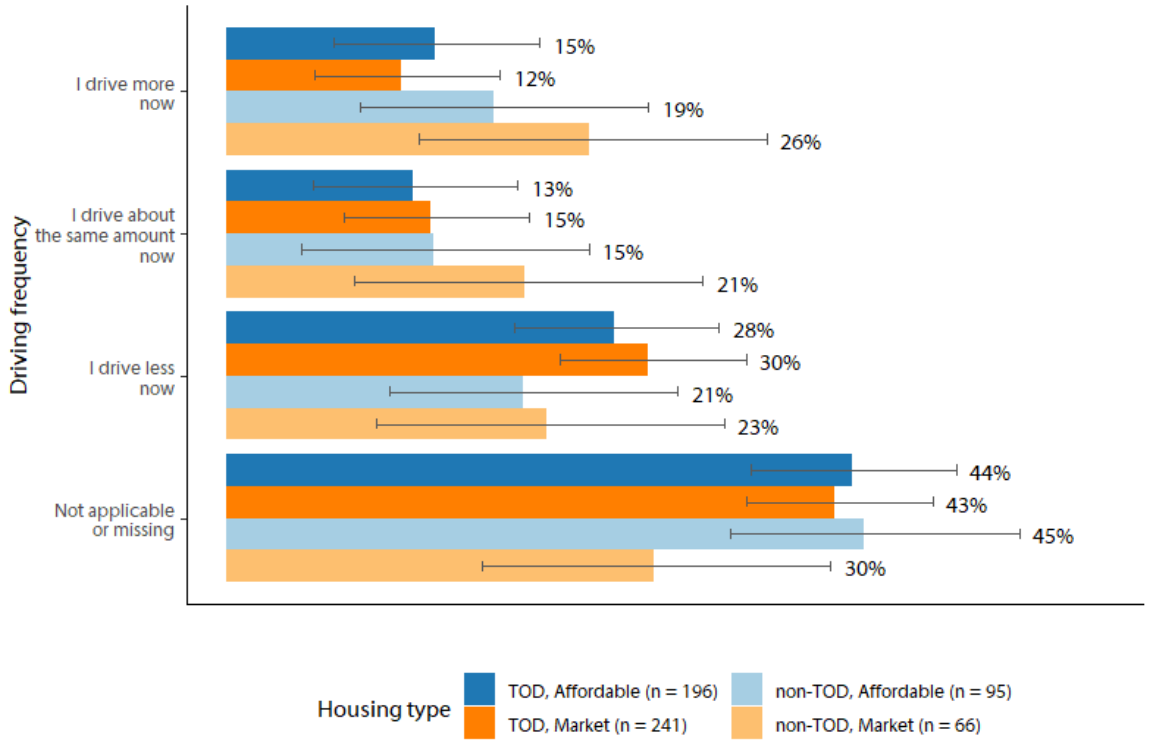

Figure 16: Frequency of driving after moving by housing type

Results for changes in BART use are shown in Figure 17. One quarter of both affordable and market-rate TOD residents took BART more at the time of the survey than they did before they moved, significantly more than non-TOD residents. This proportion was significantly greater for market-rate TOD residents: only 15% reported taking BART with the same frequency, and 4%

took BART less often. However, roughly equivalent numbers of affordable housing residents took BART the same amount or less as those who took BART more. Interestingly, affordable housing residents not living in TODs were about three times as likely to report taking BART less after their move compared to those who took BART more, suggesting a greater proportion may have relocated out of a BART service area. A high proportion of respondents (44% in total) either moved from outside the Bay Area—and thus did not have BART as a mode choice—or had a missing response to this question.

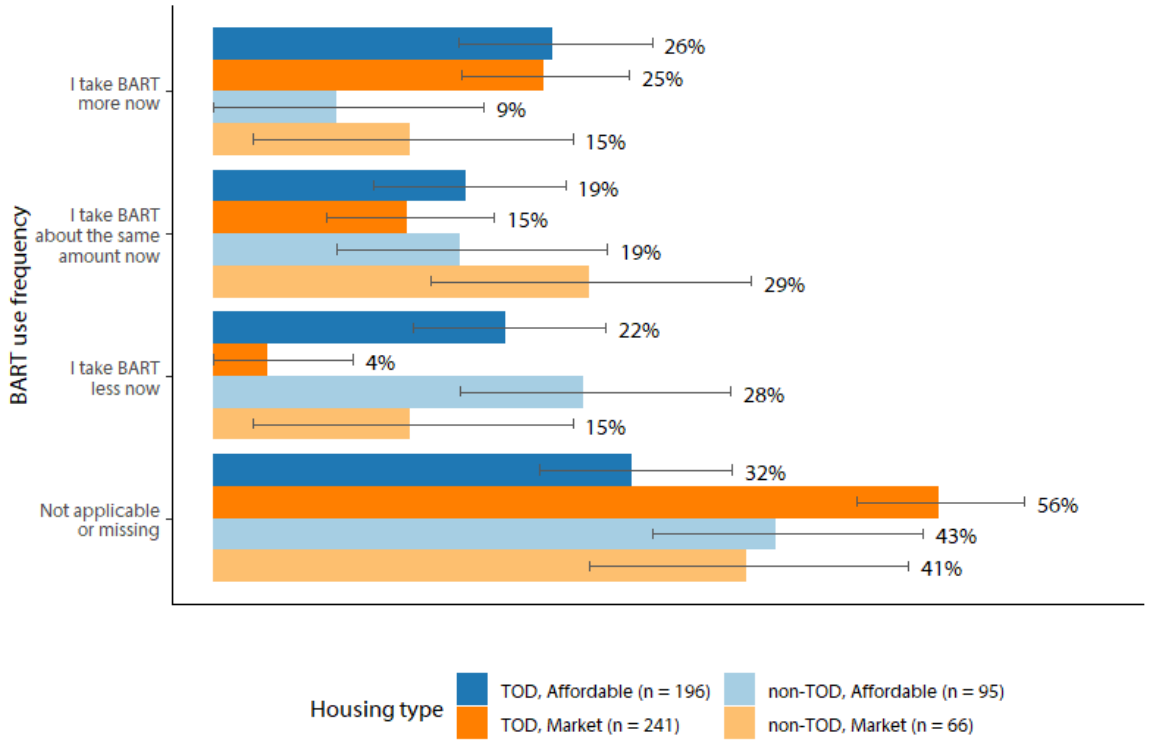

Figure 17: Frequency of BART use after moving

We also analyzed whether BART use changed based on where people moved from; that is, did moving from outside BART station catchment areas into a TOD area (or vice versa) influence the relative frequency with which a respondent took used BART? Results for respondents who lived in the Bay Area previously are shown in Figure 18. The sample size was too small to analyze by housing affordability, so we report only results for proximity to transit. New TOD residents substantially increased their BART use: 53% reported taking BART more now than at their previous non-TOD residence. 84% of new TOD residents and 70% of remaining TOD residents used BART the same or more than at their former homes. A greater proportion of those who remained outside a TOD area or moved out of a TOD area took BART less compared to TOD residents.

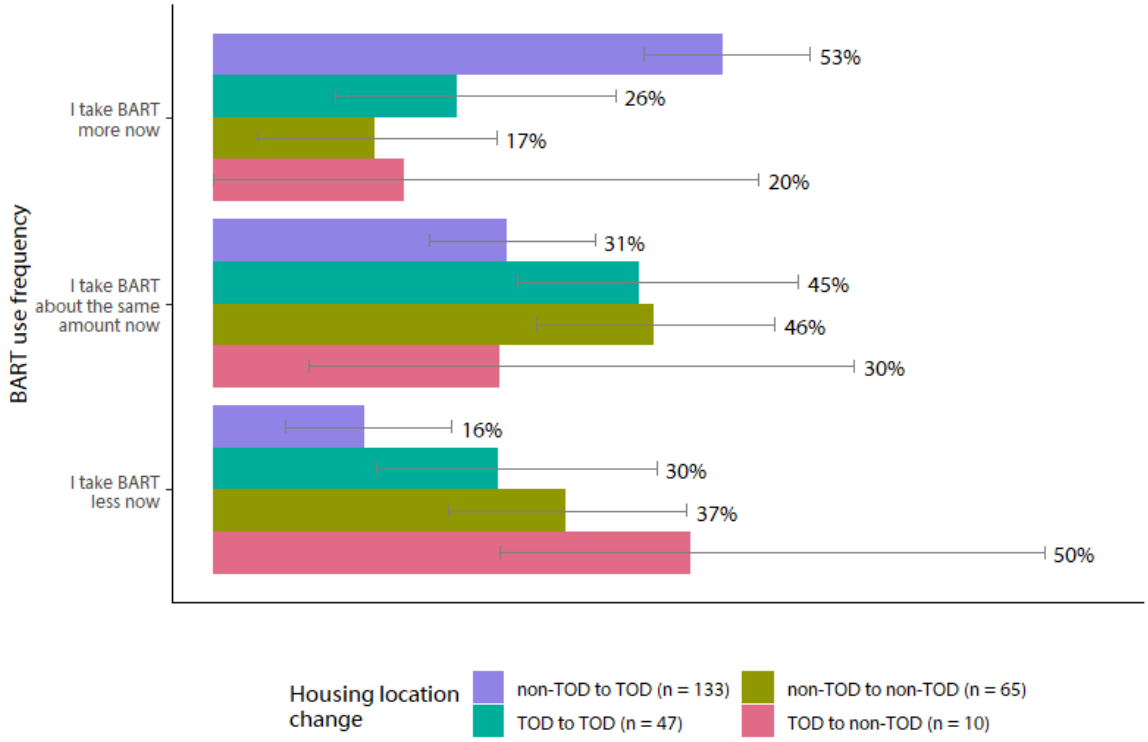

Figure 18: Changes in BART use after residential relocation

For respondents who were employed, we asked what mode they usually took to work before they moved to their current residence and compared those answers to the usual mode they took currently. The sample size was too small to disaggregate by both housing type and TOD or non-TOD; only 88 respondents had complete information for these questions. We found that 28 people took usually took a different mode to work compared to their previous residence (32%), but there was not a significant difference in the proportion of TOD residents who switched compared to the proportion of non-TOD residents. Of those who reported using a different mode currently, most had switched to BART from other modes (43%). The most common change was from a drive alone commute to a BART commute (25% of all respondents who took a different mode to work after moving.

Travel Trends

In this section, we compare mode share at two BART station groupings across the earlier TOD studies. The previous TOD report compared mode share for all trips and work trips between 1992 and 2003 at South Alameda County BART stations, which included Union City and South Hayward, and Pleasant Hill BART station (Lund, Cervero, and Willson 2004). The report compared travel only at the developments in common between the two years. In this report, we perform a similar comparison with two key differences. First, we compare all developments at the same station groupings, not just the ones in common across all three studies. Lund, Cervero, and Willson (2004) omitted two housing developments at the South Alameda station grouping that

appeared in Cervero (1993), while the present study added four sites that did not appear in either previous study. At the Pleasant Hill BART station, both Lund, Cervero, and Willson (2004) and the present study added a development that did not appear in Cervero (1993). Thus, the comparisons represent aggregate travel at all TOD sites in the identified station groupings rather than between individual housing developments. Second, we compare the mode share for all trip purposes but not for only work trips. Sample sizes for work trips were too small to yield valid comparisons; therefore we omit that comparison. We recomputed the aggregate mode share for each station grouping to include developments not previously included in the analysis.[12] Developments compared are identified in Table 7.

Table 7: Number of trips per survey year per development compared.

Grouping	BART Station	Development	1992	2003	2019
Pleasant Hill					
	Pleasant Hill	Coggins Square	-	36	26
	Pleasant Hill	Park Regency	124	246	97
South Alameda					
	South Hayward	Alta Mira	-	-	11
	South Hayward	Archstone Barrington Hills	-	51	12
	South Hayward	Cadence	-	-	30
	South Hayward	Foothills Apartments	124	-	-
	South Hayward	Mission Heights	50	-	-
	Union City	Parkside Apartments	33	-	-
	Union City	Station Center	-	-	54
	Union City	Union Flats	-	-	59
	Union City	Verandas	97	105	36

Over the three-decade span, there was a decline in vehicle travel and an increase in travel by most other modes at both station groupings (Table 8). The pattern in the interceding years was inconsistent; for example, vehicle travel rose and then declined sharply in Pleasant Hill, while the decrease in the South Alameda station grouping was more consistent across the time periods. Likewise, BART mode share fell then rose in Pleasant Hill but did the opposite in South Alameda County. The most significant difference across the three studies was the substantial increase in active travel. More than one in ten trips were made on foot or by bicycle in 2019; this represents a seven-fold increase at Pleasant Hill and a near doubling from the 1993 share of active travel trips in South Alameda County. Ridesharing entered the scene between 2003 and 2019 and was used

[12] Lund, Cervero, and Willson (2004) lacked information about the number of trips at each site, so it was not possible to re-weight mode shares precisely. Mode share was estimated by multiplying the number of individual respondents by 3, assuming each person made a complete report of all three main trips on the surveyed travel day. This calculation is different from that computed in Lund, Cervero, and Willson (2004), which was population-weighted.

for between 3% and 7% of trips at the two station groupings, but it is not clear from the data what modes that share is supplanting.

Table 8: Mode share by survey year.

Station Grouping	Mode	1992	2003	2019
Pleasant Hill				
	Vehicle	63%	68%	41%
	BART	31%	29%	38%
	Bus	4%	1%	2%
	Walk/bicycle	2%	2%	14%
	Uber/Lyft			3%
	Other	0%	0%	2%
	Total trips	*124*	*282*	*123*
South Alameda				
	Vehicle	68%	60%	50%
	BART	20%	34%	24%
	Bus	5%	2%	4%
	Walk/bicycle	7%	4%	13%
	Uber/Lyft			7%
	Other	0%	0%	0%
	Total trips	*304*	*156*	*202*

Note: Developments at station groupings differ by year

Chapter 6: Focus Groups

Focus group participants commonly were long-term residents of the housing development they lived in. In most cases, average length of residence was within a couple years of when the housing development opened, although in two cases there was more of a mix of newer and longer-tenured residents. Over half of participants earned less than $25,000 per year, and an additional third earned less than $50,000 per year. One site, Lion Creek, consisted only of participants who earned less than $25,000 per year. About 45 percent of participants did not own a car. An additional 21 percent had fewer cars than licensed drivers in the household, while about one-third had at least as many cars as household drivers. For those who owned cars, expenses varied dramatically. The average monthly vehicle expense was $446, which ranged from $102 to $1305 and including car payments, gas, insurance, and parking fees. The average carless household spent about $93 per month on transportation expenses, which typically included transit fares and ride hailing costs and occasionally included paratransit fares.

Focus group discussions centered on several themes: reasons for residential location, neighborhood amenities, safety, opportunities for and barriers to BART use, transportation costs, perceptions of inequality, and accessibility. In the remainder of the chapter, we describe how participants talked within each of these themes. In chapter 7, we share how these themes together with the quantitative data inform policy recommendations.

Residential Location Choice

What seemed to draw residents to their buildings most was affordability and a sense of stability. They frequently commented that it was "a blessing" or "wonderful" to have found their current homes. "We felt rich moving here," said one Colma resident. Participants described difficult circumstances that required them to relocate from their previous homes. Personal issues were most common. Participants cited instances of divorce, domestic abuse, health concerns, and homelessness as reasons to seek affordable housing. Charles moved to Dublin from Oakland to improve his living situation:

> I'm a recovering homeless person and I was through a program in Palo Alto because I rejected open VA system [in Oakland]. And so in the process of that, I needed a place … Well I got my HUD grant and I needed a place that I could focus on myself and also step away from the from the unhealthy environment I was in.

Similarly, Colma resident Manuela shared that she was not seeking to live in an affordable housing development. But a series of unfortunate incidents rendered her unable to find permanent shelter for two years until she was accepted at Trestle Glen.

For some, external factors were just as important. Even for those who were better situated, rising housing costs coupled with unforeseen circumstances were too much for them to handle. Christine discussed the reasons for her move:

> I had been renting a house in Hayward for 17 years with a really great rent that she'd never upped, it was like 1800 for a four bedroom, 17 years, huge house, huge backyard. And she decided to sell it. So there's no way. I'm a single mom, two kids, and there was no way I could find even a one bedroom for that price. Then I found out about this [place] and I was really happy that it was in Dublin, much safer neighborhood. Yeah, so we were lucky enough to get in.

Several others were also priced out of their former neighborhoods. They were happy that they could get more space than they could otherwise afford on the private market. Yet others had experiences with poor housing conditions: deferred maintenance, mold, and overcrowding prompted them to seek new housing.

A better neighborhood environment was an important benefit of the affordable housing locations. Nearly everyone agreed that their current residence was safer than where they had moved from. In the more suburban locations, people generally described their neighborhoods as safe. Judy, as with several others, had moved to get away from a violent neighborhood:

> I'm originally from—I'm a Southerner, from the South—but I moved from there to here, to Oakland…. I stayed in West Oakland, the Acorns. It ain't as bad as people say. It ain't as bad, but it wasn't somewhere where I wanted to raise my daughter, at the time. It was a lot of shoot-outs, a lot of donuts in the street. I didn't have any problems, but people around me had problems. It got to the point where my employer would send van service to pick me up, because there were so many shootings in the streets, which was good….We don't have a lot of people just hanging out here, in the area. Like, in front of the building. In West Oakland, people just hang out on the streets til all times of the night.

Daniel, who lived in Colma, liked his neighborhood because it was quiet. He joked that he had "peaceful neighbors": the housing development was located next to a well-maintained, park-like cemetery. Even in East Oakland, which has relatively high levels of interpersonal violence, residents thought of their community as safer than surrounding areas. One portion of the conversation highlighted this sort of relative safety:

> Denise: Well, [this neighborhood] has its ups and downs for safety, it can be safe but it's not all the time the tenant, it's the outsiders that come in and make it unsafe for the tenants that live there. It's not always the tenants.
>
> Tanya: But I really like it because we're a gated in community. It's really hard for a person to come walk up to the gate and try to come to your house.
>
> Denise: Right. They actually have to be let in. Which is another thing, if it wasn't security we would somewhat be in an insecure state.
>
> Tanya: And having a 65 pound dog helps too!

Participants in this focus group session described each other as "family," and the fact that they looked out for each other made them feel safer in their community. This sense of community was evident in most of the other focus groups as well.

Selection for an open subsidized unit is based on a lottery, so luck plays a significant role in housing choice. Peter, a Colma resident, reminded the group that their choice was not the choice to *live* in the building, but rather the choice to *apply* to the building. Some participants described looking in a limited set of cities to be near family, friends, and work, or to move away from neighborhoods they thought were unsafe. Others cast a wider net, hoping to land any affordable unit they could. As we saw from the survey results (Section 4.3), the cost of housing and finding an affordable unit were two of the most commonly selected reasons why affordable housing residents chose their current residence; other reasons were secondary.

Neighborhood Amenities

The benefits of being located near a transportation node was a main theme of the focus group discussions. Some described transportation itself as the benefit, while some placed more value on the amenities and services available nearby. Part of this distinction was based on relative geography in the Bay Area. Residents of the inner East Bay sites (Oakland and Union City) generally spoke of the transportation benefits of being near BART, though not necessarily for taking BART itself. For example, Mural Apartments at the MacArthur BART station is an important transit node for bus and shuttle services, as well as a major transfer point for BART trains themselves. Residents there tended to rely on multiple transit services for daily travel, particularly AC Transit and the shuttles—much less so on BART. They liked shuttle services because they were reliable and free, including the Emery Go-Round shuttle to Emeryville shopping areas, Kaiser Permanente hospital shuttles, and the Mills College shuttle. Lion Creek Crossing residents in East Oakland were even more multimodal, often using BART in combination with bus and rideshare to get to work, school, and grocery shopping.

Nearly all participants thought the convenient location was a significant benefit of living in a TOD. Most daily needs were located nearby. Rahini, a Union City resident, spoke of the difference between her previous residence and her current residence, exemplified this perception in a typical exchange:

> Rahini: The stores were there, but better here because Safeway is close by and everything we have, walking is good.
>
> Moderator: So, Safeway is nearby. What other sorts of amenities or things that you need to get are around here close by?
>
> Rahini: Everything actually: the Chinese store is close by, Safeway is close by, Rite Aid is close by. And then across from Rite Aid, if you look over there's pizza places and food places and the Indian store right across the street from us. We're surrounded with everything that we need, except Kaiser.

Many amenities were within walking distance, an easy public transit trip, or a short drive. Participants found value in being close to grocery stores, restaurants, and other shopping centers. Superstores like Walmart or Costco were generally not as easy to get to, though many participants wished that they were. While the hospital was not accessible from Station Center in Union City as

Rahini discussed, hospital shuttles were available at Mural in Oakland making that a convenient health care option for residents there.

Neighborhood context was important to know when considering whether a location was accessible, however. For example, as Tyrone described his building in Dublin, he noted that he was surprised by how good the area was, remarking on "the location to the BART, all the shopping and just a nice, safe neighborhood, especially for a HUD, Section 8 type environment." Later in the conversation, an exchange with Charles highlighted the price of living in such a nice community:

> Moderator: What are some of the things that you're surprised that you've had to adjust to [after moving to Dublin]?
>
> Charles: The lack of liquor stores. There ain't none! You know, I'm accustomed to stopping in the store and getting a can of beer. And you got to go buy 12 packs
>
> Moderator: So if I could maybe broaden that out. It sounds like some of the conveniences you were used to—
>
> Charles: Yes. The corner markets are not there for purchasing groceries and stuff. I find the groceries overpriced—
>
> Tyrone: Grossly overpriced! Safeway. Number one. God they're horrible.
>
> Charles: What do we have near the house? It's a Safeway or Target.
>
> Tyrone: And they're both overpriced.
>
> Charles: They're both overpriced.
>
> Tyrone: It's the price for Dublin.
>
> Charles: Yeah. The small conveniences that you find in the inner city are not available. You have to adjust to that. So I get on BART and go to Berkeley or North Oakland and hang out.

This was true at the other Dublin development too: people had to travel much further distances to get groceries they could afford. This problem was not distinct to outlying areas—East Oakland residents described a nearby convenience store as the "million dollar market" because sold goods at prices too high for them to afford—but was exacerbated by having few other options nearby.

Affordable housing provided amenities beyond the value of a less expensive place to live and neighborhood destinations. Resident managers often lived on site, creating a feeling of security. They hosted events such as resource fairs that connected residents with social services they were eligible for. At least one development held summer camps to care for children while school was out of session. Some had food giveaways for seniors. Buildings were new and well maintained. Residents took advantage of the common spaces on site, such as playgrounds, event rooms, and computer labs.

Safety

While nearly everyone considered their current neighborhoods as safer than where they moved from, not everyone thought of them as safe. Participants thought of their immediate environments as safe enough to walk in during the day, but certain circumstances colored their opinions. Participants in two of the focus groups described discarded needles as substantial barriers to walking in their neighborhoods. Samantha described the problem in Oakland:

> In San Francisco they have people literally walking up and down the street picking up needles. They need that in Oakland, too, because it's like a lot of needles around here and kids and it's not safe. You could be walking down the street with your sandals on and just get pricked in the foot by a needle. You don't know where that needle came from and it is so sad.

Colma residents also found used needles in the vicinity of their building. As in Oakland, they described it as problematic for children and they found it especially unsafe because their building hosted a daycare. Other incivilities, such as trash, dead animals, and human waste, made walking unpleasant in those neighborhoods. It was more common for people to describe it as unsafe to walk around at night; Elisa from Colma walked quickly with her keys in hand at night when walking to her building, while Daniel described the nighttime walking environment as unsafe "even for a man." East Oakland residents had a different perspective, however. While Li Wei thought that extensive surveillance cameras around the property indicated that their neighborhood was a "danger zone," Jesse took a more moderate stance: "You've got to be careful when you come in. You keep to yourself and you should be fine. If something's happening, just don't go out." Others in the group did not agree that the neighborhood was dangerous and otherwise thought that it was non-residents who caused problems; people who lived in the housing complex looked out for each other.

Circumstances were markedly different in suburban Dublin. Participants were attracted to the city because of its reputation as a safe place. In one focus group, Tyrone remarked that while "anything can happen anywhere, the higher the rent, the lower the drama," suggesting that there were safety benefits to living in a wealthier neighborhood despite obvious challenges with affordability. Participants in the other Dublin focus group described accidentally having left keys in their doors overnight or valuables in plain sight in their vehicles without incident. Because the resident manager lived on site, residents of that building felt an additional sense of security in their buildings and neighborhood. Managers at some other developments also lived on site.

Opportunities for and Barriers to BART Use

Using BART as a primary mode of transportation was infrequent, though most used it at least occasionally. Only a handful of participants were regular BART users, generally correlating with employment in Oakland or San Francisco. For those who did rely on BART, the system provided distinct advantages. Melanie, a Colma resident, described how BART allowed her to search for jobs far beyond where she would have been able to without it. For example, although it would not have been her preference to cross into the East Bay for work, she searched there because she knew

she could rely on BART to get her there without having to drive. Charles, who now lived in Dublin, had family and friends who lived near where he used to stay in Oakland and Berkeley. Without BART access, he would be unable to visit them because he did not drive and would lose his previous social networks. Li Wei, who lived in East Oakland, no longer drove having recently donated his car. He used BART weekly to visit Chinatown for groceries and stay connected with the Chinese community. Christina had developed a health condition that made it difficult for her to drive, so she wanted to be nearby reliable transportation so her children could get places. Infrequent users would use BART to get to special events, such as baseball games, or to go shopping and visiting in San Francisco where parking is scarce and expensive. BART was extremely valuable for those who relied on it and it often formed part of a multimodal package of transportation modes.

The consensus perception among focus group participants was that BART was convenient in some circumstances but significant challenges related to safety, cost, and access prevented people from using it more. Every focus group discussion incorporated a conversation about safety in at least one way and safety was the improvement planners most needed to prioritize according to participants. When we asked the groups what the biggest transportation problems that planners needed to solve were, safety rose to the top. For some, the walking environment near BART stations felt insecure. As we described earlier, residents in a few environments were concerned about neighborhood incivilities such as discarded needles, trash, or violence in station areas near their homes. Others described instances within BART stations themselves. The murder of a young Black woman on a BART platform at the MacArthur station the year before shook the confidence of several Oakland focus group participants. Bethany described how the incident changed her travel habits, in response a to a question about how often she used BART:

> Every once in a while. I'm not really a BART rider. After that girl got sliced on the BART I don't really like to ride the BART. A couple more people just got sliced a couple of days ago. I would love to ride BART more but it just rocked my whole world with the stabbing part. You never know who comes for you so I, just like no, I just drive.

This prompted a longer discussion about barriers to using BART related to insecurity: thefts, drug use, and problems with cleanliness that participants associated with homelessness made for an unwelcoming environment. Many of these same issues arose in the other focus group sessions.

Those who paid full fare for BART found it to be too expensive. Participants commonly compared the distance-based fare structure to flat fares found in other Bay Area transit systems or transit systems in other cities they knew about and wondered why BART could not do something similar. Traveling with children was especially difficult when parents were required to pay full fares for them. Latoya described her challenges when using BART with her family:

> Well, BART is expensive but it's really expensive when you have kids. That's the only thing that I don't like about taking BART is because I have a six and a two-year-old. Why do I need to pay for a six— I understand as an adult you have to pay but for little kids why are we paying? Maybe 12 and up but 12 and under should not have to pay to get on BART. That's ridiculous. My kids like

> to go so usually when we get on BART it's like I have to make sure I have this much money because I have to pay for all three of us to get all the way out to San Francisco and back home and pay for wherever you guys want to go in San Francisco. That's so expensive for me to pay for me and— I ain't going to lie, sometimes I just be like 'go under the thing' because I ain't going to pay for you all.

Apart from raising the age for which riders would be required to pay full fares, participants suggested alternative fare structures such as family fares, where parents could pay a higher fare but all children would travel fee, and free tickets after spending a certain amount of money.

Transportation Costs

Affordable housing residents did careful budgeting to make sure they could afford transportation, minimizing their costs however they could. Those who drove had several strategies for ensuring that their car payments were made and their gas tanks remained full. For example, Chris performed his own car maintenance, while Christina cut back on non-essentials like eating out and more expensive clothing purchases. Rashini used Scoop, a carpool matching service, to share rides when her schedule was predictable, but drove by herself if she had to work late. Tammi described her precise method for accounting for transportation costs:

> I do data so, numbers are my thing. So, I generally have a spreadsheet, I literally have a budget that I enter all my numbers in and I have gauged through the years what I spend on gas. You kind of allow for the two dollar, three dollar difference here and there but, for me, I have carpooled more because you know, just as a way of saving gas. So that's been one way, I've looked at my budget and just trying to find ways to be able to carpool, save on gas and get on BART and carpool back. If I'm only taking BART one way, or Uber one way, that cuts $20 from my commute because it's $20 dang near to get there all on Uber and $20 to get back. That's a full tank of gas.

Her method shows how low-income households piece together transportation within daily tours to balance between efficiency and minimizing costs. Other participants gave rides to friends and neighbors and split travel costs, or borrowed cars if they needed to drive somewhere. Several participants described using rideshare services in emergencies, or budgeting for them to use occasionally for shopping or social trips. Parking costs at home were not a concern: nobody reported having to pay for a parking space. But not everyone thought saving money on vehicle use was worth the additional planning or time it took to take public transit. For example, Jesse, an East Oakland resident, shared that because "time is money," it was more valuable for him to take a quicker mode of transportation even if it cost him more. George described his decision-making process this way:

> Moderator: How do you think about the costs of transportation within your overall budgeting?
>
> George: I worked it out. If I were to catch BART every day versus driving, I would save a lot more money by catching BART every day. But my time— it's pure laziness. I won't even walk a couple more miles if I can drive instead.

> Moderator: So for you, you considered your time— the time that you save by driving is more valuable for you than the cost you would save on taking the BART all the time to work. Correct?
>
> George: Yeah.

Non-drivers had another set of strategies to ensure they controlled their transportation costs. Many talked about being multimodal; some would take a quicker but pricier mode of transportation to a destination and a slower but cheaper mode back. Similar to Tammi's strategy, Oakland residents discussed some other common money-saving strategies:

> Samantha: Sometimes when I go to San Francisco, sometimes I take the bus versus the BART because I have my Clipper card and I can just get on the bus. I can get all the way to San Francisco on my Clipper card for free so sometimes if change is short I'll be like I'm not going to take BART downtown and I'll catch the bus to San Francisco.
>
> Moderator: How many of you do that?
>
> Joe: I haven't yet, but I talked about it. We just don't go to San Francisco that often. About the only time we go now is when [my wife] has an appointment at the hospital. We usually go on East Bay Paratransit. We go early in the morning, and to ride East Bay Paratransit out to the campus we were going to is about $9.50 one way for both of us. And then what we would do is we would catch the shuttle from the hospital downtown and then catch the BART back home because it's a lot quicker.

Because participants lived within walking distance to stores and restaurants, they found it easy to walk to save money. For those in good health and who felt safe in the neighborhood, walking the last mile from a transit stop was also a cost-saving mechanism. Several participants qualified for discount transit fares because of disability, age, or other qualified reasons. Those individuals took advantage of transit more frequently because of the cost savings. In a few instances, they shared information with other participants on how to apply for the discount programs if they did not already know about them.

Perceptions of Inequality

A thread that surfaced in several conversations was one of perceptions of housing inequality. This manifested in a couple specific ways. At the Mural site, affordable housing units were built first. This meant that focus group participants were among the first residents at the development and have endured construction nuisance for the length of time they have lived there. A prominent example of the effect has been that they do not have direct access to the BART station entrance; residents must walk around the block to get to the entrance, or cut through a parking garage facing danger from cars speeding through the structure or, as we describe later, getting locked into a corridor. The conversation became animated when talking about the challenges participants faced with the new market-rate building just finishing construction next door and the features available to the future tenants of that building. Residents were made to feel as if they did not belong in the neighborhood, as exemplified by this exchange:

Latoya: Because they have all that construction going on, on the other side of the apartment, the other night I took a walk because I've never seen that side [of the new building] so I wanted to see what it looked like. As I went, I crossed that little gate that was right here and the security was looking at me like you guys are not supposed to be over here.

Stephanie: Speaking of security, we've been asking for security for the longest and we couldn't get any security but as soon as the [market-rate] building over here opened they started having security.

…

Mike: And [the security guards] do ask me … I was taking a walk to see it and they asked me where I lived and I said it was none of their business and they start getting on their walkie talkies, talking to each other like they're going to come after me. I'm serious.

Participants were also incredulous that the new building would have amenities such as a swimming pool, on-site gym, and a dog walk, while they were not able to get a full-sized playground for their children after a long time advocating for one. The difference in living conditions was stark and residents felt a sense of resignation about their circumstances:

Lisa: I mean when I look at that other building I look that they have better than us. I know this is low income but I really feel like we're poor. I think everybody—

Samantha: We feel left out.

Lisa: Because we have less because we're low income.

Victoria: It's like we don't exist.

Samantha: We don't deserve what they get because we're less privileged.

It is important to remember that, for the most part, affordable housing residents felt that their personal situations had improved by moving into their current homes. In absolute terms, they described being satisfied with their housing and neighborhood. But the comparison with wealthier neighbors was difficult to ignore.

The second example of perceived inequality related to the price of goods in the affordable housing neighborhoods. Focus groups talked about the mismatch between housing location and affordable food and shopping options. Participants described having to travel outside of their neighborhoods to find items they could afford, even if the same type of store was located nearby. This was true in both suburban neighborhoods and in Oakland. Some attributed rising prices to gentrification and a reduction of services formerly available to low-income residents. East Oakland residents felt they were being pushed out of their neighborhood, slowly but surely:

Bethany: You know, I just paid two dollars for a cabbage last night at Walmart. I usually get that from WIC [Special Supplemental Nutrition Program for Women, Infants, and Children] for a dollar.

Tanya: And they took that away from us because remember, WIC used to be right next door to the East Bay Health Center. They shut it down. Their excuse? They weren't making enough money. It's not supposed to be about money. You're supposed to be here to help these women

> and families in the community have fresh groceries and healthy items for their children. … They're trying to make it so hard for us up here. That once it gets to that point where we can't get to what we're going to get to, they want you to move. The gentrification is *real*.

Thus, even when neighborhoods had stable housing options, structural factors made it seem that the stability did not have permanence in more distressed neighborhoods. This was a not a universally held opinion across focus groups but shows that affordable housing is only part of the overall affordability picture for low-income residents.

Accessibility Challenges

Two participants, Scott and Ruby, relied on motorized wheelchairs to get around. While their particular circumstances may not always be applicable to able-bodied people, their comments highlighted design flaws and transportation systems engineering deficiencies that could be remedied through closer attention to principles of universal design. Both remarked on significant accessibility challenges in the pedestrian environment. While Scott felt that Dublin was better than neighboring Pleasanton, he still felt it was not easy to get around in his wheelchair because it was difficult to get improvements for locations that were still inaccessible. He indicated that the city placed the onus on property or business owners to make the needed upgrades that then reduced accountability mechanisms for ensuring the improvements were implemented. Ruby lived in Oakland and made similar comparisons of the pedestrian environment to neighboring Berkeley. In general, she described Berkeley as better simply because people crossing the street were not required to push a button to activate a pedestrian signal. Homeless encampments in Oakland encroached on or fully occupied the sidewalk, creating semi-permanent obstacles to wheelchair access. Ruby was quick to not lay blame on people living in tents, but rather on the state agencies on whose land the encampments were generally located because she felt they had abdicated their responsibility for ensuring clean and clear pathways for pedestrian access.

Access for wheelchair users was challenging in other ways that are easily overlooked. For example, because wheelchairs sit lower to the ground, drivers are less likely to see people in them when they cross the street. Scott had affixed a flag to his wheelchair because he had been hit by vehicles eight times. For Ruby, a simple change in the way that a parking garage access door was designed would prevent her from getting locked into a passageway. This was important because construction on the new building next door blocked direct access from the BART station to the front door of her residence, causing her to take a shortcut through the garage. Ruby could not fully navigate BART on her own. She is unable to swipe her fare card without assistance from a gate agent, so if there is no agent on duty she has to enter without paying. Elevators are not fully accessible because they do not have footplates for her to use, and she described how 20 to 30 minute waits for assistance were not infrequent. The Ashby BART station is fully accessible and a model for other stations, she thought, but many times it was just easier to take the bus because she could be guaranteed an accessible trip.

Summary

The value of affordable TOD is its central location to both transportation services and neighborhood amenities in a mixed-use development. While focus group participants did not use BART as a primary mode of transportation, being near BART did facilitate their use of the rail system as one mode in a multimodal package of transportation services. The main advantage appeared to come about because TOD sites serve as hubs for other transit modes, such as local bus service and private shuttle services to shopping, hospitals, and work. TOD residents liked being in a walkable environment with nearby restaurants and shopping, but these amenities were not always affordable leaving residents to have to travel farther for their daily necessities. Low-income TOD households did careful budgeting of transportation costs and often built in contingency budgets to account for emergency use of taxis or rideshare services. Living near BART allowed them to live car-free because transportation options were available to them, but daily use of BART was out of reach many times because it was a significant expense above bus fares or walking.

Although only a couple of focus group participants relied on wheelchairs for their independent mobility, other participants had mobility impairments of varying degrees. Infrastructure to accommodate their needs was not universally available; some cities, neighborhoods, and transit stations were better than others, so they adapted their travel behavior to avoid deficiencies in service of experiencing the least amount of stress.

Chapter 7: Conclusions and Policy Recommendations

Research Summary

This mixed-methods study set out to describe the travel characteristics of TOD residents characterized by housing affordability, show how travel has changed over time, and explain how affordable housing residents see their access to opportunity as a result of living in a TOD. The survey reached a cross-section of affordable housing and market-rate residents in large housing developments within a quarter mile of BART stations, as well as residents living between one and two miles of BART to act as a control group. There were significant differences in the demographic composition of each housing type, with market-rate TOD residents having the highest incomes, the fewest people of color, and the youngest average age. TOD residents owned fewer cars per household, with affordable residents owning the fewest on average. The cost of housing was the most frequently cited reason for moving into a current residence, though market-rate TOD residents reported that relocating near transit was a more important reason to choose their homes. Affordable housing residents, on the other hand, were more likely to list the availability of a subsidized housing unit to be a top factor in their location choice.

The typical TOD resident was more multimodal than the typical non-TOD resident. They used BART more, walked more, and drove less, but the magnitude of difference varied across housing affordability type. Market-rate TOD residents used BART for the greatest share of their trips and more than affordable TOD resident. Employed affordable housing TOD residents used BART much less than the unemployed. This difference is explained in part by the fact that their workplace locations are less likely to be near BART, and so they have fewer opportunities to use BART. Affordable TOD residents used BART more frequently than market-rate TOD residents for non-work travel, however. Affordable housing residents were also more likely to take their trips outside the peak hours.

Travel trends at two BART station groupings indicated that TOD residents are driving less, using BART more, and walking more than they did almost three decades ago. We speculate that the maturing of TOD projects and changes in the nearby destinations may have contributed to some of the travel changes.

Focus groups revealed that affordable housing residents in TODs found their neighborhoods to be improvements over where they lived previously. They appreciated that amenities were nearby, though suburban residents faced high costs in retail outlets targets for a wealthier clientèle. They were most likely to use BART for destinations where parking was scarce, such as in San Francisco, and for special events like baseball games. In some neighborhoods, residents reported safety challenges nearby their buildings, and nearly all who rode BART thought that safety and sanitary conditions on trains had deteriorated recently and that managements should fix the problem. Affordable housing residents had to budget for transportation costs closely; BART fares, driving costs, and ridesharing fees were high enough that they often had to make tradeoffs between travel and other purchases. Discussions also highlighted the challenges for people with mobility

impairments; the transportation system was not fully accessible, creating substantial barriers to reaching destinations.

There are a few limitations that readers should be aware of when considering the findings of this study. First, the survey achieved only a 6% response rate despite multiple contact attempts, coordination with resident managers, and several monetary incentives meant to encourage participation. Low response rates plague survey-based research across multiple domains and is thus not unique to this study. Some structural factors related to survey design may have contributed to the low response rate. For example, while the average completion time for the survey was estimated to be 15 minutes, the apparent length of the survey at eight pages may have turned off recipients from taking time to complete it. Several developments in the sample frame had been surveyed multiple times in the recent past; in fact, other researchers affiliated with the University of California, Berkeley were simultaneously conducting a travel study of affordable housing residents and also had a low participation rate (Zuk et al. 2019). Resident managers of these developments were reluctant to involve their residents in additional research efforts as they attempted to prevent survey fatigue. But in three locations where we were able to engage on-site with residents, we were successful in increasing the number of survey responses, suggesting additional on-site events could have improved response rates. However, increasing participation through personal engagement may come at a cost of representativeness because those with ample time—non-working individuals—are more likely to participate. Because the purpose of the survey was to understand travel across the TOD landscape in the region, it was not feasible to personally engage with all 62 survey sites. Focus group interviews corroborated many survey findings, so we have confidence in the patterns we found even if our confidence in the magnitudes is smaller.

A second limitation is that our survey was less linguistically inclusive than intended. While we translated the survey into Spanish and Chinese, resources limited the availability of these languages to the online version of the survey. Only seven participants submitted a response in a language other than English. Because about 40% of the respondents indicated speaking a language other than English at home, this suggests those with lower levels of English proficiency were generally left out of the sample. This may account for our underrepresentation of the Latino population relative to the regional population, for example.

Finally, this study did not account for land use characteristics of the surveyed sites beyond their proximity to a BART station. We conducted analyses by BART station access typology, but differences across station types were not substantially different enough to warrant inclusion in this report. Station access captures availability of parking at TOD sites—and thus density in the immediate station vicinity—but does not capture microscale built environment features, destination accessibility, or availability of other transit modes, nor does it capture land use at non-TOD stations. Future work might consider a short intercept survey of TOD residents to capture very basic demographic and travel information to increase survey participation, coupled with an examination of land use characteristics and changes over time to estimate influences on TOD travel.

Policy Recommendations

The findings support at least five policy recommendations related to equitable and affordable TOD: promote development of full-featured TODs, increase flexibility of transit fare options, work with employers and developers on travel demand management, review parking policies, and continue to develop affordable housing at BART. The breadth of issues would require regional coordination across multiple stakeholders, including BART, local jurisdictions, MTC/ABAG, other transit agencies, housing developers, employers, and community-based organizations, other private-sector and non-profit entities.

Promote Development of Full-Featured TODs

As TOD proliferates across the BART system, many new developments will be in wealthier suburban locations. Subsidized housing residents will need access to groceries and other daily goods and services at affordable prices with easy access. Policies that support local business creation and encourage relevant established businesses to stay in TOD areas may help with the affordability problem, in addition to improving other co-benefits of increased physical activity, travel efficiencies with nearby services, and safety. While New Markets Tax Credits and Opportunity Zone designations incentivize development in low-income areas, retail outlets in higher-income neighborhoods may need other types of support through community capital financing or development and tax credits to ensure they can offer competitive prices for low-income households. Attracting small-format versions of national retail chains may also help bring the lower prices associated with big box stores closer to affordable housing residents. While these types of retailers may inhibit the establishment of small, locally-owned businesses, municipalities could mitigate these effects through local hire policies that prioritize job access for nearby residents. Attracting additional service-sector jobs to TOD areas would increase the likelihood that affordable housing residents in TODs could commute by BART or other forms of public transit more easily.

For services that cannot be located nearby, such as hospitals or large bulk retailers, last-mile connections from TOD sites to those facilities are critical. Shuttle services such as the free hospital and Emery Go-Round shuttles at the MacArthur BART station are models for creating these connections that should be implemented in outlying communities. Micromobility services such as shared bicycles and scooters are options for some, but concerns about safety and travel distances make them an unrealistic option for most and they exclude people with disabilities. As technology and shared-transportation services mature, equitable mobility as a service at TODs may serve as a way to build last-mile connections through car sharing (with free or discounted memberships for affordable housing residents), bike sharing, and autonomous vehicle hubs. Taken together, these policy and technology suggestions would help BART achieve TOD policy goals aimed at building complete communities.

Increase Flexibility of Fare Options

BART fares are expensive for people with limited incomes. Some affordable housing residents qualify for discount BART fares because of age or disability status, while some are given developer-funded transit passes. But not all are currently eligible for reduced fares. Introducing a means-based fare structure might encourage more frequent BART use for those who have accessible destinations. MTC is evaluating the revenue and ridership impacts of 20% fare discounts for riders earning up to 200% of the federal poverty level on BART and three other Bay Area transit systems (Metropolitan Transportation Commission 2019). Transit operators should consider the feasibility of even deeper discounts, perhaps funded through California Climate Investments or other carbon tax initiatives. Another policy under consideration is Clipper Cash, which would load a monthly cash stipend onto the transit card for low-income riders to use on BART. With the introduction of fare discounts to Clipper cards and the transition away from paper tickets on the BART system, it is important to maintain easy options for riders to purchase cards and reload value on them. Cash purchase and reload options must be available for affordable housing residents and in low-income neighborhoods: about 18% of families earning less than $30,000 do not have a bank account (FDIC 2017).

Some fare options offered to all may disproportionately benefit affordable housing residents. For example, deeper off-peak discounts could help meet twin goals of spreading out peak volumes while accommodating low-income workers who often work outside traditional 9-to-5 hours. Family fare bundled packages, in which children who are not yet independent get a free or discounted fare with an adult purchase, would ease the burden for care providers who ordinarily have to pay full fare for their children. The nature of such programs vary in practice. For example, the NJ Transit Family Supersaver Fares allow up to two children under 12 to ride free with an adult on weekends and holidays, and up to three children under 4 ride free with an adult anytime. The Chicago Transit Authority provides reduced fares to children under 12 and free fares for children under 7. The Toronto Transit Commission (TTC) offers an even more flexible family pass: on weekends and holidays, riders can purchase a single pass valid for six people if at least four of them are between 13 and 19. (Children under 12 always ride free.) BART should conduct meaningful participation with low-income families to help determine an appropriate family fare structure.

For fare policies that might be introduced, a multilingual communication strategy should be developed to ensure broad uptake of the discounts. Focus group findings indicated that not everyone who was eligible for current discount programs knew about them. In addition to traditional advertising streams, personal engagement with affordable housing resident managers could help improve distribution of benefits. Many affordable properties host resource fares for their residents that could include multilingual transit agency representatives to share information about the programs. This engagement must be continual so that new residents are made aware of their benefits. Sustained engagement and education will require that a portion of funds available for transit subsidies be made available for outreach activities.

Work with Employers and Developers to Implement Travel Demand Management

Travel demand management (TDM) strategies can be an important component of incentivizing riders to use transit. Survey results indicated a significant disparity in benefits available to employees; higher-income workers were about three times more likely than low-income employees to receive a transit benefit through their workplace. Working with businesses that employ a significant share of low-wage workers to find funding sources for transit benefits would lower the transportation cost burden for employed affordable housing residents.

Encouraging TDM implementation at affordable developments may be a streamlined way to achieve similar goals. The Affordable Housing and Sustainable Communities (AHSC) program provides grants or loans to affordable housing and other affiliated projects to achieve GHG emissions reductions. To be eligible for AHSC funds, affordable housing developers must provide free transit passes to subsidized units for at least three years (California Climate Investments, California Strategic Growth Council, and California Department of Housing and Community Development 2019). BART may consider requiring developers who build on their property to offer Clipper Cash to residents in addition to bus passes to encourage multimodal transit travel. Because the AHSC guidelines encourage sustaining programs beyond the grant term, providing transit passes for a longer period of time may also improve developers' chances of receiving funding. BART can also consider requiring developers to attain GreenTRIP certification for new affordable developments. GreenTRIP is a program run by TransForm, a Bay Area non-profit that advocates for sustainable and inclusive transportation and land use planning, in which program staff work with developers to help ensure their projects incorporate elements aimed at reducing driving, such as transit passes and smaller parking footprints. These TDM strategies may help pull TOD residents onto BART for a greater share of trips.

Incorporate Universal Design Principles in Station and Street Treatments

Over 40% of households that receive HUD assistance have at least one household member with a disability (Dawkins and Miller 2015). Thus, it is critically important that transit stations adjacent to affordable housing and the pathways that lead there be fully accessible and accommodate all types of mobility limitations. For example, station elevators should be fit with call-button footplates so that people with limited upper mobility can use them. When elevators are out for maintenance—especially when unplanned—station agents should be proactive in helping limited-mobility passengers and the system should have alternate transportation arrangements so that passengers are not left stranded. BART or a designated accessibility advocate should also work with developers to ensure that new construction is fully accessible. This could prevent circumstances like that described earlier where a blocked door traps a person in a wheelchair in a locked corridor.

Municipalities should continue to create infrastructure in the public right of way that is universally accessible. This may require infrastructure investment, such as updating curb ramps to modern standards and installing additional pedestrian recall buttons at lower heights to allow pedestrians in wheelchairs to use them. It may also require rethinking policies if they are

inadvertently excluding people with disabilities, though some of the tradeoffs may be difficult to reconcile. For example, if cities accommodate tent encampments for homeless people, they should also ensure that they do not encroach on the pedestrian right-of-way so that wheelchair users can pass by easily. If a pedestrian signal is equipped with a recall button, planners and engineers should determine whether the signal actually requires a recall or can be set so that pedestrians do not have to reach for a button to cross the street. If building owners are responsible for maintaining sidewalks adjacent to their properties, the municipality should identify effective ways to ensure the public right of way remains fully accessible.

Review Parking Policies Near Station Areas

While TOD residents had lower rates of car ownership than non-TOD residents, they still had about one car per household with market-rate residents owning fewer cars than affordable residents. A common complaint that affordable housing residents shared was around parking scarcity; in some locations, residents felt that BART customers were parking in residential areas. At some developments, visitors did not have parking spaces and so were deterred from visiting. While the evidence in this study does not support an *increase* in the amount of parking provided at BART stations, it does suggest that policies that regulate the supply of parking through permits and fees should also account for potential spillovers into residential lots and onto nearby streets. Municipalities may consider residential permit zones or other paid parking options in the vicinity of TODs; any fee-based programs should consider effects on affordable housing and other low-income residents.

Continue Development of Affordable Housing at BART

As a public agency landowner in the Bay Area, BART has an important role to play in increasing housing supply and affordability in the region. BART TOD goals include not only increasing transit ridership, but also creating affordable and equitable complete communities and contributing to regional GHG reduction goals through lowering VMT. Although this study did not measure household VMT, both affordable and market-rate TOD residents made a smaller share of their trips by car than their non-TOD counterparts suggesting potential VMT reductions. And while rail ridership returns per affordable housing resident living near a BART station are smaller than per market-rate housing resident, they make a greater share of their trips by BART than non-TOD residents. They also make more trips in off-peak periods, spreading system demand over a greater period of time, which has been a key interest of BART and transit agencies throughout the US to increase system efficiency.

Research findings highlighted several co-benefits to living in TODs besides transit access. Affordable housing residents found a sense of community with neighbors within the development and a safer environment relative to surrounding neighborhoods or neighborhoods in which they previously lived. TOD residents also walked more than those living elsewhere, suggesting TODs may enable more physical activity and yield health benefits associated with active transportation.

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Appendix

Appendix A: Acronyms and Abbreviations

AB	Assembly Bill
ABAG	Association of Bay Area Governments
AHSC	Affordable Housing and Sustainable Communities
BART	San Francisco Bay Area Rapid Transit District
CHTS	California Household Travel Survey
GHG	Greenhouse gas
HUD	US Department of Housing and Urban Development
LOS	Level of Service
M-S-G	Marketing Systems Group
MPO	Metropolitan Planning Organization
MTC	Metropolitan Transportation Commission
MTO	Moving to Opportunity
PDA	Priority Development Area
SB	Senate Bill
SCS	Sustainable Community Strategy
TCAC	California Tax Credit Allocation Committee
TDM	Travel demand management
TOD	Transit-oriented development
TTC	Toronto Transit Commission
VMT	Vehicle Miles Traveled
WIC	Women, Infants, and Children
WtWV	Welfare to Work Voucher

Appendix B: Survey

Information about you (continued)

36. Do you speak a language other than English at home?
    - ☐ No ***(Skip to question 38)***
    - ☐ Yes ⟶ What language?: _____

37. How well do you speak English?
    - ☐ Very well
    - ☐ Well
    - ☐ Not well
    - ☐ Not at all

38. Do you use a smartphone? (for example, one that access the internet and can download apps)
    - ☐ No
    - ☐ Yes

Comments

Do you have any comments or suggestions on how to improve transportation in the Bay Area? Please share them below.

Thank you and follow up

→ Thank you for completing this survey! Would you like to receive a $10 gift card as a thank-you?
- ☐ Yes, I would like to receive a $10 gift card as a thank-you

→ Are you willing to take part in a more extensive transportation and housing survey or small group interviews?
- ☐ Yes, I would like participate in another survey or a small group interview

If you checked yes to either box, write your name, phone number and email. We will only use this information to follow up with you and it will not be connected to your responses in any way.

Name:_____

Telephone: _____ Email: _____

Survey ID: _____

BAY AREA TRAVEL SURVEY

Information on your household

For this section, "household" means everyone who lives at your address with you. This may include family, partners, children, friends, and roommates.

1. How many people live in your household (including you)? _____ people
2. How many children (age 0 to 15) live in your household? _____ children
3. How many working cars, trucks, or vans do people in your household own? *Don't count motorcycles and scooters.*
   _____ cars, trucks and vans
4. Where do you park your car? ***(If you do not have a car, skip to question 5)***
   - ☐ We park in a parking space at our home ⟶ If yes, how much does parking cost? $ ____.____ per month
   - ☐ We park on the street or in a parking lot somewhere else
     - ☐ Because our building charges for parking
     - ☐ Because there are no spaces available
5. In the last month, did you borrow a car from a friend or family member who doesn't live with you?
   - ☐ Yes
   - ☐ No
6. In the last month, did you use a car share service like ZipCar, Gig, or Getaround?
   - ☐ Yes
   - ☐ No

Information on your job

7. Do you have a paying job?
   - ☐ Yes, I work full-time
   - ☐ Yes, I work part-time
   - ☐ No, I do not have a paying job ***(Skip to question 17)***
8. Do you work at the same place every day?
   If you work more than one job, list the job where you work most.
   - ☐ Yes, and it is outside my home
     - Address or nearest cross streets: _____
     - City _____
     - Zip code _____
   - ☐ Yes, and I work at home every day ***(Skip to question 17)***
   - ☐ No, I do not work in the same place every day

Information on commuting to work

9. How did you usually get to work last week? *If you usually used more than one type of transportation during the trip, mark the one used for most of the distance.*
   - ☐ Walk
   - ☐ Bicycle → Do you: ☐ Use your own bike? ☐ Use a bike share bike?
   - ☐ BART
   - ☐ Bus or other public transportation
   - ☐ Get dropped off
   - ☐ Drive alone
   - ☐ Drive in a carpool → Do you: ☐ Drive your own car? ☐ Drive a carshare or borrowed vehicle?
   - ☐ Uber, Lyft, or other ride share service
   - ☐ Taxi
   - ☐ Other: _____
10. How often do you take BART to <u>get to work</u>?
    - ☐ Never ***(Skip to question 16)***
    - ☐ Less than once per month
    - ☐ 1-3 days per month
    - ☐ 1-2 days per week
    - ☐ 3-4 days per week
    - ☐ 5 or more days per week ***(Skip to question 12)***
11. Why don't you take BART to work more often? *Check all that apply*
    - ☐ I need to have a car during the day for work, or for doing things like dropping off children or running errands
    - ☐ BART is too far from my home or work
    - ☐ BART is unreliable
    - ☐ BART is too expensive
    - ☐ BART is crowded
    - ☐ BART is unsafe
    - ☐ Other: _____
12. When you take BART to work, which station do you board the train at? _____
13. How do you usually get to this station?
    - ☐ Walk
    - ☐ Bicycle → Do you: ☐ Use your own bike? ☐ Use a bike share bike?
    - ☐ Bus or other public transportation
    - ☐ Get dropped off
    - ☐ Drive alone
    - ☐ Drive in a carpool → Do you: ☐ Drive your own car? ☐ Drive a carshare or borrowed vehicle?
    - ☐ Uber, Lyft, or other ride share service
    - ☐ Taxi
    - ☐ Other: _____
14. When you take BART to work, which station do you exit from? _____

30. How did you usually get to work from your former address? *If you usually used more than one type of transportation during the trip, mark the one used for most of the distance.*
    - ☐ Walk
    - ☐ Bicycle → Did you: ☐ Use your own bike? ☐ Use a bike share bike?
    - ☐ BART
    - ☐ Bus or other public transportation
    - ☐ Get dropped off
    - ☐ Drive alone
    - ☐ Drive in a carpool → Did you: ☐ Drive your own car? ☐ Drive a carshare or borrowed vehicle?
    - ☐ Uber, Lyft, or similar
    - ☐ Taxi
    - ☐ Other: _____

Information about you

The following information is valuable to the success of this study. We appreciate any answers you can provide and we assure you that this information will be kept confidential.

31. What is your gender? _____
32. What is your age? _____
33. What is your race or ethnicity? *Check all that apply*
    - ☐ American Indian or Alaska Native
    - ☐ Asian
    - ☐ Black or African American
    - ☐ Hispanic or Latino
    - ☐ Native Hawaiian or Pacific Islander
    - ☐ White
    - ☐ Some other race or ethnicity: _____
34. What is the highest level of school you have completed?
    - ☐ Less than high school
    - ☐ High school, GED, or equivalent
    - ☐ Some college or Associate's degree
    - ☐ Bachelor's degree
    - ☐ Graduate or professional school
35. What is your approximate annual household income after taxes?
    - ☐ $10,000 or less
    - ☐ $10,001 – $25,000
    - ☐ $25,001 – $35,000
    - ☐ $35,001 – $45,000
    - ☐ $45,000 – $60,000
    - ☐ $60,001 – $85,000
    - ☐ $85,001 – $100,000
    - ☐ $100,001 – $150,000
    - ☐ $150,001 – $200,000
    - ☐ $200,001 or more

Information on your current residence

23. What year did you move to your current address? _____ YYYY

24. Does the Federal, state, or local government pay any of the cost of your home or did you have to income qualify to live in your home? *Answer yes if you have a Section 8 voucher or live in public housing.*
    - □ Yes
    - □ No
    - □ I don't know

25. How would you order the top 3 factors you considered when moving to your current address? Write "1" for the most important factor, "2" for the second most important, and "3" for the third most important.
    - _____ Cost of housing
    - _____ Availability of a subsidized apartment
    - _____ Type or quality of housing
    - _____ Quality of local schools
    - _____ Quality of neighborhood
    - _____ Safety and security
    - _____ Near family and friends
    - _____ Near to job
    - _____ Near to stores/shopping
    - _____ Near to public transportation
    - _____ Near to highway
    - _____ Near to outside activities or recreation
    - _____ Other:_____
    - _____ Other:_____
    - _____ Other:_____

Information on your former residence

26. Where did you live before the place you live now?
    Address or nearest cross streets:

    _____

    City _____ Zip code _____

27. Do you drive more, about the same, or less than you did at your former address?
    - □ I drive more now
    - □ I drive about the same amount now
    - □ I drive less now
    - □ Not applicable: I didn't drive in either location

28. Do you take BART more, about the same, or less than you did at your former address?
    - □ I take BART more now
    - □ I take BART about the same amount now
    - □ I take BART less now
    - □ Not applicable: BART wasn't available because I didn't use to live in the Bay Area

29. Do you now work at the same place that you worked at when you lived at your former address?
    - □ Yes
    - □ No
    - □ Not applicable

15. How do you usually get from the BART station to your work?
    - □ Walk
    - □ Bicycle → Do you: □ Use your own bike? □ Use a bike share bike?
    - □ Bus or other public transportation
    - □ Get dropped off
    - □ Drive alone → Do you: □ Drive your own car? □ Drive a carshare or borrowed vehicle?
    - □ Drive in a carpool → Do you: □ Drive your own car? □ Drive a carshare or borrowed vehicle?
    - □ Uber, Lyft, or other ride share service
    - □ Taxi
    - □ Other: _____

16. Does your main job: *Check all that apply*
    - □ Allow you to work flexible hours?
    - □ Allow you to work from home? → On average, how many days per week do you work from home? _____ days
    - □ Provide free parking?
    - □ Provide transportation via commuter shuttle?
    - □ Provide a car for use during the day?
    - □ Help pay for public transportation?
    - □ Help pay for tolls, fuel, or other commuting costs? → What other costs?: _____

Information on BART travel

17. How often do you take BART for non-work activities like grocery shopping, visiting friends, or attending an event?
    - □ Never
    - □ Less than once per month
    - □ 1-3 days per month
    - □ 1-2 days per week
    - □ 3-4 days per week
    - □ 5 or more days per week

18. Why don't you take BART for non-work activities more often? *Check all that apply*
    - □ BART takes longer than other options
    - □ BART is too far from my home or destination
    - □ BART is unreliable
    - □ BART is too expensive
    - □ BART is crowded
    - □ BART is unsafe
    - □ Other: _____

19. How many trips did you take on BART last week? *Consider last week to be last Monday through last Sunday. One trip is one time riding BART, such as going from home to work in the morning, going from work to home at night, or going from work to the grocery store.*
    (if you took 0 trips, skip to question 21) _____ trips

20. Of the BART trips you took Monday through Friday last week, how many total trips started:
    - Before 7 am? _____ trips
    - From 7 am until 8:30 am? _____ trips
    - From 8:30 am until 4 pm? _____ trips
    - From 4 pm until 6 pm? _____ trips
    - 6 pm or later? _____ trips

21. Of the BART trips you took on Saturday or Sunday last week, how many total trips started:
    - Before 4 pm? _____ trips
    - 4 pm or later? _____ trips

→

Information on your daily travel

22. Please answer the following questions about THREE MAIN TRIPS you made yesterday. A trip means going from one place to another, like from home to work, from work to the grocery, or from a restaurant to home. If you went to work yesterday, please include at least one of your trips to or from work. If you did not make three trips yesterday, include all the ones that you did.

What day are you recording trips for? _____ / _____ / 2018
MM DD

TRIP 1

a. Where did you leave from?
Address or nearest cross streets (for example: Broadway & 14th):

_____

City _____ Zip code _____

b. What time did you leave? __ __ : __ __ ☐ AM ☐ PM

c. Where did you go to?
Address or nearest cross streets (for example: Shattuck & Haste):

_____

City _____ Zip code _____

d. What time did you arrive? __ __ : __ __ ☐ AM ☐ PM

e. How did you get to this place?

- □ Walk
- □ Bicycle → Did you: □ Use your own bike? □ Use a bike share bike?
- □ BART
- □ Bus or other public transportation
- □ Get dropped off
- □ Drive alone
- □ Drive in a carpool → Did you: □ Drive your own car? □ Drive a carshare or borrowed vehicle?
- □ Uber, Lyft, or other ride share service
- □ Taxi
- □ Other: _____
- □ I used multiple types of transportation (please describe): _____

f. What did you do at this place?

- □ Regular home activities (e.g. chores, sleep, etc.)
- □ Work
- □ School
- □ Shopping
- □ Eat
- □ Healthcare
- □ Pick up/drop off someone (including a child)
- □ Other errands
- □ Visit friends
- □ Recreation

TRIP 2

a. Where did you leave from?
Address or nearest cross streets

_____

City _____ Zip code _____

b. What time did you leave? __ __ : __ __ ☐ AM ☐ PM

c. Where did you go to?
Address or nearest cross streets

_____

City _____ Zip code _____

d. What time did you arrive? __ __ : __ __ ☐ AM ☐ PM

e. How did you get to this place?

- □ Walk
- □ Bicycle → Did you: □ Use your own bike? □ Use a bike share bike?
- □ BART
- □ Bus or other public transportation
- □ Get dropped off
- □ Drive alone
- □ Drive in a carpool → Did you: □ Drive your own car? □ Drive a carshare or borrowed vehicle?
- □ Uber, Lyft, or other ride share service
- □ Taxi
- □ Other: _____
- □ I used multiple types of transportation. (please describe): _____

f. What did you do at this place?

- □ Regular home activities (e.g. chores, sleep, etc.)
- □ Work
- □ School
- □ Shopping
- □ Eat
- □ Healthcare
- □ Pick up/drop off someone (including a child)
- □ Other errands
- □ Visit friends
- □ Recreation

TRIP 3

a. Where did you leave from?
Address or nearest cross streets

_____

City _____ Zip code _____

b. What time did you leave? __ __ : __ __ ☐ AM ☐ PM

c. Where did you go to?
Address or nearest cross streets

_____

City _____ Zip code _____

d. What time did you arrive? __ __ : __ __ ☐ AM ☐ PM

e. How did you get to this place?

- □ Walk
- □ Bicycle → Did you: □ Use your own bike? □ Use a bike share bike?
- □ BART
- □ Bus or other public transportation
- □ Get dropped off
- □ Drive alone
- □ Drive in a carpool → Did you: □ Drive your own car? □ Drive a carshare or borrowed vehicle?
- □ Uber, Lyft, or other ride share service
- □ Taxi
- □ Other: _____
- □ I used multiple types of transportation. (please describe): _____

f. What did you do at this place?

- □ Regular home activities (e.g. chores, sleep, etc.)
- □ Work
- □ School
- □ Shopping
- □ Eat
- □ Healthcare
- □ Pick up/drop off someone (including a child)
- □ Other errands
- □ Visit friends
- □ Recreation

Appendix C: Focus Group Materials

Focus Group Guide

Materials needed

- Name cards/tags
- Sign-in sheets
- Pens/markers
- Food
- Paper for notes
- Audio recorder

Introduction

1. Moderators introduce themselves as affiliates of University of California Transportation Center at UC Berkeley
2. About the focus group
    a. We will follow a "topic guide," which means we have a set of topics we would like to discuss but this is an open discussion, and you should feel free to bring up issues relevant to our conversation today.
    b. There are no right or wrong answers and everyone's knowledge and opinion matters
    c. We ask that you speak one at a time, so we can accurately record what the group says
    d. We won't take any longer than 90 minutes and we'll have an incentive for you on the way out
3. Review consent document and collect forms.
4. Distribute survey. (Separate page)

Basic information

Today, we want to talk about your experiences living near BART. We're going to ask you questions about why you moved into your current residence and how you travel. Before we get started, we'd like to ask you to introduce yourselves to the group. Please share your first name or nickname, which BART station you live near, and how long you have lived there. If you have not already put your name on your name card, please do so now.

Group responds

Travel experiences

- I'd like to start by asking how you usually get around for your trips, like work, shopping, medical appointments, or religious service.
    - Why do you choose these modes of travel?

    - How often do you walk for these types of trips?
    - What makes it easy for you to walk to these places? What discourages you from walking there? [*Probes: Neighborhood safety, traffic safety, nearby/faraway destinations, streetscaping, sidewalk quality and networks*]
- Do you have other options available to you for trips? When it is likely that you would use those modes of travel? [*If necessary: What about walking, driving, taking the bus, cycling, Uber/Lyft*]
    - What kinds of trips do you use BART for?
    - Does your mode of transportation change depending on where you need to go ow what you need to do?
- How have you changed the types of transportation you use since moving into your current residence? Why have you made these changes?
- What do you like about transportation in the Bay Area? How would you compare that to other places you have lived or people you know who live elsewhere?
- What challenges do you face when getting around the Bay Area? How would you compare those challenges to others you might face living somewhere else in the region?

Car Use and Shared Mobility

Next, I'd like to ask you about driving, parking, and other forms of traveling around the Bay Area.

- How often do you drive?
    - *If necessary*: Do you own a car? How many? How many licensed drivers live with you?
- How often do you have to borrow a car to get places? Why might you borrow a car? What types of places would you need to borrow a car to get to? Who do you borrow from?
    - *If necessary*: What about a paid car sharing service?
- How often do you use Uber, Lyft, or another ride share service to get around?
    - What types of trips do you use these services for?
    - What do you like about these services?
    - What do you dislike?

If time:

- Do you have to pay for parking at your address? How easy or difficult is it to find parking?
- Do you have free parking available to you at work? Do you think this influences whether you drive to work or not?
- Do you have a bike share station near your address? How often do you use bike share? What do you like about it? What do you dislike?
- Have you used a shared electric scooter before, like a Lime or Bird scooter? Where did you take it? Tell me about your experience.

Travel costs

Next, I'd like you to think about how much you pay for things, like transportation, housing, and other goods.

- How do you include transportation costs in your budgets? What tradeoffs have you had to make in household budgeting to account for transportation costs? In other words, do you find yourself having to cut out other things from your budget to make sure you have your transportation needs covered?
- How have your transportation costs changed since you moved into your current residence?

Residential location

Finally, we'd like to ask you some questions about your current and former residence.

- How would you describe your place of residence and your neighborhood? How does it compare to where you lived previously?
- Why did you choose to move to your current residence?
    - *If necessary:* How important was it for you to live near BART?
- What are some of the advantages living near BART? What are some of the disadvantages?
- What do you like about your neighborhood? What do you dislike?
    - *Prompts: Scale (how much housing vs retail/services options), density (building heights, number of developments), land uses (what land uses are important, which are missing, which would you prefer not be in the neighborhood)*
- How did you usually commute to work at your former residence? How did you usually get around for other trip purposes, like shopping, or medical appointments, or religious services?
- Do you find yourself traveling on BART more, less, or about the same as before you lived in your current residence? Why?
- How does getting around now, in general, compare to your previous residence?
- What types of places do you have access to now that you live near BART? Are there places you can't get to now that you used to be able to?
- Have you changed jobs since moving into your current residence? Did having transportation nearby influence where you decided to look for jobs?

Conclusion

- What are the most important transportation challenges that Bay Area planners should address?
- Are there other things about transportation in the Bay Area that you'd like to share that we haven't already discussed?

Focus Group Survey

See next page

BART Housing Study: Focus Group Survey

Thank you for participating in today's focus group. Before we start, please fill out the brief survey below. Your answers will help us understand more about who is attending today and how living near BART affects your travel.

1. Which housing development do you live in?

   Development Name: _____

   Street: _____

   City: _____

2. How many years have you lived at your current address? _____ years
3. Does the Federal, state, or local government pay any of the cost of your home or did you have to income qualify to live in your home? (Answer yes if you have a Section 8 voucher.)

   ☐ Yes

   ☐ No

4. How many cars do you own? _____ cars
5. How many licensed drivers live at your address? _____ drivers
6. How much do you estimate you spend **per month** on transportation in the following categories?

   a. Car payments for a car you own or lease $_____
   b. Car rentals, sharing, or borrowing $_____
   c. Gas $_____
   d. Car insurance $_____
   e. Parking $_____
   f. BART and bus fares $_____
   g. Other (please name): _____ $_____

7. What was your total household income in the last 12 months after taxes?

   ☐ Less than $25,000

   ☐ $25,000 to $49,999

   ☐ $50,000 to $99,999

   ☐ $100,000 or more

8. What is the primary language you speak at home? _____

Focus group ID: _____