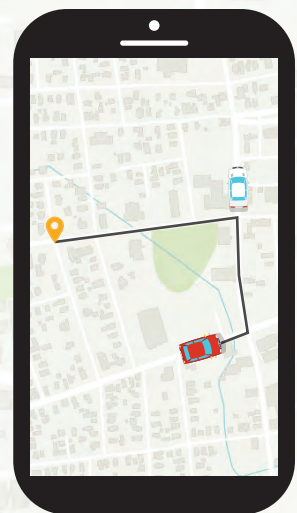# Potential Impacts of Ride-Hailing on the Brockton Area Transit Authority (BAT)

Report compiled by the Metropolitan Area Planning Council with assistance from the Old Colony Planning Council

August 2, 2019

ACKNOWLEDGEMENTS

TABLES & FIGURES

1. PROJECT BACKGROUND

The Brockton Area Transit Authority (BAT) commissioned this study to evaluate whether BAT's declining ridership in recent years is due to the growth in ride-hailing services[1] or to other factors. According to the official data from the Massachusetts Department of Public Utilities (DPU), there were 433,835 ride-hailing trips that started in the City of Brockton in 2017, with over 200,000 additional ride-hailing trips originating in the other communities that are part of the BAT service area. In 2018, ride-hailing usage increased by over 60 percent in Brockton and collectively in the other communities that are part of the BAT service area. In 2018, the average ride-hailing trip length was 4.8 miles, and lasted 15.6 minutes. Given the relatively short distance of these typical ride-hailing trips, some that began in Brockton may be competing with BAT services, and may have had an impact on BAT ridership, which has been lower than previous years.

Brockton's recent decline in transit ridership reflects statewide and national trends[2] that correlate with the explosive growth in ride-hailing. While studies have found that Uber and Lyft riders have switched some transit trips for ride-hailing, other studies have suggested that several factors, such as increased car ownership, and even the growth in e-commerce, have had a greater impact on transit ridership than ride-hailing.

This study will explore whether the growth in ride-hailing is having an impact on BAT ridership, whether changes in BAT services might address the decline in transit ridership (due to ride-hailing and other factors), and what potential partnerships BAT should consider with ride-hailing providers to boost the overall performance and coverage of transit. Specifically, the questions considered in this study:

1. What information is available on ride-hailing trips and services in BAT's service areas?
2. What are other likely factors contributing to ridership decline?
3. Which examples of successful ride-hailing/transit partnerships are most relevant to BAT?
4. What steps could BAT undertake to further understand the impacts of ride-hailing in the BAT service area, and to evaluate potential partnerships – specifically in terms of customer service, costs, equity, and ridership?

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1 Examples of ride-hailing companies are Uber and Lyft, sometimes referred to as Transportation Network Companies (TNCs). They operate differently from traditional taxi companies, in that ride-hail drivers are considered independent contractors (providing their own vehicles), and the ride-hail companies typically do not own or directly operate the vehicles. For the purposes of this report, we will use the terms ride-hail and ride-hailing.

2 US Annual unlinked passenger transit trips have decreased from 10.7 billion in 2014 to 10.1 billion in 2017 (APTA Fact Book, 2018); similarly, Massachusetts's annual RTA trips have decreased from 33.4 million in 2016 to 30.3 million in 2018, and have remained relatively flat since 2007 (2018 MassDOT Annual Report on Regional Transit Authorities, December 31, 2018).

2. ANALYSIS OF EXISTING DATA

BAT and its Service Area

The Brockton Area Transit Authority (BAT) is one of 15 regional transit authorities (RTAs) in the Commonwealth of Massachusetts. BAT provides public transportation for the greater Brockton area, as well as between Brockton and the Ashmont Station in Dorchester. BAT services 17 communities with some form of transit service, including fixed-route and paratransit[3] service.

BAT's 18 fixed routes primarily serve Brockton, but also extend into portions of Abington, Avon, Bridgewater, Easton, Rockland, Stoughton, and Bridgewater State University. Nearly all of the routes operate on a pulse system, starting and ending at the BAT Intermodal Centre in downtown Brockton at approximately the same time to allow for easier connections between bus routes. The two exceptions are Route 13, the Mini Maller, which serves western Brockton and the retail areas in and around Westgate Mall; and the Rockland Flex, which serves eastern Brockton, Abington, and Rockland. BAT's fixed-route fleet consists of approximately 50 buses. Service hours on most routes are 6:00 A.M. to 9:00 P.M. on weekdays, with the exception of Route 12, where service extends past 9:00 P.M. BAT operates a reduced schedule on weekends and major holidays. BAT's typical full one-way fare is one dollar and fifty cents to two dollars and twenty five cents, depending on the route, with discounts available for students, seniors and persons with disabilities.

3 Paratransit is typically an origin-to-destination service based on prior reservations that is primarily used to meet the needs of the elderly and disabled.

BAT also maintains a successful, longstanding partnership with Bridgewater State University (BSU) that has been identified as a best practice state-wide at the 2018 Regional Transit Authority Task Force. BAT provides buses, training, and maintenance, and BSU provides student drivers, student managers, fuel, and professional administration.

BAT's paratransit service (DIAL-A-BAT) serves people with disabilities and seniors in Brockton, Abington, Avon, Bridgewater, East Bridgewater, Stoughton, West Bridgewater, Whitman, and parts of Easton, Hanson, and Rockland. DIAL-A-BAT serves all of Brockton as well as trips in other municipalities where the trip origin or destination is within three-fourths of a mile of BAT fixed route bus service. DIAL-A-BAT operates a fleet of 37 mini-buses designed for easier boarding by those with disabilities and seniors. BAT also assists with transportation for area Councils on Aging (CoA).[4]

BAT maintains a diverse and multilingual workforce that reflects the demographics of its service area. Administrative staff, supervisors, and operators are able to provide language assistance in trip planning, service announcements, and translation services for public meetings and documents.

To further increase accessibility and improve customer service, BAT created the position of Navigator. BAT's Navigator is multi-lingual and based out of the fully accessible BAT Intermodal Centre, where every major bus route originates or terminates. BAT has also recently hired a multilingual Administrative Assistant to further help customers at BAT's Administrative Offices and provide back-up to the Navigator.

Given that most BAT trips start or end in Brockton, MAPC analyzed the city's most recent 2013-2017 American Community Survey (ACS) data to determine recent trends in demographics, transportation, and employment. Where possible, MAPC compared the most recent data to 2010 Census data and other 2010 data, as this allowed for a more complete picture of emerging trends in population, employment, and commuting.

As seen in Table 1, Brockton's estimated population is 95,161, a slight increase since the 2010 US Census. Although the total number of households has decreased from 2010 to 2017, there has been an increase in average household size. During this time, the median age of Brockton's population has not significantly changed, although there has been an increase in the number of workers 16 years and older.

Brockton's population has become more diverse, with an increase in the number of people who identify as African-American or Hispanic/Latino. Brockton seems increasing to be a magnet for immigrants in Massachusetts: the percentage of Brockton residents who are foreign-born has increased since 2010, as has the percentage of those who speak a language other than English.

Massachusetts's median household income has increased nearly 15 percent between 2010 and 2017. During that same period, Brockton's median household income rose less than 5 percent, and today stands at $52,393, well below the statewide median of $74,167.

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4 Avon, Bridgewater, East Bridgewater, Easton, Hanson, Rockland, Stoughton, West Bridgewater, and Whitman.

Table 1. Select Demographic Data for City of Brockton, 2010 and 2017

	2010 Census	2013-2017 ACS
City of Brockton		
Total Population	93,810	95,161
Total Households	33,303	31,991
Average Household Size	2.76	2.90
White*	42.9%	36.6%
African-American*	29.8%	39.3%
Hispanic or Latino	10.0%	10.6%
Foreign-Born Population**	23.7%	27.9%
Population who speak English only**	65.5%	57.2%
Population who speak language other than English**	34.5%	42.8%
Median Age	35.9	35.5
Median Household Income**	$49,913	$52,393

Note: All changes from 2010 and 2017 shown here are outside of the margin of error for 2013-2017 data.
*Not Hispanic or Latino
**2010 Data from 2006-2010 American Community Survey (ACS)

The mean travel time to work, and the percentage of people who drive or get a ride rather than using transit in Brockton changed little between 2010 and 2017 (see Table 2). The percentage of households with one vehicle, and that of households with no vehicles, also remained stable, though the margin of error may be masking a decrease. There are relatively fewer households with two vehicles, but relatively more households with three or more vehicles. There may, therefore, be a growing divide in Brockton between households with no or one vehicle and households with three or more vehicles.

Table 2. Travel Time to Work, Means of Transportation to Work, Vehicles per Household in Brockton

	2006-2010 ACS	2013-2017 ACS	MOE (2017)
Mean Travel Time to Work	29.3 min	30.9 min	1.0 min
Workers 16 years and over	42,560	44,155	843
Means of Transportation to work – car, truck, van	88.7%	86.6%	1.4%
Public Transportation	6.6%	7.5%	1.1%
Workers 16 years and over in households	42,418	44,059	851
Households with no vehicle available	4.3%	5.5%	1.1%
Households with one vehicle available	26.9%	28.7%	2.0%
Households with two vehicles available	43.5%	37.3%	2.2%
Households with three or more vehicles available	25.3%	28.5%	2.2%

ACS = American Community Survey; MOE= margin of error, plus or minus

Employment patterns also play a role in people's commuting decisions. Between 2010 and 2017, Brockton gained approximately 3,000 jobs. As seen in Table 3, health care continues to be the largest employment sector. These jobs are associated with Brockton hospitals, but only in part: the number of "health care establishments" in Brockton has increased dramatically. The average weekly wages for health care workers, however has decreased – from $1,077 in 2010 to $989 in 2017 (both in 2017 dollars). This may be an indicator of the expansion in home health care in Massachusetts.[5] These jobs often require workers to provide their own transportation to travel from patient to patient.

Another employment trend to note is the dramatic decrease in manufacturing and the growth in construction jobs. While both of these industries have higher-than-average wages, construction jobs often require workers to use their own transportation to reach various job sites, and manufacturing jobs are often structured in shifts.

Table 3. Employment in Brockton, 2010 and 2017

	2010	**2017**	**2017 Avg. Weekly Wage**
Utilities	395	422	$2,097
Construction	923	1,246	$1,470
Manufacturing	2,010	1,018	$1,034
Wholesale Trade	1,018	1,182	$1,294
Retail trade	4,600	4,930	$649
Transportation and Warehousing	1,619	1,723	$954
Information	510	275	$1,430
Finance and Insurance	801	615	$1,170
Real Estate and Rental/Leasing	274	309	$937
Professional and Technical Services	778	673	$1,189
Management of Companies and Enterprises	522	860	$1,750
Administrative and Waste Services	2,186	1,721	$525
Educational Services	3,377	3,596	$1,095
Health Care and Social Assistance	11,348	13,701	$989
Arts, Entertainment, and Recreation	279	291	$433
Accommodation and Food Services	2,293	2,443	$373
Other Services	2,436	2,242	$563
Public Administration	1,489	1,579	$1,544
Total Employment	36,857	39,939	$955

Source: ES-202, Massachusetts Executive Office of Labor and Workforce Development

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5 Health Care Employment, Structure and Trends in Massachusetts. December 2016.

Fixed Routes

Overall Ridership Trends

The 2015 Comprehensive Regional Transit Plan (CRTP) noted that BAT average weekday ridership declined 3 percent between 2010 and 2014, to approximately 10,250 in 2014. Between 2015 and 2018, that downward trend has continued in average daily ridership, with a 3.2 percent system wide decrease between 2015 and 2018 (Figure 1).

Figure 1. BAT Fixed-Route Trends, 2015-2018

BAT Fixed Route Average Daily Ridership, 2015-2018

BAT Fixed Route Passengers per Revenue Mile, 2015-2018
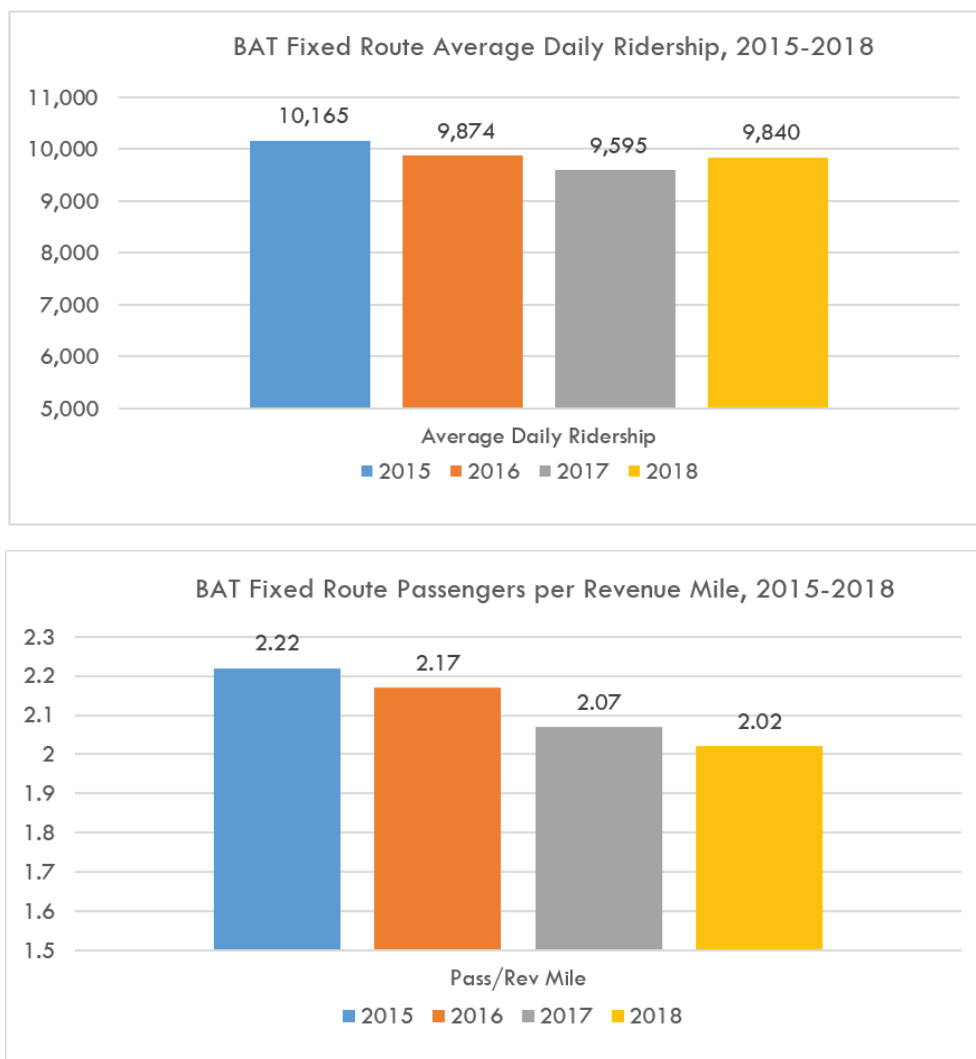
Figure 1. BAT Fixed-Route Trends, 2015-2018
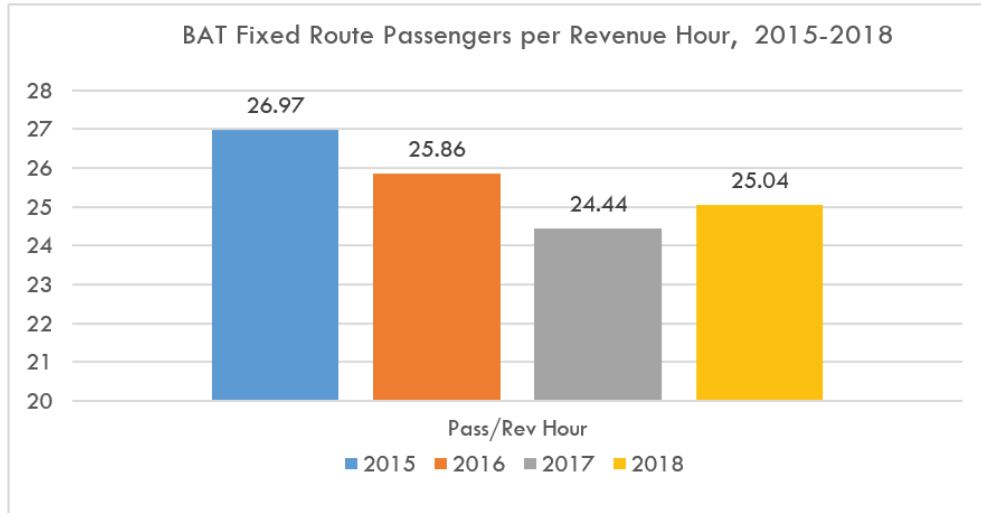
Route Performance

Of the BAT fixed routes, the Ashmont Route 12, which runs between Brockton and Boston, and connects to the MBTA Red Line at Ashmont Station, has by far the highest ridership. The three highest ridership bus routes operating primarily in Brockton are the Campello Route 2, the Belmont Street Route 3, and the Westgate Route 4. As seen in Figure 2, nearly all of the fixed routes have seen decreasing ridership since 2015, with nearly half seeing double-digit decreases. Only the Ashmont Route 12 and Route 13 Mini-Maller have seen modest increases in ridership since 2015.

Figure 2. BAT Weekday Fixed-Route Ridership, 2015-2018

Figure 2. continued

BAT Ashmont Route 12 Ridership, 2015-2018
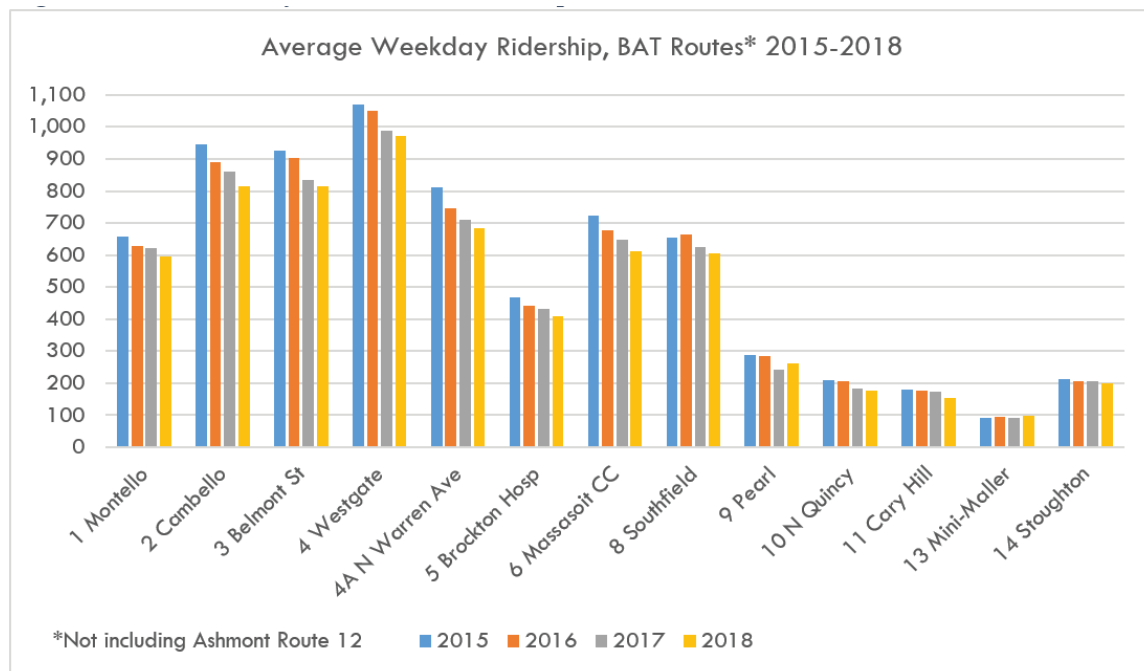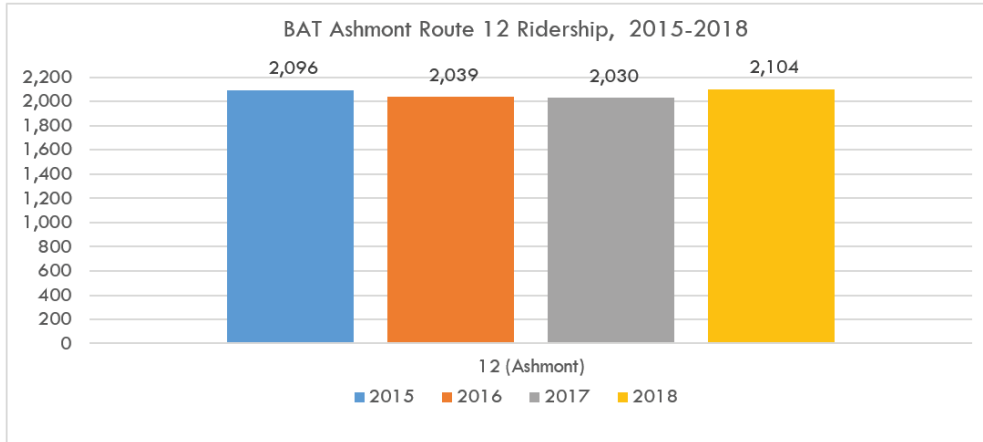
Weekend ridership trends tell a similar story, with Saturday ridership down nearly 12 percent since 2015. Nearly every route is down by double digits since 2015 except Ashmont Route 12, which increased approximately 3 percent on Saturdays; and the Route 13 Mini-Maller, which has grown, but which has the lowest ridership of all fixed route. System-wide Sunday ridership is down less than 1 percent since 2015; but only half of the routes operate, and the figures include the 31 percent growth in the Ashmont Route 12. The increase in the Ashmont Route 12 ridership is likely due in part to the relatively new option of Sunday service on that route, which started in 2015.

Time of Day Ridership

To determine the times at which ridership changed, BAT provided MAPC with hourly boarding rates for October in the years 2015 through 2018. In all of the fixed routes outside of Route 12, there are decreases in each operating hour, with the largest percentage of declining ridership in the hours of 9:00 A.M., Noon, and 3:00 P.M., as well as after 6:00 P.M. The largest decline, at 9:00 A.M., is partially due to a service decrease at that hour that began in July 2018. Data for Ashmont Route 12, which has seen modest ridership increases year to year, do not show substantive boarding changes in peak versus off-peak hours.

Figure 3. Percent Change in BAT Fixed-Route Ridership per Hour, 2015 - 2018
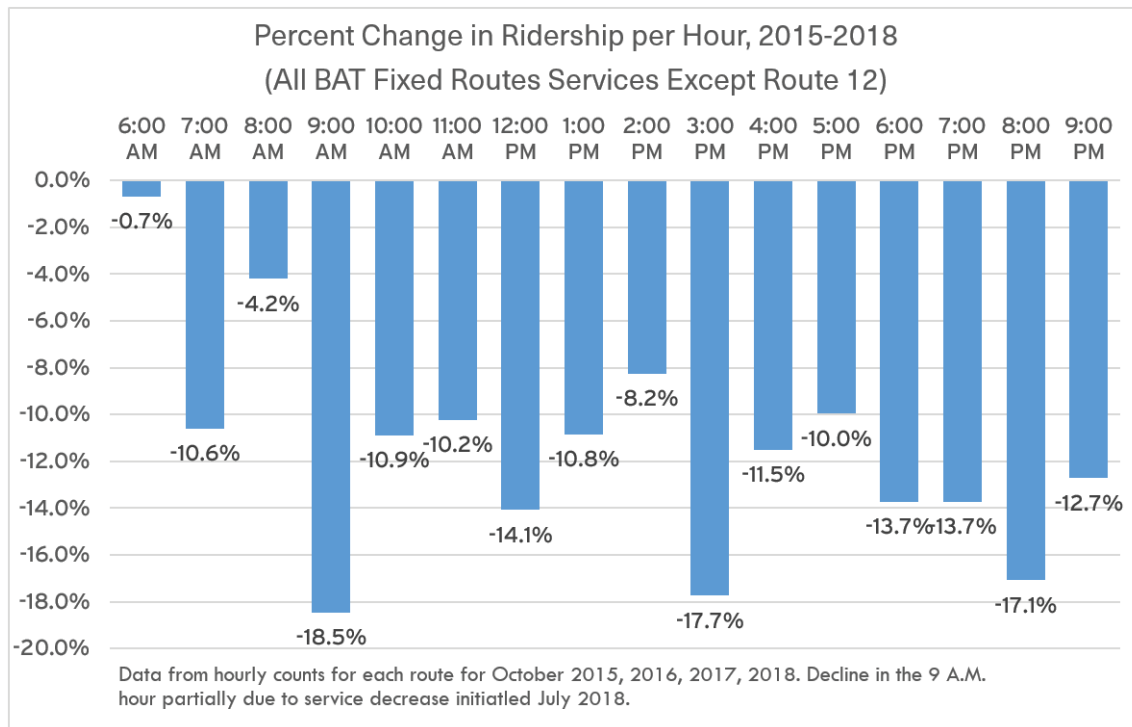
Possible Gaps in Service Area

The 2015 CRTP noted a concentration of jobs outside of the BAT fixed route services in Abington, Avon, downtown Bridgewater, Rockland, and West Bridgewater (Figure 4). As seen on the Census Bureau's OnTheMap website,[6] the areas with the largest concentrations of jobs and without fixed-route transit are the wholesale, retail, and warehousing jobs in northwest Avon near Route 24, and the office and manufacturing employment clusters near Route 3 in Rockland. According to Census data, Brockton is the largest source of commuters to the jobs in Avon and Rockland. This may indicate an untapped transit market for BAT.

6 https://onthemap.ces.census.gov/

Figure 4. Employment Density in BAT Service Area (2015)
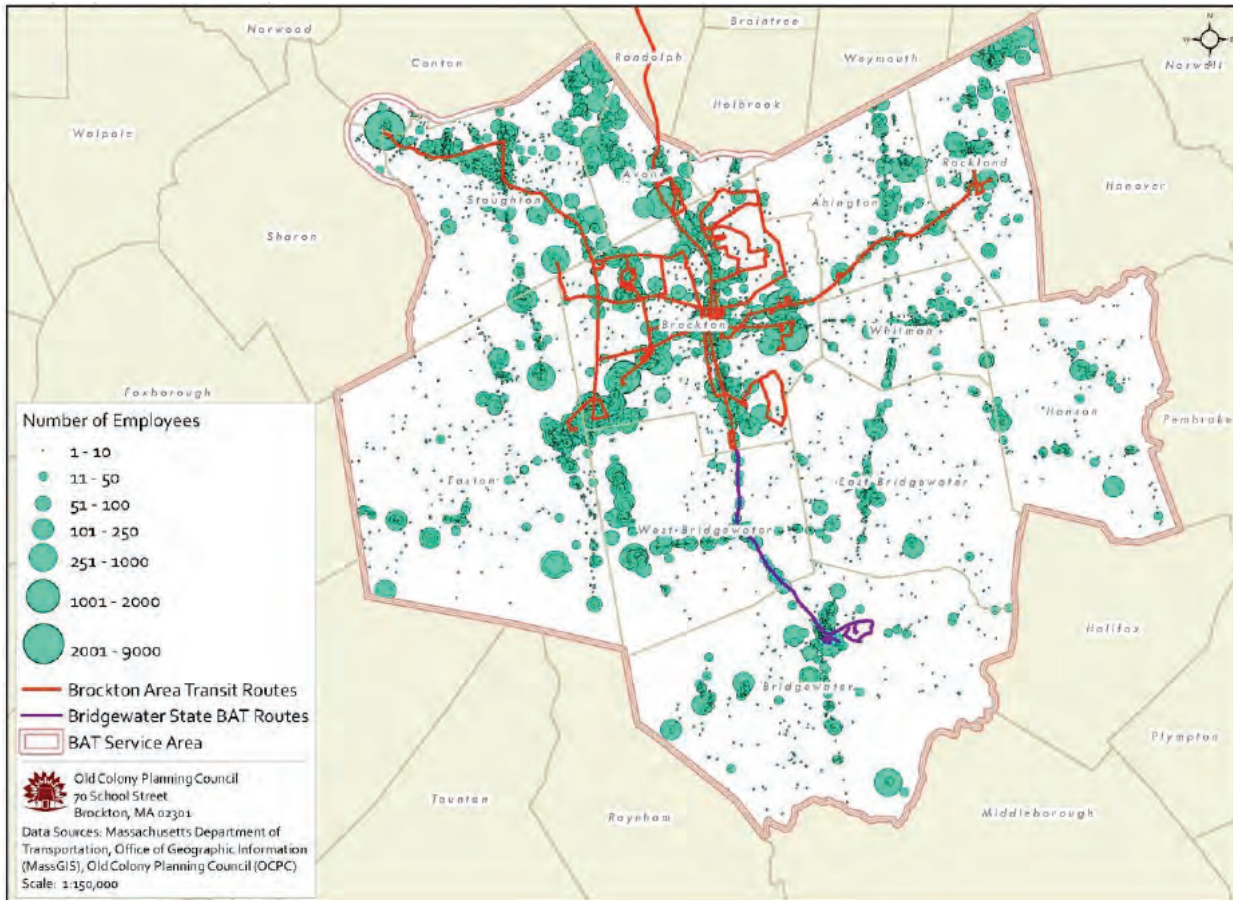
From 2015 Brockton Area Transit Authority Comprehensive Regional Transportation Plan. Map created by OCPC.

Paratransit

BAT operates a paratransit service (DIAL-A-BAT) primarily for people with disabilities and seniors (65 years old and older). The services are available within three-quarters of a mile of fixed route services. BAT also provides medical transportation to over 40 medical facilities in the BAT service area, as well as contracted transportation to Councils on Aging (COA) in Avon, East Bridgewater, Easton, Rockland, Stoughton, West Bridgewater, and Whitman.

The 2015 CRTP notes that DIAL-A-BAT ridership declined between 2010 and 2014. The 2017 and 2018 total paratransit ridership data show a further decrease in both DIAL-A-BAT and Council on Aging annual trips. This is despite projected growth in the aging population in the BAT service area. Conversations with BAT staff suggest that the decline may be due to the changes in demographics in the area, recent fare increase, the decentralization of medical services, and the increase in home health care throughout the region.

Figure 5. BAT Demand Response Data, 2017-2018

BAT Demand Response Trips, 2017-2018

	2017	2018
Councils on Aging	35,446	31,275
Dial-a-BAT	144,074	141,849

■ Dial-a-BAT   ■ Councils on Aging

BAT Demand Response Passengers per Revenue Hour, 2015-2018

2015	2016	2017	2018
2.57	2.58	2.52	2.56

■ 2015   ■ 2016   ■ 2017   ■ 2018
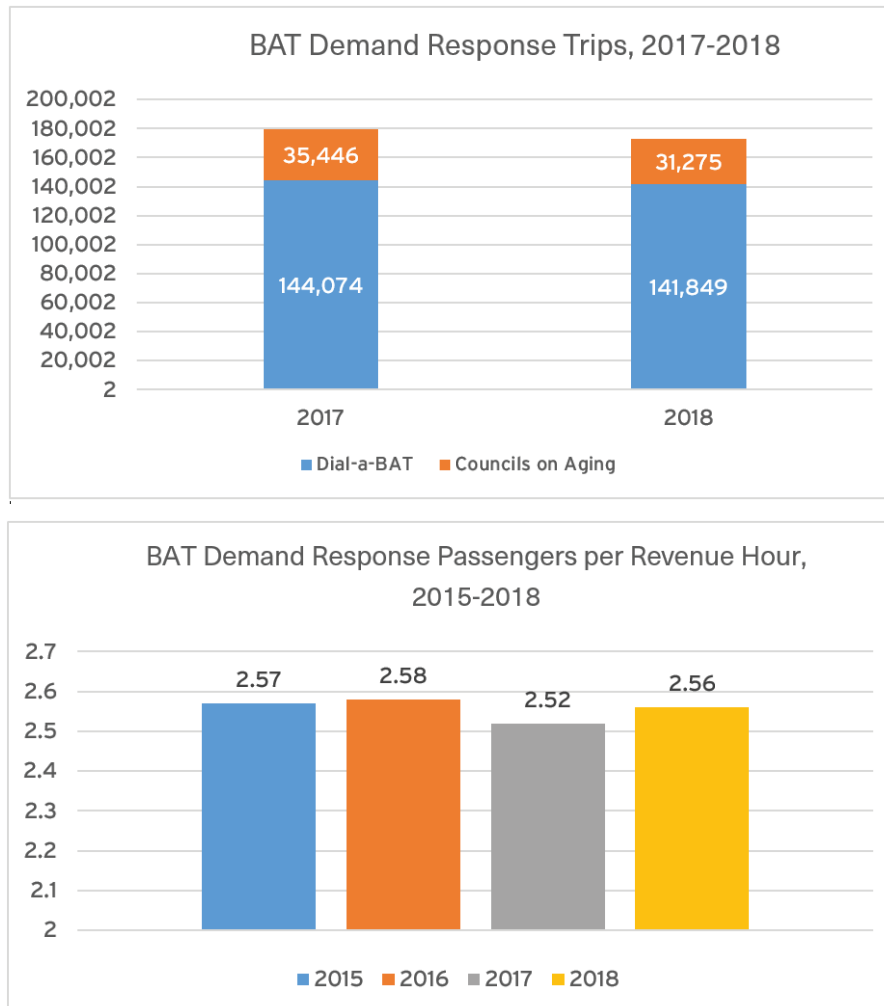
MBTA Services

The MBTA also provides transit service – three commuter rail stations and two bus routes – in the BAT service area.

MBTA Bus Services

The MBTA and MassDOT recently undertook a comprehensive review of each MBTA bus route as part of the MBTA's Better Bus Project. This review included an analysis of the MBTA bus route 230, which operates between Boston and Brockton. Route 230 connects to the MBTA Red Line at Braintree, Quincy Adams, and Quincy Center, as well as to the Montello commuter rail station in Brockton. The review also looked at the MBTA bus route 240, which connects Boston and Avon, with two stops on the MBTA Red Line (at Ashmont and Central Avenue). One-way MBTA bus fares are $1.70 with a Charlie Card and $2.00 for cash, with discounts for seniors, students, and people with disabilities.

The MBTA's analysis found that, because of traffic congestion and the trip length, both routes have poor on-time performance, but are important connectors for residents. As does the BAT Route 12, the routes primarily take people into Boston to connect to the MBTA Red Line. Interestingly, although these MBTA routes somewhat parallel BAT Ashmont Route 12, they have experienced declining ridership (Table 4). The MBTA is not recommending any changes to the routes as part of their Phase One individual route revisions, but there will be a system-wide Phase Two Bus Network Redesign in 2019.

Table 4. 2012 versus 2018 Average Weekday Ridership, MBTA Routes 230 and 240

MBTA Route	2012	2018	Change
230 (Montello Commuter Rail Station – (Quincy Center)	1,730	1,600	-7.5%
240 (Avon Square – Ashmont)	2,910	2,500	-14%

2012 figures rounded to nearest 10. Sources: Ridership and Service Statistics, Fourteenth, Edition, 2014 (2012 data); MBTA Better Bus Project, 230 and 240 Route Overviews, 2018.

MBTA Commuter Rail

Commuter rail services offered by the MBTA serve Brockton via the Middleborough/Lakeville line, with stops at Campello, downtown Brockton, and Montello. Other commuter rail stops in the BAT service area include Bridgewater, Stoughton (Stoughton/Providence Line), and Abington (Kingston/Plymouth Line). Standard one-way rail fares to Boston South Station range between $8.25 and $10.00, depending on the origin station; discounted fares are available for seniors, students, and people with disabilities.

A vast majority of the riders use the commuter rail to commute to work in and out of Boston. Recent 2018 ridership survey data (Table 5) show strong growth in ridership on the Middleborough/Lakeville Line since 2012, when the last commuter rail ridership survey was completed. Brockton continues to be one of the busiest stations on the line, and one of the fastest growing in overall ridership. According to MBTA survey data, the downtown Brockton station has seen an 88 percent increase in boardings to Boston since 2012. Other stations on the Middleborough/Lakeville line in the BAT service area saw more modest increases in boardings ranging from 7 to 23 percent.[7] This growth in Brockton's commuter rail ridership shows that Boston continues to be the major destination for regional work trips, and that the recent growth in housing in downtown Brockton likely includes a growing number of residents commuting into Boston.[8]

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7 https://www.mass.gov/lists/2018-commuter-rail-counts

8 Boom in Transit Ridership Could Signal Big Changes for Brockton, Taunton Gazette, March 30, 2019. https://www.tauntongazette.com/news/20190330/boom-in-transit-ridership-could-signal-big-changes-for-brockton

Table 5. 2018 Commuter Rail Average Daily Counts on Select Middleborough/Lakeville Line Stations

Station	Trains to Boston – ons (Boardings)	Trains to Boston – offs (Alightings)	Trains from Boston – ons (Boardings)	Trains from Boston – offs (Alightings)
Bridgewater	588	12	12	531
Campello	326	24	8	318
Brockton	546	31	30	526
Montello	395	10	21	387

Source: Spring/Fall 2018 CTPS Commuter Rail Passenger Counts,
https://www.mass.gov/lists/2018-commuter-rail-counts

Peer Transit Agencies in Massachusetts

A review of transit data for the MBTA and three other peer Massachusetts RTAs – the Greater Attleboro Transit Regional Authority (GATRA), the Lowell Regional Transit Authority (LRTA), and the Worcester Regional Transit Authority (WRTA) – show similar bus ridership declines. Data from 2015 through 2017 – the three most recent years of data from the National Transit Database – show that the MBTA has seen a 13 percent drop, GATRA a nearly 16 percent decrease, LRTA a 7 percent decrease in annual bus trips, and WRTA a more than 5 percent decrease (Table 6).[9] These decreases are not unique to Massachusetts: nationwide, total transit ridership has decreased nearly 4 percent since 2015, and bus ridership has dropped almost 8 percent.[10]

Table 6. Annual Bus Trips, BAT and Peer Massachusetts Transit Agencies, 2015-2017

	2015	2016	2017	Percent Change, 2015-2017
BAT	2,845,824	2,852,686	2,720,902	-4.4%
GATRA	904,686	852,744	764,345	-15.5%
LRTA	1,536,250	1,514,841	1,425,640	-7.2%
WRTA	3,814,451	4,040,499	3,599,241	-5.6%
MBTA	122,479,984	113,777,520	106,326,072	-13.2%

Source: National Transit Database (NTD): https://www.transit.dot.gov/ntd III.

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9 National Transit Database, https://www.transit.dot.gov/ntd. Data reporting requirements by NTD may produce slightly different ridership numbers than those reported in other documents, such as transit agency and annual reports.

10 https://www.transit.dot.gov/ntd/ntd-data

3. RIDE-HAILING, TAXI, AND LIVERY ACTIVITY IN THE BAT SERVICE AREA

Ride-Hailing Activity

Because ride-hailing companies like Lyft and Uber are private corporations, there are limited data sources publicly available on the impact of these newer technologies. To better understand the growth in ride-hailing in Massachusetts, MAPC reviewed data reported by Uber and Lyft to the Massachusetts Department of Public Utilities, as well as data shared by Uber in their Uber Movement online tool.

Ride-Hailing Data Submitted to DPU for Calendar Years 2017 and 2018

According to the Department of Public Utilities, there were 81.3 million ride-hailing trips statewide in 2018.[11] Of those, 1,059,129 (about 1 percent), originated in BAT service area. Overall, this was a 62 percent increase in the total number of ride-hailing trips originating in each community between 2017 and 2018. The BAT service area has seen a relative increase in ride-hailing trips significantly higher than the overall 25 percent state increase.

Ride-hailing trips have more than doubled in all BAT communities. These increases in ridership indicate that ride-hailing is not just limited to cities. Of the total ride-hailing trips in the BAT service area, 67 percent originated in Brockton, followed by Stoughton (10 percent) in 2018. As shown in Table 7, the ride-hailing trips of the other BAT service area communities have ride-hailing trip origin percentages ranging between one to four in 2018. By comparison, of the statewide total, approximately 50 million trips, or 62 percent, originated in Boston and Cambridge alone.

Table 7. Number of Trip Origin Ride-Hailing Trips in BAT Service Area Communities

Municipality	Number of Trip Origin Trips in 2017	Percent of Total	Number of Trip Origin Trips in 2018	Percent of Total	Percent Change (2017-2018)
Brockton	433,885	66%	706,754	67	63%
Stoughton	70,721	11%	109,030	10	54%
Abington	29,620	5%	46,512	4	57%
Rockland	26,884	4%	44,289	4	65%
Easton	22,119	3%	36,288	3	64%
Bridgewater	20,900	3%	34,882	3	67%
Avon	16,300	2%	25,409	2	56%
Whitman	16,300	2%	21,609	2	67%
West Bridgewater	7,800	1%	15,218	1	95%
East Bridgewater	7,463	1%	12,721	1	70%
Hanson	4,012	1%	6,417	1	60%
TOTAL	**652,654**		**1,059,129**		**62**%

Source: 2017 and 2018 Rideshare Data Reports, Rideshare in Massachusetts, Department of Public Utilities.

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11 https://www.mass.gov/orgs/tnc-division. Data are collected by DPU as required in the 2016 legislation regulating Transportation Network Companies in Massachusetts. Because of newness of the regulations, no data are available prior to 2017.

Seventy-five percent of ride-hailing trips that started in Brockton ended in Brockton, followed by Bridgewater at 46 percent. With the exception of Brockton, more people are using ride-hailing to leave these communities than to enter them. The percent of ride-hailing trips that start and end in same community range from 7 percent in Avon to 32 percent in Easton. These variations show that ride-hailing services are used differently by communities in the BAT service area.

Table 8. Number of Trip Origin and Destination Ride-Hailing Trips in BAT Service Area Communities

Community	Number of Origin Trips	Percent of Origin Trips within Community (%)	Number of Destination Trips	Percent of Destination Trips within Community (%)
Brockton	706,754	75	685,150	77
Stoughton	109,030	30	111,449	28
Abington	46,512	25	47,856	25
Rockland	44,289	26	43,934	26
Easton	36,288	32	38,947	29
Bridgewater	34,882	46	35,222	45
Avon	25,409	9	26,389	8
Whitman	21,609	25	22,373	24
West Bridgewater	15,218	15	16,333	14
East Bridgewater	12,721	17	13,500	16
Hanson	6,417	22	7,030	20
TOTAL	**1,059,129**		**1,048,183**	

Source: 2018 Rideshare Data Report, Rideshare in Massachusetts; Department of Public Utilities.

Uber Movement Dataset

Uber Movement is a tool provided by Uber that displays average travel times on a census tract level for select cities, including Boston. To determine ride-hailing use, MAPC collected one month each from 2016, 2017, and 2018 of travel-time data for trips that originated in the BAT Intermodal Centre's census tract.

Uber Movement displays data only when a census tract is the destination for a certain minimum number of Uber trips originating from the BAT Intermodal Centre's census tract. If a census tract was the designation for fewer than that minimum, Uber Movement does not show the data. The number of trips is not available, but the data do provide some insight into the growth of the ride-hailing.

Figure 6, below, shows where a minimum number of Uber trips originated in or near the BAT Intermodal Centre, and does so for three years. Light green shows areas where there were a minimum number of Uber trips in 2016; darker green areas show where the minimum number of Uber trips were reported for 2016 and 2017, and the darkest green areas show those areas where a minimum number of Uber trips are reported for all three years (2016, 2017, and 2018.) The figure shows that the area from which the minimum number of Uber trips have originated over three years has steadily increased.

Figure 6. Uber Movement Trip Origin Census Tract: BAT Intermodal Centre
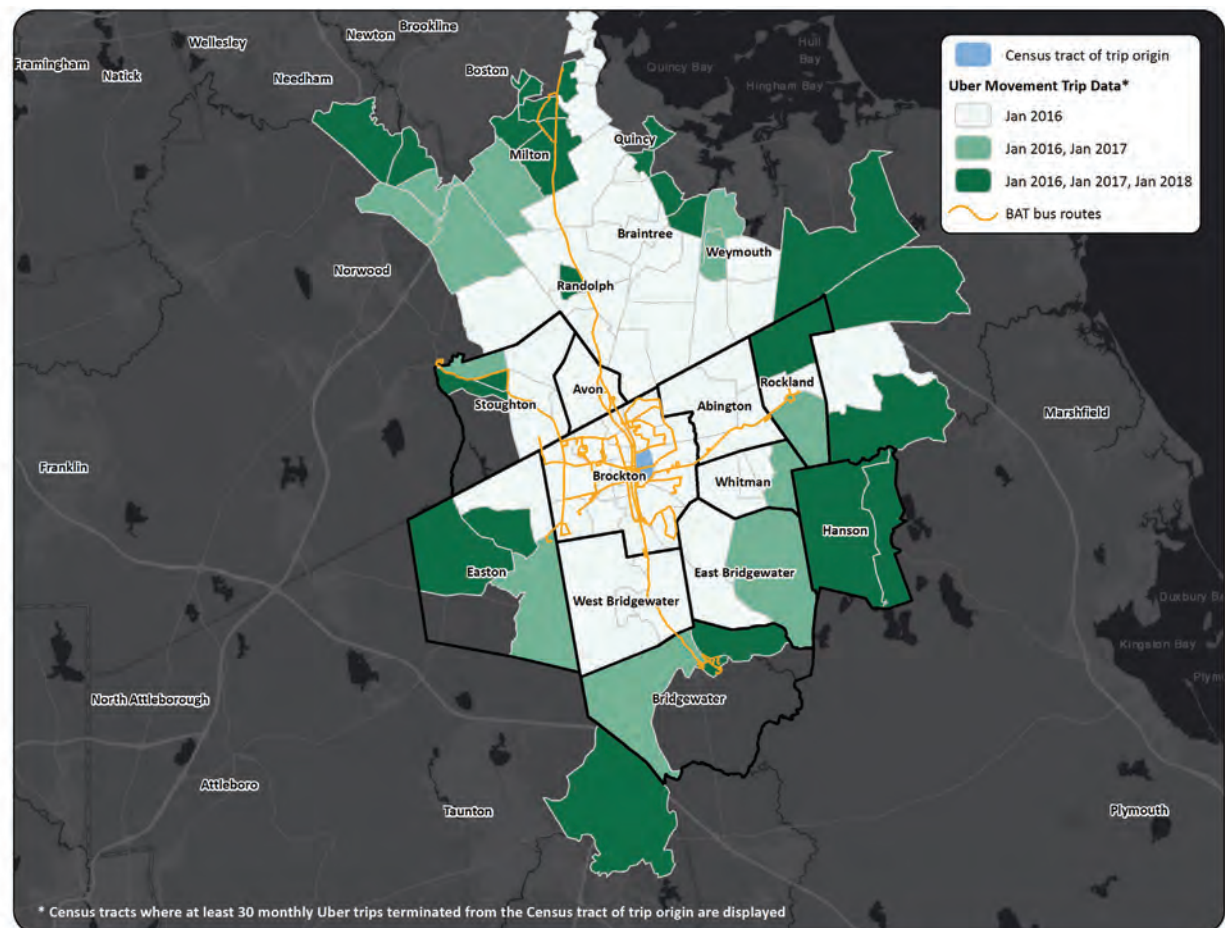
Source: Uber Movement data compiled by MAPC.

Taxi and Livery Data

To better understand the impact of ride-hailing on the for-hire transportation marketplace, MAPC reviewed publicly available taxi and livery data for the greater Brockton area. The core differences between taxi and livery services are that taxis operate to service on-demand transportation needs. Taxis can be called via phone or app, hailed on the street, or contracted at a cab stand. Livery businesses, on the other hand, operate to serve pre-arranged transportation needs and specialize in airport travel, events (e.g., weddings, proms), or business support.

Comparison of 2016 and 2018 Data

In 2018, the number of taxi and livery businesses and employees was comparable statewide. There were an estimated 374 taxi businesses with approximately 4,450 total employees. The livery industry comprised 424 businesses with about 4,400 total employees.

In the BAT service area, the number of taxi companies remained consistent between 2016 and 2018, with 10 and nine companies respectively. Although the number of companies did not greatly vary, overall employment size declined by 14 percent and annual sales declined by 40 percent. As of 2018, there are an estimated 153 employees working for nine taxi companies with a combined annual sales volume of $6.3 million. Bill's Taxi Service in Bridgewater experienced a significant decline in employment size and annual sales volume, whereas Yellow Cab of Brockton underwent a significant increase in employment size and annual sales volume. In 2018, Yellow Cab of Brockton comprised 65 percent of all employees and 64 percent of annual sales volume of the taxi companies within the BAT service area.

On the other hand, the number of livery companies increased between 2016 and 2018, from 13 to 17. Since a complete picture of employment size and annual sales volume data is not available for 2016, it cannot be definitively concluded whether these numbers collectively increased or decreased. However, for livery companies with data available for 2016 and 2018, both employment size and annual sales volume data are relatively stable. In 2018, the 17 livery companies in the BAT service area comprised an estimated 109 employees and generated $7.5 million in annual sales volume, an estimated 52 percent annual sales increase from 2016. The largest livery company in the BAT service area is Classic Limousine-New England based in Stoughton.

The overall pattern of the taxi industry declining and the livery industry staying constant is consistent with statewide and nationwide trends. A key factor is the use of smart phone technology, which enables a user to easily summon a ride-hail vehicle. This is then followed by the perception (whether true or not) that ride-hail trips are less expensive than taxis.

Municipalities impose substantial regulations on the taxi industry and to a lesser extent on the livery industry (e.g., number of vehicles, pricing, and geographic restrictions), whereas the ride-hailing is regulated at the state level only where there are currently no limitations on the number of drivers or vehicles on the road. In what is seen as an additional regulatory handicap, taxi and livery businesses are both required to hold commercial insurance policies that ride-hailing businesses are not.

Unlike the taxi industry, the livery industry serves a specific market share around pre-arranged transportation needs. This is the primary reason cited for the resiliency of the livery industry compared to the taxi industry. The taxi industry is also fragmented both by geography and lack of a unifying goal.

Scalability is also a factor. In Massachusetts, the total number of taxi and livery employees is estimated to be 4,450 and 4,400 respectively.[12] As of early 2019, the number of approved ride-hailing certificates by the Massachusetts Department of Public Utilities was almost 200,000.[13]

Table 9. Taxis – Employment Size and Annual Sales Volume, 2016 and 2018

		Employment Size		Annual Sales Volume		Annual Sales Volume (percent change)
Company Name	**Municipality**	**2016**	**2018**	**2016**	**2018**	
A & T Taxi and Livery of South Shore	Stoughton	27	7	1,589,000	337,000	-79%
Bay Trans Inc	Stoughton	2	2	117,000	97,000	-17%
Bill's Taxi Service	Bridgewater	100	2	5,886,000	81,000	-99%
Brian's Taxi	Brockton	5	25	294,000	1,008,000	243%
Classic Livery	Rockland	2	2	117,000	81,000	-31%
Cowen's Taxi	Brockton	2	5	117,000	202,000	73%
R & R Transportation Service Inc.	Stoughton	6	6	353,000	289,000	-18%
Robbins Livery	Rockland	4	4	235,000	162,000	-31%
South Shore Taxi	Whitman	5	no info	294,000	no info	no info
Yellow Cab – Brockton	Brockton	25	100	1,471,000	4,032,000	174%
	TOTAL	**178**	**153**	**10,473,000**	**6,289,000**	**-40%**

Source: InfoSource

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12 InfoGroup, 2018.

13 As of March 1, 2019, the total number of approved certificates was 199,669. Of note, not all drivers are full-time.

Table 10. Liveries – Employment Size and Annual Sales Volume, 2016 and 2018

		Employment Size		Annual Sales Volume		Annual Sales Volume (percent change)
Company Name	**Municipality**	**2016**	**2018**	**2016**	**2018**	
A Special Classic Limousine	Stoughton	2	2	137,000	149,000	9%
AAA VIP Limousine	Abington	2	2	137,000	132,000	-4%
Abby Mae's Limousine	Brockton	6	6	411,000	396,000	-4%
Bourne Enterprises Inc.	Brockton	3	3	205,000	198,000	-3%
BP Livery	East Bridgewater	no info	3	no info	198,000	no info
Classic Limousine – New England	Stoughton	no info	30	no info	2,230,000	no info
Concert Limo	Hanson	1	1	68,000	66,000	-3%
Concierge Limousine	Stoughton	4	no info	274,000	no info	no info
Den-Mar Limousine Service	Rockland	3	no info	205,000	no info	no info
Emanuel Goncalves	Brockton	15	15	1,028,000	990,000	-4%
Excellence Transportation Service	Brockton	20	20	1,371,000	1,320,000	-4%
Extreme Limousine	East & West Bridgewater	10	10	684,000	660,000	-4%
Liberty Coach Limousine	East Bridgewater	no info	3	no info	198,000	no info
Limoliner	Stoughton	no info	2	no info	149,000	no info
MCS Limousine	Bridgewater	4	4	274,000	264,000	-4%
Mr. Limo	Brockton	1	1	68,000	66,000	-3%
Pires Limo Inc.	Brockton	no info	3	no info	198,000	no info
RMN Limousine	Brockton	1	1	68,000	66,000	-3%
Yaska Limo Inc.	Brockton	no info	3	no info	198,000	no info
	TOTAL	**72**	**109**	**4,930,000**	**7,478,000**	**52%**

Source: InfoSource

There are additional transportation providers in the BAT service area of for which ridership data is not known. These services include Mentor Adult Day Health, which provides drop-off and pick-up services to and from Mentor Adult Day Health centers[14] as well to medical appointments, community activities, and shopping/errands. In addition, the South Shore Community Action Council provides transportation services for eligible residents.

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14 Bom Dia Adult Day Health Center, Stoughton, Brockton Adult Day Health Center, Brockton, Fortus Adult Day Health Center, Brockton, and the South Shore Haitian Adult Day Health Center (Paradi Ayisyen) – Brockton.

4. THE RELATIONSHIP BETWEEN RIDE-HAILING AND TRANSIT

As ride-hailing as grown, transit ridership has stayed flat or has declined in almost every major city in the United States. Between 2016 and 2017, transit use fell in 31 of the 35 largest metropolitan areas in the country. 2017 was the lowest year of overall transit ridership since 2005. Bus ridership alone fell 5 percent.[15]

There are various explanations for what might be causing this trend: income growth, increased teleworking, increased online shopping, lower fuel costs, higher car ownership, service cuts to public transportation, the reliability of public transportation, and the expansion of ride-hailing such as Uber and Lyft.

15 Falling Transit Ridership Poses an 'Emergency' for Cities, Experts Fear, The Washington Post, March 24, 2018.
16 Who's On Board, 2019, p 7.

Studies that Attribute Reductions in Transit Use to Ride-Hailing

Understanding the Recent Transit Ridership Decline in Major US Cities: Service Cuts or Emerging Modes? (Michael Graehler, Gregory F. Ernhardt, and Alex Mucci, University of Kentucky, 2019)
This study found that declines of transit ridership closely parallel with the rise of ride-hailing. It concluded that for each year after ride-hailing services enter an urban market, bus ridership and heavy rail ridership can be expected to decrease by 1.7 percent and 1.3 percent respectively.[17] As a result, the net effect could be substantial. Bus ridership, for example, could decrease by 12.7 percent after eight years. In sum, the "TNC effect" accrues annually and could be a critical driver of recent declines in transit ridership.

Mass Transit Rider Research Report – Key Factors Influencing Ridership in North America: The Emerging Urban Mobility Ecosystem (Masabi, 2018)
This study looks at the results of a 2017 Google Surveys poll that was given to more than 1,000 US residents to determine trends in public transit use in North America. Respondents included both transit riders and non-transit riders. While the study does not directly address reasons for declining transit ridership in the US, it does shed light on why riders choose transit versus other travel modes. Over 9 percent of the study's respondents said they are using ride-hailing instead of public transit on at least a weekly basis. More than 15 percent of 18–24 year olds, and nearly 13 percent of 25–34 year olds are using Uber and Lyft on a weekly basis, indicating that the millennial and Gen Z generations are more apt to use these ride-hailing services regularly. The report recommends that transit agencies look for ways increase the convenience of transit with vehicle tracking apps and with apps that allow riders to purchase transit tickets on their mobile devices.

Disruptive Transportation: The Adoption, Utilization, and Impacts of Ride-Hailing in the United States (Regina R. Clewlow and Gouri Shankar Mishra – University of California, Davis, Institute of Transportation Studies, 2017)
Researchers at the U.C. Davis Institute of Transportation Studies surveyed 4,094 people about their travel habits in seven cities[18] to determine the extent to which they have changed their travel patterns in response to ride-hailing. The survey found that ride-hailing is substituting for other modes of travel. Specifically, between 49 to 61 percent of ride-hailing trips would have been made by walking, biking, transit, or would not have been made at all. The study concludes that ride-hailing contributes to a reduction in transit ridership. Specifically, ride-hailing is associated with 6 percent decrease in bus trips, a 3 percent decrease in light rail trips, and, interestingly, a 3 percent increase in commuter rail trips.

Examining the Impact of Ride-hailing Services on Public Transit Use (Yash Babar and Gordon Burtch, University of Minnesota, 2017)
This study determined that when ride-hailing enters a market, ridership on rail increases, while ridership on buses declines, though the latter to a less-pronounced extent in cities with higher quality

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17 Based on an analysis using monthly transit ridership data from the National Transit Database for 22 transit agencies and four modes (commuter rail, heavy rail, light rail and motor bus).

18 Boston, Chicago, New York, Seattle, Washington DC, Los Angeles, and San Francisco.

transit. Ride-hailing, according to the study, is associated with a 1.05 percent decline in city bus service utilization, which equates to a median annual loss of more than $100,000 in revenue for an average city. Subway and commuter-rail services, however, experience annual increases of subway use and commuter rail use at 2.59 percent and 7.24 percent respectively.[19]

Studies that Attribute Reductions in Transit Use to Non-Ride-Hailing Factors

Who's on Board 2019 – How to Win Back America's Transit Riders (Transit Center, 2019)
This study was conducted to give insight into why transit ridership has been declining nationwide and what agencies can do. The report conducted focus groups and a survey of 1,700 transit riders in seven cities.[20]

Who's on Board found that over the course of two years, 9 percent of respondents stopped using transit altogether, and 24 percent of respondents substantially decreased their transit use. Although riders are reducing their use of transit, they are not leaving the system altogether. The study concluded that survey respondents who abandon or scale back their transit use are replacing those trips with increased private car use, which this study attributes to be the most probable reason for overall declines in transit use. The authors also note that while "the private car is the strongest competitor… transportation network companies (TNCs) like Uber and Lyft are nibbling away at some transit trips, especially in dense cities such as Boston…"[21]

Is Uber a Substitute or Complement for Public Transit? (Journal of Urban Economics, 2018)
Using information for all transit agencies in the National Transit Database, this study found that, in a way that grows slowly over time, ride-hailing increases ridership and serves as a complement for the average transit agency. Ride-hailing increases transit ridership by 5 percent after two years for an average transit agency. Researchers arrived at this conclusion by applying a "difference-in-differences design that exploits variation across U.S. metropolitan areas in both the intensity of Uber penetration and the timing of Uber entry."[22] Uber penetration was measured using Google Trends, or the measure of search queries for the word "Uber" in metropolitan statistical areas. "In smaller cities" says this report, "a greater share of transit riders are those who cannot afford to drive. These "captive riders" are unlikely to switch to Uber."[23]

19 The average commuter rail agency gained over $500,000 annually and the average subway agency gained over $6.5 million annually, p 3.

20 Chicago, Denver, Los Angeles, New Orleans, New York City, Pittsburgh and Seattle.

21 Who's on Board, p 2.

22 Is Uber a Substitute or Complement for Public Transit?, p 36.

23 Is Uber a Substitute or Complement for Public Transit?, p 38.

Falling Transit Ridership: California and Southern California (Michael Manville, Brian D. Taylor, Evelyn Blumenberg, UCLA Institute for Transportation Studies, prepared for the Southern California Association of Governments, 2018)
Based on data from 2000 to 2015, this study analyzes ridership trends and falling transit ridership in Southern California and concludes that this trend is largely due to increased auto ownership among lower-income immigrant populations. Declines in transit ridership began before ride-hailing increased in popularity, the study points out, ride-hailing is not likely a primary factor. One of the study's recommendations is for transit agencies to encourage people who rarely or never use transit to ride transit occasionally, as this cohort represents a significant untapped potential.

Broadening Understanding of the Interplay between Public Transit, Shared Mobility, and Personal Automobiles(Sharon Feigon and Colin Murphy – Transit Cooperative Research Program, TRB, 2018)
This study concludes that peak use of ride-hailing occurs during weekends and evenings, not during rush hours, when public transit use is highest. Findings from this study also suggest that ride-hailing is used on an occasional basis and is primarily used to either fill gaps in service or serve specific needs, but does not function as a central mode of travel for most users. The study found no correlation between transit ridership and peak-period ride-hailing use when analyzing data from six metropolitan areas. Accordingly, this study infers that since most ride-hailing trips are off-peak, there must be other primary causes of declining transit ridership.

Although the study recognizes that the relationship between the level of peak-hour ride-hailing use and longer-term changes in the study region's public transit usage is unclear, one of the study's core recommendations is that transit agencies collaborate with ride-hailing companies to enhance and strengthen public transit services. Findings from the study were based on origin-destination trip data provided by a ride-hailing company for five cities[24] from 2010 to 2016, modeled data for the City of San Francisco, and from a 10,000-person survey of transit and shared-mobility users.

Boston-Based Studies on Ride-Hailing and Transit Use

Although declines in transit ridership are frequently referred to as a nationwide issue, transit ridership is influenced by distinct local factors. As such, transit agencies should address these factors individually. The local factors that affect transit ridership and the frequency in ride-hailing use include the macroeconomic, such as changes in gas prices or economic growth/recession; the technological, such as ride-hailing; demographic, such as population and job density; and the geographic, such as development patterns, land use, and street design. It is important to underscore that "it is not yet clear the extent to which the adoption of shared-mobility services *causes* an increase (or a reduction) in transit use, as opposed to both of those conditions being caused by other variables (such as residential location, age/stage in lifecycle, and vehicle ownership) which in turn more broadly affect one's mobility style and travel behavior decisions."[25]

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24 Nashville, Tennessee; Los Angeles, Chicago, San Francisco, Seattle, and Washington, D.C.
25 Who's on Board, p 16.

There are two recent Boston-based studies that addressed the question of better understanding the relationship between ride-hailing and transit.

Fare Choices: A Survey of Ride-hailing Passengers in Metro Boston
In late 2017, MAPC surveyed nearly 1,000 ride-hailing passengers to ask about their trip, and why they chose ride-hailing over other modes of transportation. Fare Choices provides insights into the ways that ride-hailing services are changing travel behavior and affecting the existing transportation system. The survey found that most ride-hailing users are under the age of 35, that most of them use the service on a weekly basis, and that most do not own a car. The survey also found that reported rider incomes are similar to the region overall, and a substantial number of trips are made by people from households earning less than $38,000 per year. Most of those lower-income riders are in from the workforce, not student, population.
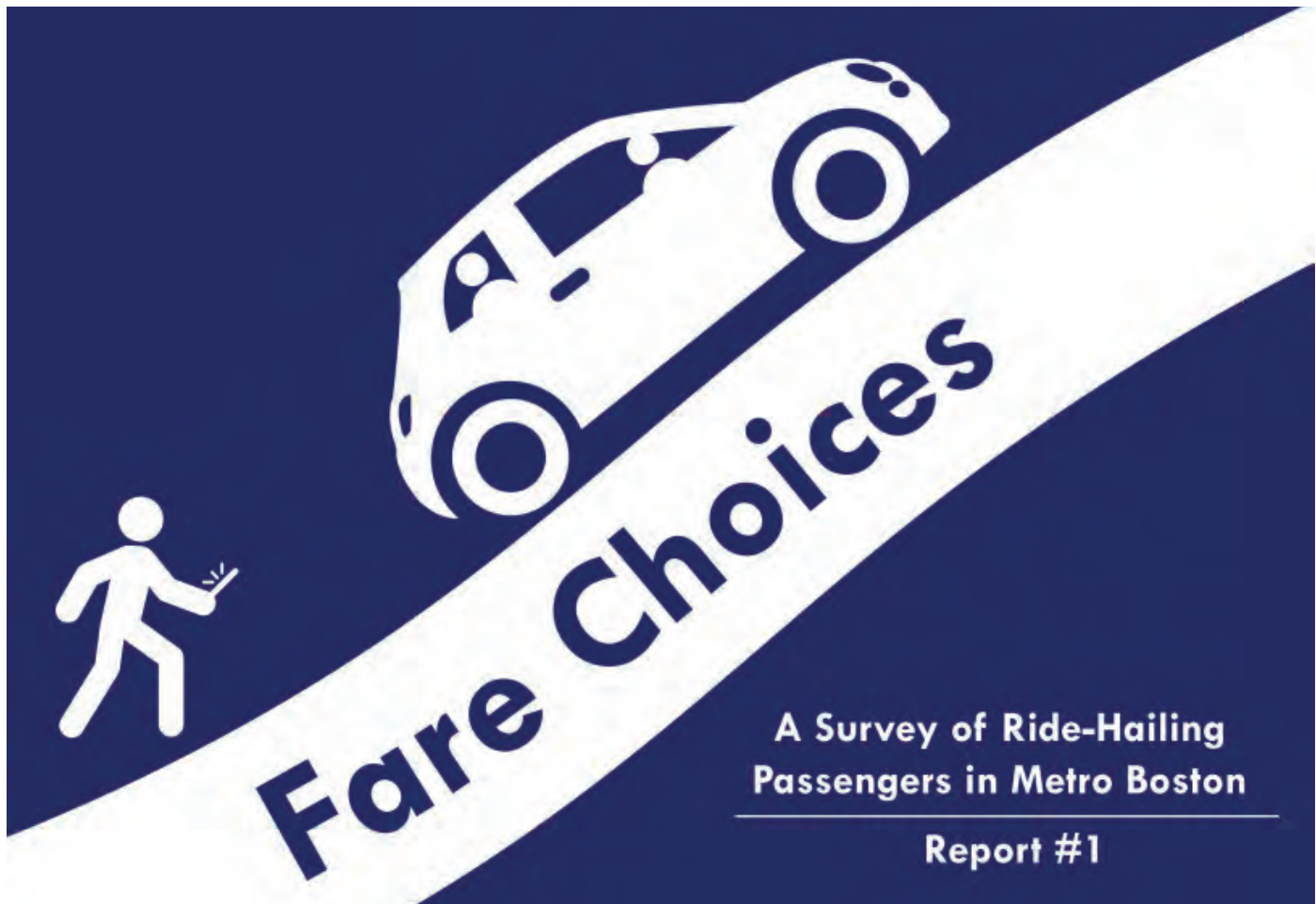
The survey results also provide some hard data about the types of trips made via ride-hailing. Most trips start or end at home, but nearly a third are from one non-home location to another. Ride-hailing usage is distributed throughout the day. The hours from 7:00 P.M. to midnight see the greatest

frequency of trips, but about 40 percent of weekday trips take place during the morning or afternoon commute periods. People also like to travel by themselves: only a fifth of customers opt for a truly shared ride (e.g., UberPOOL), and the majority of travel is for a single passenger. Riders are willing to pay a substantial premium for the convenience and predictability of ride-hailing. Nearly two thirds of trips cost more than ten dollars, and one in five costs more than twenty dollars.

Fare Choices maintains that the growing use of ride-hailing may result in negative outcomes for traffic congestion, transit use, and active transportation. When asked how they would have made their current trip if ride-hailing hadn't been an option, 12 percent said they would have walked or biked, and over two-fifths (42 percent) of respondents said they would have otherwise taken transit. Some of this "transit substitution" takes place during rush hours. MAPC estimated that 12 percent of *all* ride-hailing trips are substituting for a transit trip during the morning or afternoon commute periods; an additional 3 percent of riders during these times would have otherwise walked or biked. Overall, 15 percent of ride-hailing trips are adding cars to the region's roadways during the morning or afternoon rush hours.

Notably, MAPC found that this "transit substitution" is more frequent among riders with a weekly or monthly transit pass. Those who ride transit more often are more likely to drop it for ride hailing, even while doing so at a huge cost differential, and even when they have already paid for the transit.

The findings identified in *Fare Choices* begin to provide a better understanding of this evolving mobility option that will undoubtedly continue to change the way people travel around the region. MAPC's analysis raises concerns about how users are becoming accustomed to on-demand mobility, and what that means for the future of the region's transportation system. One of the study's conclusions is that for transit to thrive, it must change, perhaps by incorporating the types of on-demand response and real-time information that riders value.[26]

MBTA's 2017 Intercept Customer Satisfaction Survey
An Intercept Customer Satisfaction Survey conducted by the MBTA in 2017 found that approximately 67 percent of MBTA's transit users report also using ride-hailing services. About 30 percent of MBTA riders reported that use of ride-hailing reduces their MBTA usage. This percentage is consistent for express bus riders, but lower for local bus riders (23 percent). Approximately 10 percent responded that ride-hailing services increases their use of the MBTA.

Data from the *MBTA's Customer Satisfaction Survey* show that while ride-hailing usage varies slightly by income level, the younger cohorts report frequent use of ride-hailing. Specifically, 41 percent of the respondents in the 22–34 age cohort responded that ride-hailing decreases their use of the MBTA. The 18–21 age cohort and the 35–44 age cohort responded similarly by 29 percent and 26 percent respectively. Ride-hailing use declines for the older population. The 45–64 age cohort and the 65 or older age cohort reported that they do not use ride-hailing services by 53 percent and 66 percent respectively.[27]

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26 https://www.mapc.org/farechoices/

27 MBTA Ridership Update FY15-17. MassDOT office of Performance Management and Innovation. Presentation to the FMCB, October 23, 2017. https://www.scribd.com/document/372433149/MBTA-Ridership-Update-FY15-FY17

5. BAT RIDER SURVEY

MAPC, in coordination with BAT and OCPC, conducted a survey of BAT riders to better understand their uses of ride-hailing and transit. The survey was conducted in-person over two days as well as online over a 10 day period.

Survey Development and Deployment

To create the survey, MAPC reviewed similar survey questions from the following sources: recent surveys of transit riders and ride-hail passengers from across the US[28]; the questions used in the 2017 MAPC *Fare Choices* ride-hailing survey; the 2017 rider intercept survey conducted by the MBTA, and; BAT rider surveys used in the 2015 CRTP and in the 2018 BAT Transit Fare Analysis. From these various sources, MAPC, with input from OCPC and BAT, developed questions that would be most relevant in understanding ride-hailing and transit ridership in the BAT service area. Because most respondents would need to complete the survey within a few minutes before boarding a bus (when intercepted in person), or while riding the bus (when using a web link from a poster or flyer), the survey needed to be succinct and completable in five minutes or less. The deployed survey included up to 19 questions on topics such as frequency of riding BAT, trip purposes, frequency of using ride-hailing and other methods of travel, attitudes towards ride-hailing, as well as demographic inquiries. Some questions could be skipped, depending on the responses from survey takers. BAT staff translated the survey from English into Spanish, Portuguese, and Haitian Creole.

In an effort to gather as many responses as possible, MAPC conducted the survey both online and in person using tablets. Both the tablet and web surveys were conducted via Qualtrics and were identical, with the exception of an additional question on the web version that asked how the respondent learned about the survey (flyer, Facebook, poster, etc.). Finally, as an incentive to take the survey, people were allowed to enter their email address or mobile number at the end of the survey for the chance to win a 31-day BAT transit pass.

28 Shared Mobility Survey Instrument and Transit Agency Survey Instrument deployed as part of Broadening Understanding of the Interplay between Public Transit, Shared Mobility, and Personal Automobiles research.

An 11 x 17 poster advertising the survey and the survey web link was developed in four languages and posted in each of the BAT buses and DIAL-A-BAT vans for approximately 10 days.[29] MAPC staff, assisted by staff from BAT and OCPC, then conducted a one-day effort on April 24, 2019 to intercept survey BAT riders and others at four locations in Brockton – the BAT Transit Centre, the Brockton commuter rail station, Massasoit Community College, the BAT inbound bus stop near Brockton High School, and at Westgate Mall (both at the Market Basket stop outside the mall as well as inside the mall). MAPC staff also surveyed riders at Ashmont Station in Boston (where the BAT Route 12 stops) the day before the Brockton survey efforts. Staff asked riders to take the survey directly on touch-screen tablets (via a Qualtrics app) and distributed flyers to riders waiting for and exiting BAT buses and MBTA commuter rail trains. The flyers were similar to the poster in the BAT vehicles, in four languages and with a web link to take the survey online. Finally, BAT posted the link to the survey on their Facebook page and the City of Brockton Facebook page. In total, the study collected 599 surveys: 343 surveys via in-person on the tablets and 256 online.

A more detailed discussion of the survey development and deployment, including copies of the survey questions, poster, and flyer can be found in the Appendix.

Survey Findings

Of the 599 intercept survey responses, 93 percent were taken in English. Three percent each were taken in Haitian Creole and Portuguese and 1 percent were taken in Spanish.

Demographics

The survey respondents represented a range of ages. At 32 percent, the most substantial was the 45-64 year cohort followed by the 18-24 year cohort at 19 percent. A greater number of women (59 percent) than men (39 percent) took the survey. Forty percent of the respondents identified as White and 33 percent as African American. Sixteen percent identified themselves as disabled.

Ninety percent of the respondents were in the BAT service area, with a vast majority of those from Brockton.

Thirty three percent of respondents reported having two adults in the household. Thirty percent reported one adult in the household, 20 percent reported three, and 17 percent reported four or more.

Educational Attainment and Work Status

Fifty-four percent of respondents reported having completed high school or an equivalent or having less than a high school education. Nineteen percent of the respondents reported having an associate/bachelor's or an advanced degree.

Fifty-seven percent of respondents reported they are currently working, either full- or part-time. Of those not working, 18 percent are students (full- or part-time), 14 percent are unemployed, and 12 percent are retired.

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29 April 19-28, 2019.

Of the respondents who did report their household income, 81 percent reported earning $49,999 or less followed by 55 percent reporting earnings of $24,999 or less. Over a third did not report household income.

Travel Characteristics

The survey respondents reported heavily utilizing transit with 72 percent reporting riding the BAT bus within the past week, and 54 percent using the MBTA commuter rail or subway. While 43 percent of households reported not having a vehicle, a substantial number – 41 percent – also drive, either by themselves or by getting a ride from someone. Within the last week, 19 percent of the survey respondents had used a ride-hailing service.

Transit-related Characteristics

Almost half of the survey respondents reported using BAT frequently (four or more times per week) followed by approximately one-quarter using BAT regularly (one to three times per week). Seven percent of the survey respondents reported never using BAT.

Slightly over half of survey respondents reported that the primary reason they have used BAT over the past three months is for work or school, followed by shopping/errands or medical (30 percent).

Ride-Hailing-Related Characteristics

Although 44 percent of the respondents report having never used ride-hailing or, at 20 percent, rarely using it, 18 percent reported they are either frequent (four or more times per week) or regular (one to three times per week) ride-hailing users. In total, over half of respondents reported having used Uber or Lyft in some capacity.

Of those who reported using ride-hailing, there were additional questions on their use of Uber and Lyft. When asked whether using ride-hailing has changed their use of BAT, 68 percent of the survey respondents who use Uber or Lyft reported that using ride-hailing has not changed their use of BAT. Twenty-two percent reported that using ride-hailing has decreased their use of BAT while 10 percent indicated that ride-hailing has increased their use of BAT. These findings are strikingly similar to the findings of the MBTA's 2017 Intercept Customer Satisfaction Survey discussed in Chapter 4.

Figure 7. Responses to the Question "How have Uber and Lyft affected how often you use BAT?"
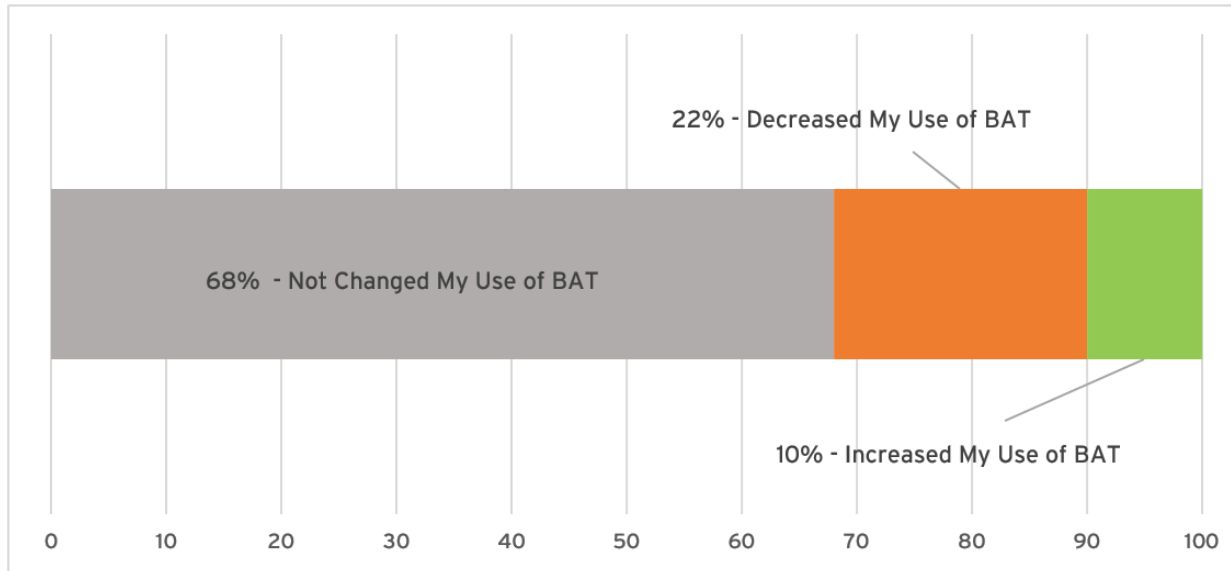
As seen in Figure 8, the top three reasons survey respondents reported choosing ride-hailing over BAT are that BAT is not available when service is needed (43 percent), BAT does not provide service to where they need to go (32 percent) and that ride-hailing is more convenient by providing on-demand, door to door service (31 percent). Respondents were permitted to select multiple responses.

Figure 8. Responses to the Question "What are the main reasons you choose Uber or Lyft over riding BAT?"
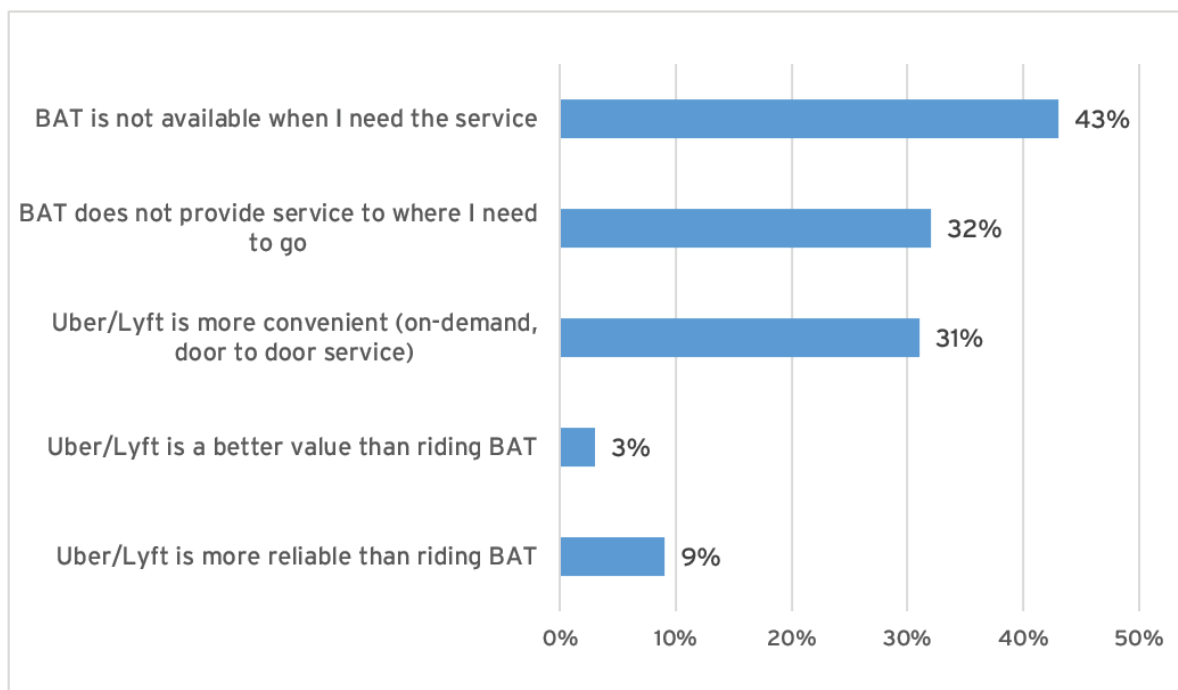
Forty percent of all respondents reported agreeing with the statement "Uber and Lyft have significantly changed how my family and friends travel," with 25 percent disagreeing and 35 percent unsure. However, 46 percent disagreed with the statement "In the future, I will more often use Uber and Lyft for travel." Twenty-one percent agreed, and a third were unsure about this statement. These responses indicate that while respondents agree that ride-hailing has changed how people travel, they also believe there may be a limit to the growth in how much they will use ride-hailing.

Cross-Tab Findings

MAPC cross-tabulated reported ride-hailing adoption frequency, impact, and utilization by BAT riders across age, income, and car ownership cohorts. As described in more detail below, two of the most significant findings are that 1) age-related results point to generational differences in ride-hailing adoption and that 2) ride-hailing appears to have a greater impact on the survey respondents who report using BAT sometimes or rarely. Finally, vehicle ownership by respondents does not appear to show a meaningful relationship to ride-hailing use or BAT use.

Age

Respondents who are under 35 years old were more likely to use ride-hailing, regardless of how often they rode BAT, as illustrated in Figure 9.

Figure 9. Cross-tabulation of Current Ride-hailing Adoption Frequency by BAT Riders across Age Cohorts
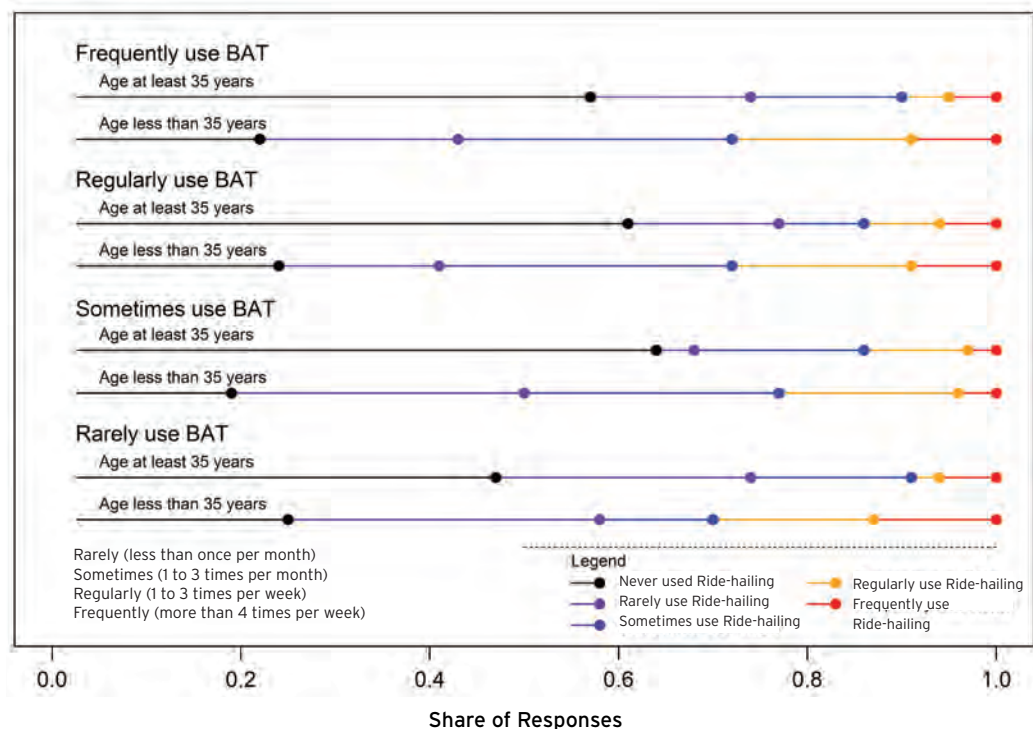
Regardless of frequency of use, younger BAT users[30] agree more that ride-hailing will increase in the future than older BAT users[31].

Frequent or regular BAT users more often report that ride-hailing has not changed or increased their use of BAT compared to those who sometimes or rarely use BAT, regardless of age cohort.

Income

Ride-hailing usage takes place in communities of all income levels. Figure 10 shows that ride-hailing trips are distributed across income cohorts, suggesting that ride-hailing is used to some degree by people across the income spectrum. Frequent and regular users of BAT report the same level of ride-hailing use regardless of income.

Figure 10. Cross-tabulation of Current Ride-hailing Adoption Frequency by BAT Riders across Income Cohorts
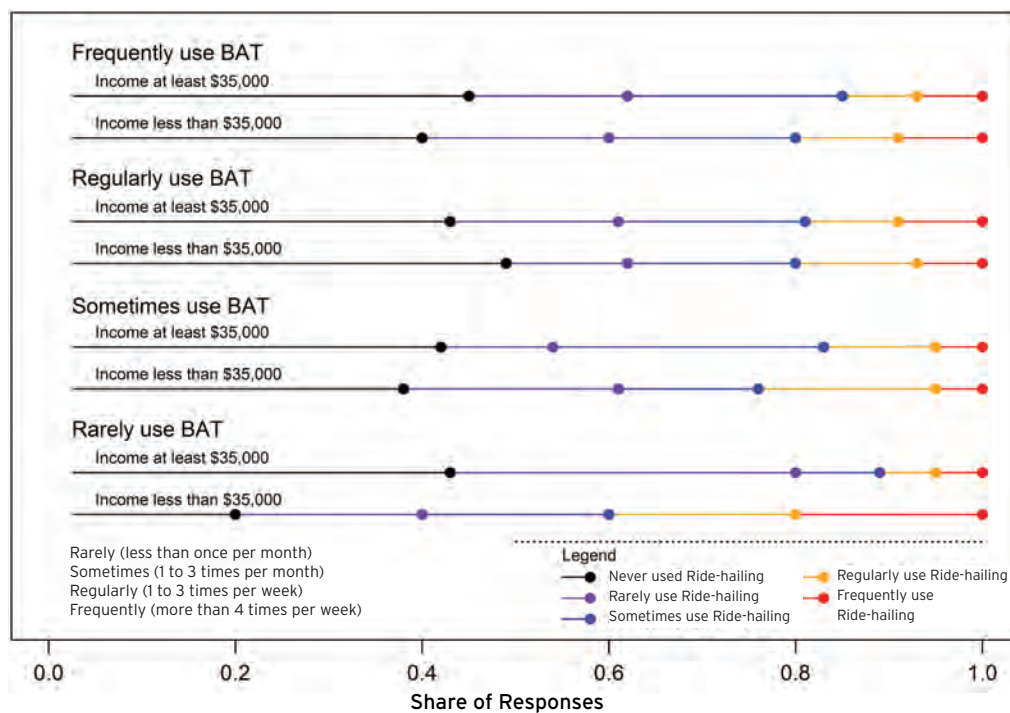
There is a clear distinction between the higher[32] and lower[33] income cohorts for those who report that they sometimes use BAT. The majority of those in the higher income cohort state that ride-hailing has not changed their use of BAT, while those in the lower income cohort report that ride-hailing has decreased their use of BAT.

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30 Age at least 35 years.

31 Age less than 35 years.

32 Income at least $35,000.

33 Income less than $35,000.

More people who sometimes use BAT compared to those who frequently, regularly, or rarely use BAT agree with the statement that ride-hailing use will increase in the future, regardless of income cohort.

Vehicle Ownership

In the cross-tabulations, vehicle ownership does not appear to be an indicator for ride-hailing usage for frequent, regular, and sometimes users of BAT. Furthermore, vehicle ownership did not appear to influence whether respondents agree or disagree with the statement that they believe they would increase their ride-hailing use in the future.

Ashmont Station Respondents

MAPC reviewed data from those who were surveyed in-person at Ashmont Station to see if there were differences in the responses. Less than 10 percent of the total 599 surveys were taken in-person at Ashmont.

Compared to those who took the survey at other locations or by other means, the Ashmont Station respondents are more transit-dependent. Over 90 percent responded that they rode the BAT bus within the last week and almost 20 percent indicated that their household has no vehicle. The vast majority of respondents, 73 percent, reported that the primary reason they use BAT is for work or school. It is also noteworthy to mention that 49 percent of these survey respondents identified as African American, and 11 percent as White.

Additional information on the survey and the data are available in the Appendix.

6. FINDINGS AND AREAS FOR FURTHER RESEARCH AND CONSIDERATION

Overall Findings

Although a majority of survey respondents did report some level of ride-hail use, the survey data showed that a majority of BAT riders do not use ride-hailing on a regular basis. However, 22 percent of those who use ride-hailing stated that ride-hailing has decreased their use of BAT. Of those who use ride-hailing services, over 40 percent stated that they chose Uber or Lyft over BAT because BAT is not available when they need transportation. Over a third stated that they use ride-hailing because BAT is not available where they need to travel.

There is a distinct difference in how those under 35 years old view ride-hailing versus those who are older than 35: younger riders are more likely to use ride-hailing, and a greater percentage of them stated that they will use ride-hailing in the future. Furthermore, those who ride BAT only sometimes or rarely are more likely to note that ride-hailing has decreased their BAT use – indicating that these riders, who are less dependent on BAT, may be more likely to choose ride-hailing. All of these above suggest that ride-hailing is one factor among many that are causing year over year declining BAT ridership. The data also suggest that as younger BAT riders age, they may be more willing than previous generations to substitute ride-hailing for transit.

There are several factors likely having an impact on ridership that are beyond the control of BAT, including the historically low price of gasoline, the rise in telecommuting, as well as a shift in the types and locations of jobs in the greater Brockton area and in greater Boston overall. Furthermore, there are technological changes in the online commercial landscape that are only now being studied for their impacts on our transportation system: the increased availability of online shopping with same-day delivery, third-party restaurant deliveries, such as GrubHub and Uber Eats, and grocery delivery services. The survey of BAT riders, and a review of other transit and ride-hailing studies, however, indicate that a fundamental shift in individual mobility options is occurring, which is having some amount of impact on transit use. BAT, like other transit systems, is likely losing transit trips, even if it is not necessarily losing transit riders. Whereas previously a transit rider who switched to driving would likely stop using transit altogether, transit riders who use ride-hailing are likely substituting individual trips, and not shifting wholly away from transit.

This study could not determine that ride-hailing is the primary cause of recent declines in BAT ridership, but there are areas of further research recommended for BAT as well as recommendations on how BAT could partner with the ride-hailing technologies to improve its services. These are descried in greater detail below.

Areas for Further Research

To ensure that bus routes continue to serve areas with the highest demand, BAT should conduct a more detailed analysis of demographics, employment, and retail changes in the BAT service area. This will ensure that bus routes continue to serve the areas with the highest need, and serve areas that are destinations for BAT riders. As noted in Chapter 1 of this report, Brockton's population and average household size has increased, but the median household income has only increased marginally compared to the rest of Massachusetts. While an analysis of census tract or block group data is outside of the scope of this study, MAPC did view census data for the Brockton area posted in the Transit Center web-based GIS tool (insights.transitcenter.org). Two maps that stood out were the change in median household income, and change in population density from 2010 to 2016. These maps indicate that tracts in and near downtown Brockton and south of downtown have seen decreasing median household income, while several tracts in surrounding municipalities have experienced increased median household income. Brockton has also experienced somewhat of a decline in population density in tracts to the south, but an increase in population density to the west. These maps indicate a geographic shift in the population that makes up BAT's fixed-route ridership, which in turn may warrant revisions in BAT's fixed-route services. In the next five-year transit plan, BAT should conduct a comprehensive review of the ridership for each route and stop. With shifts in the housing, employment, and retail landscape of Brockton, some stops could be eliminated, and bus routes revised to serve other destinations.

Figure 11. Changes in Median Household Income and Population Density, 2010-2016
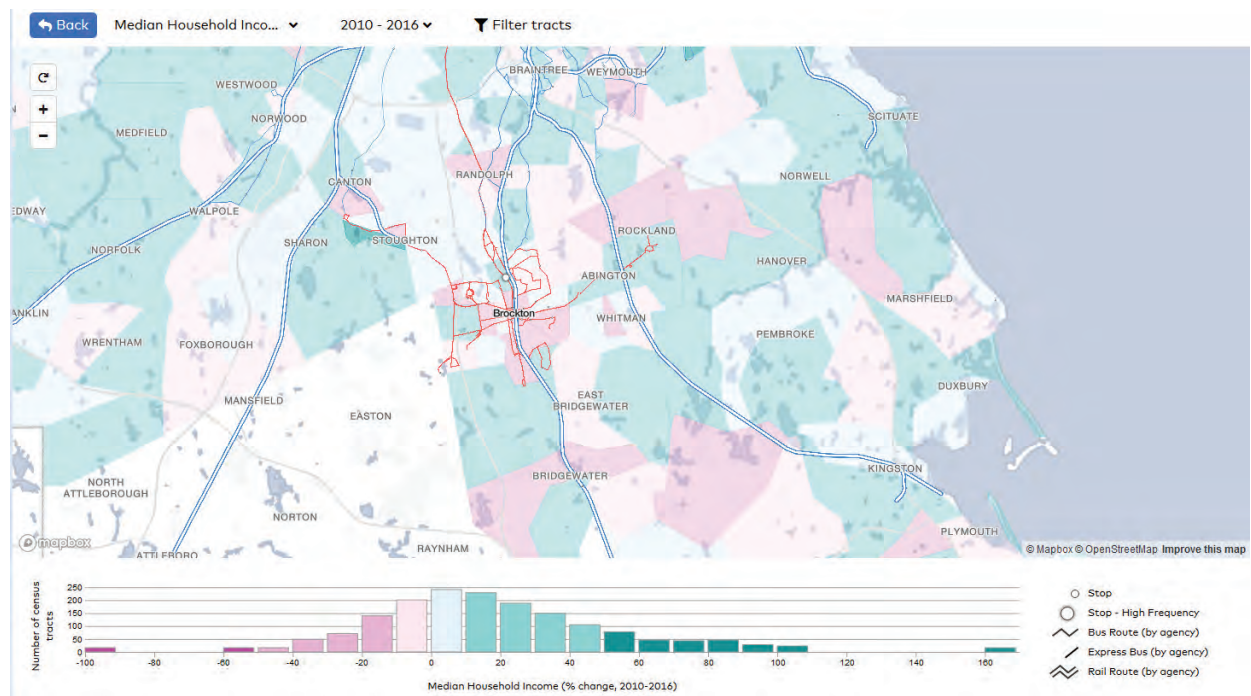
Screenshot from insights.transitcenter.org – reddish areas indicate declines and blue-green areas indicate increases in median household income, 2010-2016.
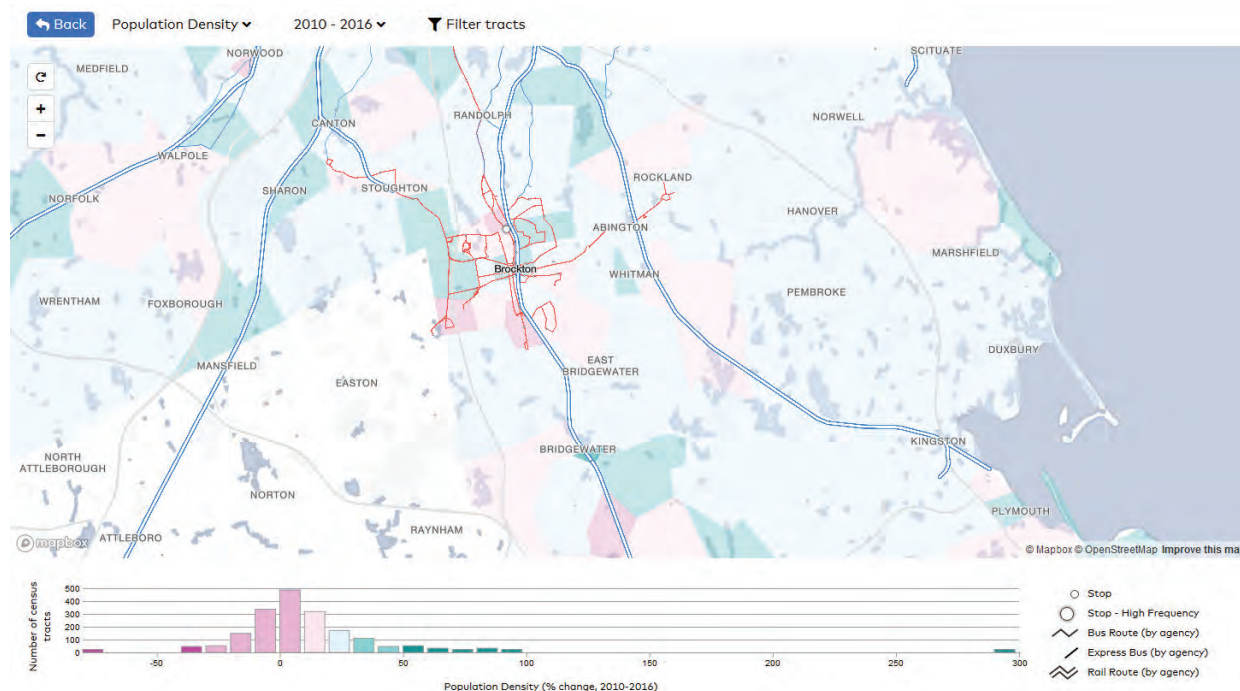
Screenshot from insights.transitcenter.org – reddish areas indicate declines and blue-green areas indicate increases in population density, 2010-2016.

While overall the number of jobs has increased in Brockton region, the geographic distribution of these jobs continues to be more dispersed and outside of BAT fixed-route services. Using the Census Bureau's OnTheMap website, MAPC has found large concentrations of wholesale, retail, and warehousing jobs without fixed-route transit in northwest Avon near Route 24 and in the office and manufacturing employment clusters near Route 3 in Rockland. According to Census data, Brockton is the largest source of commuters to the jobs in these towns. This may indicate an untapped transit market. If extending bus services to these areas, BAT should also consider a limited express operation between downtown Brockton and the employment centers to ensure speedier service and greater on-time performance.

An evaluation of on-time performance for each route could identify slow-downs where BAT and Brockton could initiate transit signal prioritization and bus queue jumps to help speed up bus travel time. Changes such as these can help make BAT fixed-route services more responsive to the changing transit marketplace.

Finally, BAT should ensure that the next five-year transit plan includes a more comprehensive passenger survey. The survey should continue to ask riders about alternative travel modes such as ride-hailing. This will allow tracking of changes over time in the adoption and frequency of ride-hailing.

Future surveys should follow the example of the BAT ride-hail survey in providing online surveys, mobile-friendly surveys, and surveys in all relevant languages. Following these protocols can allow for a greater amount of data to be collected in conjunction with intercept surveys conducted on board and at the BAT Intermodal Centre. Further, there are newer online interactive mapping surveys (such as ArcGIS Survey123) where respondents can easily identify with an interactive "pin drop" possible trip origins and destinations that could be served.

BAT should also consider conducting one or more focus group meetings with riders to discuss needs and possible changes. These rider focus groups can also allow for a more nuanced investigation of why riders might use ride-hailing or choose to drive for some trips.

Partnerships for Consideration

Nationwide, many transit agencies have entered into partnerships with ride-hailing services. In spite of concerns that ride-hailing competes with transit, the primary impetus for transit agencies to enter into partnerships is to respond to ridership declines. It is important to underscore that most of these partnerships, which are considered pilot programs, did not begin until 2016. Many of these pilot programs were in effect for a only a few months, and were modified once they were underway. The overall effectiveness of these partnerships is still unproven.[34]

Why Transit Agencies Form Partnerships

Transit agencies form partnerships to establish first-mile/last-mile connections, to address gaps in service, and to augment paratransit. Partnerships have also been formed to service new areas or select areas of employments, and to enhance the service of specific bus lines that may be underperforming. Other common rationales for why transit agencies form partnerships with ride-hailing services are to:

- increase mobility for existing and/or new transit customers; increase cost-effectiveness;
- meet or respond to a specific policy goal or challenge; or
- demonstrate innovation and flexibility to experiment.

What Markets are Targeted

Partnerships between transit agencies and ride-hailing services target various markets. The most frequently targeted markets for these partnerships include:

- existing and/or potential transit ridership;
- people connecting to transit;
- paratransit or demand-response customers;
- service at locations and times when there is less transit service (e.g., late at night, during the weekend);
- lower-density areas;

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34 Much of this information came from a literature review of various case studies of ride-hail partnerships. Three reports stand out as the most informative – Partnerships Between Transit Agencies and Transit Network Companies (2019), Partners in Transit (2018), and Private Mobility, Public Interest (2016).

- traditionally underserved groups (e.g., individuals with low incomes); and
- shift workers.

A strong marketing and outreach effort is critical to increase awareness and understanding of a pilot program. It is also important to clearly convey instructions for the program's use.

Partnership Models

There are three distinctive models that partnerships between transit agencies and ride-hailing providers can take. In one, the transit agency directly subsidizes ride-hailing trips from the ride-hailing platform. In another, the agency markets ride-hailing services as a complement to fixed-route services but does not directly subsidize ride-hailing trips. In the third, the agency leverages ride-hailing platforms to offer streamlined, on-demand transit service using its own fleets and operators. This last is an emerging area of collaboration.

Considerations in Forming Ride-hailing Partnerships

Before entering into a partnership with a ride-hailing service, a transit agency should first evaluate and leverage existing assets, establish goals and objectives, and develop an evaluation plan. When establishing a partnership with a ride-hailing service, establishing a data sharing agreement and marketing are paramount.

A. Evaluate and Leverage Existing Assets

Prior to entering into a partnership with a ride-hailing service, a transit agency should evaluate opportunities to strengthen and make existing transit service more efficient. Examples of these opportunities include infrastructure changes, such as designating dedicated lanes or designing streets with "bus bulb-outs." Both of these measures can allow buses to stop and board passengers without leaving the travel lane. Optimizing traffic-light timing by using "transit signal priority" reduces delay for buses at intersections controlled by traffic signals. It is also important to work with municipalities to implement infrastructure improvements, such as sidewalk and lighting improvements, that improve the passenger experience. Allowing riders to board through all doors and consolidating closely-spaced bus stops reduces the time passengers spend waiting at bus stops. Combined, these strategies all contribute to buses moving more safely and reliably.[35]

Conducting a comprehensive analysis of the performance of existing bus routes is also imperative. A comprehensive analysis will evaluate the productivity and efficiency of a transit agency's services and will call attention to routes that may need to be adjusted.

B. Establish Goals, Objectives, and Evaluation Plan

The predominant role of public transit is to reduce traffic congestion and to provide access for people of all income levels, especially those who are unable to drive. In sum, a transit agency's goals should focus on providing equitable, efficient, affordable, and sustainable transportation. When considering a partnership, a transit agency should consider how ride-hailing complements these overarching goals.

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35 The Stark (and Hopeful) Facts About Bus Ridership

Prior to entering a partnership with a ride-hailing service, it is imperative that a transit agency establish clear goals, objectives, and an evaluation plan from the outset. An evaluation plan will need to be substantiated with metrics and data in order to measure the partnership's success. Examples of metrics include number of trips, cost per trip and overall cost, number of shared trips, as well as customer satisfaction. Developing an evaluation plan can assist with the negotiation process when a transit agency negotiates a data sharing agreement with a ride-hailing service.

C. Data Sharing Agreement

Entering into a data sharing agreement is frequently the most challenging aspect for a transit agency when developing a partnership with a ride-hailing service. Although ride-hailing services are disinclined to share data due to privacy concerns, public records requests, and competitive advantage, it is critical that a data sharing agreement be formed as part of any partnership.

Ride-hailing data provides detailed data that can enable transit agencies better understand transportation demands, make necessary adjustments, and effectively plan for the future. Transit agencies have also reported needing data for the ability to measure whether the pilot was meeting the transit agency goals and understand who is using the pilot and for what purpose. It is worth mentioning that transit agencies should not report data on subsidized ride-hailing trips to the NTD (National Transit Database) until a formal assessment is undertaken by the Federal Transit Authority (FTA).[36]

Examples of data transit agencies have requested from ride-hailing providers include trip origins and destinations, vehicle miles traveled, fare amount paid, ride volumes by time and date, whether the trip was shared or solo; agency (customer cost), dispatch log that includes trips taken and cancelled/or no show, and complaint log and resolution. Transit agencies have also requested safety-related datasets such as crash volumes, causes of crashes, and crash locations.

D. Regulatory Challenges

There are hurdles and legal restrictions at the federal, state, and local levels that make forming partnership agreements between transit agencies and TNCs challenging.

For any pilot, transit agencies need to adhere to the Americans with Disabilities Act (ADA) and Title VI of the Civil Rights Act. Some transit agencies have engaged a third-party wheelchair-accessible vehicle (WAV) provider, in addition to the ride-hailing provider, to address the challenge of providing service with WAVs and ensure equivalent response times. Transit agencies generally address Title VI requirements with a call center for customers without smartphones. For unbanked customers, transit agencies have offered pre-paid debit cards or engaged with a third-provider that accepts cash for unbanked customers.

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36 "Currently, the only TNC services that may meet the definition of public transportation are their shared ride products (e.g. UberPOOL and Lyft Line). However, until FTA undertakes a formal assessment of these shared ride services, transit agencies subsidizing or promoting TNC trips as part of a partnership should not report those trips to the NTD." - Partnerships Between Transit Agencies and Transit Network Companies, 2019, p 5-9.

Regulatory considerations are particularly relevant for transit agencies that seek to use specific funding sources to enter into partnerships with ride-hailing providers. These funding agreements may be contingent upon additional regulatory requirements, particularly for funding from federal resources.

When entering into a partnership, there are specific regulations for transit agencies to consider. These regulations include, but are not limited to: liability insurance, procurement, and employment classification. *Legal Considerations in Relationships between Transit Agencies and Ridesourcing Service Providers*[37] provides regulatory guidance for transit agencies to consider when contemplating a relationship with a ride-hailing provider.

Partnerships between transit agencies and ride-hailing providers have developed both contractually and non-contractually under a patchwork of rules and regulations.

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37 Transit Cooperative Research Program, Legal Research Digest 53, 2018. http://www.trb.org/TCRP/Blurbs/177575.aspx

7. BAT-SPECIFIC AREAS FOR POTENTIAL PARTNERSHIPS

Based on a review of BAT data and national case studies, there are three potential ride-hail partnerships that could receive further study. These potential ride-hail partnerships are: New Service Zones in Avon and Rockland, Extended Service Hours, and Enhanced DIAL-A-BAT Service.

New Service Zones in Avon and Rockland

Under this pilot, BAT would create a new service in Avon and/or Rockland by subsidizing ride-hail trips within these municipalities. As noted earlier in this study, Avon and Rockland are two major employment centers in the area without fixed-route bus service. Census data also show that Brockton is the largest supplier of workers to these areas. The Rockland service would also provide first mile/last mile connections with the commuter rail station in Rockland, and replace or supplement the Rockland Flex service. Under this pilot, the following ride-hail trips would be eligible for a subsidy:

- Within the town limits of Avon and Rockland.
- Originating or ending at the Abington or Rockland commuter rail stations and anywhere in Rockland, to provide connections with MBTA rail services.
- Between Avon or Rockland and the BAT Intermodal Center, to allow for connections with other BAT services and the MBTA commuter rail in downtown Brockton.
- Between Avon and the Westgate Mall area, to connect with other BAT bus services.
- Rockland trips originating or ending at the Walmart in Abington, to connect with BAT Route 5.

This pilot would be similar to the Pinellas Suncoast Transit Authority's (PSTA) "Direct Connect" program that provides a subsidy for Uber, Lyft, and taxi rides to connect with PSTA bus routes, and similar to the Uber partnership that North Shore Community College has developed to shuttle students between campuses and to connect with MBTA bus and commuter rail hubs.

Under this pilot, only those trips that end or begin at or within a specific "geofenced" area would be eligible. BAT could also tailor the pilot to require users to register for the program to help set a limit to the number of subsidized trips per user. BAT could also set time-of-day restrictions to match the operating hours of BAT fixed-route bus services. Figure 12 shows the possible geographic reach of this pilot.

Figure 12. Potential Ride-Hail Partnership Service in Avon and Rockland
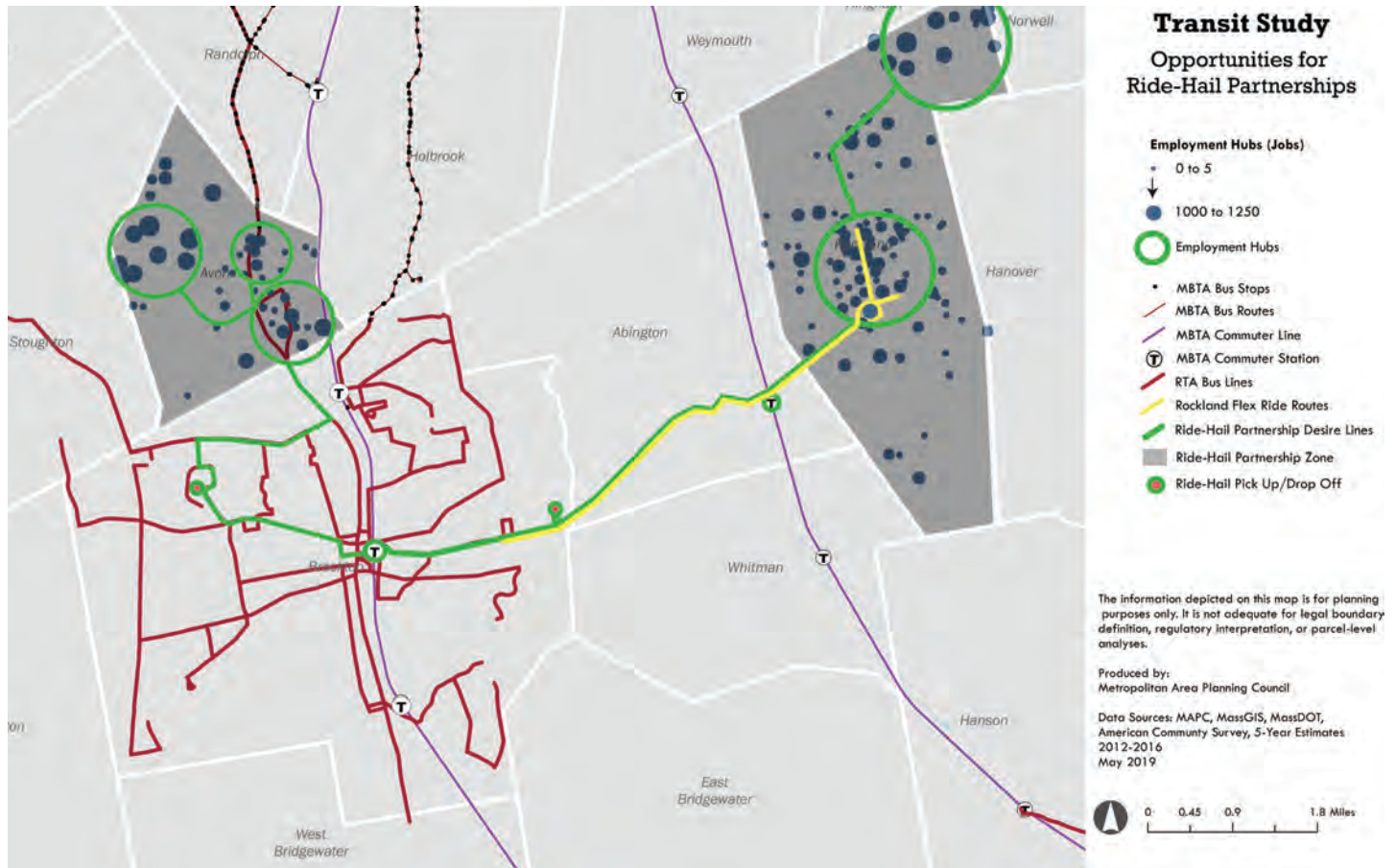
Extended Service Hours (late night/early morning)

With this pilot, BAT would provide a subsidy to cover part of the costs of eligible Uber, Lyft, or taxi trips within the BAT fixed-route service area during early morning and late night hours when BAT fixed route buses do not operate. This partnership would target shift workers who cannot get to work on BAT because service does not begin early enough, or to who cannot get home on BAT because service does not operate late enough. Under this option, BAT would see an increase in fixed-route ridership, since riders will use BAT services for at least one portion of their trip (work or home). This pilot would help retail and restaurant workers, who may have work shifts that are later than BAT service or who must arrive at work earlier than 6 A.M. when BAT service begins. The program would also help health care workers, who are in the largest sector of employees in Brockton.

This pilot would be similar to the Community Accessing Rides (CAR) program sponsored in part by GATRA. With CAR, ride-hail trips requested for periods outside of the time when GATRA fixed-route services operate are eligible for the subsidy. This pilot would also be similar to the PSTA "TD Late Shift" program that provides low-income residents free Uber rides between 9 P.M. and 6 A.M., when PSTA buses do not operate. BAT could also establish income requirements similar to the PSTA program.

Enhanced DIAL-A-BAT Service

Under this concept, BAT would subsidize trips via taxi, Uber, or Lyft taken by DIAL-A-BAT riders. The program would allow for an expansion of demand response service without an increase in BAT drivers and vehicles. The program would be beneficial to those who do not need a wheelchair accessible vehicle and able and willing to enter and exit a passenger vehicle, but who cannot drive themselves.

Many transit agencies enter into paratransit rider-hail partnerships primarily to save operating costs. MBTA's The RIDE pilot with Uber and Lyft, for example, has experienced an average savings of over 50 percent per trip when compared to a typical RIDE trip. However, because BAT's demand-response services average twenty dollars per trip, the pilot likely would not provide much cost savings, if any. Instead, the advantage of the program would be the additional convenience for paratransit customers to book trips in real time without the typical 24-hour notice. Given the lack of cost savings for BAT and the possible ADA and other regulatory challenges (described above in this chapter), however, this pilot is not recommended at this time.

Microtransit Services

An alternative that BAT may wish to consider is a microtransit service. Microtransit is a public transportation service that uses dynamically-generated routes derived from advanced software, and which may expect passengers to make their way to and from common pick-up or drop-off points. Unlike more traditional dial-a-ride transit, microtransit does not require the typical 24- to 48-hour advance scheduling. Microtransit uses ride-hailing technology like Uber's and Lyft's, with dynamic trip routing and vehicles that are hailed by the user with a smartphone app. Unlike Uber and Lyft, microtransit vehicles are public. Drivers are not individual private contractors but professionally trained drivers who usually operate wheelchair accessible vehicles. Moreover, as a public transit operation, microtransit ridership and other trip data are in the public domain.

Microtransit vendors can provide a range of services. Some agencies or municipalities hire the microtransit vendor to provide the dynamic scheduling software to route the vehicles and to develop the mobile app, with the agency or municipality using its own drivers and vehicles. Other microtransit vendors can provide a turnkey service – consulting, scheduling software, hardware, drivers, and vehicles.

All three of the ride-hail partnerships described above could be developed as microtransit pilots from the beginning, or they could evolve from ride-hailing into a microtransit service after data are collected on trip demand and popular origins and destinations.

BAT should also consider expanding the Mini-Maller into a microtransit option on the western side of Brockton. Although this has limited hours and geographic reach, the route is maintaining ridership and provides a crucial link for residents living on Brockton's west side. A cursory analysis of Brockton's demographic trends since 2010 shows a growing population of lower-income residents in and around Route 24 near the Westgate Mall. A microtransit pilot on the west side could provide trips connecting

any household within a set geographic area to Westgate Mall, including Market Basket, Aldi, and Walmart. This service could be either a replacement of the Mini-Maller loop, or a complementary microtransit that serves household beyond the stops of the Mini-Maller route.

Currently, the only microtransit service operating in Massachusetts is a night transit service operated by Via for Harvard University students and faculty. The City of Newton is now developing a microtransit service for their senior transportation, and GATRA is evaluating a microtransit pilot in the Foxboro area as a first- and last-mile connection with commuter rail.

There are several microtransit pilots now operating in the US. For example, Sacramento Transit in California is currently operating microtransit services in two areas. Riders can connect with commuter rail and light rail stations, as well as any other destination in the microtransit service zone. In addition to using the mobile app, riders can hail the vehicle on their computer, or by calling the transit agency in a manner similar to other demand-response services. More details can be found at https://smartride.sacrt.com/.

8. CASE STUDIES

Examples of Massachusetts Ride-Hailing Partnerships

Various ride-hail partnership pilots have been developed in the last few years in Massachusetts; these can provide BAT some best practices. Three of these pilot programs are summarized below.[38]

MBTA the RIDE

MBTA's the RIDE partnership with Uber, Lyft, and taxis is one of the longest operating partnerships in Massachusetts. The average RIDE cost is approximately fifty-five to sixty dollars per revenue hour. The pilot was developed to advance cost-savings while providing a high level of service to RIDE customers. In 2016, a Request for Proposals (RFP) was issued to solicit bids from ride-hailing vendors for an on-demand paratransit pilot. Only companies that could serve the entire RIDE service area and user population, including non-smartphone users and customers needing Wheelchair Accessible Vehicles (WAV), were considered. The pilot launched in the fall 2016 and was at first limited to 400 participants with a thirteen dollar MBTA subsidy and universal trip cap. The pilot was very popular with riders and has since been expanded. Currently, the program has a forty dollar per trip maximum MBTA subsidy.

As of 2018, there were approximately 1,250 active users taking 13,000 monthly trips. That total represents only 10 percent of total MBTA monthly paratransit trips. The average ride-hail trip costs the MBTA around seventeen dollars. Due to its popularity, the pilot has been extended until July 2019. In July 2018, the pilot was expanded to include Curb Mobility (a taxi app), which was launched in the metro Boston area, increasing access to non-dedicated WAVs and making a cash solution available for individuals without credit or debit cards. In 2019, the MBTA and MassDOT announced a one-year pilot program to provide financial incentives to ride-hail companies to deploy WAVs, using funds collected though the per-trip ride hail fee collected by the Commonwealth.[39]

Community Accessing Rides

In 2016, GATRA was asked to join, along with other community organizations, the Attleboro Area Social Responsibility Alliance to participate in pilot programs that could help meet community needs. The alliance was launched in 2016 from an earlier 2015 community needs assessment, which found that transportation was the most critical issue for under-resourced residents – specifically, the need for transportation at night and on weekends, which fall outside of GATRAs normal service hours. The goal of the pilot was to expand options and to provide mobility that would extend beyond GATRA's services.

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38 Most of the information on these Massachusetts pilots is derived from a ride-hail partnership forum hosted by MAPC in September 2018 (see https://www.mapc.org/planning101/how-have-public-agencies-and-nonprofits-partnered-with-tncs/), from the Massachusetts Mobility Center Practice Briefing on TNC partnerships from April 2019 at https://www.mass.gov/service-details/partner-with-a-transportation-network-company-to-improve-community-mobility, as well as from the authors' conversations with program directors of these pilots.

39 https://www.mbta.com/news/2019-04-01/massdot-and-the-mbta-partner-transportation-network-companies-support-more

The Alliance created the "Community Accessing Rides" (CAR) initiative and formed three subcommittees – operations, funding and marketing – to further develop the initiative. Uber was identified as a possible solution due to their service availability and ride-booking platform. GATRA's role in the partnership included developing a Google Earth resource for pilot members to use to identify fixed-route bus services for their clients before logging in for an Uber ride. GATRA's goal was to help agencies first look to see if an existing bus route might provide service, and then book an Uber ride only if GATRA transit services might not meet the transportation need. GATRA also secured a Community Transit Grant to help fund the pilot.

The pilot began in 2017. The funding for the pilot program included donations from the seven social service organizations that agreed to be part of the pilot. Other contributors to the pilot were businesses, community organizations, the Community Transit Grant, and funding from the state legislature. The program is a success, providing an average of 125 rides per month. It should be noted that GATRA did not directly order any rides for customers – instead, all rides were booked through the various organizations that were part of the pilot. GATRA obtained transit funding and assisted in ensuring the program complemented its bus service by providing subsidized rides only outside of GATRA's service span and geography.

North Shore Community College

Until 2016, North Shore Community College (NSCC) operated a shuttle connecting its campuses in Danvers, Middleton, and Lynn. The shuttle only operated every 90 minutes and was prone to being late. Together with the high operating costs and low ridership, the shuttle was not meeting the needs of the students. Therefore, the college needed to find a solution that was cost-effective for students and the college, but was more convenient and could be available whenever classes were in session.

The college began a pilot program with Uber in 2016, while also still operating the shuttle. Students who need assistance with transportation must register online and are then eligible for a ten dollar Uber ride subsidy when travelling between the Danvers campus and the bus station at North Shore Mall or the Beverly commuter rail station. In 2017, the college also expanded the service to the Middleton campus.

The pilot provides a first mile/last mile connection with area transit services that is a more cost-effective transportation option than the shuttle. Whereas the shuttle operated only Monday through Friday, 8:00 A.M. to 5:00 P.M., the Uber option is available to students whenever NSCC classes are in session, including nights and Saturdays.

Ride-Hailing Partnerships across the US

The following is a summary of national case studies of transit agencies that have established innovative partnerships with ride-hailing services. The pilot programs feature discounted or free rides for low-income residents and late shift workers, and accommodating customers without access to smartphones or who are unbanked. Other pilots promote shared trips or provide seniors and those with disabilities service options beyond ADA paratransit. A pilot targeted to employees at selected employers and a partnership with no exchange of funds are also highlighted.

Discounted or free rides for low-income residents and late shift workers.

Pinellas Suncoast Transit Authority (PSTA)
Pinellas County Transportation Disadvantaged (TD) Program – Pinellas County, FL
Target Market: Low-income residents.
The TD program provides low-income residents free Uber rides between 9:00 P.M. and 6:00 A.M. To qualify, residents must live in Pinellas County, not have access to a personal car, have a documented income at or below 150 percent of federal poverty guidelines, and have a job that begins or ends between 10:00 A.M. and 6:00 A.M. Qualified residents can receive 25 free Uber or Lyft rides each month when they purchase a monthly bus pass. TD Late Shift is a component of the TD program aimed at improving point-to-point mobility for low-income service workers who need transportation in late evening hours after PSTA's fixed-route service stops operating.

Discounted rides for low-income residents.

Pierce Transit
Limited Access Connections – Pierce County, WA
Target Market: Low-income residents.
Provide Lyft discounts to, from, or within select geographic zones, with designated days and times for each zone.

Accommodate customers without access to smartphones and unbanked customers.

Los Angeles County Metropolitan Transportation Authority (METRO)
Mobility on Demand Pilot – Los Angeles County, CA
Target Market: Existing and new transit customers, vulnerable populations, geographic diversity.
Customers without access to smartphones will be able to call a call center to create a Via account and book a ride. Via will operate its own call center and subcontract to LionBridge, which is also a contractor for Metro, for non-English speakers. Via's contract with LionBridge is separate from Metro's contract with LionBridge. Unbanked customers will have the option to use pre-paid debit cards.

Promote shared trips and accommodate customers without access to smartphones.

Livermore Amador Valley Transit Authority
GoDublin! – Livermore, CA
Target Market: Transit customers.
Only shared rides booked through UberPOOL, Lyft Line, or DeSoto Share are eligible for the promotion. Customers who do not have access to a smartphone, wish to pay in cash, or are in need of a wheelchair-accessible vehicle can request rides by calling the DeSoto Cab Company.

Provide seniors and people with disabilities service options beyond ADA paratransit.

Omitrans
RIDE Taxi & Lyft Program – San Bernardino, CA
Target Market: Seniors and people with disabilities.
Seniors age 62 and above and people with disabilities who live within the Omnitrans service area are eligible for the transit agency's several specialized programs, which include RIDE, taxi, and Lyft. Interested individuals complete a written application to determine eligibility. The application process includes signing a "hold harmless" form where the applicant agrees that *"being driven by others is an inherently dangerous activity... and I agree to indemnify and hold harmless Omnitrans, its officers...from any and all claims, losses and liabilities...arising out of or in any way connected with my participation in the [specialized transportation service] programs."*

Pilot targeted to employees at selected employers – not the general public.

Solano Transportation Authority (STA)
First Mile/Last Mile Pilot – Solano County, CA
Target Market: Employees at selected worksites within two to five miles of a rail station.
Employees from specified employers sign up for the program by contacting STA and will receive a discount code that will save up to ten dollars of 40 Lyft trips a month to/from a regional rail station to their place of work.

Partnership with no exchange of funds.

Southeastern Pennsylvania Transportation Authority (SEPTA)
Philadelphia, PA
Target Market: People driving and parking at SEPTA rail stations.
The partnership between SPETA and UBER involved no exchange of funds. SEPTA purchased ad space on its own system to market the promotion – Uber funded a 40 percent discount for rides to or from the 11 stations, up to ten dollars per trip. The approach of co-promotion rather than subsidizing rides was done to reduce the program's complexity and to avoid scrutiny by regulators.

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10. APPENDIX: BAT RIDER SURVEY

The Metropolitan Area Planning Council (MAPC), in coordination with the Brockton Area Transit Authority (BAT) and the Old Colony Planning Council (OCPC), conducted a survey of BAT riders to better understand their uses of ride-hailing and transit. The survey was conducted in-person over two days as well as online over a 10 day period in April 2019.

Survey Development and Deployment

To create the survey, MAPC reviewed similar survey questions from the following sources: recent surveys of transit riders and ride-hail passengers from across the US[1]; the questions used in the 2017 MAPC *Fare Choices* ride-hailing survey; the 2017 rider intercept survey conducted by the MBTA, and; BAT rider surveys used in the 2015 Comprehensive Regional Transportation Plan and in the 2018 BAT Transit Fare Analysis. From these various sources, MAPC, with input from OCPC and BAT, developed questions that would be most relevant in understanding ride-hailing and transit ridership in the BAT service area. Because most of the people surveyed would need to complete it within a few minutes before boarding the bus (when intercepted in-person), or while riding the bus (when using a web link from a poster or flyer), the survey needed to be succinct and completed in five minutes or less. The deployed survey included up to 19 questions on topics such as frequency of riding BAT, trip purposes, frequency of using ride-hailing and other methods of travel, attitudes towards ride-hailing, as well as demographic inquiries. Some questions could be skipped, depending on the responses from survey takers. BAT staff translated the survey from English into Spanish, Portuguese, and Haitian Creole.

In an effort to gather as many responses as possible, MAPC conducted the survey both online and in-person using tablets. Both the tablet and web surveys were conducted via Qualtrics and were nearly identical; the web survey had one additional question on how the person learned about the survey (flyer, Facebook, poster, etc.). Finally, as an incentive to take the survey, people were allowed to enter their email address or mobile number at the end of the survey for the chance to win a 31-day BAT transit pass.

A poster advertising the survey (including the survey web link) was developed in four languages and posted in each of the BAT buses and DIAL-A-BAT vans for approximately 10 days[2]. A copy of this poster is included in this Appendix.

MAPC staff, assisted by staff from BAT and OCPC, then conducted a one-day effort on April 24, 2019 to intercept survey BAT riders and others at four locations in Brockton. MAPC also hired two additional contract surveyors from the Central Transportation Planning Staff (CTPS) to assist in the efforts. Finally, MAPC staff also surveyed riders at Ashmont Station in Boston (where the BAT Route 12 stops) the day prior to the Brockton survey efforts.

The table below generally summarizes the efforts taken on April 24, 2019 to distribute flyers and conduct in-person rider surveys in Brockton. Four tablets were rotated among surveyors at the BAT Intermodal Centre. Surveyors at the BAT Intermodal Centre included some OCPC and BAT staff who spoke Portuguese or Haitian Creole, as well as MAPC staff who spoke Spanish.

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[1] Shared Mobility Survey Instrument and Transit Agency Survey Instrument deployed as part of *Broadening Understanding of the Interplay between Public Transit, Shared Mobility, and Personal Automobiles* research.
[2] April 19-28, 2019.

Surveyors both intercepted riders waiting inside the Centre, as well as outside on those at the bus platforms. One tablet/surveyor was assigned to the Brockton commuter rail platform area. Others were assigned to be at the Massasoit Community College campus, at the bus stop near Brockton High School, inside Westgate Mall, and at the bus stop at Market Basket at Westgate Mall.

Tablet	Surveyor (s)	Assignment 1	Assignment 2
Tablet 1*	MAPC staff BAT staff (Portuguese speaking and/or Haitian Creole speaking)	BAT Intermodal Centre – In building and at bus platforms 7 am – 12:30 pm	BAT Intermodal Centre – In building and at bus platforms 12:30 pm – 6 pm
Tablet 2*	MAPC staff BAT staff (Portuguese speaking and/or Haitian Creole speaking)	BAT Intermodal Centre – In building and at bus platforms 7 am – 12:30 pm	BAT Intermodal Centre – In building and at bus platforms 12:30 pm – 6 pm
Tablet 4*	BAT staff (Portuguese speaking and/or Haitian Creole speaking) OCPC staff (Portuguese speaking)	BAT Intermodal Centre – In building and at bus platforms 7 am – 12:30 pm	BAT Intermodal Centre – In building and at bus platforms 12:30 pm – 6 pm
Tablet 5*	CTPS staff CTPS staff	BAT Intermodal Centre – In building and at bus platforms 7 am – Noon	BAT Intermodal Centre – In building and at bus platforms Noon – 6 pm
Tablet 3	MAPC staff (Spanish speaking)	BAT Intermodal Centre – Commuter Rail platform 7 am – 11 am and Noon to 1:30 pm	BAT Intermodal Centre – Commuter Rail platform 1:30 pm - 6 pm
Tablet 7	OCPC staff – Massasoit – A1 (AM) OCPC staff – BAT HS bus stop – A2 (PM)	Massasoit CC 9:30 am – 12:30 pm	BAT bus stop near Brockton High School 1:30 pm – 3:30 pm
Tablet 8	BAT Staff -- inside mall	Westgate Mall – inside Mall 11 am – 4:30 pm	
Tablet 9	OCPC -- at Market Basket stop	Westgate Mall – at BAT bus stop at Market Basket 11 am – 4:30 pm	
Tablet 10	OCPC – Massasoit - A1 (AM) OCPC – BAT HS bus stop – A2 (PM)	Massasoit CC 9:30 am – 12:30 pm	BAT bus stop near Brockton High School 1:30 pm – 3:30 pm

general assignment – tablets were rotated among surveyors as need to allow for charging and downloading of surveys. Tablets 4, 5, 7, 8, and 9 were also used to conduct surveys at Ashmont Station in Boston.

Staff asked people to take the survey directly on touch-screen tablets (via a Qualtrics app), as well as distributed flyers to riders waiting for and exiting from BAT buses and MBTA commuter rail trains. The flyers were similar to the poster in the BAT vehicles, in four languages and with a web link to take the survey online. MAPC estimates that approximately 300 flyers were distributed over

the two day in-person survey period. Finally, BAT also posted the link to the survey on their Facebook page and the City of Brockton Facebook page.

In total, the study collected 599 surveys -- 343 surveys via in-person on the tablets and 256 online. A list of the questions (in English) is included at the end of this Appendix.
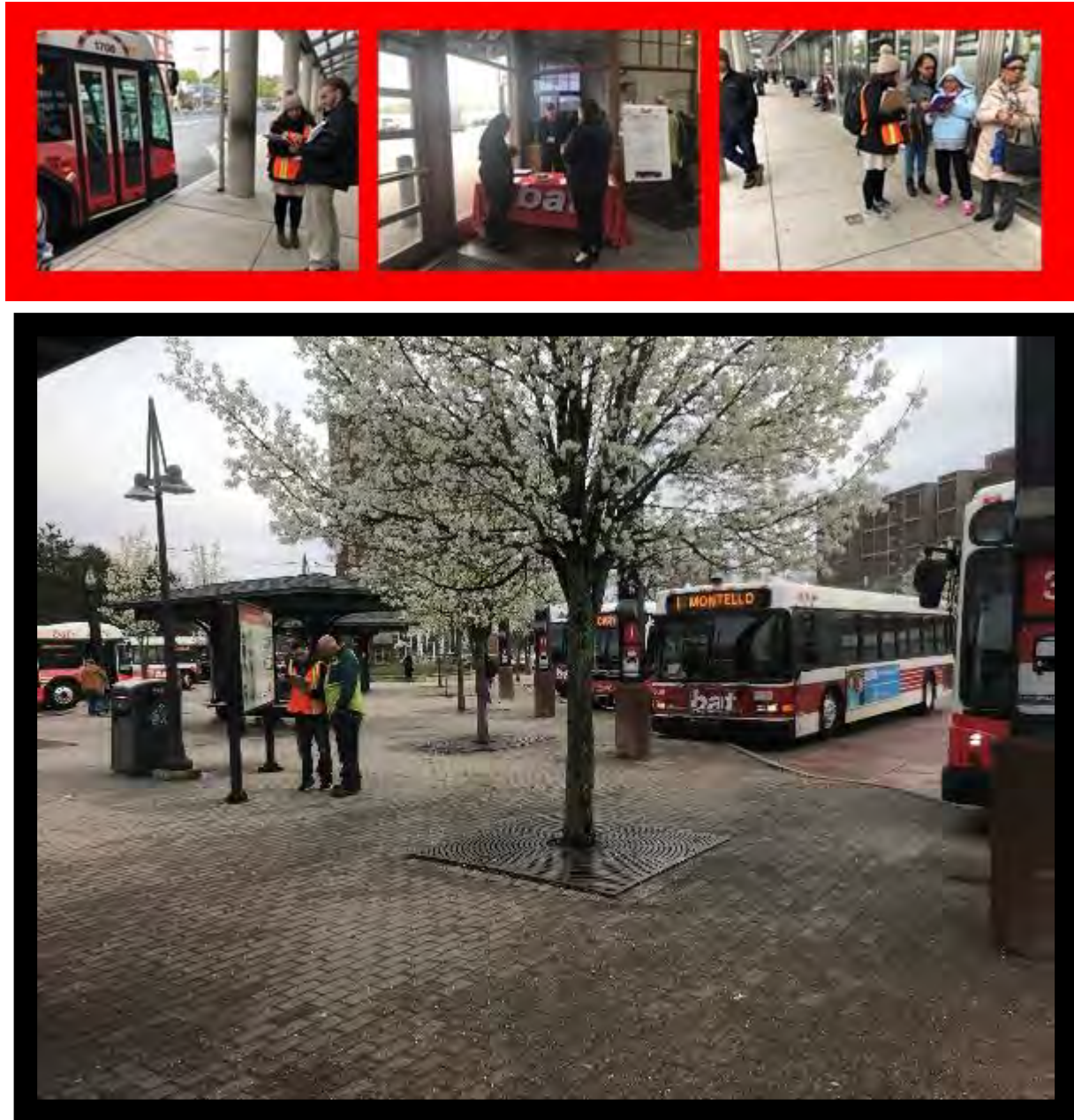
The following pages include more detail on the locations of the in-person surveys.

Ashmont Station

Address: Dorchester Avenue and Ashmont Street, Boston

General Time Period: 4 pm to 7 pm

Surveyor Location: Bus bay with stop for BAT Route 12
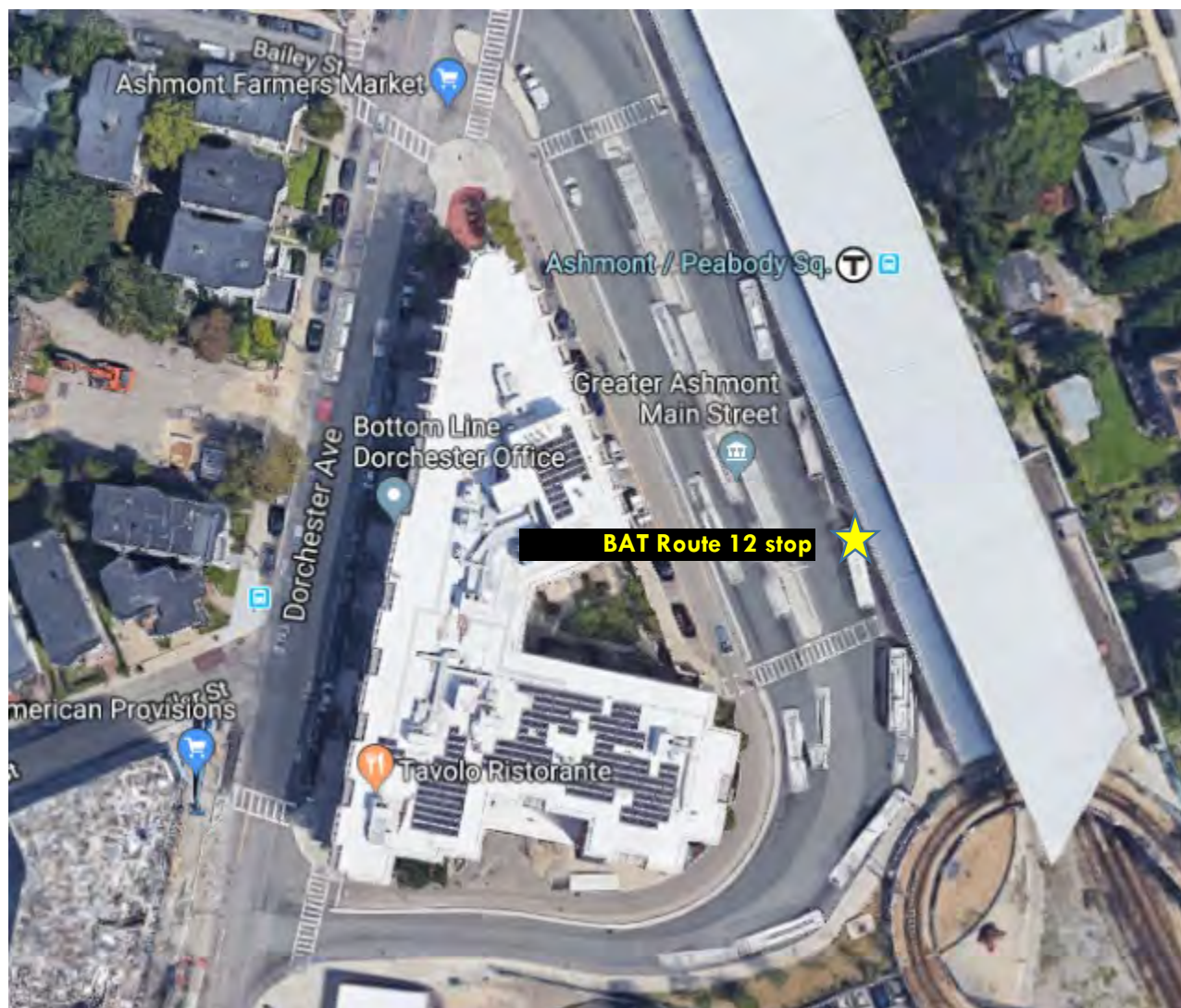
BAT Intermodal Centre and Commuter Rail Station

Address: 10 Commercial Street, Brockton

General Time Period: 7 am to 6 pm

Surveyor Locations:

- Inside BAT Intermodal Centre (with poster and table with candy)
- On bus platforms
- At commuter rail platform (with poster and table with candy)

Brockton High School (BAT Bus Stop)

Address: Inbound bus stop at MA 123 (Belmont Street) and Memorial Drive, Brockton

General Time Period: 1:30 pm – 3:30 pm

Massasoit Community College

Address: 1 Massasoit Boulevard, Brockton

General Time Period: 9:30 am to 12:30 pm

Surveyor Locations: Inside cafeteria, at Student Center with poster and candy. Table and chairs provided by CC.

Westgate Mall/Market Basket

Address: Westgate Drive, Brockton

General Time Period: 11 am – 4:30 pm

Surveyor Locations: At BAT bus stop by Market Basket, and inside mall near Kay Jewelers with poster and candy.

Survey Results

The following tables show the results of the survey:

➢ All surveys responses (n=599) – Tables 1 and 2
➢ Tablet intercept surveys responses (n=343) – Tables 3 and 4
➢ Web-based intercept survey responses (n=256) – Table 5 and 6
➢ Ashmont Station surveys (n=52) – Tables 7 and 8

In addition, Figures 1 through 9 illustrate several cross-tabulations of the survey results. Figures 1-3 address age cohorts, Figures 4-6 address income cohorts, and Figures 7-9 address vehicular ownership.

Survey skip logic: Readers should note that, depending on the responses to certain questions, some questions were not asked of respondents. Only those who indicated they did ride BAT were asked three questions on their BAT use and BAT fare payment. Similarly, only those who indicated they have used Uber or Lyft were asked two questions about their ride-hail use.

TABLE 1. Descriptive statistics of demographic characteristics for intercept survey respondents (n = 599).

Variable	n	%	Variable	n	%
Individual Characteristics			*Household Characteristics*		
Survey Language			**Home location**		
English	559	93	Inside BAT service area	491	90
Creole (Haitian)	18	3	Outside BAT service area	52	10
Portuguese	15	3			
Spanish	7	1	**Household income**		
			Less than $13,000	117	22
Age			$13,000 to $24,999	83	15
Under 18 years	40	7	$25,000 to $34,999	53	10
18 to 24 years	106	19	$35,000 to $49,999	41	8
25 to 34 years	79	14	$50,000 to $74,999	37	7
35 to 44 years	86	15	$75,000 to $124,999	25	5
45 to 64 years	183	32	$125,000 or more	9	2
65 years or older	70	12	PNA	175	32
Gender			**Household adults**		
Male	221	39	1	165	30
Female	337	59	2	183	33
Other/PNA	9	2	3	113	20
Race/Ethnicity			4 or more	92	17
Asian	5	1			
African American	187	33	**Household vehicles**		
Hispanic/Latinx	43	8	0	243	43
White	227	40	1	155	27
Multiracial	28	5	2	106	19
Other/PNA	72	13	3	39	7
			4 or more	21	4
Educational Attainment					
Less than high school	99	18			
High school or equivalent	199	36			
Some college	148	27			
Associate/Bachelor's	81	15			
Advanced degree	24	4			
Work Status *					
Working, full- or part-time	310	57			
Unemployed	75	14			
Student, full- or part-time	99	18			
Disabled	88	16			
Retired	65	12			
Other/PNA	25	5			

Notes: PNA = Prefer not to answer; * = Multiple responses permitted.

TABLE 2. Descriptive statistics of travel characteristics for intercept survey respondents (n = 599).

Variable	n	%
General Travel Characteristics		
In the last week, how have you traveled? *		
Drove myself	102	18
Ride from someone else	132	23
BAT bus	418	72
MBTA commuter rail	91	16
MBTA subway	133	23
Walk	179	31
Bike	19	3
Ride-hailing service (Uber or Lyft)	109	19
Traditional taxi	22	4
Other	13	2
Transit-related Characteristics		
How often do you ride BAT?		
Rarely: Less than once per month	60	10
Sometimes: 1 to 3 times per month	59	10
Regularly: 1 to 3 times per week	140	24
Frequently: 4 or more times per week	288	49
Never used BAT	43	7
In the last three months, what is primary reason you have used BAT? ^		
Subsistence activities: Work or school	294	56
Maintenance activities: Shopping/errands or medical	157	30
Discretionary activities: Social/entertainment	39	7
Other/Transit connection (airport or rail station)	38	7
In the last three months, what are other reasons you have used BAT? * ^		
Subsistence activities: Work or school	222	43
Maintenance activities: Shopping/errands or medical	288	56
Discretionary activities: Social/entertainment	138	27
Other/Transit connection (airport or rail station)	71	14
How do you typically pay for BAT bus trips? ^		
Monthly BAT pass	81	15
Weekly BAT pass	22	4
Daily BAT pass	31	6
Cash on board	219	41
Stored value on transit card	164	31
Student pass	17	3
Ride-hailing-related Characteristics		
How often do you use Uber or Lyft?		
Rarely: Less than once per month	112	20
Sometimes: 1 to 3 times per month	109	19
Regularly: 1 to 3 times per week	60	11
Frequently: 4 or more times per week	38	7
Never used Uber or Lyft	252	44
How have Uber and Lyft affected how often you use BAT? #		
Using Uber and Lyft have not changed my use of BAT	210	68
Using Uber and Lyft have increased my use of BAT	31	10
Using Uber and Lyft have decreased my use of BAT	69	22

What are the main reasons you choose Uber or Lyft over riding BAT? * #

BAT is not available when I need the service	136	43
BAT does not provide service to where I need to go	101	32
Uber/Lyft is more convenient (on-demand, door-to-door service)	99	31
Uber/Lyft is a better value than riding BAT	11	3
Uber/Lyft is more reliable than riding BAT	30	9
Other	49	16
Uber and Lyft have significantly changed how my family and friends travel		
Agree	227	40
Disagree	142	25
Don't know	195	35
In the future, I will more often use Uber and Lyft for travel		
Agree	116	21
Disagree	253	46
Don't know	181	33

Notes: * = Multiple responses permitted; ^ Respondents (n=547) who reported riding BAT; #
Respondents (n=319) who reported using Uber/Lyft.

TABLE 3. Descriptive statistics of demographic characteristics for tablet intercept survey respondents (n = 343).

Variable	n	%	Variable	n	%
Individual Characteristics			*Household Characteristics*		
Survey Language			**Home location**		
English	310	90	Inside BAT service area	251	85
Creole (Haitian)	16	5	Outside BAT service area	43	15
Portuguese	12	3			
Spanish	5	1	**Household income**		
			Less than $13,000	63	22
Age			$13,000 to $24,999	45	16
Under 18 years	27	9	$25,000 to $34,999	22	8
18 to 24 years	68	22	$35,000 to $49,999	21	7
25 to 34 years	47	15	$50,000 to $74,999	12	4
35 to 44 years	45	14	$75,000 to $124,999	12	4
45 to 64 years	84	27	$125,000 or more	3	1
65 years or older	41	13	PNA	111	38
Gender					
Male	145	46	**Household adults**		
Female	167	53	1	98	32
Other/PNA	3	1	2	106	35
			3	57	19
Race/Ethnicity			4 or more	44	14
Asian	2	1			
African American	128	41	**Household vehicles**		
Hispanic/Latinx	27	9	0	135	43
White Multiracial	95	31	1	89	29
Other/PNA	12	4	2	59	19
	47	15	3	20	6
			4 or more	9	3
Educational Attainment					
Less than high school	68	22			
High school or equivalent	111	36			
Some college	78	25			
Associate/Bachelor's	33	11			
Advanced degree	11	6			
Work Status *					
Working, full- or part-time	165	56			
Unemployed	47	16			
Student, full- or part-time	59	20			
Disabled	38	13			
Retired	37	13			
Other/PNA	7	2			

Notes: PNA = Prefer not to answer; * = Multiple responses permitted.

TABLE 4. Descriptive statistics of travel characteristics for tablet intercept survey respondents (n = 343).

Variable	n	%
General Travel Characteristics		
In the last week, how have you traveled? *		
Drove myself	37	11
Ride from someone else	62	19
BAT bus	258	79
MBTA commuter rail	57	17
MBTA subway	82	25
Walk	84	26
Bike	11	3
Ride-hailing service (Uber or Lyft)	49	15
Traditional taxi	13	4
Other	8	2
Transit-related Characteristics		
How often do you ride BAT?		
Rarely: Less than once per month	30	9
Sometimes: 1 to 3 times per month	31	9
Regularly: 1 to 3 times per week	81	24
Frequently: 4 or more times per week	180	54
Never used BAT	14	4
In the last three months, what is primary reason you have used BAT? ^		
Subsistence activities: Work or school	187	59
Maintenance activities: Shopping/errands or medical	82	26
Discretionary activities: Social/entertainment	26	8
Other/Transit connection (airport or rail station)	22	7
In the last three months, what are other reasons you have used BAT? * ^		
Subsistence activities: Work or school	139	47
Maintenance activities: Shopping/errands or medical	153	52
Discretionary activities: Social/entertainment	77	26
Other/Transit connection (airport or rail station)	40	14
How do you typically pay for BAT bus trips		
Monthly BAT pass	54	17
Weekly BAT pass	14	5
Daily BAT pass	26	8
Cash on board	110	35
Stored value on transit card	94	30
Student pass	12	4
Ride-hailing-related Characteristics		
How often do you use Uber or Lyft?		
Rarely: Less than once per month	60	19
Sometimes: 1 to 3 times per month	71	22
Regularly: 1 to 3 times per week	30	9
Frequently: 4 or more times per week	22	7
Never used Uber or Lyft	138	43
How have Uber and Lyft affected how often you use BAT? #		
Using Uber and Lyft have not changed my use of BAT	130	74
Using Uber and Lyft have increased my use of BAT	21	12
Using Uber and Lyft have decreased my use of BAT	25	14

What are the main reasons you choose Uber or Lyft over riding BAT? * #		
BAT is not available when I need the service	72	40
BAT does not provide service to where I need to go	54	30
Uber/Lyft is more convenient (on-demand, door-to-door service)	50	28
Uber/Lyft is a better value than riding BAT	3	1
Uber/Lyft is more reliable than riding BAT	11	6
Other	28	16
Uber and Lyft have significantly changed how my family and friends travel		
Agree	131	42
Disagree	79	25
Don't know	104	33
In the future, I will more often use Uber and Lyft for travel		
Agree	61	20
Disagree	139	46
Don't know	103	34

Notes: * = Multiple responses permitted; ^ Respondents (n=322) who reported riding BAT; #
Respondents (n=183) who reported using Uber/Lyft.

TABLE 5. Descriptive statistics of demographic characteristics for web-based intercept survey respondents (n = 256).

Variable	n	%	Variable	n	%
Individual Characteristics			*Household Characteristics*		
Survey Language			**Home location**		
English	249	97	Inside BAT service area	240	96
Creole (Haitian)	2	1	Outside BAT service area	9	4
Portuguese	3	1			
Spanish	2	1	**Household income**		
			Less than $13,000		22
Age			$13,000 to $24,999	38	15
Under 18 years	13	5	$25,000 to $34,999	31	12
18 to 24 years	38	15	$35,000 to $49,999	20	8
25 to 34 years	32	13	$50,000 to $74,999	25	10
35 to 44 years	41	16	$75,000 to $124,999	13	5
45 to 64 years	99	39	$125,000 or more	6	2
65 years or older	29	12	PNA	64	25
Gender			**Household adults**		
Male	76	30	1	67	27
Female	170	67	2	77	31
Other/PNA	6	2	3	56	23
			4 or more	48	19
Race/Ethnicity					
Asian	3	1	**Household vehicles**		
African American	59	24	0	108	43
Hispanic/Latinx	16	6	1	66	26
White	132	53	2	47	19
Multiracial	16	6	3	19	8
Other/PNA	25	10	4 or more	12	5
Educational Attainment					
Less than high school	31	12			
High school or equivalent	88	35			
Some college	70	28			
Associate/Bachelor's	48	19			
Advanced degree	13	5			
Work Status *					
Working, full- or part-time	145	58			
Unemployed	28	11			
Student, full- or part-time	40	16			
Disabled	50	20			
Retired	28	11			
Other/PNA	18	7			

Notes: PNA = Prefer not to answer; * = Multiple responses permitted.

TABLE 6. Descriptive statistics of travel characteristics for web-based intercept survey respondents (n = 256).

Variable	n	%
General Travel Characteristics		
In the last week, how have you traveled? *		
Drove myself	65	26
Ride from someone else	70	28
BAT bus	160	63
MBTA commuter rail	34	13
MBTA subway	51	20
Walk	95	38
Bike	8	3
Ride-hailing service (Uber or Lyft)	60	24
Traditional taxi	9	4
Other	5	2
Transit-related Characteristics		
How often do you ride BAT?		
Rarely: Less than once per month	30	12
Sometimes: 1 to 3 times per month	28	11
Regularly: 1 to 3 times per week	59	23
Frequently: 4 or more times per week	108	43
Never used BAT	29	11
In the last three months, what is primary reason you have used BAT? ^		
Subsistence activities: Work or school	107	48
Maintenance activities: Shopping/errands or medical	75	34
Discretionary activities: Social/entertainment	13	6
Other/Transit connection (airport or rail station)	16	7
In the last three months, what are other reasons you have used BAT? * ^		
Subsistence activities: Work or school	83	38
Maintenance activities: Shopping/errands or medical	135	61
Discretionary activities: Social/entertainment	61	28
Other/Transit connection (airport or rail station)	31	14
How do you typically pay for BAT bus trips		
Monthly BAT pass	27	12
Weekly BAT pass	8	4
Daily BAT pass	5	2
Cash on board	109	49
Stored value on transit card	70	31
Student pass	5	2
Ride-hailing-related Characteristics		
How often do you use Uber or Lyft?		
Rarely: Less than once per month	52	21
Sometimes: 1 to 3 times per month	38	15
Regularly: 1 to 3 times per week	30	12
Frequently: 4 or more times per week	16	6
Never used Uber or Lyft	114	46
How have Uber and Lyft affected how often you use BAT? #		
Using Uber and Lyft have not changed my use of BAT	80	60
Using Uber and Lyft have increased my use of BAT	10	7
Using Uber and Lyft have decreased my use of BAT	44	33

What are the main reasons you choose Uber or Lyft over riding BAT? * #		
BAT is not available when I need the service	64	47
BAT does not provide service to where I need to go	47	34
Uber/Lyft is more convenient (on-demand, door-to-door service)	49	36
Uber/Lyft is a better value than riding BAT	8	6
Uber/Lyft is more reliable than riding BAT	19	14
Other	21	15
Uber and Lyft have significantly changed how my family and friends travel		
Agree	96	38
Disagree	63	25
Don't know	91	36
In the future, I will more often use Uber and Lyft for travel		
Agree	55	22
Disagree	114	46
Don't know	78	32

Notes: * = Multiple responses permitted; ^ Respondents (n=225) who reported riding BAT; #
Respondents (n=136) who reported using Uber/Lyft.

TABLE 7. Descriptive statistics of demographic characteristics for tablet intercept survey respondents at Ashmont Station (n = 52).

Variable	n	%	Variable	n	%
Individual Characteristics			*Household Characteristics*		
Survey Language			**Home location**		
English	49	94	Inside BAT service area	25	81
Creole (Haitian)	0	0	Outside BAT service area	6	19
Portuguese	3	6			
Spanish	0	0	**Household income**		
			Less than $13,000	2	5
Age			$13,000 to $24,999	8	18
Under 18 years	7	15	$25,000 to $34,999	8	18
18 to 24 years	7	15	$35,000 to $49,999	4	9
25 to 34 years	8	17	$50,000 to $74,999	3	7
35 to 44 years	6	13	$75,000 to $124,999	1	2
45 to 64 years	16	34	$125,000 or more	0	0
65 years or older	3	6	PNA	18	41
Gender			**Household adults**		
Male	22	46	1	10	22
Female	26	54	2	17	37
Other/PNA	0	0	3	10	22
Race/Ethnicity			4 or more	9	20
Asian	1	2			
African American	23	49	**Household vehicles**		
Hispanic/Latinx	5	11	0	9	19
White	5	11	1	23	49
Multiracial	4	9	2	13	28
Other/PNA	9	19	3	2	4
			4 or more	0	0
Educational Attainment					
Less than high school	9	20			
High school or equivalent	18	39			
Some college	13	28			
Associate/Bachelor's	4	9			
Advanced degree	2	4			
Work Status *					
Working, full- or part-time	29	66			
Unemployed	3	7			
Student, full- or part-time	9	20			
Disabled	2	5			
Retired	5	11			
Other/PNA	1	2			

Notes: PNA = Prefer not to answer; * = Multiple responses permitted.

TABLE 8. Descriptive statistics of travel characteristics for tablet intercept survey respondents at Ashmont   Station (n = 52).

Variable	n	%
General Travel Characteristics		
In the last week, how have you traveled? *		
Drove myself	5	10
Ride from someone else	10	50
BAT bus	46	92
MBTA commuter rail	12	24
MBTA subway	21	42
Walk	11	22
Bike	1	2
Ride-hailing service (Uber or Lyft)	9	18
Traditional taxi	3	6
Other	3	6
Transit-related Characteristics		
How often do you ride BAT?		
Rarely: Less than once per month	6	12
Sometimes: 1 to 3 times per month	2	8
Regularly: 1 to 3 times per week	13	25
Frequently: 4 or more times per week	28	55
Never used BAT	0	0
In the last three months, what is primary reason you have used BAT? ^		
Subsistence activities: Work or school	37	73
Maintenance activities: Shopping/errands or medical	8	16
Discretionary activities: Social/entertainment	4	8
Other/Transit connection (airport or rail station)	2	4
In the last three months, what are other reasons you have used BAT? * ^		
Subsistence activities: Work or school	27	55
Maintenance activities: Shopping/errands or medical	12	24
Discretionary activities: Social/entertainment	7	14
Other/Transit connection (airport or rail station)	4	8
How do you typically pay for BAT bus trips		
Monthly BAT pass	9	18
Weekly BAT pass	5	10
Daily BAT pass	1	2
Cash on board	15	31
Stored value on transit card	18	37
Student pass	1	2
Ride-hailing-related Characteristics		
How often do you use Uber or Lyft?		
Rarely: Less than once per month	7	14
Sometimes: 1 to 3 times per month	14	28
Regularly: 1 to 3 times per week	4	8
Frequently: 4 or more times per week	5	10
Never used Uber or Lyft	20	40
How have Uber and Lyft affected how often you use BAT? #		
Using Uber and Lyft have not changed my use of BAT	21	72
Using Uber and Lyft have increased my use of BAT	4	14
Using Uber and Lyft have decreased my use of BAT	4	14

What are the main reasons you choose Uber or Lyft over riding BAT? * #		
BAT is not available when I need the service	12	41
BAT does not provide service to where I need to go	7	24
Uber/Lyft is more convenient (on-demand, door-to-door service)	8	28
Uber/Lyft is a better value than riding BAT	0	0
Uber/Lyft is more reliable than riding BAT	3	10
Other	3	10
Uber and Lyft have significantly changed how my family and friends travel		
Agree	26	53
Disagree	5	10
Don't know	18	37
In the future, I will more often use Uber and Lyft for travel		
Agree	13	27
Disagree	18	38
Don't know	17	35

Notes: * = Multiple responses permitted; ^ Respondents (n=52) who reported riding BAT; #
Respondents (n=30) who reported using Uber/Lyft.

FIGURE 1. Cross-tabulation of current ride-hailing adoption frequency by BAT riders across age cohorts.
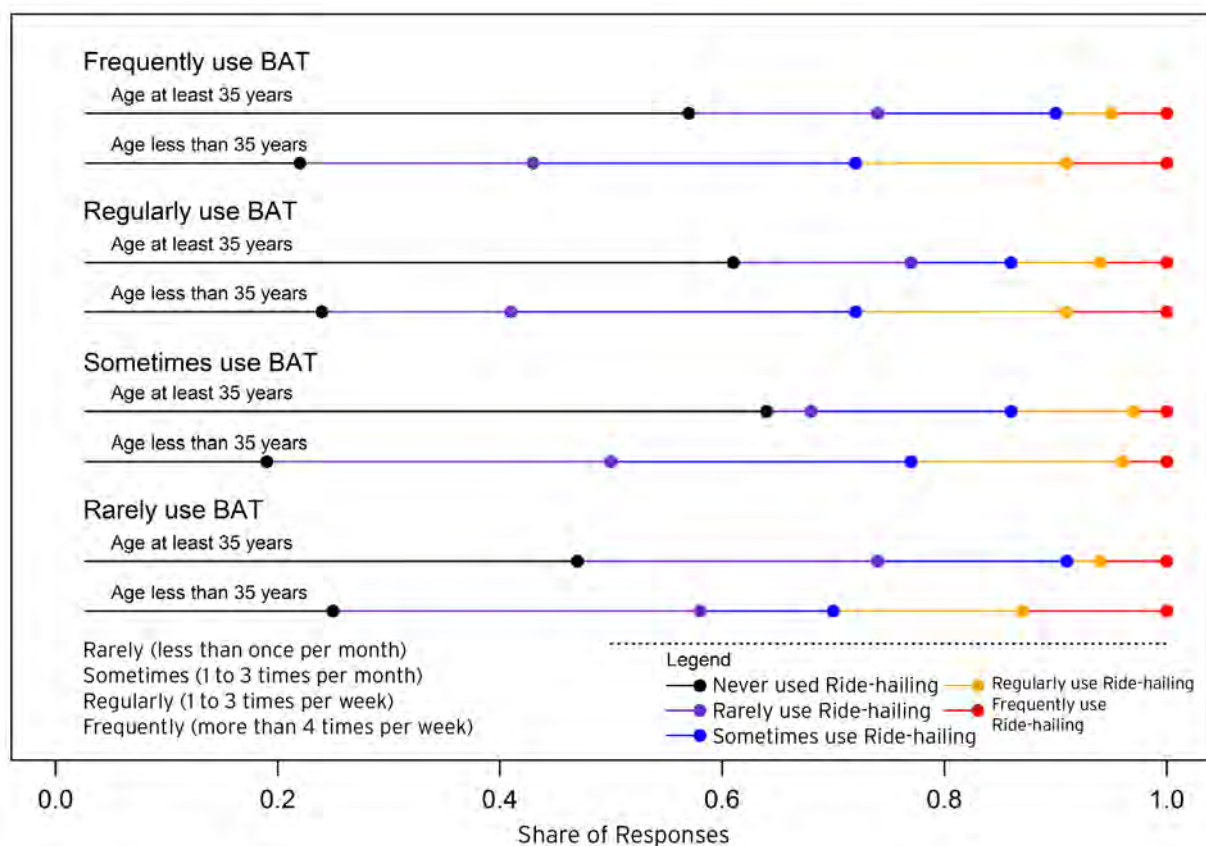
FIGURE 2. Cross-tabulation of current ride-hailing impact on transit use by BAT riders across age cohorts.
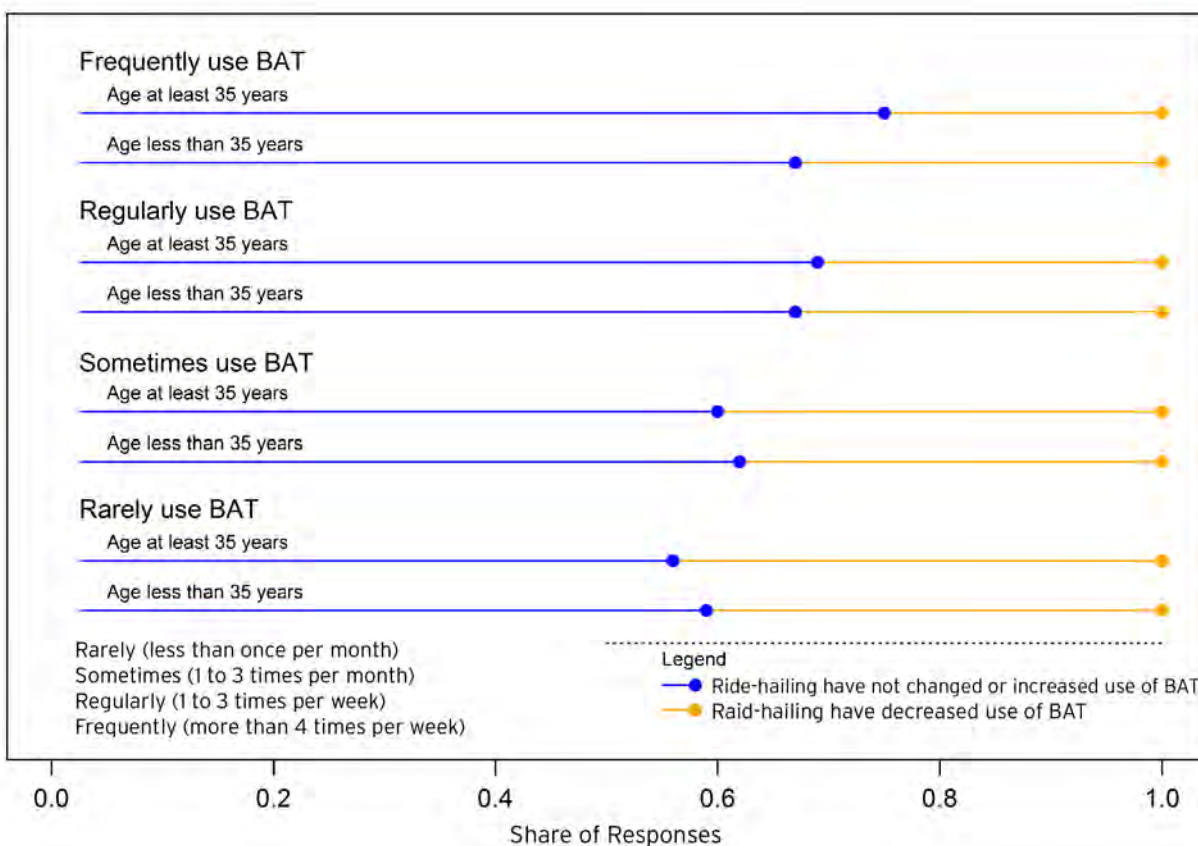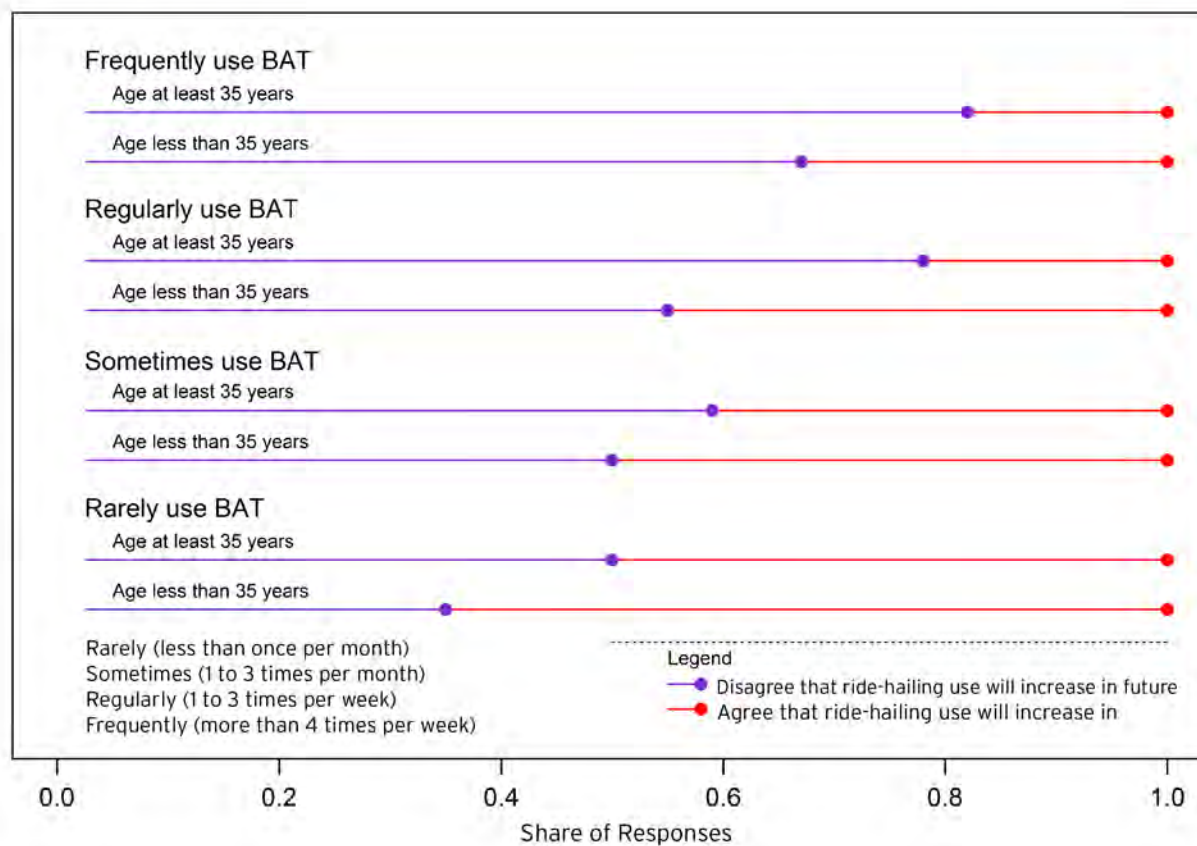
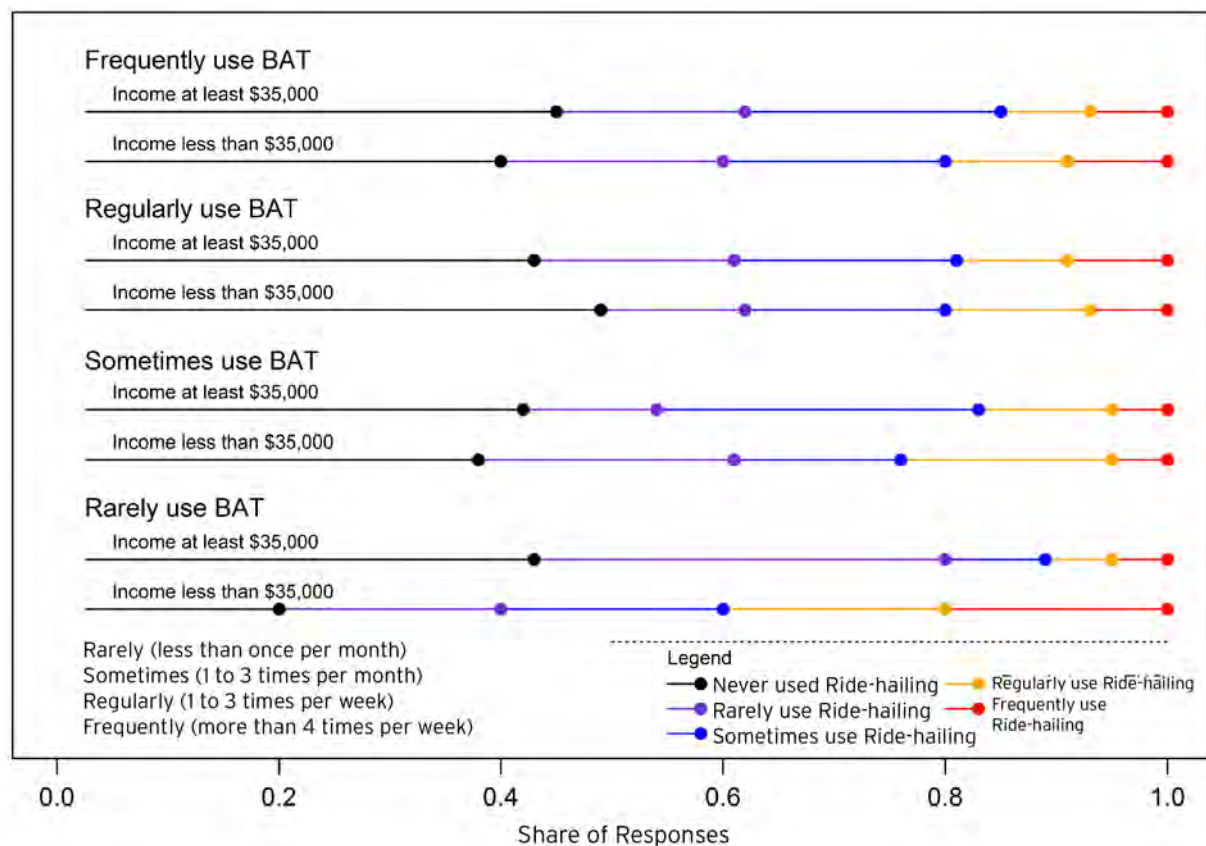**FIGURE 3.** Cross-tabulation of future ride-hailing utilization by BAT riders across age cohorts.

FIGURE 4. Cross-tabulation of current ride-hailing adoption frequency by BAT riders across income cohorts.
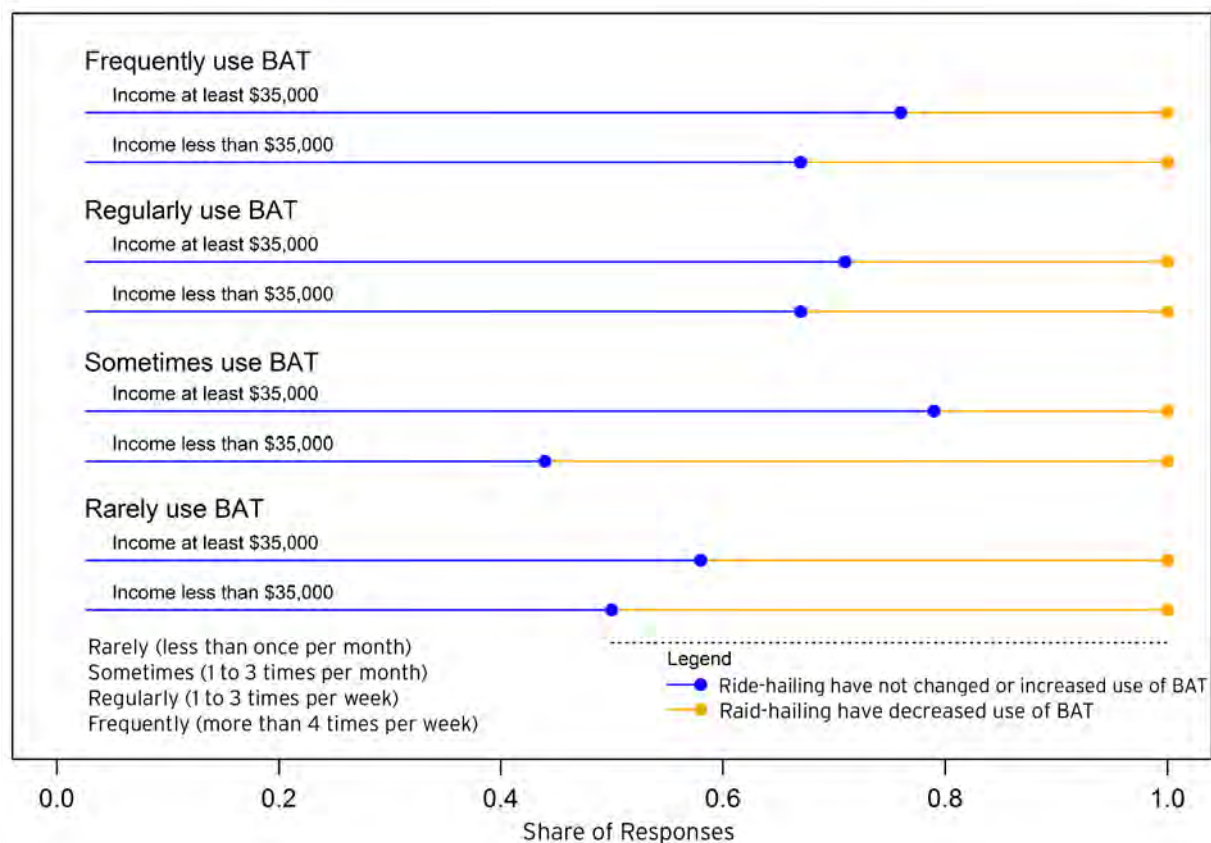
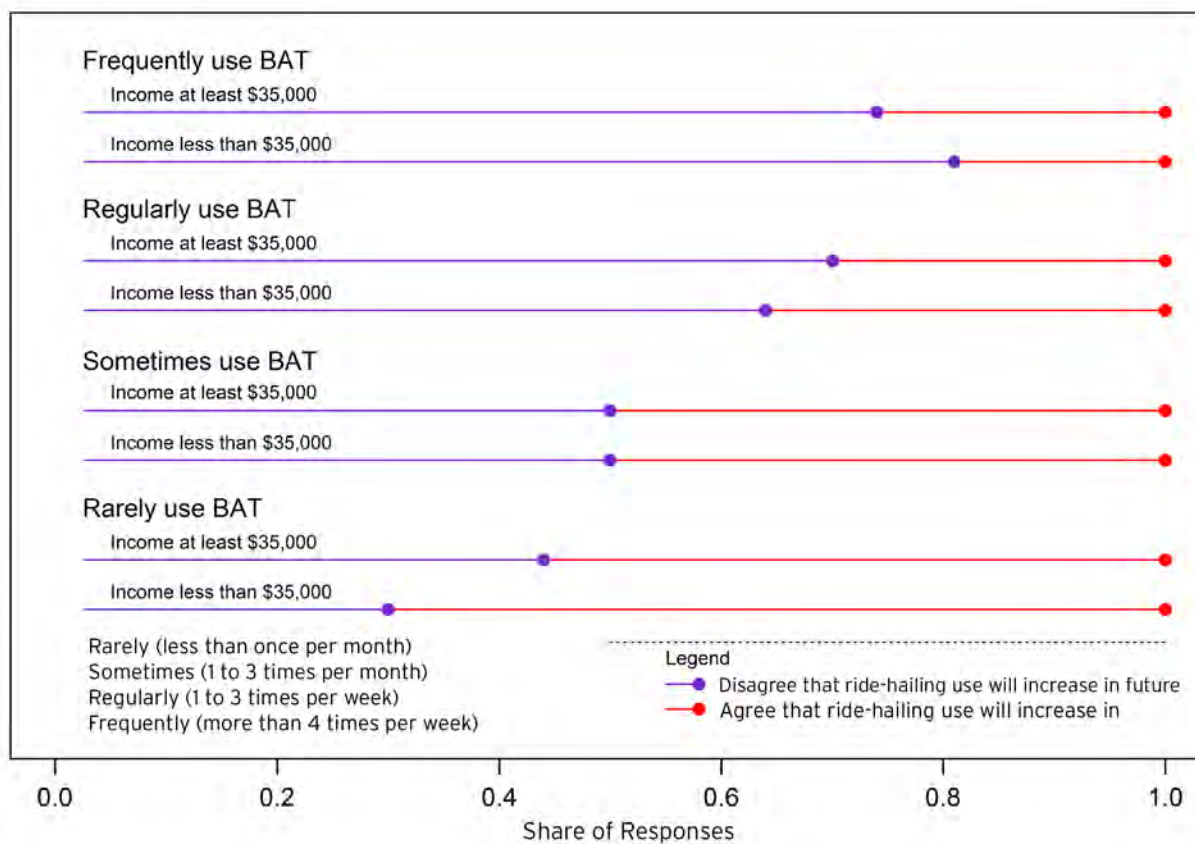**FIGURE 5.** Cross-tabulation of current ride-hailing impact on transit use by BAT riders across income cohorts.

FIGURE 6. Cross-tabulation of future ride-hailing utilization by BAT riders across income cohorts.

FIGURE 7. Cross-tabulation of current ride-hailing adoption frequency by BAT riders across car ownership cohorts.
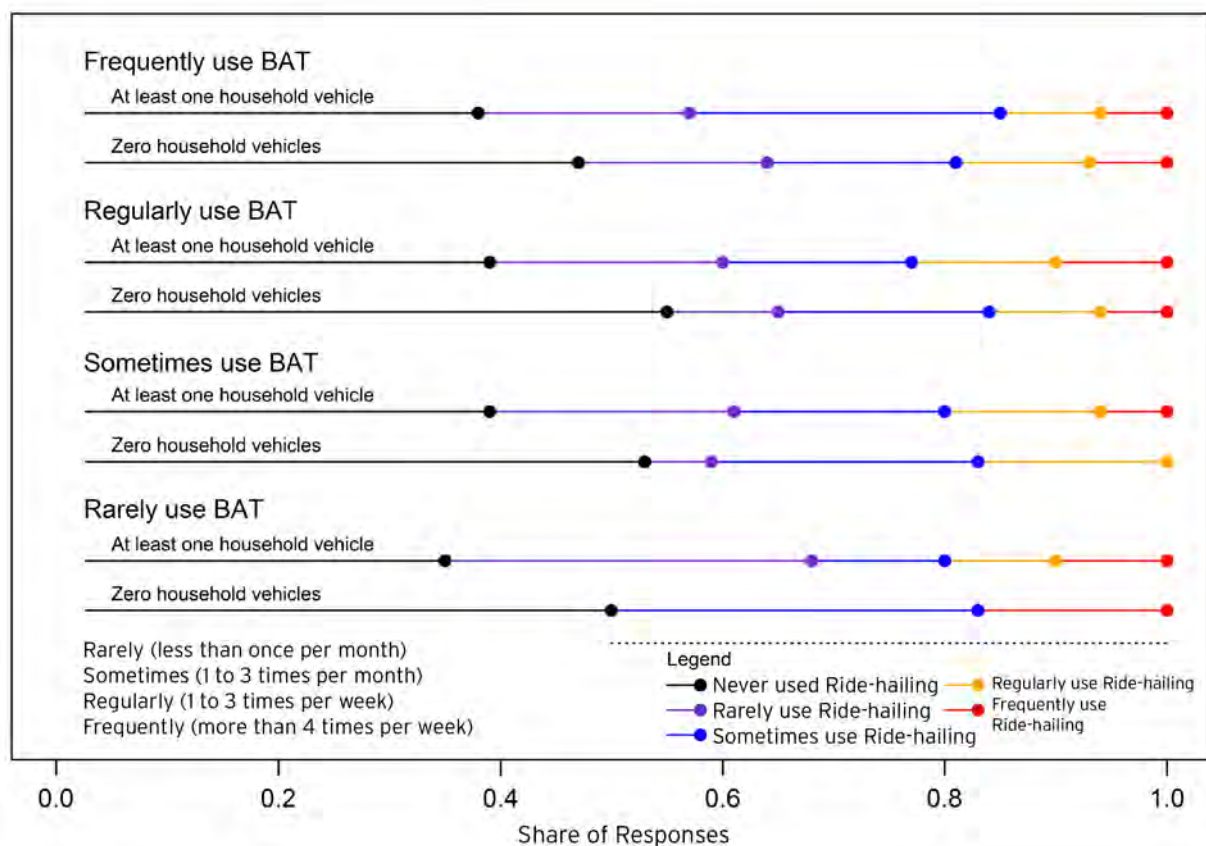
FIGURE 8. Cross-tabulation of current ride-hailing impact on transit use by BAT riders across car ownership cohorts.
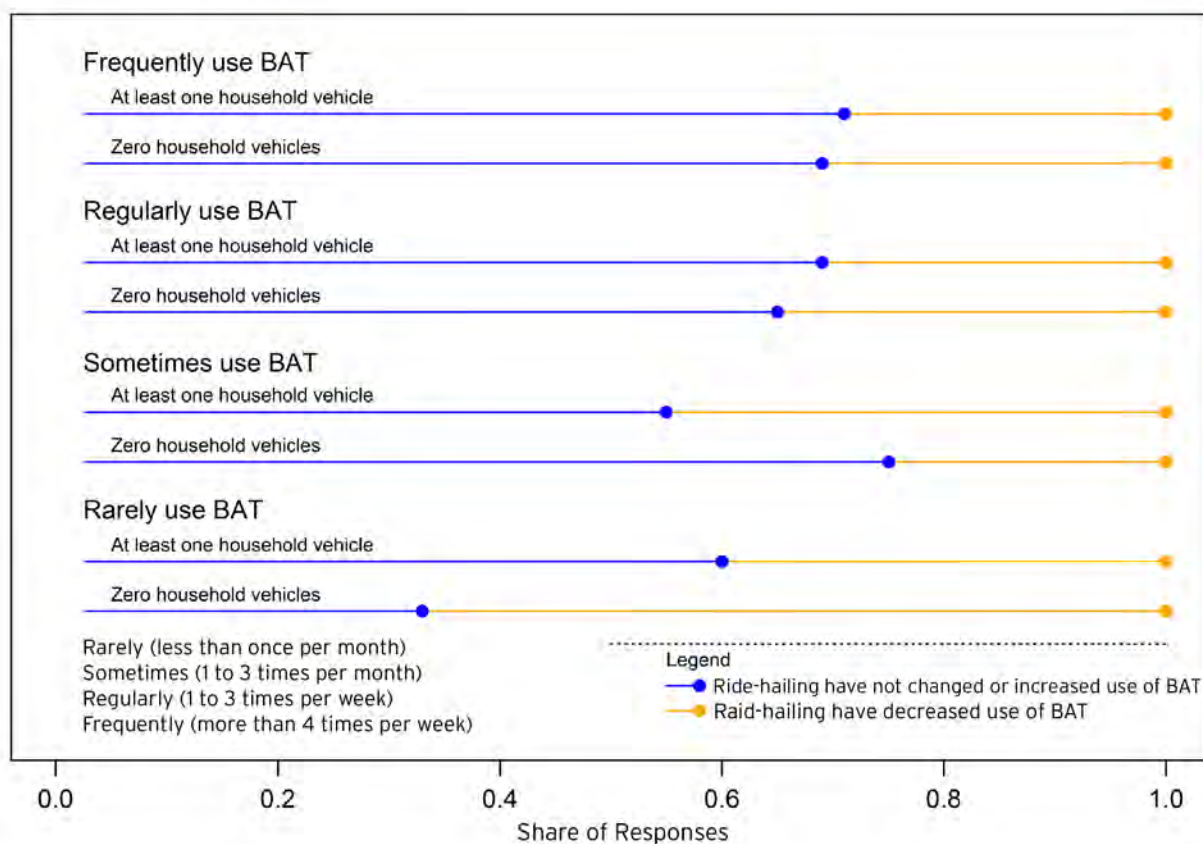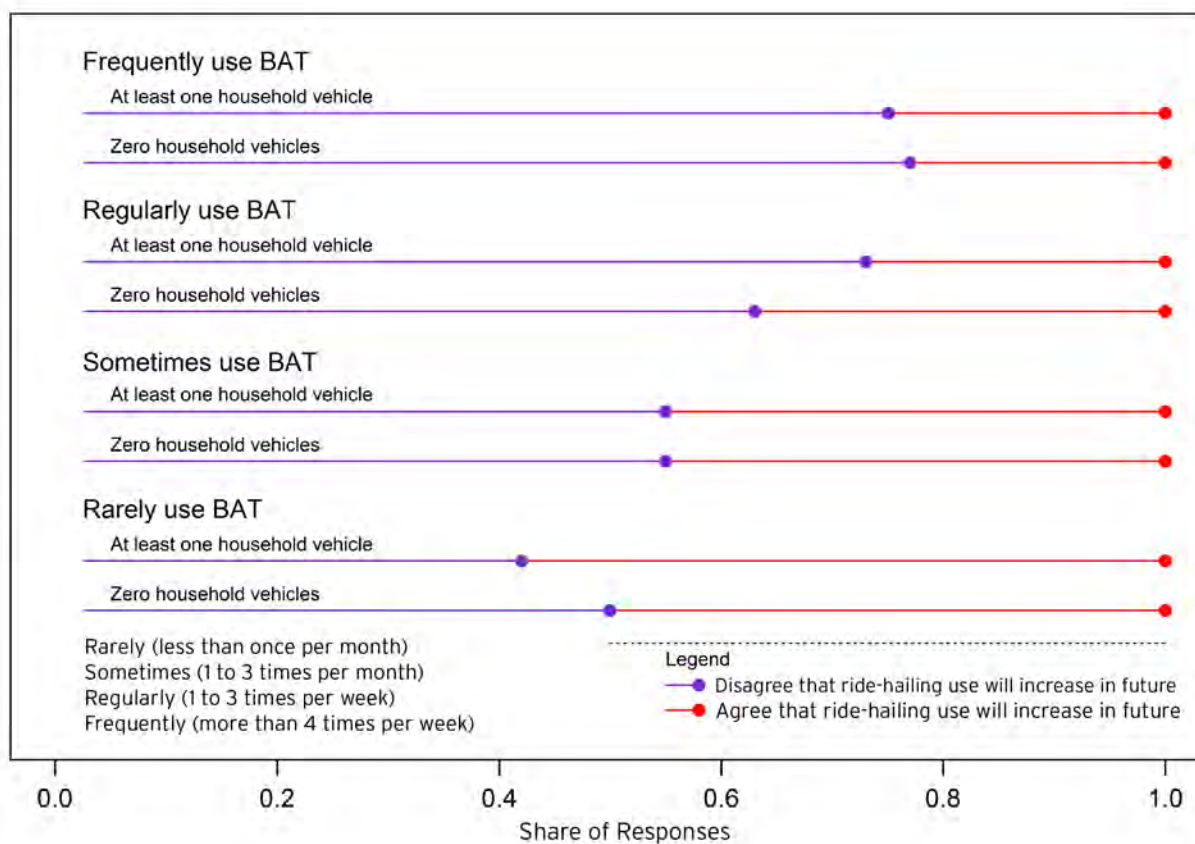
FIGURE 9. Cross-tabulation of future ride-hailing utilization by BAT riders across car ownership cohorts.

Survey Flyer/Poster

bat

We Want to Hear From You!

The Brockton Area Transit Authority (BAT) is conducting a survey to learn more about transportation choices in the greater Brockton Area. Thank you for taking a few minutes to answer our short survey at the BAT Centre or Online:

www.mapc.ma/BATsurvey

By completing the survey, you can be eligible to enter a drawing to win a free monthly BAT pass!

Queremos saber de ti!

A Brockton Area Transit Authority (BAT) esta produciendo una encuesta para aprender mas sobre las opciones de transporte en el area mayor de Brockton. Gracias por tomarse unos minutos para responder a nuestra breve encuesta en BAT Center o en linea:

www.mapc.ma/BATsurvey

Queremos ouvir de voce!

A Brockton Area Transit Authority (BAT) é uma pesquisa producão para saber mais sobre as opções de transporte na área de Brockton maior. Obrigado por tomar alguns minutos para responder à nossa breve pesquisa no BAT Center ou Online:

www.mapc.ma/BATsurvey

Nou Vle Tande Vwaw Tou!

Bat Brockton Are Transit Authority yo ap antame yon Sonday sou Chwa moun Fe Pou yo Vwayajc man zon Brockton nan. Mesi Paske ou pran yon ti minet pou Ranpli Ti Kout Sonday Sa swa nan Bat Centre a cubyon anliy.

www.mapc.ma/BATsurvey

Le ou Ranpli Sonday ou Kalifye Pou W Patisipe nan yon tiraj KI ap pemet ou gonyen yon (1) mwa pas gratis.

For any questions related to this survey, or to receive a copy of the survey results, please email BATsurvey@mapc.org.

Para cualquier pregunta relacionada con la encuesta, para recibir una copia de resultados de encuesta, envie un correo electronico BATsurvey@mapc.org.

Para qualquer questões relacionadas com a pesquisa, para receber uma cópia dos resultados de pesquisa, por favor enviapara e-mail BATsurvey@mapc.org.

Pou Plis Kesyon Sa Soinday sa oubyen Pou W Jwenn Yon Kopi Rezilta Sonday sa, Tanpri email nou BATsurvey@mapc.org.

Survey Questions (English)

The Brockton Area Transit Authority (BAT) is conducting this survey to learn more about how people make transportation choices in the Brockton area. Thank you for taking a few minutes to answer our short survey!

By completing this survey, you can be eligible to enter a drawing to win a free monthly BAT pass!! There is a limit of one survey entry per person.

1. How often do you ride BAT?

    Rarely (less than once per month)
    Sometimes (1 to 3 times per month)
    Regularly (1 to 3 times per week)
    Frequently (more than 4 times per week)
    I never used BAT [Qualtrics will skip to Question 5]

2. In the last three months, what is the *primary reason* you have used BAT?

    Work or work-related meeting
    School
    Shopping/Errands
    Social/Entertainment (going out/ recreational/dining/visiting friends or family)
    Medical appointment (e.g., doctor's office, urgent care, hospital)
    Transit connection (airport, rail station)
    Other
    I have not used BAT in the past three months

3. In the last three months, what are *other reasons* you have used BAT? (choose all that apply)

    Work or work-related meeting
    School
    Shopping/Errands
    Social/Entertainment (going out/recreational/dining/visiting friends or family)
    Medical appointment (e.g., doctor's office, urgent care, hospital)
    Transit connection (airport, rail station)
    Other
    I have not used BAT in the past three months

4. How do you typically pay for bus trips?

    Monthly BAT Pass
    Weekly Bat Pass
    Daily BAT Pass
    Cash on board
    Stored value on Charlie Card
    Student pass

5. In the last week, how have you travelled? (choose all that apply)

    Drove myself
    Got a ride from family and/or friends
    BAT bus
    MBTA commuter rail

MBTA subway (Red Line, etc.)
Walk
Bike
Uber/Lyft
Taxi (Yellow Cab, etc.)
Other

6. How often do you use Uber/Lyft?

   Rarely (less than once per month)
   Sometimes (1 to 3 times per month)
   Regularly (1 to 3 times per week)
   Frequently (more than 4 days per week)
   I've never used Uber/Lyft [Qualtrics skips Questions 7 and 8]

7. How have Uber/Lyft affected how often you use BAT?

   I do not use Uber/Lyft
   Using Uber/ Lyft have not changed my use of BAT
   Using Uber/ Lyft have increased my use of BAT
   Using Uber/ Lyft have decreased my use of BAT

8. What are the main reasons you choose Uber/Lyft over riding BAT? (choose up to two)

   BAT is not available when I need the service
   BAT does not provide service to where I need to go
   Uber/Lyft is more convenient (on-demand, door-to-door service)
   Uber/Lyft is a better value than riding BAT
   Other

9. Please tell us to what extent you agree with this statement:
   Uber and Lyft have significantly changed how my family and friends travel.
   Agree
   Disagree
   Don't Know

10. Please tell us to what extent you agree with this statement:
In the future, I will more often use Uber and Lyft for travel.
Agree
Disagree
Don't Know

Please tell us about yourself

11. What is the ZIP code where you live? _____

12. How many cars does your household own?
0
1
2
3
4 or more

13. My age is:
Under 18
18-24
25-34
35-44
45-64
65 or older

14. I identify my race/ethnicity as:
Asian
Black/African American
Hispanic/Latinx
White
Multi-racial
I prefer not to answer
Other

15. What is your gender?
Male
Female
Other/Prefer not to answer

16. What currently describes your status? (choose up to three)
    Working Full-time
    Working Part-time
    Unemployed, but looking for work
    Unemployed and not looking for work
    Part-time Student
    Full-time Student
    Disabled
    Retired
    Something else
    I prefer not to answer

17. What is your current annual *household* income?
    Less than $12,999
    $13,000 to $24,999
    $25,000 to $34,999
    $35,000 to $49,999
    $50,000 to $74,999
    $75,000 to $124,999
    $125,000 and greater
    I prefer not to answer

18. What is your highest level of education completed?
    Less than high school
    Graduated high school or equivalent
    Some college, no degree
    Associate or Bachelor's Degree
    Advanced degree (Master's, Ph.D.)

19. Including yourself, how many adults (18 years old and over) live in your household?
    1
    2
    3
    4 or more

20. [Web link question only] How did you hear about this survey?
    Facebook
    Poster on BAT bus
    Flyer
    Other

Please enter your e-mail address so you can be eligible to enter a drawing to win a free monthly BAT pass!! _____

Thank you for your time and participation!

For any questions related to this survey or to receive a copy of the survey results, please e-mail BATsurvey@mapc.org.