



The Research Bureau

Resurging Regional Ridership

An analysis of mobility flows, riders, and ridership in the WRTA region

Report 23-03

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Research in the Public Interest

Worcester Regional Research Bureau, Inc.

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Executive Summary

As of March 2023, the WRTA Advisory Board's Audit and Finance Committee has recommended continuing Fare Free through the end of June 2024; the full Advisory Board will vote on this budget on April 20, 2023. This report is the second in the Worcester Regional Research Bureau's 2023 analysis of the WRTA and fare-free service, beginning with [*All Aboard: Financing a Fare-Free WRTA*](#). To gain a comprehensive perspective of the WRTA, this analysis focuses not only on the profiles of the WRTA's riders and its ridership recovery, but also on regional mobility, key to understanding the context within which the WRTA's riders choose to use its service. This report ultimately finds that the WRTA experienced rapid ridership monthly-recovery since March 2020, and by December 2022 it exceeded pre-pandemic levels; in FY23, the WRTA is projected to have a total of 3,913,772 total UPT across all modes, the highest since its historic peak in 2016. Fare-free service undoubtedly played a role in that recovery. This report is divided into three sections that explore these aspects in detail:

- ⇒ Pages 3-9 discuss the mobility of workers in Central Massachusetts:
 - According to the 2021 American Community Survey (ACS), **the pandemic doubled remote work and halved the use of public transit for work commutes** in Worcester.
 - According to 2019 commute data, among workers who commuted outside their communities, **nearly 10% of those from Worcester traveled to Shrewsbury and Auburn**, while 47% of workers from those two communities traveled to Worcester. A further **8% of Worcester residents commuted to Suffolk County for work**.
- ⇒ Pages 10-15 analyze rider profiles using the American Community Survey (ACS) and WRTA data:
 - According to the ACS, when comparing public transit users in the communities served by fixed route buses to those who drive to work, public transit users:
 - * Have a **younger median age and a higher poverty rate**.
 - * **Black and Hispanic populations are overrepresented**, since they make up 14% of all workers but 22.6% of work-related public transit users. White population makes up 75% of the total.
 - * Are twice as likely to take more than 30 minutes to get to work and **six times more likely to take more than an hour**.
 - * Nearly half (47.7%) **work in “management, business, science, and arts” occupations**.
 - According to WRTA satisfaction surveys conducted in 2018 and 2019, although **“Work” is the number one reason to take the bus, more than half (61%) use it for other purposes** (medical, shopping, social, etc.), and almost half of riders (44%) use it daily. Around two-thirds **(65%) reported yearly earnings below \$25,000, and (70%) not owning a vehicle**.
- ⇒ Pages 16-28 review ridership and its pandemic recovery:
 - Demand response ridership in FY2022 (141,273 Unlinked Passenger Trips UPTs) doesn't reach mostly-pre-pandemic FY2020 levels (141,951 UPT). In FY2022, **fixed route ridership of 3,064,750 UPT reached and surpassed pre-pandemic FY2019 (3,013,268) and FY2020 (2,421,591)**.
 - Between CY2019-2022, most fixed route trips were made in the second half of the year (54%), especially in October; on routes 11, 19, 26, or 27 (38%); and taken in Worcester (85%).
 - Although all service metrics (vehicle revenue miles, vehicle revenue hours, and vehicles operated in maximum service) have fully recovered, the number of unlinked passenger trip improved the most. **The WRTA achieved complete pre-pandemic UPT recovery in early CY2022 and closed the year with a 140% recovery rate, above MA peer agencies that haven't reached CY2019 values**.
 - The final pages of the report explore suggestions by the Transit Cooperative Research Program (TCRP) to improve public transit UPT for agencies such as the WRTA.

Introduction

The Worcester Regional Research Bureau has issued three reports analyzing the feasibility of a fare-free WRTA. In May 2019, the Bureau released [The Implications of a Fare-Free WRTA](#), followed by [Bureau Brief—Addendum to 'The Implications of a Fare-Free WRTA](#) in November 2020. More recently, the Bureau has released [All Aboard: Financing a Fare-Free WRTA](#), which was an updated analysis of the WRTA's finances and the feasibility of continued fare-free service. The WRTA's exceptionally speedy ridership recovery, with 140% of 2019 pre-pandemic values by the end of 2022, may be due *in part* to the fare-free service begun in March 2020.

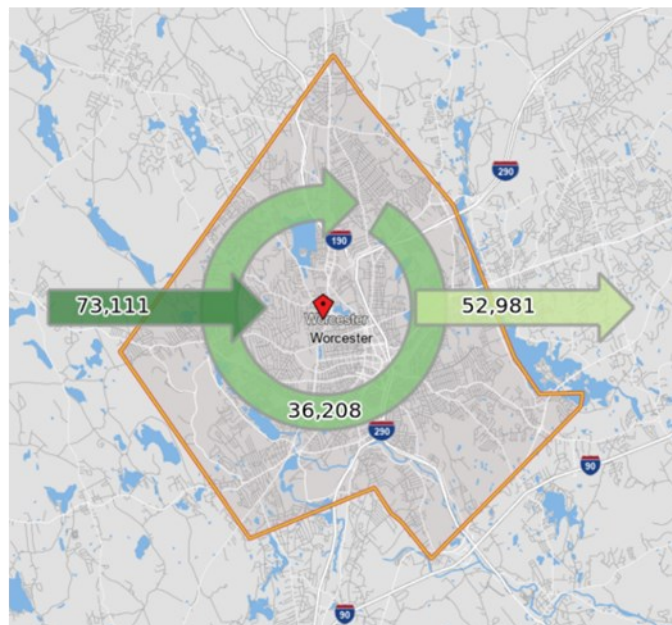
The following report focuses on ridership and commuting throughout the WRTA region. The significance of the WRTA in the region extends beyond isolated numbers about ridership. To fully grasp its impact, the broader context in which it operates must also be considered: the flow of workers throughout the region (including those that do not use public transit) and the profiles of the riders themselves. This report aims to provide insights to enhance this understanding, adopting a more comprehensive approach that transcends mere ridership figures.

A region in motion

The Worcester Regional Transit Authority (WRTA) serves the City of Worcester and 36 neighboring communities in Central Massachusetts.

The latest available LODES dataset, from 2019, is based on surveys, tabulated, and modeled administrative data instead of derived from a probability-based sample. It contains more than three million pre-pandemic records for all of Massachusetts, showing home-to-work commuting patterns at the block level, and allows for disaggregation by age, income, and economic sector. The Census Bureau's OnTheMap tool, demonstrated on Map 1, shows Worcester workers coming to work in the city and leaving it to work elsewhere. The map shows that **73,111 workers live outside the city (67% of all workers), 36,208 live and work in the city, and 52,981 live in the city but work elsewhere (60% of working city residents).**

Map 1: Worcester workers inflow/outflow. All jobs, 2019



Source: 2019 U.S. Census Bureau tool 'On The Map,' <https://onthemap.ces.census.gov/>

Worcester as Origin and Destination of workers

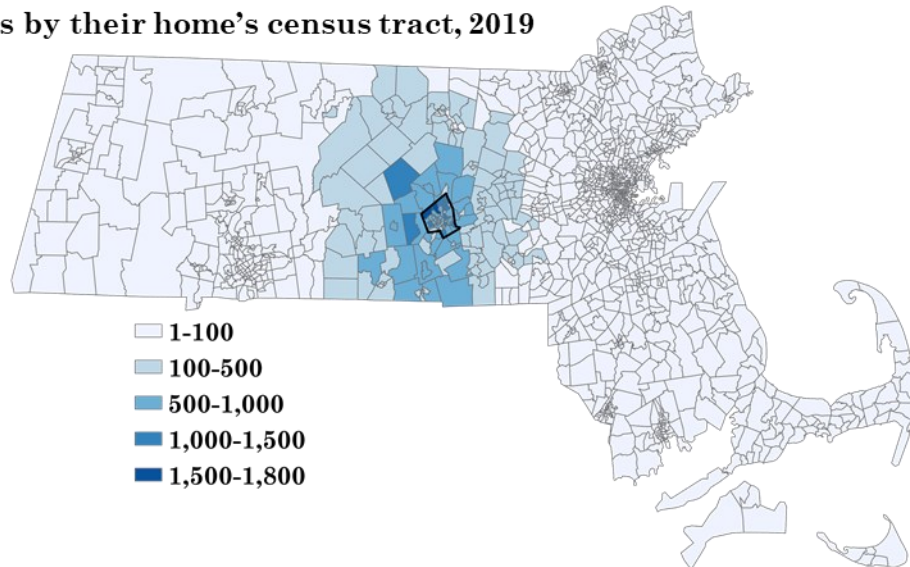
With a population of over 200,000, Worcester serves as a fundamental node in the complex network of movements in the region. This is why a closer look will be taken at the metrics of workers traveling to and from the City of Worcester for work.

Table 1A, based on the 2019 LODES records for Massachusetts, which excludes any origin or destination outside the state, shows the **top 20 MA origin communities** for workers whose job is within the city. Map 2A shows the geographic distribution of these origin communities. Table 1B shows the **top 20 MA destination communities** to which city residents travel for work, and Map 2B shows the geographic distribution of their workplaces. Employees working in the city in 2019 originated from a wider geographic array of communities compared to the number of communities city residents travel to for work. **At least one employee came to work in Worcester from practically every community in the state.** Worcester residents who worked outside of the city tended to work in the surrounding communities.

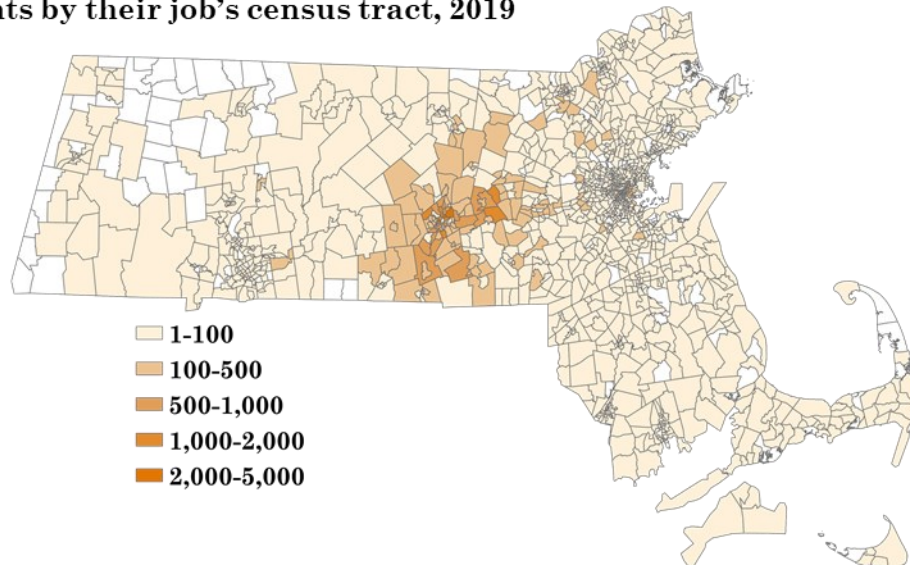
Table 1A: Top 10 city workers' origin communities in MA, 2019		
MA Community of Origin	Worcester workers	%
Worcester	36,208	35.4%
Shrewsbury	3,579	3.5%
Holden	3,089	3.0%
Auburn	2,635	2.6%
Leicester	1,716	1.7%
Millbury	1,693	1.7%
Oxford	1,655	1.6%
Webster	1,576	1.5%
Boston	1,412	1.4%
Grafton	1,410	1.4%
Other	47,371	46.19%
Total	102,344	100%

Table 1B: Top 10 city residents' work destinations in MA, 2019		
MA Community of Destination	Worcester residents	%
Worcester	36,208	42.4%
Boston	4,016	4.7%
Westborough	2,879	3.4%
Marlborough	2,761	3.2%
Shrewsbury	2,663	3.1%
Auburn	2,128	2.5%
Framingham	1,922	2.2%
Northborough	1,508	1.8%
Millbury	1,046	1.2%
Leominster	932	1.1%
Other	29,392	33.63%
Total	85,455	100%

Map 2A: City workers by their home's census tract, 2019



Map 2B: City residents by their job's census tract, 2019



Source: Longitudinal Employer-Household Dynamics (LEHD), 2019 LEHD Origin-Destination Employment Statistics (LODES) data for Massachusetts. 2019 is the latest data available.

Moreover, there is an asymmetry between the east and west of the state: while there are significant flows of employees towards more distant eastern communities such as Burlington, Waltham, Woburn, and Boston, in the west, there are many communities where no employee living in Worcester went to work in 2019.

Origins and Destinations in general

Expanding the analysis of employee origins and destinations to all who lived in and worked in Worcester County in 2019 shows that workers came from everywhere but were concentrated in a few Census Tracts. Map 3A shows where **employees' homes** in the county were concentrated, and Map 3B where these **employees' jobs** were concentrated.

As expected, employees' households were more widespread throughout the county. Since the variable is the total number of workers, there is also a positive correlation between this number and census tract size. Employees' workplaces seemed to be concentrated in more specific locations. Examples of these workplace clusters (the darker census tracts on Map 3B) are Downtown Worcester and two census tracts north of Route 9, corresponding to the areas of Bell Hill and the Biotech Park (the UMass Memorial

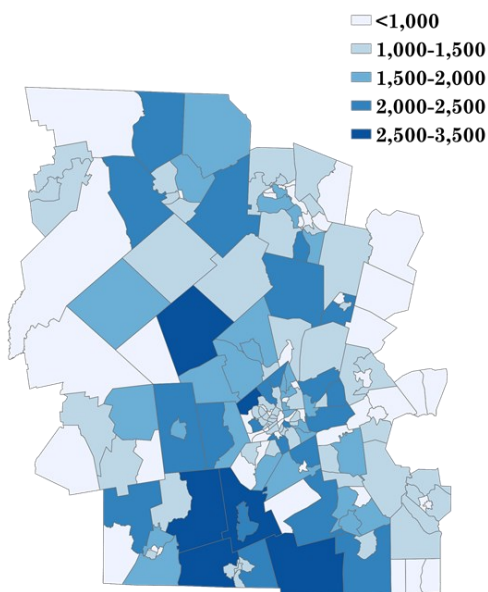
Medical Center Campus and the University of Massachusetts Medical School are in these two census tracts, respectively). Among the sites outside the city that attract the highest flows of workers from Worcester are: the northeast region of Westborough, where Olympus, eClinicalWorks, Astellas, and BNY Mellon Wealth Management are located; and the Eastern region of Marlborough, where APEX entertainment, corporate offices of TJX, Hologic, and Quest Diagnostics are situated.

Public transit for work commuting?

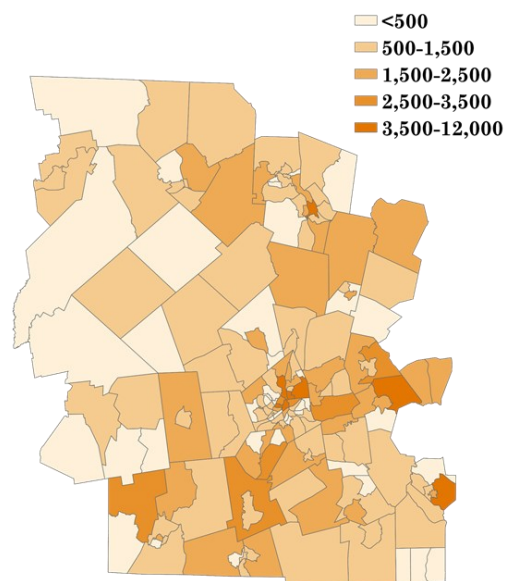
All the Origin-Destination analyses so far have been exclusively using the LODES data, last updated in 2019, so all findings are pre-pandemic. A detailed analysis of the impact of the pandemic on workers' commuting dynamics will only be possible when the LEHD publishes updated databases.

So far, the report has discussed employees commuting to work without specifying how this is accomplished. The majority of residents in the analyzed region travel to work by driving. However, from this point forward, public transportation users are the focus of this report.

Map 3A: Total of employees who WORK IN THE COUNTY by their home's census tract (Origins of county workers), 2019



Map 3B: Total of employees who LIVE IN THE COUNTY by their job's census tract (Work's destination of county residents), 2019



Source: Longitudinal Employer-Household Dynamics (LEHD), 2019 LEHD Origin-Destination Employment Statistics (LODES) data for Massachusetts. 2019 is the latest data available.



In order to do this, the report will turn to other databases to study the use of public transportation and how the pandemic has affected it. Table 2, using data from the American Community Survey, shows the percentage of 2019 and 2021 Worcester workers that used public transportation to get to work or worked from home. According to ACS 1-year estimates, the COVID-19 pandemic had an important impact on mobilization within Worcester, **reducing employees' public transportation use by almost half between 2019 and 2021 and nearly doubling the work-from-home percentage.**

Table 2: Worcester's public transportation use and work-from-home rates, 2021

City of Worcester	2019	2021
Employees commuting to work by public transportation (excluding taxicab)	3.5%	1.8%
Employees who worked from home	6.9%	12.4%

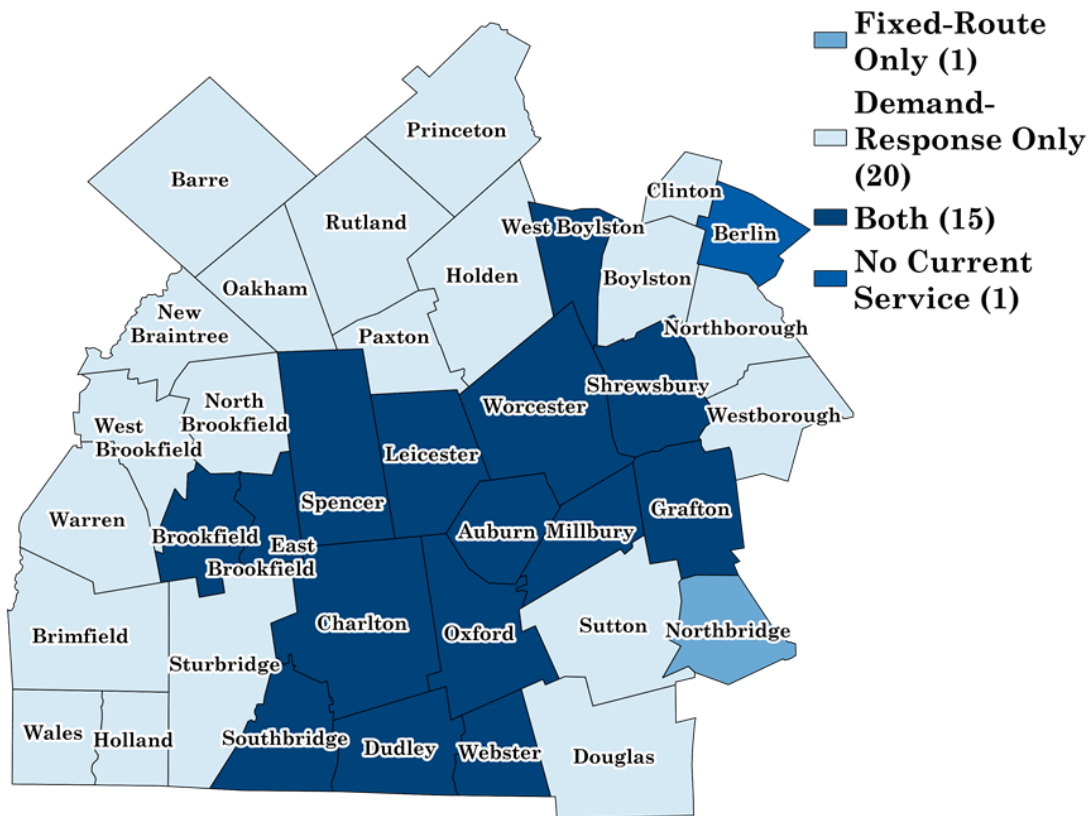
Source: 2021 American Community Survey (ACS), Table S0801 1-Year Estimates

Defining the WRTA-Fixed Route Service Area

Instead of examining the entire state, county, or city alone, the focus will now be on the area served by the WRTA. Most of the WRTA's 37 communities receive fixed route bus service and/or demand response service, as shown on Map 4.

As explained in the first report of this series, **fixed route** buses follow a predetermined route and schedule, while **demand response** primarily covers paratransit services for elderly and disabled users. The scale of fixed route is exceptionally larger than in terms of users, budgets, and expenses. To simplify the analysis, this report will refer to the 16 communities that receive fixed route service as **the WRTA-FR Area**. Maps 5 and 6 use the 2021 ACS 5-Year estimates over the WRTA-FR Area to show the geographic distributions of employees' public transportation use and work-from-home rates at the census tract level. **The WRTA-FR Area, as a whole, has an average of 2.1% of employees commuting by public transportation and 8.8% working from home.** However, averages

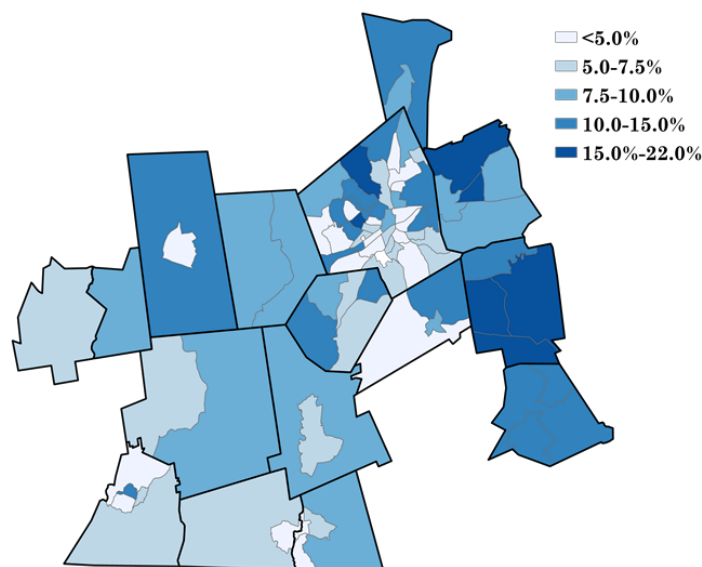
Map 4: WRTA communities by service type



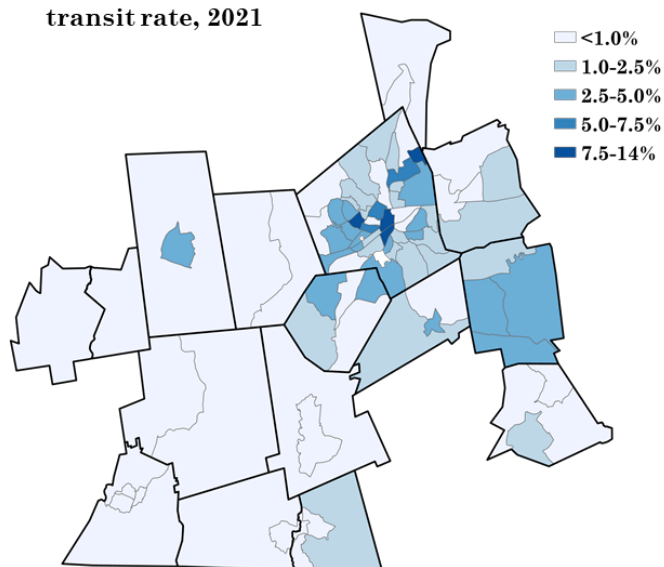
Source: Worcester Regional Transit Authority, FY22 Annual Financial Audit



Map 5: WRTA-FR Area work-from-home rate, 2021



Map 6: WRTA-FR Area work commute by public transit rate, 2021



Source: 2021 American Community Survey (ACS), Table S0801 5-Years Estimates

hide geographical differences, and without the maps, averages alone would prevent us from seeing that there are entire towns where the use of public transportation is less than 1%, whereas there are areas of the city that public transit use is up to 14%. Similarly, the average of working from home by itself does not show that within Worcester itself, two adjacent census tracts can have values below 5% and over 20%, respectively.

One final analysis using LODES data, this time restricted to the WRTA-FR Area, can help us understand worker flow better. Remember once again that this data corresponds to 2019, only to workers (in opposition to the general population), and does not restrict the means of transportation to work (meaning it is not exclusive to public transportation users). Finally, given the relevance of Boston as a work destination (as seen in Table 1A), for this final analysis, Suffolk County (Boston, Chelsea, Revere, and Winthrop) was included. According to the LODES dataset, the WRTA-FR Area plus Suffolk County has 333,675 records for 2019 (employees who live and work in any community within these areas). With **origins** in the rows and **destinations** in the columns, Table 3 shows the intricate flows among all these communities. Many findings can be drawn from this, as each community can study the geographical distribution of the origins and destinations of their workforce.

To make it easy to find temporal trends, Table 3 cells were color-coded, except for the total number of employees who live and work in Worcester and Suffolk County, given that, as outliers, they would distort the relative value of the rest of the records, preventing the identification of relevant patterns. Some of the multiple conclusions that can be drawn from the Origins-Destinations Matrix include how **Suffolk County was a top destination for these communities. Of the Suffolk County residents working in the WRTA-FR area, 65% of them go to Worcester.** After Suffolk County, the most common destinations for workers living in the city are Auburn and Shrewsbury. This relationship is bidirectional as they are also part of the top-origin communities for those working in the city.

Table 3: Total of employees, by origin (home) and destination (work) in WRTA-Area communities plus Suffolk County, 2019

		Destinations																	
Origins		Worcester	Suffolk	Auburn	Brookfield	Charlton	Dudley	East Brookfield	Grafton	Leicester	Millbury	Northbridge	Oxford	Shrewsbury	Southbridge	Spencer	Webster	West Boylston	Total
	Worcester	36,208	4,314	2,128	19	402	156	22	572	403	1,046	500	791	2,663	290	284	426	822	51,046
	Suffolk	1,633	222,793	175	1	24	14	6	76	26	91	54	62	246	16	10	53	55	225,335
	Auburn	2,635	560	968	3	84	71	6	99	73	147	75	148	286	72	33	158	61	5,479
	Brookfield	276	93	55	99	35	7	26	16	11	12	6	29	38	44	77	23	2	849
	Charlton	1,338	302	317	5	655	166	13	53	53	71	38	207	143	253	108	174	31	3,927
	Dudley	870	253	249	0	214	586	7	58	23	66	65	263	107	300	32	568	26	3,687
	East Brookfield	239	69	39	8	37	5	105	8	18	6	1	17	33	35	113	27	2	762
	Grafton	1,410	622	140	0	26	12	0	825	14	152	158	49	313	38	12	59	28	3,858
	Leicester	1,716	385	251	0	72	34	5	27	554	75	32	104	157	64	127	90	50	3,743
	Millbury	1,693	465	152	2	29	27	1	146	19	770	96	99	230	46	13	74	41	3,903
	Northbridge	869	327	118	0	25	23	4	171	8	112	1,034	64	128	22	18	86	16	3,025
	Oxford	1,655	289	369	1	123	107	5	79	55	124	89	714	174	129	53	308	24	4,298
	Shrewsbury	3,579	1,431	202	6	47	20	0	156	32	93	46	96	1,815	57	21	61	121	7,783
	Southbridge	1,057	396	259	4	496	241	14	37	39	55	45	144	102	1,955	87	321	18	5,270
	Spencer	1,365	360	281	20	113	31	57	45	125	62	32	88	132	121	678	75	41	3,626
	Webster	1,576	407	289	3	113	357	5	69	31	101	123	381	207	227	35	1,332	28	5,284
	West Boylston	973	265	42	0	6	7	0	15	14	22	13	13	111	12	6	12	289	1,800
	Total	59,092	233,331	6,034	171	2,501	1,864	276	2,452	1,498	3,005	2,407	3,269	6,885	3,681	1,707	3,847	1,655	333,675

Source: Longitudinal Employer-Household Dynamics (LEHD), 2019 LEHD Origin-Destination Employment Statistics (LODES) data for Massachusetts. 2019 is the latest data available.



Key Takeaways:

- Worcester represents the central hub in the network of labor commutes in Worcester County. **66.9% of those who work in the city come from outside, and 59.5% of employees who live in the city work in other communities.**
- Among those who work in the city but live outside it, **Shrewsbury, Holden, and Auburn are the top communities of origin.** Among those who live in the city and work outside it (a group that has a greater preference for communities in the eastern part of the state), **the top communities of destination are Boston, Westborough, Marlborough, and Shrewsbury.**
- When studying Worcester County as a whole, employees' homes appear to be well distributed throughout the region. At the same time, workplaces concentrate in specific areas, with Worcester's downtown and surrounding zones being key.
- When comparing just the City of Worcester in 2019 and 2021, **the pandemic doubled remote work and halved the use of public transportation for commuting to work.**
- When analyzing the fixed route service (WRTA-FR) area, **a strong bidirectional relationship between Worcester and the communities of Shrewsbury and Auburn can be observed.** Almost 10% of all Worcester workers who commute outside the city for work go to these two communities. And 47% of residents of Shrewsbury and Auburn who work outside their communities, do so in Worcester.
- At the state level, there is also a bidirectional relationship between Worcester and Suffolk County. **8% of the city residents who commute outside of it work in Suffolk County. Of the residents of Suffolk County who work in the WRTA-FR area, 65% work in Worcester.**

Who is riding the WRTA?

Public Transit Users

Now that the flow of employees in the WRTA-FR Area has been reviewed in some detail, and the proportion of them using public transportation has been estimated, it's time to get to know who's riding the WRTA.

One indirect way to answer this question is to use the ACS and the data it provides on transportation to work. The transportation modes considered as public transportation by the ACS are: bus; subway or elevated rail; long-distance train or commuter rail; light rail, streetcar, or trolley; and ferryboat. This means these results show both WRTA and MBTA Commuter Rail users. Table 4A shows, for the City as a benchmark, some differences between (1) all employees, (2) those who commute to work by driving alone, and (3) those who use public transportation. Table 4B shows these results in the WRTA-FR Area. As seen in Tables 4A and 4B sources, these tables are based on different ACS estimates. To further analyze the reasons behind this decision, refer to the *Methodological Notes* in page 31.

The poverty rate and median earnings values for public transit users in Table 4B are omitted due to methodological limitations of the ACS dataset, explained in the *Methodological Notes*. Despite its

limitations, the ACS is still the dataset with the most observations available for this analysis. While the presented data is not representative of all communities, the sample size of public transportation commuters in the tracts for which information is available amounts to 2,648 in the city and 3,904 in the entire WRTA-FR Area.

Additionally, the ACS has a breakdown of workers by means of transportation to work by race and ethnicity. Although the statistical representativeness of the public transit user category still falls short compared to the rest, there is a substantial improvement in these metrics. For example, out of the 91 tracts in the WRTA-FR Area, race and ethnicity information is available for 60 tracts, doubling the response rate of variables in the previous analysis in Table 4A.

Chart 1, in next page, shows that in the WRTA-FR Area, **people of color are overrepresented among public transit users**. This means that, while the Black population represents 7.4% of the area's total workforce, this population makes up almost 14% of public transit users. For Worcester itself (Chart 1, Panel 1B), a similar pattern remains only for the Black and Hispanic/Latino communities. The Asian population is underrepresented among public transit users compared to their share of the total city's workforce.

Table 4A: City of Worcester employees' characteristics by mean of transportation to work, 2021

	All workers	Vehicle - Drove Alone	Public Transportation
Median Age	37.9	39.5	28.5
Poverty	8.6%	8.0%	13.7%
Median earnings	\$41,082.00	\$43,279.00	\$15,461.00

Source: 2021 American Community Survey (ACS), Table S0802 1-Year Estimates

Table 4B: WRTA-FR Area communities' employee characteristics (simple average) by means of transportation to work, 2021

	All workers	Vehicle - Drove Alone	Public Transportation
Median Age	41.6	42.1	39.4
Poverty	5.5%	4.3%	NA
Median earnings	\$47,571.24	\$49,753.2	NA

Source: Own calculation based on 2021 American Community Survey (ACS), Table S0802 5-Years Estimates



Chart 1: Race/Ethnicity Breakdown by Mean of Transportation to Work, 2021

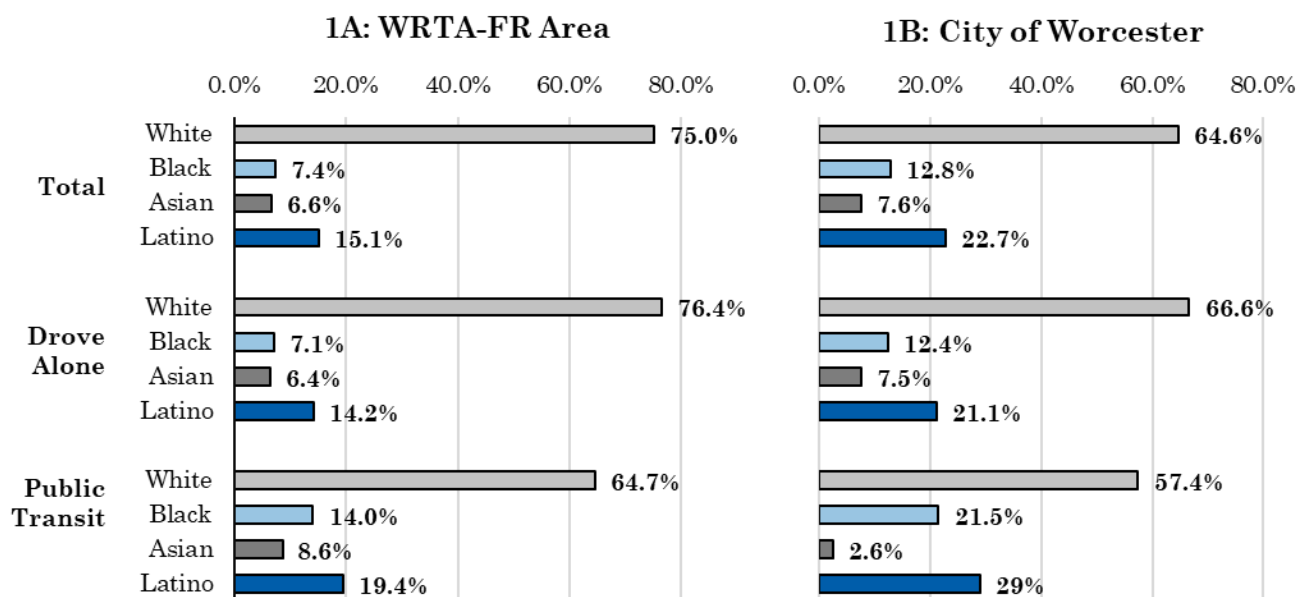
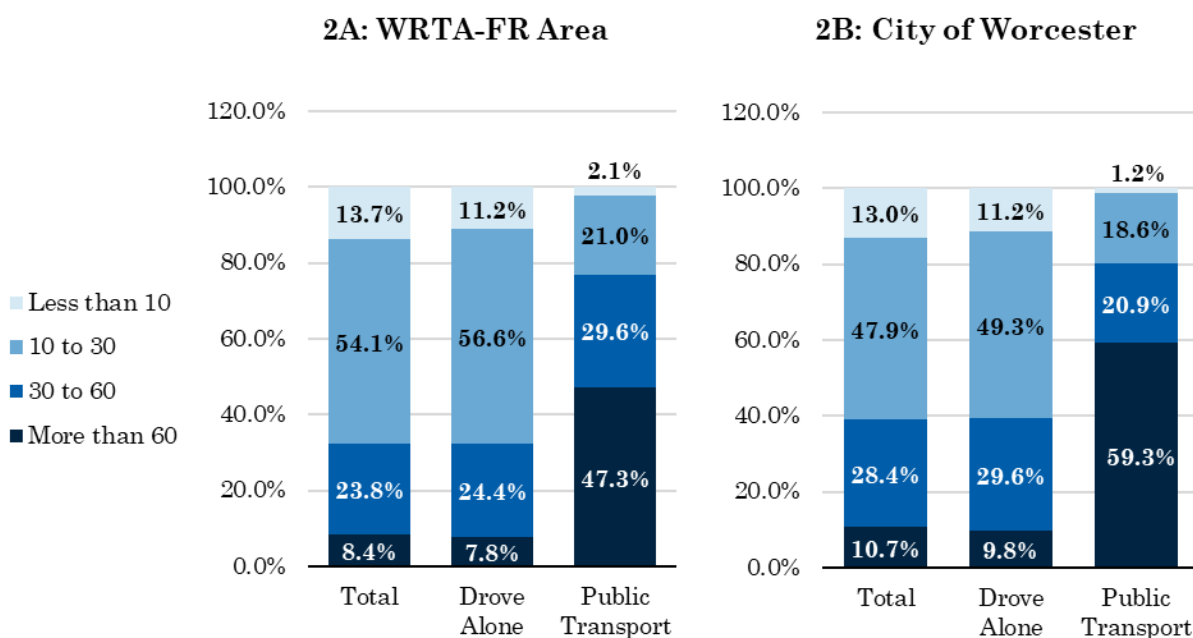


Chart 2: Travel Time to Work Breakdown by Mean of Transportation (minutes), 2021



Source: 2021 American Community Survey (ACS), Table S0802 5-Years Estimates

Another possible analysis (with statistical representativeness similar to that of race and ethnicity) is travel time to work. Chart 2 shows this comparison and, unsurprisingly, **the ratio of those who take more than an hour to get to their jobs is disproportionately larger among public transit users, six times the ratio of those who commute by driving** in both the WRTA-FR Area (Chart Panel 2A) and the city (Chart Panel 2B).

Tables 5 and 6 show local occupation and industry categories, separated by employee means of transportation to work. Almost half of the public transit users are classified within the *Management, business, science, and arts occupations* category, and one-third of total users work in *Educational services, and health care and social assistance*.



Table 5: Employees' occupation by mean of transportation to work, WRTA-FR Area 2021

Occupation	Total	Drove Alone	Public Transit
Management, business, science, and arts occupations	41.7%	41.4%	47.7%
Service occupations	18.7%	18.9%	21.2%
Sales and office occupations	19.4%	19.2%	12.7%
Natural resources, construction, and maintenance occupations	7.0%	7.4%	3.3%
Production, transportation, and material moving occupations	13.1%	12.9%	14.9%
Military specific occupations	0.1%	0.1%	0.3%

Table 6: Employees' industry by mean of transportation to work, WRTA-FR Area 2021

Industry	Total	Drove Alone	Public Transit
Educational services, and health care and social assistance	30.2%	30.8%	34.1%
Retail trade	11.6%	11.8%	13.0%
Professional, scientific, management, and administrative and waste management services	10.6%	9.9%	12.9%
Arts, entertainment, and recreation, and accommodation and food services	7.5%	7.0%	12.2%
Information and finance and insurance, and real estate and rental and leasing	8.1%	7.4%	12.0%
Manufacturing	10.6%	11.0%	8.6%
Transportation and warehousing, and utilities	5.2%	5.2%	2.5%
Public administration	3.3%	3.7%	1.6%
Construction	5.9%	6.0%	1.5%
Other services (except public administration)	4.6%	4.6%	1.1%
Armed forces	0.2%	0.3%	0.3%
Wholesale trade	2.0%	2.1%	0.3%
Agriculture, forestry, fishing and hunting, and mining	0.2%	0.2%	0.0%

Source: 2021 American Community Survey (ACS), Table S0802 5-Years Estimates

WRTA Users

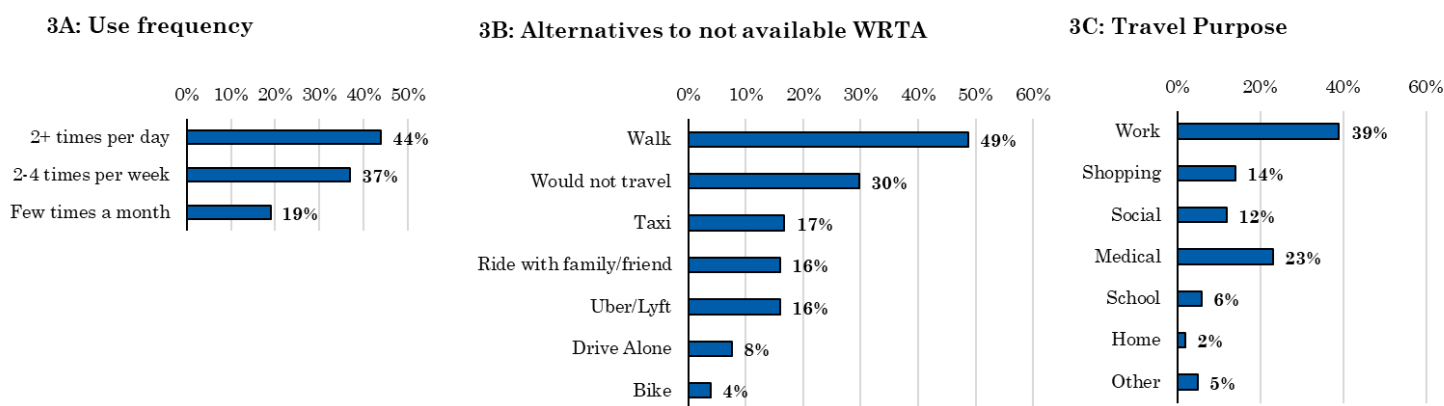
As many may have noticed, in section 1, we talked about ‘employees’ in general, even though those who use public transportation are a minority within that group. So far in section 2, the analysis was limited to the subgroup ‘workers who reported commuting to their jobs on public transportation.’ However, this is still not the whole story for at least two reasons.

First, when the ACS establishes categories of means of transportation, it does not define an exclusive category of ‘bus users’ (which, in this case, would correspond to the WRTA fixed-route buses). Instead, it establishes a catch-all category of “public transportation,” which distorts the analysis because it includes those who, for example, use the MBTA Commuter Rail to get to their jobs.

Secondly, public transportation use, including WRTA buses, is not solely for commuting to work. The analyses so far have been limited to employees because that is the available data, but commuting to work accounts for less than half of the flow of the riders on WRTA buses.

All analyses in the following sections are restricted to exploring data exclusive to the WRTA. So, who is riding the WRTA’s fixed route or demand response services? The WRTA collected customer satisfaction surveys which included a demographic data component. The survey for fixed route bus users was conducted in 2018, and the demand response survey was conducted in 2019. In other words, these are pre-pandemic results.

Chart 3: Fixed-Route Buses Satisfaction Survey Results, 2018



WRTA Fixed-Route Buses

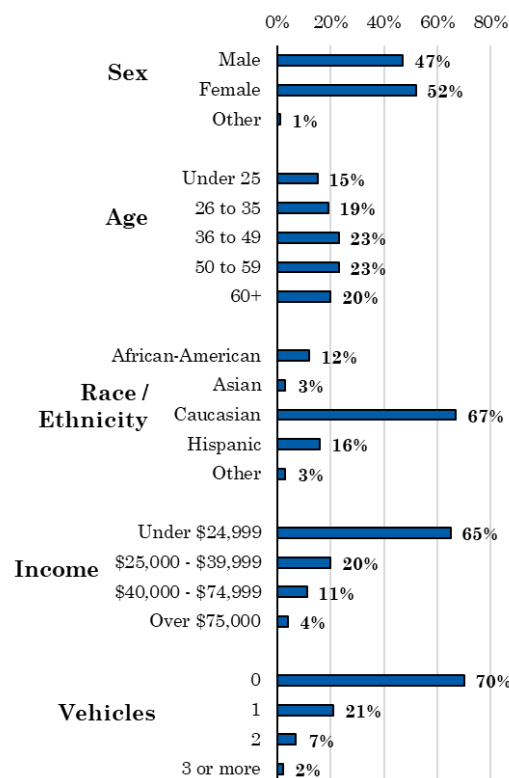
Conducted between February and March 2018, this survey had a total of 406 respondents (205 on paper and 201 online), and it was available in two languages (387 completed it in English and 19 in Spanish).

From Chart 3, Panel 3A shows that while 37% of the respondents used WRTA buses a few times per week, **44% of them used them on a daily basis (at least twice per day)**. Given this last figure, it is not surprising to see in Panel 3B that, when asked hypothetically what they would do **if the buses were not available, 30% of the respondents said they would not travel at all, and half of them (49%) would walk**.

Another crucial finding, which puts all the analyses presented so far into perspective, is the question about the purpose of the trip. As explained earlier, due to the limited data available, the analysis so far has focused on workers commuting to their jobs. Still, Panel 3C shows that **only 39% of respondents were traveling for work purposes**. This implies that, for the ACS-based results found in the previous section to be representative of WRTA users, the surveyed sample would need to be more than double. This is why this section is essential, as it presents more representative data on actual fixed route bus users.

According to Panel 3D, although women are the majority, the balance between men and women is relatively even. Similarly, age groups are evenly

3D: Demographics



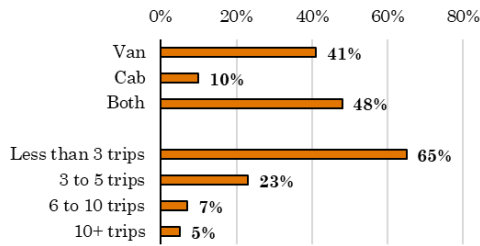
Source: Worcester Regional Transit Authority, 2018 Fixed-Route Satisfaction Survey

distributed, with almost one in five users falling into each category. With two-thirds of the total self-identifying as Caucasian, the **Hispanic and African-American communities are the second-largest populations among users**. **Two-thirds of the surveyed individuals reported incomes of less than \$25,000, and more than that reported not having a vehicle**. There is internal coherence between the results, as these figures are consistent with the majority using the buses daily and the finding that if the WRTA were not available, prospective riders would walk or simply not travel at all.

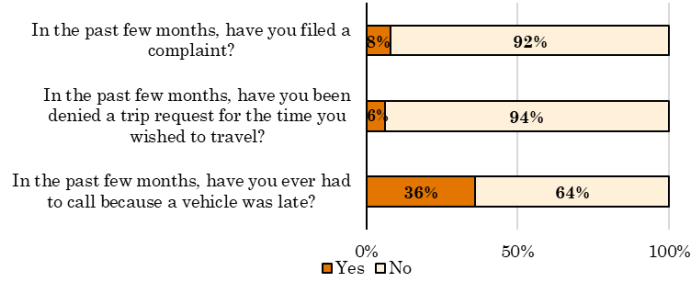


Chart 4: Demand-Response Service Satisfaction Survey Results, 2019

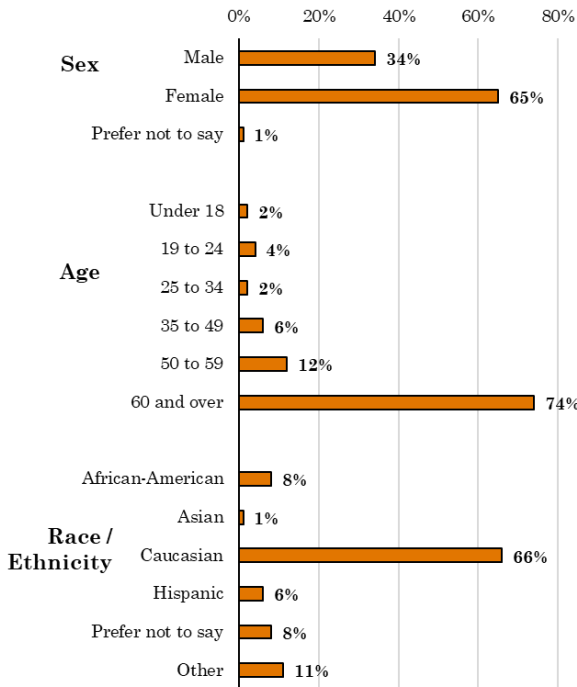
4A: Use frequency and vehicle type



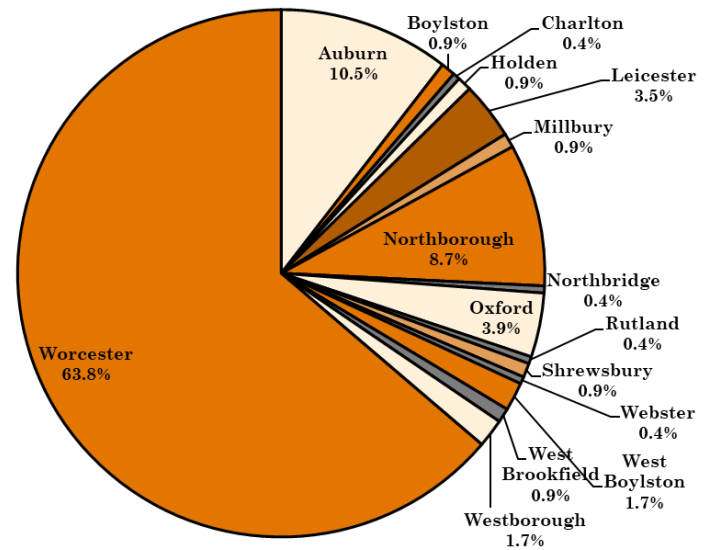
4B: Service Feedback



4C: Demographics



4D: User's community



Source: Worcester Regional Transit Authority, 2019 Demand-Response Satisfaction Survey

WRTA Demand-Response Service

Between October and November 2019, when there were 2,378 paratransit-eligible customers on record, a total of 229 Demand Response/Paratransit Customer Satisfaction surveys were completed (228 in English and 1 in Spanish). This sample was achieved by reaching out to 500 randomly selected paratransit clients.

Chart 4, Panel 4A shows that **most users opt for a combination of van and cab**, with only 10% exclusively choosing a cab. Additionally, **two out of three users request fewer than three weekly trips**. Panel 4B shows that while **one-third of respondents reported calling for a delayed vehicle in the past few months**, less than 10% reported being denied a ride or filing a complaint in the same period.

According to Panel 4C, **women were twice as likely as men to use the service, and three out of four users are over 60 years old**. Caucasians once again make up two-thirds of the total, and **Hispanics and African-Americans represent the second largest communities, as 11% of respondents self-identified as "Other."**

As shown by Panel 4D, nearly two out of every three users of the system live in Worcester. Although **Auburn and Northborough are, respectively, the second (10.5%) and third (8.7%) most common places of origin for users**, neither of them alone accounts for even one-sixth of the users from Worcester. The other 13 communities of origin share 17% of the trips.



Key Takeaways

- According to the ACS, of the total employees in the WRTA-FR Area, between 2-3% use public transportation to commute to work. Still, according to WRTA data from 2018, **only 39% of their bus passenger flow had work-related motives for transportation.**
- Although not without methodological limitations, the ACS estimates that when compared to those who commute to work by driving alone, WRTA-FR Area public transportation users generally have a younger median age and a poverty rate approximately twice as high.
- **According to the ACS, for the WRTA-FR Area, of the public transit users, Black and Hispanic populations are overrepresented**, since they make up 14% of all workers but 22.6% of work-related public transit users. White population makes up 75% of the total.
- According to the ACS, in the WRTA-FR Area, the probability of taking more than half an hour to get to work when using public transportation, compared to those who drove alone (32.2%), is more than double (76.9%). **The probability of taking more than an hour is more than six times as high (7.8% vs 47.3%).**
- Nearly half (47.7%) of those who reported using public transportation for work in the ACS work in *Management, business, science, and arts occupations*, and one-third work in the *Educational services, and health care and social assistance* industry.
- According WRTA surveys, fixed route bus users appear to be more evenly distributed in terms of gender and age, while **demand response users are predominantly women and people over 60.**
- According to WRTA surveys, although **work is the number one reason for trips on fixed-route buses, more than half use it for other purposes (medical, shopping, social, etc.)**. The majority use it daily, and if the service were not provided, **they would either walk or not travel**. In addition, **around two-thirds of respondents reported earning less than \$25,000 and not owning a vehicle.**
- Of the demand-response users, the majority request fewer than three trips per week and usually use a combination of van and cab.

Although a third have experienced delays in their trips, less than 10% report significant issues. Around six of every ten users come from Worcester, one from Auburn, and another from Northborough. The rest are divided among 13 other communities.

Ridership

At this point, a considerable amount of ground has been covered. Section one examined some patterns of transportation flows in the region. In section two, the profile of public transportation users was analyzed, both directly through WRTA surveys and indirectly through ACS data. Given this context, this final section will cover a detailed analysis of ridership, not only to gain a better understanding of passenger distribution by route, community, day of the week, year, or month but also to take a look at the recovery the WRTA has experienced after the COVID-19 pandemic started in 2020.

Demand Response before and after the pandemic

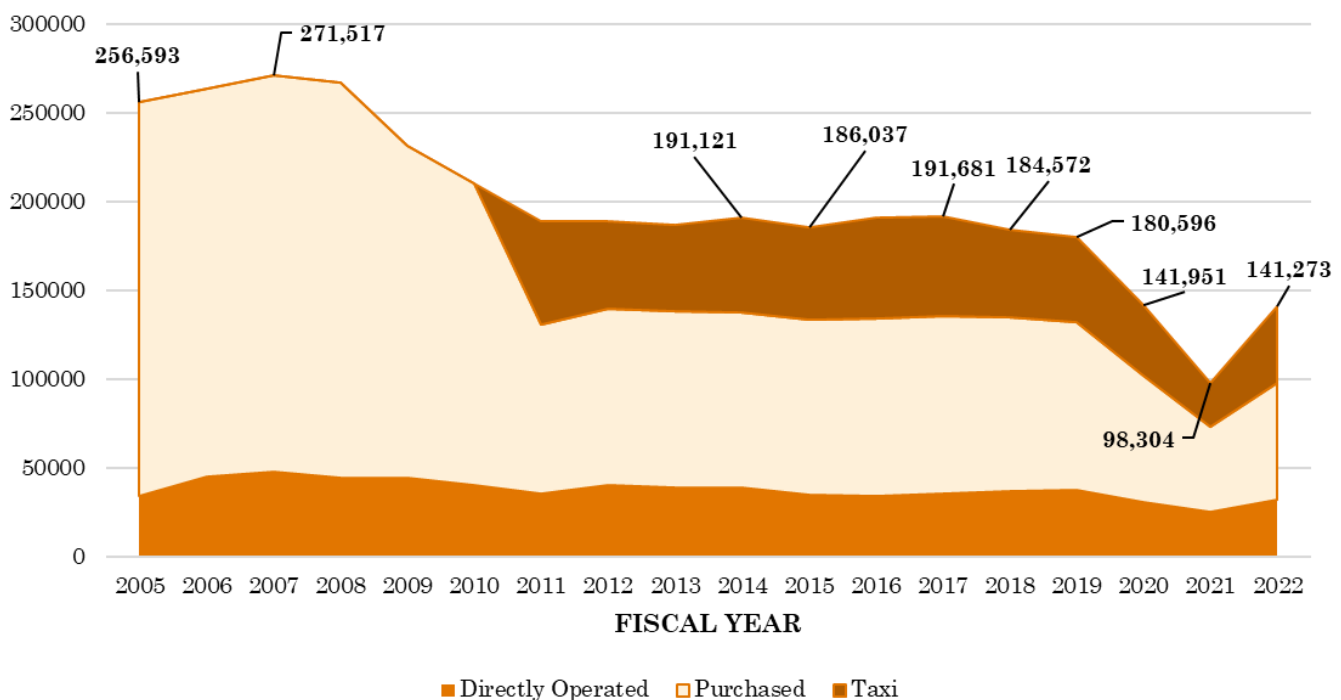
Demand response services represent a minority of WRTA trips. For instance, **in 2022, out of every 100 Unlinked Passenger Trips (UPT), four correspond to demand response services and 96 to fixed route buses.**

The National Transit Database defines Unlinked Passenger Trips (UPT) as the number of passengers who board public transportation vehicles, counted each time they board, no matter

how many vehicles they use. Demand response UPTs are classified according to the service modality, which can be Directly Operated (DO, provided directly by a transit agency), Purchased Transportation (PT, contracted from a third party, typically a private operator), or Taxi (TX, taxicab operators). Chart 5 shows demand response UPTs by modality across time and includes the total across all modalities. When compared to FY2021, FY2022 and its 141,273 trips represent a 43.7% increase, but not at the mostly-pre-pandemic FY2020 levels (141,951) yet, which had been the lowest point in demand-response ridership in the last 15 years.

Demand response services play a vital role in the communities they serve. While Demand Response services are available in all 37 communities within the WRTA service area, twenty-one WRTA communities have only demand response services. Fixed route buses carry much more weight in financial terms (as shown in the first report of this series, [All Aboard: Financing a Fare-Free WRTA](#)), which is understandable given both services' nature, which make them not comparable to each other. The following section analyzes fixed route bus ridership in depth.

Chart 5: Annual Demand-Response Service Ridership, FY 2005-2022



Source: National Transit Database (NTD), 2022 Monthly Ridership Time Series



Fixed-Route Buses Ridership Trends

With the early 2023 release of final data for the calendar year 2022, recovery to and beyond pre-pandemic levels is resounding.

Although FY2021 showed a reduction of 9.3% compared to the mostly-pre-pandemic FY2020 (2.42 million UPT), **FY2022 and its 3.06 million UPT not only reached it but exceeded it.**

Although the trajectory of the FY-totals in Chart 6 clearly shows the recovery, an analysis, not at an annual but at a monthly level, will allow more understanding of the recovery and the trends from almost 20 years of data.

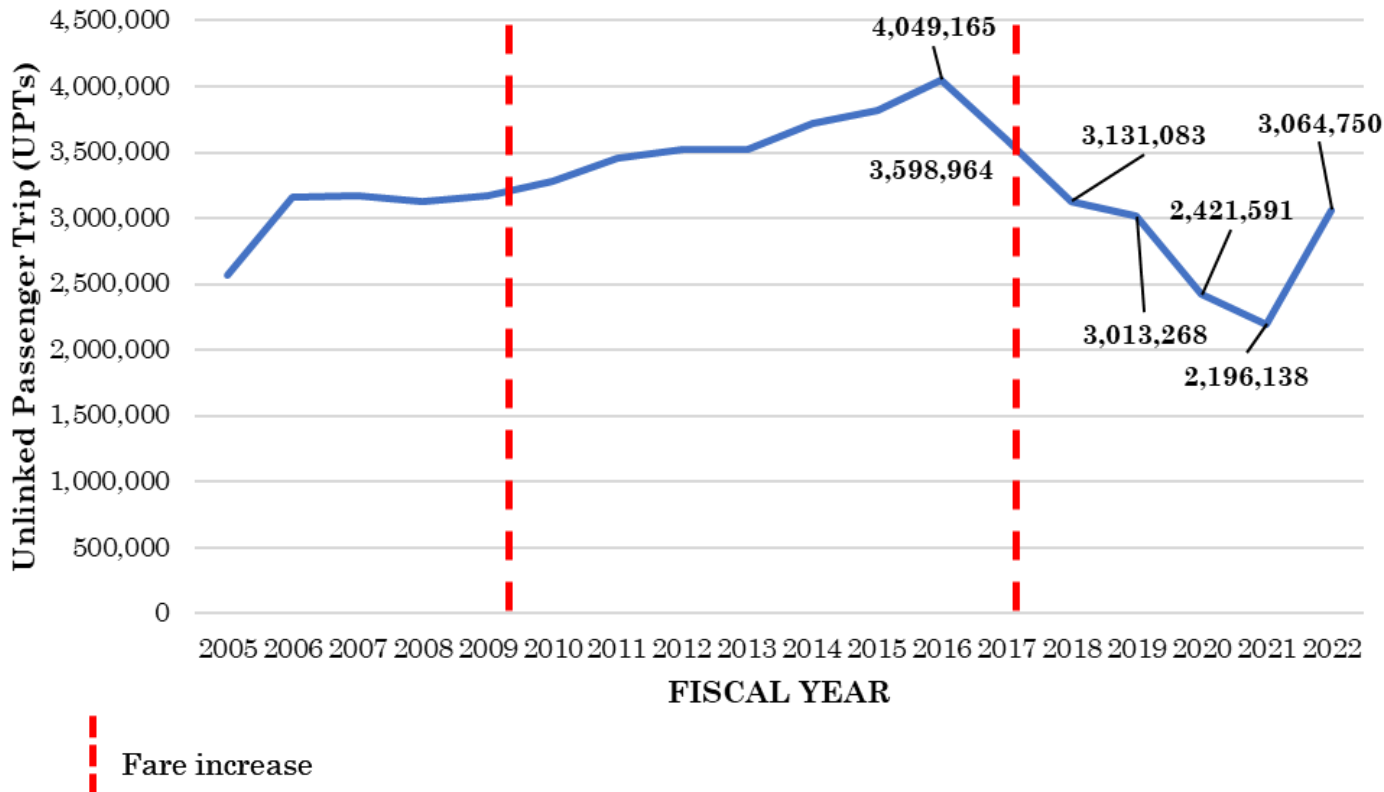
Table 7 on next page shows monthly rider totals, which have been color-coded to make clear some trends over almost 20 years of data. The values for July and August of 2004, which correspond to a drivers' strike from July 7 to September 13, are

excluded as outliers that would distort the analysis of the rest of the data.

Among the multiple findings that can be observed, the recovery in CY2022 does not show uniformly high totals every month but rather that the best results were achieved in the year's second half. Similarly, **October has historically been a good month for ridership.** The historical peak in CY2015 corresponds to a cluster of substantially good months; the end of CY2022 reached levels comparatively similar to these historical monthly peaks.

The analysis by year and month, using data made available by the National Transit Database, deepens our understanding of historical patterns. The following section presents how ridership is distributed by day of the week, bus route number, and the communities of origin of the passenger.

Chart 6: Annual Fixed-Route Buses Ridership, FY 2005-2022



Source: National Transit Database (NTD), 2022 Monthly Ridership Time Series



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2004	317,101	297,867	345,892	323,701	313,628	330,948	40,477	0	170,690	255,429	253,925	278,910	2,928,568
2005	255,506	241,237	282,244	256,820	262,707	270,171	252,875	279,140	260,820	255,188	260,524	264,726	3,141,958
2006	255,575	244,487	285,688	249,911	275,778	273,265	266,596	282,824	252,267	267,260	264,151	265,434	3,183,236
2007	276,101	235,989	274,455	253,285	271,559	261,977	259,944	278,012	244,472	275,404	254,335	251,522	3,137,055
2008	252,835	236,680	258,976	273,197	280,997	265,593	265,258	262,954	280,434	312,016	251,025	247,193	3,187,158
2009	234,393	244,532	269,572	273,655	265,395	269,609	261,891	263,563	288,555	297,359	265,784	264,600	3,198,908
2010	245,601	243,168	298,670	290,750	276,362	287,498	283,307	281,668	301,654	298,753	288,826	282,047	3,378,304
2011	234,729	246,981	324,707	299,153	302,060	307,107	289,790	323,185	326,428	319,157	322,111	319,018	3,614,426
2012	293,616	269,642	295,578	269,472	253,616	240,940	284,872	317,817	294,001	322,877	282,061	268,329	3,392,821
2013	280,854	273,023	299,803	306,034	306,086	283,801	303,523	311,152	323,849	329,517	296,887	292,965	3,607,494
2014	286,253	279,204	315,516	328,351	331,819	317,902	327,234	314,142	361,266	377,936	308,477	325,093	3,873,193
2015	277,062	258,594	317,657	302,648	320,510	324,219	359,910	340,201	360,123	375,687	338,394	338,697	3,913,702
2016	278,782	298,940	341,796	327,325	334,330	355,314	290,539	326,711	325,134	320,293	301,290	292,985	3,793,439
2017	288,625	261,302	307,674	277,969	301,582	305,137	264,594	298,990	280,567	283,996	258,861	235,314	3,364,611
2018	229,375	242,931	254,358	246,755	275,269	260,073	254,268	280,330	261,105	288,652	248,030	237,609	3,078,755
2019	228,402	218,729	246,916	251,121	257,720	240,386	258,351	262,897	263,157	262,706	222,173	212,471	2,925,029
2020	237,280	241,035	188,804	81,288	93,391	98,038	157,910	174,681	184,638	188,516	168,442	174,879	1,988,902
2021	161,492	153,299	202,017	197,684	208,308	224,272	243,997	225,620	252,790	255,154	243,734	253,379	2,621,746
2022	201,017	213,447	274,942	272,891	303,262	324,517	312,747	364,722	342,709	354,456	333,052	318,177	3,615,939
Total	4,834,599	4,701,087	5,385,265	5,082,010	5,234,379	5,240,767	4,978,083	5,188,609	5,374,659	5,640,356	5,162,082	5,123,348	61,945,244

Source: National Transit Database (NTD), 2022 Monthly Ridership Time Series. **Bolded cells** (January 2009 and July 2017) represent fare increases



By Type of Day, Routes, and Community

Unlinked passenger trips were classified by type of day, bus route, and community in the following data from the WRTA as of February 15, 2023. In Table 8, that data is categorized by the type of day the trip was made (Weekday, Saturday, or Sunday) and shows the daily averages by day type for four calendar years. It is clear that **most passengers travel on weekdays, with an average weekday almost doubling Saturday and more than quadrupling Sunday in 2022.**

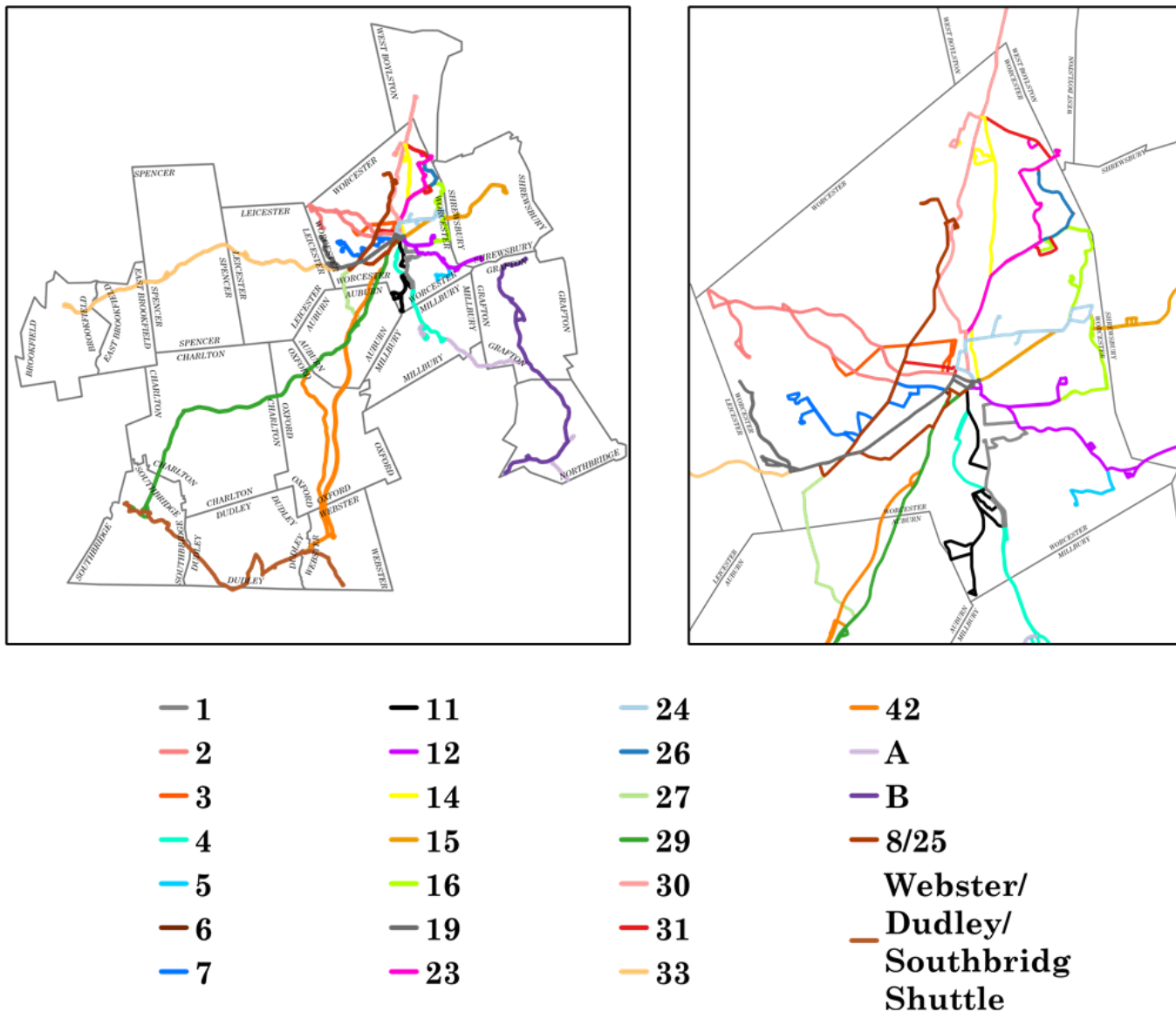
Although some routes have operated temporarily, the 26 routes that have provided their services at some point from CY2019 to CY2022 are shown on Map 7. Once again, the map confirms how Worcester is the key hub of the public transportation network in the region, as it is the location of most bus routes and serves as a pivot for the rest of the communities in the WRTA-FR Area.

	Weekday	Saturday	Sunday
2019	9,921	5,028	1,618
2020	6,630	3,445	1,654
2021	8,771	4,736	1,821
2022	11,965	6,468	2,601

Source: Own Calculation Based on Worcester Regional Transit Authority Data Request Response Issued on February 15, 2023



Map 7: Fixed-Route Bus Routes and the WRTA-FR Area communities



Source: Central Massachusetts Regional Planning Commission (CMRPC)

To further deepen the characterization of ridership, using the data provided by the WRTA, Table 9 shows the annual total UPTs by route for each year between CY2019 and CY2022. Likewise, each route’s relative weight in the ridership of each year is shown. This detail allows us to see how the overall aggregate corresponds to a set of routes with quite heterogeneous ridership. **For example, in CY2022, 40.2% of all UPTs occurred on routes 11, 19, 26, and 27.**

Routes 11 (Union Station Hub – The Fair Plaza via Vernon Hill and Greenwood St), 19 (Union Station Hub – Webster Square – Clark University via Main St.), 26 (Union Station Hub – Great

Brook Valley via Lincoln St.), and 27 (Union Station Hub – Auburn Mall via Main St.) appear to have consistently remained at the top of trips counts over this period.

Finally, the WRTA data provided included a breakdown of trips by the community in which passengers boarded the bus in the period CY2019-CY2021. Table 10 shows this breakdown and confirms, once again, how **Worcester had the highest number of trips overall and represents an increasing share of total trips, going from 83.8% in 2019 to 86.4% in 2021.**



Route	2019	2020	2021	2022	2019	2020	2021	2022
1	77,880	54,349	71,744	93,881	2.7%	2.7%	2.7%	2.6%
2	72,653	45,739	64,572	79,497	2.5%	2.3%	2.5%	2.2%
3	47,570	28,843	39,261	55,358	1.6%	1.5%	1.5%	1.5%
4	79,403	54,574	72,312	97,971	2.7%	2.7%	2.8%	2.7%
5	85,495	52,999	59,707	85,848	2.9%	2.7%	2.3%	2.4%
6	72,022	43,498	61,843	93,149	2.5%	2.2%	2.4%	2.6%
7	189,411	130,256	160,675	228,048	6.5%	6.5%	6.1%	6.4%
8	7,087	6,388	13,515	21,997	0.2%	0.3%	0.5%	0.6%
11	258,019	194,494	257,912	327,558	8.8%	9.8%	9.8%	9.1%
12		9,605	25,174	64,297	0.0%	0.5%	1.0%	1.8%
14	85,111	33,709	56,767	87,069	2.9%	1.7%	2.2%	2.4%
15	67,764	39,267	47,985	68,663	2.3%	2.0%	1.8%	1.9%
16	96,732	50,865	78,002	115,406	3.3%	2.6%	3.0%	3.2%
19	250,213	174,931	243,613	376,745	8.6%	8.8%	9.3%	10.5%
23	185,656	137,887	176,222	209,355	6.3%	6.9%	6.7%	5.8%
24	171,079	111,574	142,537	182,055	5.8%	5.6%	5.4%	5.1%
25	36,524	13,002	24,363	19,770	1.2%	0.7%	0.9%	0.6%
26	251,895	210,535	262,880	383,447	8.6%	10.6%	10.0%	10.7%
27	233,378	197,082	268,309	352,418	8.0%	9.9%	10.2%	9.8%
29	58,730	41,678	46,337	58,661	2.0%	2.1%	1.8%	1.6%
30	217,024	134,885	148,847	205,047	7.4%	6.8%	5.7%	5.7%
31	146,891	60,567	119,148	148,936	5.0%	3.0%	4.5%	4.2%
33	130,587	95,698	103,233	125,220	4.5%	4.8%	3.9%	3.5%
42	80,027	59,214	68,428	87,439	2.7%	3.0%	2.6%	2.4%
A/B	9,565	6,544	7,534	12,632	0.3%	0.3%	0.3%	0.4%
Downtown-Hub Loop	10,978				0.4%	0.0%	0.0%	0.0%
Elder Shopper Special	3,336	718	645	2,141	0.1%	0.0%	0.0%	0.1%
Total	2,925,030	1,988,901	2,621,565	3,582,608	100%	100%	100%	100%

Source: Worcester Regional Transit Authority, Data Request Response Issued on February 15, 2023

Community	2019	2020	2021	2019	2020	2021
Worcester	2,451,282	1,689,388	2,263,774	83.8%	84.9%	86.4%
Auburn	108,302	73,464	95,871	3.7%	3.7%	3.7%
Brookfield	3,265	1,723	1,858	0.1%	0.1%	0.1%
Charlton	2,349	917	1,019	0.1%	0.0%	0.0%
Dudley	0	0	226	0.0%	0.0%	0.0%
East Brookfield	5,354	6,029	6,504	0.2%	0.3%	0.2%
Grafton	2,334	1,525	1,959	0.1%	0.1%	0.1%
Leicester	40,432	23,909	27,439	1.4%	1.2%	1.0%
Millbury	40,099	26,523	35,143	1.4%	1.3%	1.3%
Northbridge	3,491	2,415	3,059	0.1%	0.1%	0.1%
Oxford	11,524	6,336	7,322	0.4%	0.3%	0.3%
Shrewsbury	42,623	26,584	32,486	1.5%	1.3%	1.2%
Southbridge	30,364	17,380	20,452	1.0%	0.9%	0.8%
Spencer	43,717	29,815	33,261	1.5%	1.5%	1.3%
Webster	40,014	27,416	32,842	1.4%	1.4%	1.3%
West Boylston	96,142	52,875	58,348	3.3%	2.7%	2.2%
Westborough	3,740	2,605	0	0.1%	0.1%	0.0%
Total	2,925,032	1,988,904	2,621,563	100%	100%	100%

Source: Worcester Regional Transit Authority, Data Request Response Issued on September 15, 2022

The table shows how Auburn and West Boylston have consistently maintained second and third places during those three years, but even together, these two communities represent less than 6% of all trips. On the one hand, **Auburn is covered by routes 27, 29, and 42, which in CY2022 totaled 17% of all trips (12% corresponds to route 27 alone). On the other hand, West Boylston is served by route 30, which accounted for 7% of all trips in CY2022.**

An exceptional recovery

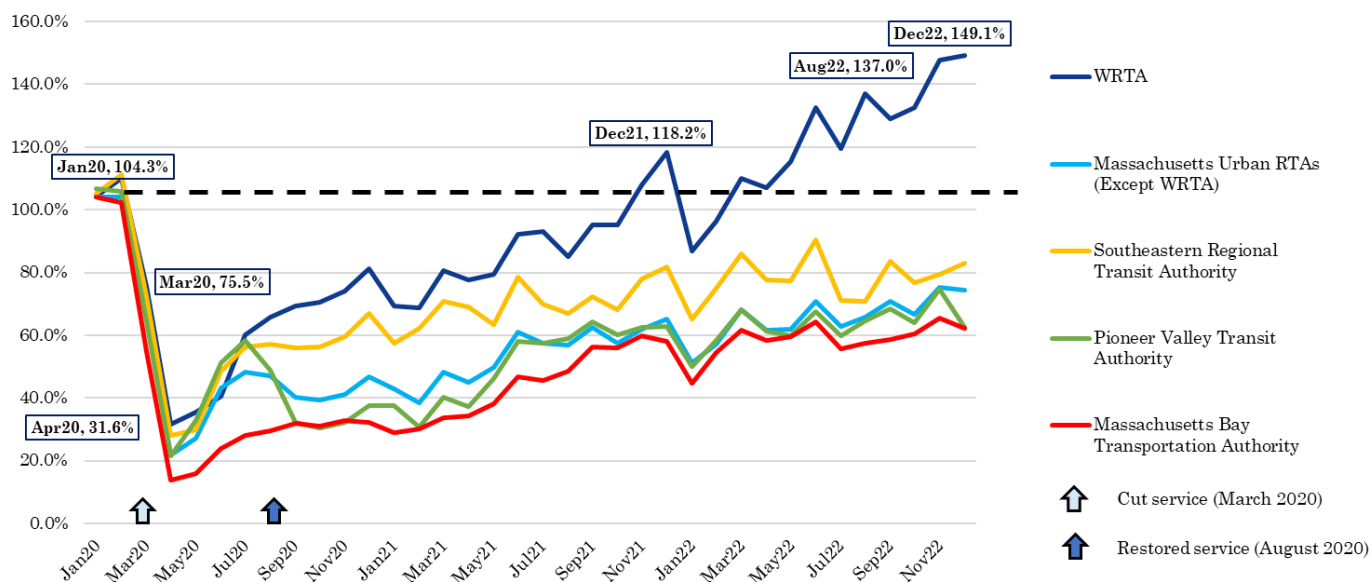
Using the pre-pandemic year of 2019 as a baseline, month-to-month unlinked passenger trip data from the National Transit Database (NTD) shows steep ridership recovery between January 2020 and December 2022. To ensure that the comparisons respect the intrinsic seasonality of ridership, each month will be compared to its corresponding month in 2019. Thus, for example, the months of December 2020, 2021, and 2022 will all be compared to December 2019. The results can be seen in Chart 7.

Eleven of the 14 remaining RTAs have been included as comparison points for ridership recovery; Martha’s Vineyard Transit Authority (VTA), the Nantucket Regional Transit Authority (NRTA), and the Franklin Regional Transit Authority (FRTA) were excluded due to lack of

month-to-month ridership data at the NTD due to their status as rural reporters. In addition to contributing to the aggregate of urban RTAs, the Southeastern Regional Transit Authority (SRTA) and the Pioneer Valley Transit Authority (PVTA) are presented separately, as it was stated in early 2023 that the best apples-to-apples comparison was between the WRTA and these two agencies (Telegram and Gazette, 2023). Regarding the Pioneer Valley Transit Authority (PVTA), note that, although their services are not generally free, they and their partnerships with UMass Amherst and their "UMass Transit" buses are an example of focused alternatives where fares on certain routes have been kept free. Finally, although their institutional, financial, and geographic coverage is not perfectly comparable, the Massachusetts Bay Transportation Authority (MBTA) is added as the agency with the highest passenger flows in the state.

The WRTA has had an unparalleled recovery in the region. It is not only the unique agency in the analysis that **reached and surpassed its pre-pandemic values (which it achieved for the first time in November 2021), but it has continued to grow, closing December 2022 with 149.1% of its 2019 UPTs.** Of the agencies considered in the comparison, the second-best performer is the Southeastern Regional Transit Authority (SRTA). Its best month in this period was June 2022, with 90.5% of its trips from 2019.

Chart 7: 2020-2022 Recovery Rate (Compared to 2019 monthly totals)



Source: Own Calculation Based on the National Transit Database (NTD) 2022 Monthly Ridership Time Series

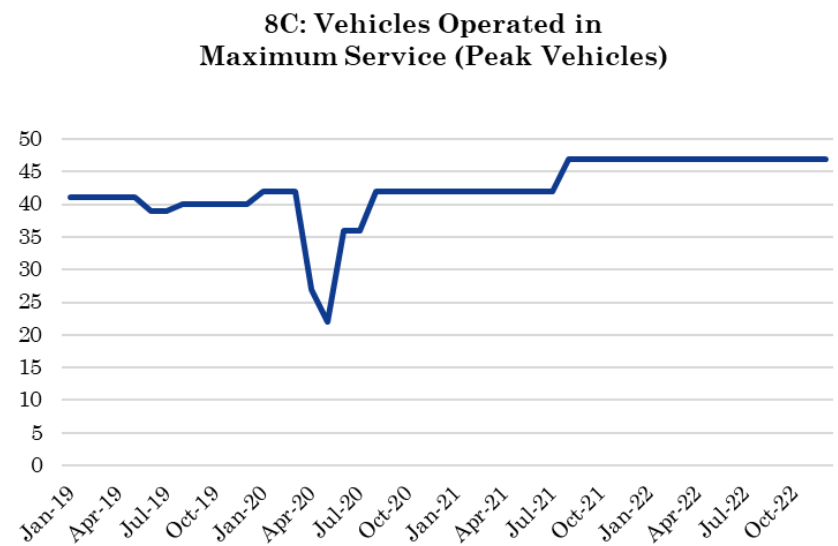
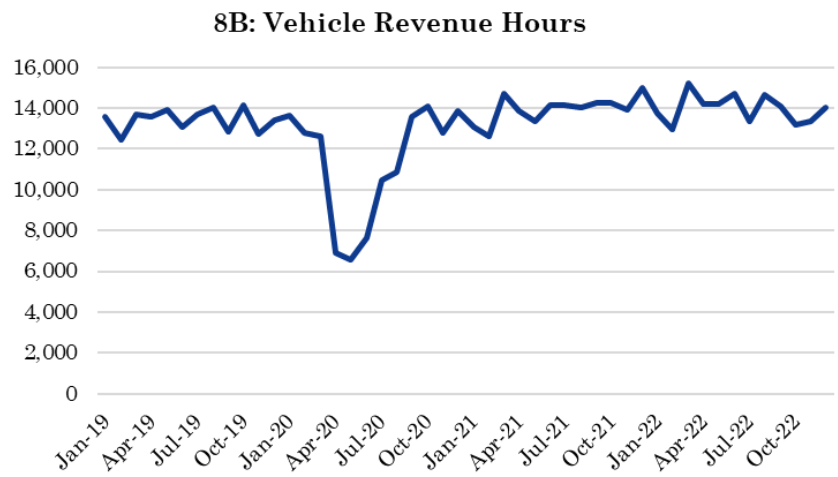
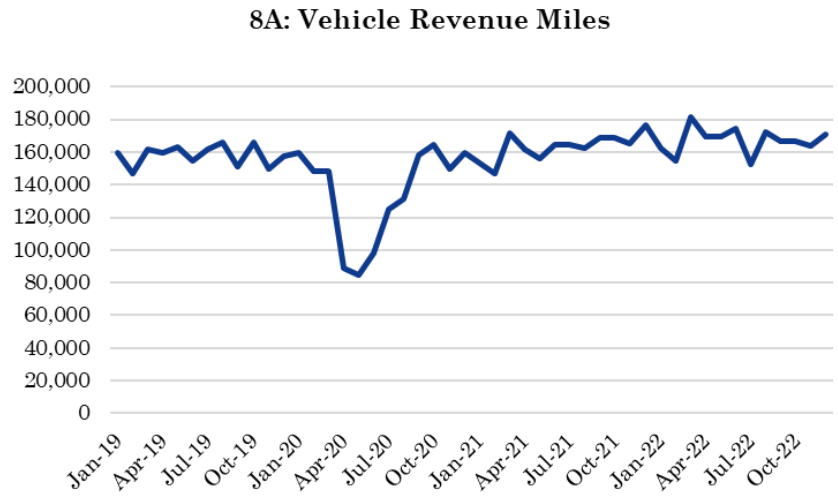


While UPTs are usually the most relevant indicator in recovery analysis, the NTD collects and publishes data on three additional service metrics. Vehicle Revenue Miles (VRM) and Vehicle Revenue Hours (VRH) refer to the miles and hours, respectively, that vehicles are scheduled to or actually travel while in revenue service, including layover/recovery time, but excluding deadhead (miles and hours that a vehicle travels when out of revenue service), operator training, vehicle maintenance testing, and other non-revenue uses of vehicles. The third metric is Vehicles Operated in Annual Maximum Service (VOMS), or the number of revenue vehicles operated to meet the annual maximum service requirement. This is the revenue vehicle count during the year's peak season, on the week and day that maximum service is provided, excluding atypical days or one-time special events.

Panels 8A, 8B, and 8C display the behavior of these variables during the period 2019-2022. The impact of the COVID-19 pandemic is clear and visible in all variables, as well as the widespread recovery to pre-pandemic levels.

Chart 9 shows the monthly recovery of vehicle revenue miles, vehicle revenue hours, and vehicles operated in maximum service using the corresponding 2019 month as a baseline. One hundred percent was reached in all three variables by September 2020, and otherwise, the values have remained relatively stable. The number of Vehicles Operated in Maximum Service (VOMS) deserves special mention as it has shown the highest recovery rates, which could be one of the explanatory variables for the increase in ridership.

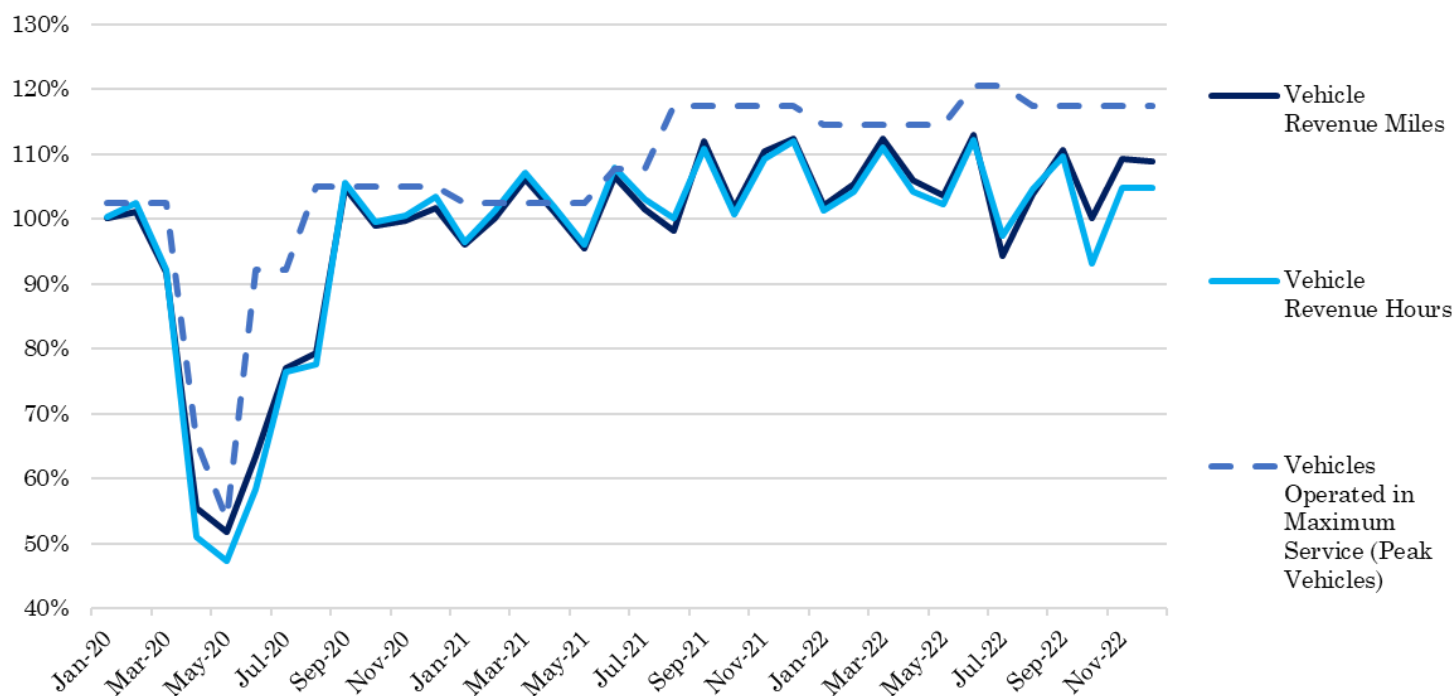
Chart 8: Fixed-Route Buses Service Metrics, 2019-2022



Source: National Transit Database (NTD), 2022 Monthly Ridership Time Series



Chart 9: WRTA Recovery of Service Metrics, 2020-2022



Source: Own Calculation Based on the National Transit Database (NTD) 2022 Monthly Ridership Time Series

How to increase ridership

The full recovery and the upward trajectory of ridership seen in 2022 is a valuable achievement in and of itself, and it has had a positive impact on other metrics, such as the cost per passenger, which was analyzed in the first report of this series, [All Aboard: Financing a Fare-Free WRTA](#). There is no doubt that a plausible goal, from which all involved would benefit, is maintaining this upward trend in ridership. This would benefit both current users and new ones, simultaneously bolstering economic, educational, social, and equity purposes. This final section of the report will provide a brief overview of improving ridership, offering some ideas that could be considered for this purpose.

The [Transit Cooperative Research Program \(TCRP\)](#) study, *Elements Needed to Create High-Ridership Transit Systems* (TCRP, 2007), sponsored by the Federal Transit Administration, thoroughly analyzes ridership at the national level.

The report suggests that initiatives aimed at improving ridership can be categorized into four areas: (1) operating and service adjustments; (2) partnerships and coordination; (3) marketing, promotional, and informational efforts; and (4) fare collection structure. These components will be analyzed in detail below.

The study emphasizes that before implementing any improvement strategy, the first step should always be to identify service gaps and opportunities. This involves analyzing the overall route structure, travel patterns, and users' demographic profiles, including the types of riders, employment trends, travel purposes, and so on.

In 2018, the WRTA surveyed its users to evaluate fixed route bus service satisfaction. Panels from Chart 10 display some of the results. Panel 10A, for example, shows that **the number one factor that respondents said would make them use the WRTA more frequently is More Weekend Service, closely followed by More Frequent Service and Longer Service Hours**. While it is

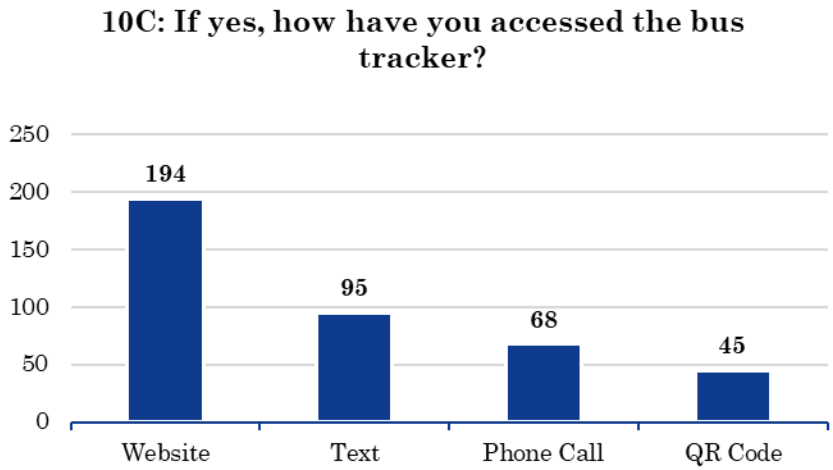
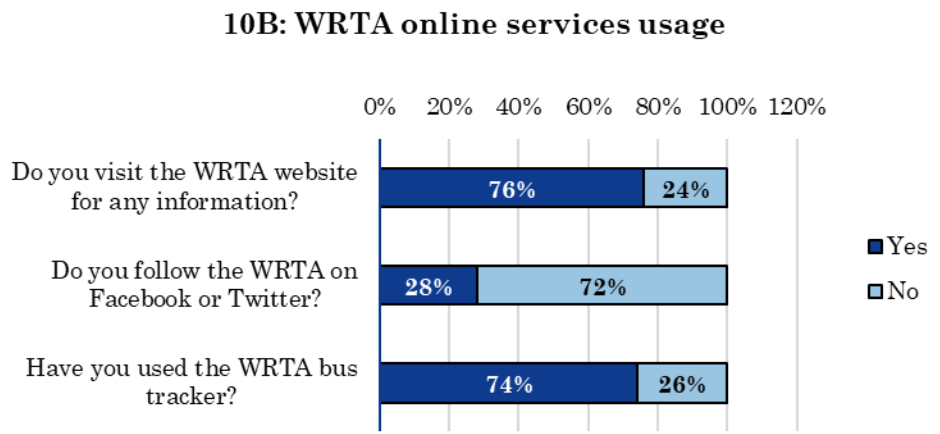
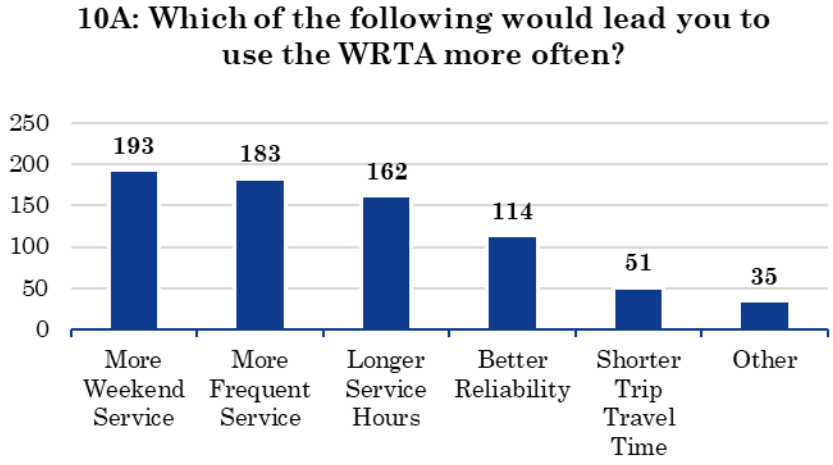
true that the survey was conducted in 2018, and Chart 9 shows recovery and growth in services offered post-pandemic, it is still important to understand the areas for improvement that users identified during a year, such as 2018, which was the third in a row with declining ridership.

In Panel 10D, respondents rated different aspects of the service. **The lowest ratings correspond to aspects already reflected in Panel 10A: service frequency, buses arriving on time, and hours of operation.** Although the survey was conducted in 2018, it is plausible to assume that the results would maintain given changes like the cutbacks on Fridays due to driver shortages. There appears to be consistency in the opinions of users regarding the areas that need improvement.

Finally, it is worth mentioning that, since 2018, many of these results may have already improved and may be contributing to the increase in ridership in 2022. However, this cannot be known for sure unless instruments such as the satisfaction survey are conducted again to update and compare to the results from 2018.

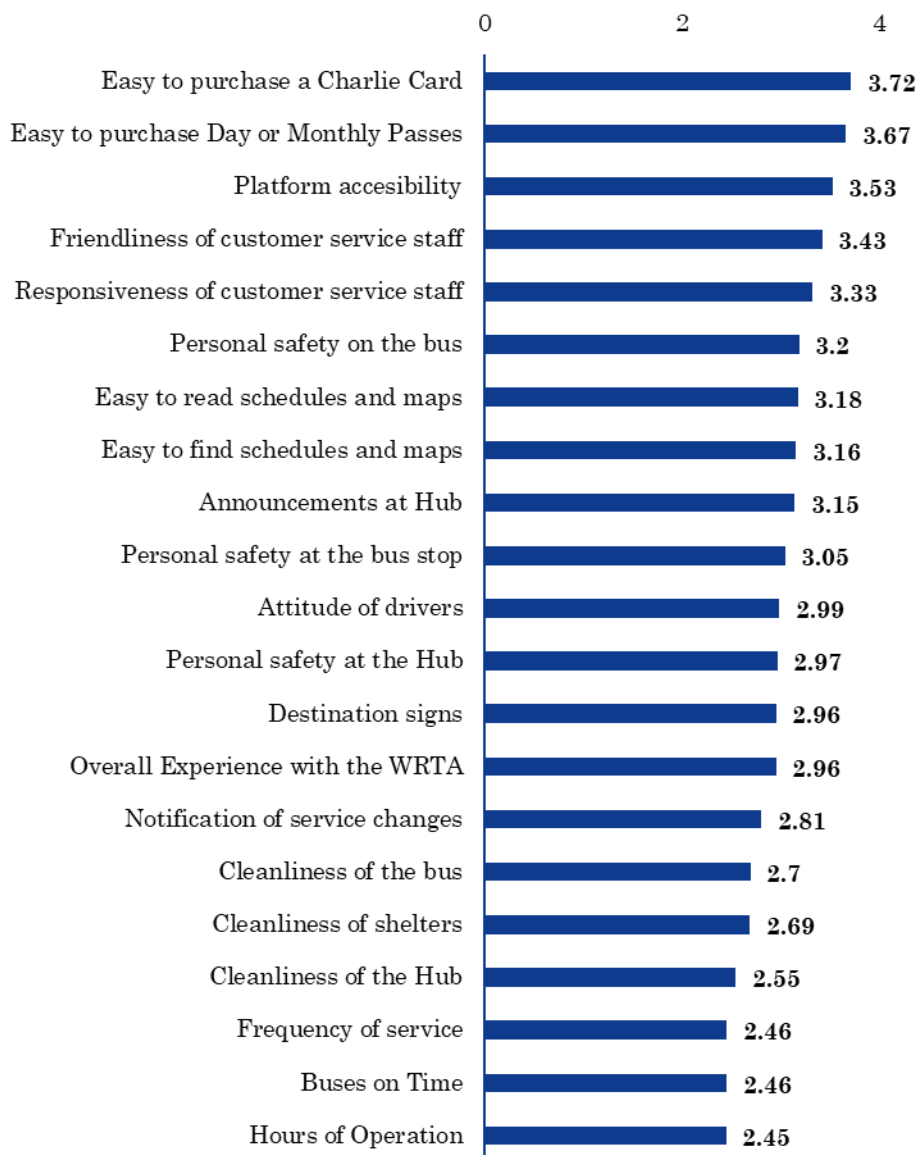
Having reviewed some areas for improvement directly from the voices of users, we can now present the four components identified in the TCRP report for increasing ridership.

Chart 10: Fixed-Route Buses Satisfaction Survey Results, 2018



Source: Worcester Regional Transit Authority, 2018 Fixed-Route Satisfaction Survey



10D: Average ratings (the higher the number, the more favorable opinion)

Source: Worcester Regional Transit Authority, 2018 Fixed-Route Satisfaction Survey

Operations

Under this category, the report groups activities such as scheduling and frequency of service, types of services offered, and amenities. This highlights why the first step of identifying gaps in service is vital. Once these shortcomings are identified, choosing the mechanisms to address them becomes much simpler. Some of the elements that translate into "better reliability" in panels 10A and 10D correspond to this component. Based on its calculations and estimates across several regions of the country, the report concludes that improvements to operations had the most significant impact on ridership.

The report classifies the possible adjustments into four categories: routing/coverage, scheduling/frequency, new types of service, and improved amenities. These types have subcategories, and the report explains them and give real examples for all of them.

Partnerships

This category includes all strategies aimed at working with other entities in the community to capitalize on some of their built-in markets, such as universities, which have many potential riders. This point, in fact, was mentioned by The Research Bureau in its first report published in

2019, [The Implications of a Fare Free WRTA](#), and reiterated in the 2023 series' first report, [All Aboard: Financing a Fare-Free WRTA](#). Among the examples cited in the report as successful in increasing ridership are:

- In Chicago, more than 40,000 eligible college students were using the CTA's U-PASS program, accounting for over 10 million rides per year; a quarter to a third of these were considered to be new transit rides, and half of total U-PASS ridership was thought to take place in midday/evening hours.
- In Seattle, 86% of eligible university students, faculty, and staff participated in the U-PASS program, accounting for over 8 million rides per year (more than 10% of all Metro and Community Transit rides); 45% of these were estimated to be new transit rides.
- The University of California at Santa Cruz worked with Santa Cruz METRO to establish a university transit pass program. A student ID entitles the holder to unlimited free rides on any METRO route. The university makes payments to METRO, funded by a fee added to tuition. Ridership has increased on routes serving the university .

Moreover, it is important to note that the region has an example: UMass Amherst and the Pioneer Valley Transit Authority (PVTA) have a partnership that allows "UMass Transit" buses, partially funded by UMass, to operate fare-free for students of the "Five Colleges Consortium" in the Pioneer Valley.

Marketing and Information

This component is defined in the report as those elements that aim to promote and advertise the types of services provided by public transportation systems. It is important to note that this is perhaps the only component where the temporal gap regarding its publication has more weight. While the first two components offer viable and valuable alternatives despite being proposed more than 15 years ago, the widespread use of social media now means that this component cannot be studied from a 2007 perspective. In 2022, the TCRP published the report *Uses of Social Media in Public Transportation* (TCRP, 2022), which seems more

suitable for studying this component.

According to this report, the motivations for transit providers to use social media can fall into one, or a combination of some, of these purposes: updates and crisis information, public education and awareness, public engagement, transit promotion, and support and influence on organizational goals. The report concludes with a list of best practices for using social media in this field through an analysis that combines an exhaustive literature review, an online survey conducted with 47 transit service providers, and several case examples.

However, it is important to highlight something regarding this component. Looking again at panels 10B and 10C, only 1 in 4 riders follow WRTA on Facebook and/or Twitter, while 3 in 4 riders report visiting the website, the same site where they access the bus tracker, far above the use of text messages, phone calls, and QR codes. Furthermore, remember that, according to Table 4A and Chart 3D, public transportation users have lower incomes and higher levels of poverty, which may limit their continuous access to WRTA's social media. This could indicate that marketing efforts would be better directed towards the website in the short and medium term. If this component is included in ridership increase strategies, it may be feasible to rethink a social media rebranding strategy in the medium to long term.

Fare Collection Structure

The last of the four components in ridership increase strategies pertains to fare collection. The essential recommendation that the report makes is to simplify the fare structure. While this may entail digital fare collection systems or similar options, it is essential to recall the discussion that was made on this issue in the first report of this series, where it is noted that **changing fare collection systems not only has financial costs associated with its implementation and maintenance but also may affect the quality of service**, as these fare collection methods could lengthen wait times for each trip, decreasing the reliability that WRTA users had already mentioned in the 2018 satisfaction survey.

New Strategies?

Finally, although the ideas presented in the report are valuable and potentially helpful, it is crucial to recognize that they were studied and prescribed 15 years ago. This highlights the need for an updated report that takes into account changes in labor dynamics, demographics, and economics. Fortunately, in 2022, TCRP also published the report *Recent Decline in Public Transportation Ridership: Analysis, Causes, and Responses* (TCRP, 2022), which studied ridership patterns at a national level for the period of 2012-2018, where they observed an average reduction in ridership that the pandemic only worsened.

In summary, the report found mixed trends over the years and across regions, with some places experiencing an increase in ridership and others experiencing a reduction. Among the factors that boosted ridership in the period 2012-2018 were the increased provision of services by some agencies and changes in land use (explicitly referring to demographic changes in the total population and employment growth in metro areas). On the other hand, among the factors that decreased ridership, they identified: (1) income and household characteristics, specifically how higher incomes (and subsequently higher rates of car ownership) and work-from-home have decreased the use of public transit; (2) buses and rail travel becoming more expensive, as the average fares increased across most metro area sizes; (3) driving becoming less expensive; and finally, (4) new travel modes competing with public transit, particularly ride-hailing.

Considering the wide variety of public transit systems, it is impossible for a list of recommendations to be relevant and applicable to every agency to the same extent. However, acknowledging these differences, **the report provides five major recommendations that, if validated and adjusted to fit each agency's specific context, could lay the groundwork for a discussion among the various sectors in the communities that would benefit from improvements in the system.**

General recommendations by 2022 TCRP study

- Rethink the mission, service standards, metrics, and service delivery. It is recommended to analyze each case individually, which will lead transit agencies to rethink their mission, service standards, metrics used to measure success, and service delivery options in light of what their data show.
- Redesign fare policies. The research in this report on pre-COVID trends confirms the positive impact on ridership that can be achieved through the implementation of fare discounts. However, as previously stated, the long-term impacts of the pandemic are still not fully understood, so variables such as work-from-home must be closely and consistently studied.
- Prioritize transit. This can significantly increase transit ridership by increasing average speeds, reducing travel times, and improving service reliability, which all contribute to making transit service more attractive to potential riders.
- Carefully consider partnerships with shared-use mobility providers. Although many experts recommend alliances with shared-use mobility providers (such as ride-hailing, micro-transit, car-sharing, and micro-mobility alternatives like bike sharing and scooters), they should be considered, identifying whether these services are substitutes competing with transit or complementary. As an example, the WRTA's had a two-year partnership with VIA, which has provided over 33,000 weekday rides to Westborough and Shrewsbury.
- Encourage transit-oriented density. The report shows that regions with increased density experienced growth in transit ridership. While density is defined by metropolitan and municipal planning policies, which are not under the control of transit agencies, these agencies can play an essential role in encouraging transit-oriented density.

Key Takeaways

- The demand-response service of the WRTA, mostly operated by purchased transportation, hasn't reached mostly-pre-pandemic FY2020 ridership.
- In FY2022, **fixed-route buses reached 3,064,750 Unlinked Passenger Trips (UPT) surpassing the pre-pandemic levels** of FY2019 (3,013,268) and mostly-pre-pandemic FY2020 (2,421,591).
- Of the total UPT for fixed-route buses in the last four calendar years, **most trips were made (1) in the second half of the year, with an emphasis on October; (2) on weekdays, followed by Saturdays and Sundays in last place; (3) on routes 11, 19, 26, or 27; and (4) out of every ten trips, between 8 and 9 were taken in the City of Worcester.** In a much smaller proportion, the next-largest communities in terms of ridership are Auburn and West Boylston.
- **WRTA achieved a complete recovery in early CY2022 and closed in December with monthly recovery ratios from pre-pandemic levels (CY2019) of more than 140%.** Since then, it has continued to grow consistently and faster than peer agencies that have not yet reached their CY2019 values.
- Not only has the total number of UPTs recovered and continued to improve, but also the metrics for Vehicle Revenue Miles (VRM), Vehicle Revenue Hours (VRH), and Vehicles Operated in Maximum Service (VOMS) have fully recovered. The latter, in particular, has shown significant percentage growth, though not in the same proportion as UPTs.
- According to the 2018 fixed route satisfaction survey, **respondents consistently identified extending service on weekends, increasing frequency, more reliability, and offering longer service hours as the main areas for improvement for WRTA.**
- **Only one in four respondents followed WRTA on social media.** Three times as many reported visiting and using the website, making it the ideal mechanism to reach out to them.
- **Partnerships with institutions such as large employers or universities could be key to increasing ridership.**

Conclusion

The WRTA Advisory Board's Audit and Finance Committee vote in March 2023, recommending the continued inclusion of fare-free in the FY24 budget, is just the start of potentially longer fare-free service. More years of fare-free service would require that the WRTA design strategies to continue its upward trend in ridership.

The last section of the report summarized the recommendations provided by the Transit Cooperative Research Program (TCRP) in its 2022 study on causes and responses to the widespread decline in ridership. Of course, not every recommendation would apply to the WRTA, but it is worthwhile to examine each of the recommendations and find what is useful.

Before attempting to make improvements, though, it is important to conduct a thorough analysis of the current situation, including studying routes, communities, passenger flows, and general operations. This report contributes to this discussion, and its findings can be summarized in three parts:

- Worcester represents the central and most relevant node in an intricate and complex work mobility network in Central Massachusetts, with a strong bidirectional relationship with Shrewsbury, Auburn, and, outside of the region, Suffolk County.
- Workers commuting by all forms of public transportation are generally younger, have a higher rate of poverty, and are predominantly White (75%), but Black and Hispanic populations are statistically overrepresented compared to the population of all workers. WRTA bus riders themselves are evenly distributed in terms of age and gender, mostly use the service for work (39%), and generally have low income and low car ownership.
- Demand response services haven't reached FY2020 ridership levels. Fixed route service in FY2022, on the other hand, exceeded FY2019 and FY2020 levels and closed 2022 at 140% monthly recovery rate. Most trips in CY2019-2022 occurred in the second half of the year (54%) and in Worcester (85%).

Any future plans and strategies must be evidence-based and data-driven. For example, if the WRTA plans an improvement from the TCRP's *Marketing and Information* work, it should be

done in the context of the revelation from the 2018 fixed route satisfaction survey: that only 28% of respondents follow the WRTA on social media for service updates, while 76% visit its website directly. If the WRTA were to analyze improving service itself, following the TCRP's advice, that same 2018 survey showed that for respondents, the main areas desired for improvement were hours of operation, schedule reliability, and frequency of service. This highlights another crucial point: if data is important, up-to-date data is equally important.

Although some decisions, such as temporary Friday service reductions to select fixed-route service in late January 2023, may have negatively affected riders' service satisfaction, riders may also have experienced positive changes that were not measured, as no comparable satisfaction survey has been conducted since 2018. Ultimately, making decisions with five-year-old data, especially in the context of a global pandemic, can lead to suboptimal results. Ensuring timely data, such as an annual satisfaction survey designed for its results to be statistically reflective of riders, is essential.

Given the regional impact of the WRTA, not only in the communities it serves, but also in connecting these communities with other regional public transit like the commuter rail, future plans can and should be designed and executed within a broader theoretical and operational framework. In its Regional Master Plan, [*Imagine 2050: A Vision for Central Massachusetts*](#), the Central Massachusetts Regional Planning Commission (CMRPC) includes transportation as one of its cross-cutting themes that mirrors the regional focus of the WRTA. The WRTA, working in alignment with this master plan, could strengthen its impressive accomplishments.

A strong WRTA, using evidence-based strategies aligned with regional planning efforts, has the potential to maximize its impressive regional ridership achievements for years to come. Connecting the many residents of our region to one another and to the economic, educational, and social opportunities found within our communities, is key to the entire region's success, prosperity, and continued economic well-being.

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Glossary

1-Year Estimates: 12 months of collected data. For example, 2021 ACS 1-year estimates were collected between January 1, 2021, and December 31, 2021.

5-Year Estimates: 60 months of collected data. For example, 2017-2021 ACS 5-year estimates were collected between January 1, 2017, and December 31, 2021.

ACS: American Community Survey

Demand Response Services: Primarily covers paratransit services for elderly and disabled users.

Directly Operated (DO): Service modality provided directly by a transit agency.

Fixed Route Buses: Buses that follow a predetermined route and schedule.

LEHD: Longitudinal Employer-Household Dynamics program.

LODES: LEHD Origin-Destination Employment Statistics.

NTD: National Transit Database.

Purchased Transportation (PT): Service modality contracted from a third party, typically a private operator.

Taxi (TX): Service modality provided by taxicab operators.

TRCP: Transit Cooperative Research Program.

UPT: Unlinked Passenger Trips. The number of

passengers who board public transportation vehicles counted each time they board vehicles, no matter how many vehicles they use.

Vehicle Revenue Hours (VRH): Hours that vehicles are scheduled to or actually travel while in revenue service, including layover/recovery time, but excluding deadhead, operator training, vehicle maintenance testing, and other non-revenue uses of vehicles.

Vehicle Revenue Miles (VRM): Miles that the vehicles are scheduled to or actually travel while in revenue service, including layover/recovery time, but excluding deadhead, operator training, vehicle maintenance testing, and other non-revenue uses of vehicles.

Vehicles Operated in Annual Maximum Service (VOMS): Peak Vehicles. The number of revenue vehicles operated to meet the annual maximum service requirement. This is the revenue vehicle count during the year's peak season, on the week and day that maximum service is provided, excluding atypical days or one-time special events.

WRTA: Worcester Regional Transit Authority

WRTA-FR Area: The area of 16 communities with fixed route bus service provided by the WRTA (defined by The Bureau only for research purposes).



Methodological notes

Given the sources used throughout the report, the following are some of the limitations of the data:

LODES Data

As mentioned in Section 1, LODES data is based on surveys, tabulated, and modeled administrative data instead of being derived from a probability-based sample, which means that, while there is no sampling bias, other types may be present. The Census Bureau acknowledges that "these two data products are sourced from different inputs, cover different populations and time periods, are subject to different edits and imputations, are released under different confidentiality protection mechanisms, and are tabulated at different geographic and characteristic levels." Given this and the expected discrepancies between these datasets, the Census Bureau issued a document discussing the design comparability between these two products (U.S. Census Bureau, 2014).

Additionally, as also mentioned in Section 1, **the most recent LODES data is from 2019. This means that the patterns and trends discovered correspond to the pre-pandemic year.** To date, the LEHD has not announced when they will update this dataset.

ACS 1-Year Estimates vs. 5-Year Estimates

The choice between the two types of data depends on the analysis being conducted. The 1-Year Estimates correspond to just 12 months of collected data (for example, the 2021 ACS 1-Year Estimates are based on data collected between January 1, 2021, and December 31, 2021), while the 5-Year Estimates correspond to a longer period of 60 months (such as the 2021 ACS 5-Year Estimates, which include data collected between January 1, 2017, and December 31, 2021). Due to this difference, the 1-Year Estimates are limited in their geographic detail, providing values for cities and towns in general but not for more localized areas like census tracts or block groups.

The above highlights the trade-off at hand: temporal accuracy (1-Year Estimates) versus

geographic granularity (5-Year Estimates). This means that **if, for example, a pre- and post-pandemic comparison is desired, the 1-Year Estimates are appropriate. In contrast, if detailed information on smaller regions is needed, the only option is the 5-Year Estimates.**

It is important to note that there may also be cases where no such trade-off exists. An example is the use of 5-Year Estimates for the panels in Charts 1 and 2, where the aim was to establish the profile of public transportation users. Considering the regional scope of this report and the area of interest, geographic granularity is indispensable; therefore, the 5-year estimates are a must. Nevertheless, **this data even represents an advantage for this, as these estimates have temporal robustness by adding data from several years.** In short, although 1-Year Estimates are ideal for intertemporal comparisons, 5-Year Estimates are the only option to have local data.

It should be also mentioned that there are cases where even data collected over 5 years may not be sufficient for the desired granularity. Consider the differences between Tables 4A and 4B and the absence of data for public transit users in the WRTA-FR area, which was calculated using 5-Year Estimates. Due to the percentage of respondents under the public transit category, there are several census tracts for which no value was recorded in the 5-Years Estimates, probably due to the low number of people in the sample of that region, reducing the calculation's statistical relevance.

To illustrate this problem, take as an example the WRTA-FR Area, composed of 91 census tracts. While data on median age, earnings, and poverty is available for the 91 tracts when studying the total workers and those who drove alone; for those who commute by public transit, only 36 tracts had data on median age, 16 on income, and 20 on the poverty rate. This means that this group's poverty and median earnings calculations would be based on data from less than 30% of the studied census tracts. That is why they were omitted.

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