Report Year 2018

NTD

National Transit Database

2018 National Transit Summaries and Trends

Office of Budget and Policy

December 2019

U.S. Department of Transportation
Federal Transit Administration

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Introduction

General Information

Welcome to the National Transit Summaries and Trends (NTST), one of the Federal Transit Administration's (FTA) National Transit Database (NTD) Annual Data Products. The goal of the NTST is to present and summarize transit data in an easy-to-read format and to provide an overview of public transit in the United States. This 2018 NTST discusses data from 2009 to 2018. Except for the Rural transit exhibits presented and where explicitly noted, all data included in the NTST are from agencies operating within an Urbanized Area (UZA).

What is the National Transit Database (NTD)?

The National Transit Database (NTD) is the primary source for information and statistics on transit systems in the United States. Congress requires the NTD to collect financial and service information annually from public transportation agencies that benefit from FTA grants. The NTD also requires larger urban transit providers (Full Reporters) to submit monthly operating and safety data. Each year, the FTA uses NTD data to apportion over $12 billion to urbanized areas (UZAs) and States under funding programs such as §5307 (Urbanized Area Formula grants), §5311 (Formula Grants for Rural Areas), §5329 (Transit Safety & Oversight grants), and §5337 (State of Good Repair grants).

Who reports data to the NTD?

§5307 Program Recipients

Recipients or beneficiaries of the FTA's Urbanized Area Formula Program (§5307) must file annual reports, monthly ridership, and safety and security reports with the NTD. These reporters are also called **Urban Reporters**. Beginning in FY 2011, transit agencies with 30 or fewer vehicles became eligible for reduced reporting requirements, including reporting exemptions for passenger miles, mode-specific capital and operations costs, employee counts, maintenance performance, energy consumption, monthly ridership, and safety data.

§5311 Program Recipients

Recipients or beneficiaries of the FTA's Formula Grants for Rural Areas Program (§5311) must file annual reports to the rural module of the NTD, also called **Rural Reporters**.

States and Indian Tribes report directly to the NTD. States file reports on behalf of their sub-recipient rural transit agencies, who do not report directly to the NTD.

Voluntary NTD Reporters

The FTA accepts voluntary NTD reports from other transit systems, both public and private, that serve both urbanized and non-urbanized areas. Voluntary reporters must provide public transportation services and meet the same reporting obligations as mandatory reporters.

Some agencies that do not operate transit service report to the NTD. **Build Reporters** are agencies that benefit from federal funding and are in the process of building transit infrastructure but do not yet operate service. **Planning Reporters** do not operate transit service but instead receive federal funding and distribute the funds among transit operators in their area.

Because of the difference in reporting requirements for agencies that report as Reduced Reporters, certain exhibits within this document exclude their data for the entire ten-year period presented. In these cases, exhibits are labeled with a footnote. Unless otherwise noted, all exhibits in the NTST include data from all urban reporters.

What are the modes of transit?

Public transit includes buses, trains, ferryboats, paratransit, and much more. Certain transportation services are specifically excluded, such as intercity bus service, intercity rail service, intra-facility transport (e.g., airport people movers), and sightseeing rides.

Different types of vehicles, technologies, and operational characteristics distinguish the modes of transit. FTA identifies the following modes of public transit:

- **Aerial Tramway (TR)** is a system of aerial cables with suspended vehicles. The vehicles are propelled by separate cables attached to the vehicle suspension system and powered by engines or motors at a central location not onboard the vehicle.

- **Alaska Railroad (AR)** is a public transportation system in Alaska that shares vehicles and facilities with freight rail operations.

- **Bus (MB)** is a transit mode using rubber-tired passenger vehicles operating on fixed routes and schedules over roadways. Vehicles are powered by a motor and fuel or electricity stored on board the vehicle.

- **Bus Rapid Transit (RB)** is a fixed-route bus mode that operates frequent service (short headways), has at least 50 percent of its route in a separated right-of-way (ROW) dedicated to transit during peak periods, has defined stations, and uses active signal priority.
- **Cable Car (CC)** is a type of railway propelled by moving cables located beneath the street.
- **Commuter Bus (CB)** is a local, fixed-route bus transportation that primarily connects outlying areas with a central city and operates predominantly in one direction during peak periods. It has limited stops in outlying areas, limited stops in the central city, and at least five miles of closed-door service.
- **Commuter Rail (CR)** is an electric - or diesel - propelled railway for urban passenger train service consisting of local travel which that operates between a central city and outlying areas.
- **Demand Response (DR)** is a transit mode operating on roadways in response to requests from passengers or their agents to the transit operator, who groups rides together when possible and dispatches a vehicle to provide the rides.
- **Demand Response-Taxi (DT)** is a special form of Demand Response operated through taxicab providers with a system in place to facilitate ride sharing.
- **Ferryboat (FB)** is a mode carrying passengers over a body of water.
- **Heavy Rail (HR)** is an electric railway that operates service in exclusive right-of-way.
- **Hybrid Rail (YR)** systems primarily operate routes on the national system of railroads using light rail-type vehicles as diesel multiple-unit vehicles (DMUs).
- **Inclined Plane (IP)** is a railway that operates on steep slopes and grades with vehicles powered by moving cables.
- **Jitney (JT)** is a unique form of bus service on fixed routes where multiple companies share the operation of the service, without fixed schedules or fixed stops.
- **Light Rail (LR)** is an electric railway that operates in mixed traffic or intersects with roadways at grade crossings and is powered by overhead wires.
- **Monorail/Automated Guideway (MG)** is a an electrically powered mode that operates in an exclusive guideway. This mode includes monorail systems with

automated or human-operated vehicles straddling a single guideway and driverless people mover systems.

- **Público (PB)** are jitney services operated in Puerto Rico.
- **Streetcar Rail (SR)** is a rail system powered by overhead catenaries that operates predominantly on streets in mixed traffic.
- **Trolleybus (TB)** is a fixed-route service using manually steered, rubber-tired vehicles powered by electric current from overhead wires using trolley poles.
- **Vanpool (VP)** is a ride sharing arrangement, providing transportation to a pre-arranged group of individuals.

What is an Urbanized Area (UZA)?

The U.S. Census Bureau defines urbanized areas based on incorporated places (e.g., cities, towns, villages) and their adjacent areas. The U.S. Census Bureau considers a densely populated area of 50,000 people or more to be a UZA. There are 498 UZAs according to the 2010 U.S. census, and while UZAs make up 2.5 percent of United States land area, the populations of UZAs make up 71.5 percent of United States population.

The FTA bases UZA designations on the most recent census (currently the 2010 census). The NTD reporting system uses a unique number for each UZA that represents its numerical ranking by population. For the purpose of transit grants, the FTA also designates the Virgin Islands, Lake Tahoe, and certain areas in Puerto Rico as urbanized areas.

In the NTD, transit providers indicate the primary UZA of service operations as their “primary UZA” along with any secondary UZAs they serve. For analysis purposes, the NTST groups UZAs into the following categories:

- **UZAs over 1 million**: population of more than 1 million (42 urbanized areas, 381 agencies, or 39.6 percent of all agencies reporting Primary UZA).
- **UZAs under 1 million**: population of more than 50,000 and less than 1 million (456 urbanized areas, 581 agencies, or 60.4 percent of all agencies reporting Primary UZA).

What is a Rural Area?

Rural areas are all areas not included in a UZA. The FTA includes Urban Clusters (2,500 – 50,000 population) in rural areas, while the U.S. Census Bureau considers Urban

Clusters a part of urban areas. For this reason, the FTA provides "Formula Grants for Rural Areas Program" funds to reporters to the rural module of the NTD. In comparison to UZAs, rural areas tend to have large distances between transit destinations and smaller populations.

What data does the NTD collect?

Transit operators report information regarding service provided, service consumed, and service resources, including financial data. Service provided includes information such as Vehicle Revenue Hours (VRH) and Vehicle Revenue Miles (VRM). In this context, for rail modes, a vehicle is a single passenger car, not a train. Service consumed is described in terms of Unlinked Passenger Trips (UPT) — the total count of individual vehicle boardings — and Passenger Miles Traveled (PMT) — the total number of miles traveled by passengers. The NTD collects financial data such as Operating Expenses (OE) for each mode operated, as well as the sources of funds used to support transit service. The NTD also collects resource data related to transit staffing levels and asset data for fleets and facilities.

What is Safety and Security reporting?

NTD Safety and Security (S&S) reporting requires all reporters to provide the number of safety and security events that involve the transit system's property, along with the number of fatalities and injuries that result from those safety and security events. While the exact reporting timelines and level of detail differ slightly based on agencies' NTD reporting type, a safety or security event is one that meets any of the following criteria:

- A fatality resulting from the event occurs within 30 days;
- Injuries to one or more persons resulting from the event that require immediate transport for medical attention;
- The estimated property damage from the event is at least $25,000;
- Collisions involving transit vehicles that require towing away from the scene;
- An evacuation that is made due to potentially life-threatening conditions or to the rail right-of-way;
- Derailments including both mainline and yard derailments, as well as non-revenue vehicle derailments;
- Rail transit vehicle collisions at rail grade crossing;

- Rail transit vehicle collision with an individual on the right-of-way; and
- Collision between a rail transit vehicle and a second rail transit vehicle or rail transit non-revenue vehicle.

Generally, the NTD requires Full Reporters to provide summary data for all events on a monthly basis. However, these agencies report additional details for more serious safety events. In contrast, §5311 reporters and urban Reduced Reporters provide annual summary totals of safety and security events, fatalities, and injuries.

Rounding and Inflation

Rounding may lead to minor variations in total values from one exhibit to another within this analysis or may lead to instances where percentages may not add to 100. Due to rounding, percent changes may not exactly match the values calculated using the formatted figures shown in the exhibits.

The NTD has adjusted all exhibits involving dollar amounts to 2018 constant-dollar values, or dollar amounts adjusted in terms of constant purchasing power using the Consumer Price Index (CPI).

Web Information

For information about National Transit Database publications and training, visit the FTA website at www.transit.dot.gov or the National Transit Database website at www.transit.dot.gov/ntd.

Transit Trends in Service Operated, Service Consumed, and Costs

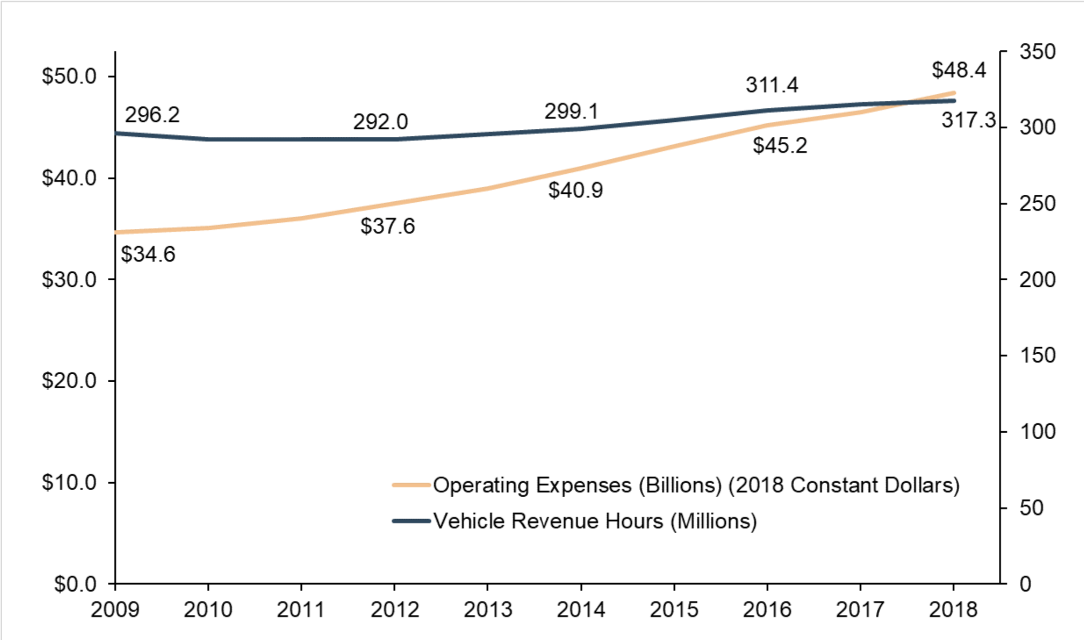

Exhibit 1. ***Operating Expenses and Vehicle Revenue Hours: Time Series***

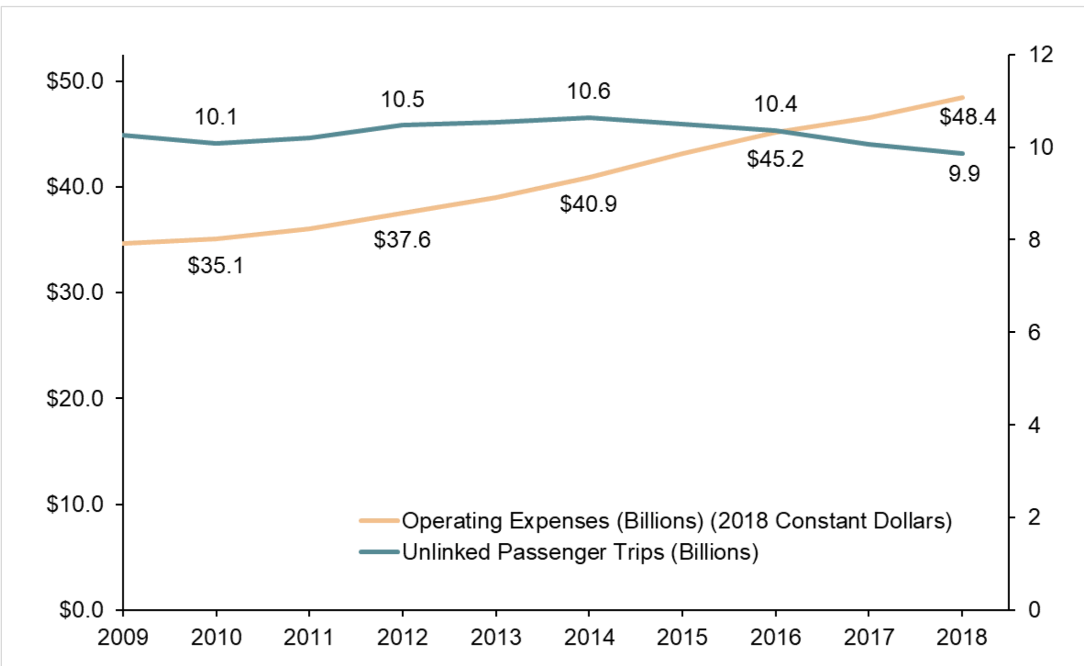

Exhibit 2. ***Operating Expenses and Unlinked Passenger Trips: Time Series***

Since 2009, both operating expenses and vehicle revenue hours have increased 39.8 percent and 7.1 percent, respectively. After increasing year-over-year from 2010 to 2014, ridership has steadily declined from 10.6 to 9.9 billion trips from 2014 to 2018.

Report Year 2018 Service and Cost Ratios

Service is provided and consumed differently for every transit mode. Service factors and expenses depend on the operating costs, travel demands, and passenger-carrying capacities of the different modes. These factors greatly affect the relative cost-effectiveness of the different modes. For example, the average operating cost per vehicle revenue hour is highest for ferries (FB, $1,565.16). However, an average of 161 passengers are on board a ferry boat, thus the cost effectiveness of ferries as measured by the average cost per passenger is relatively low ($9.73).

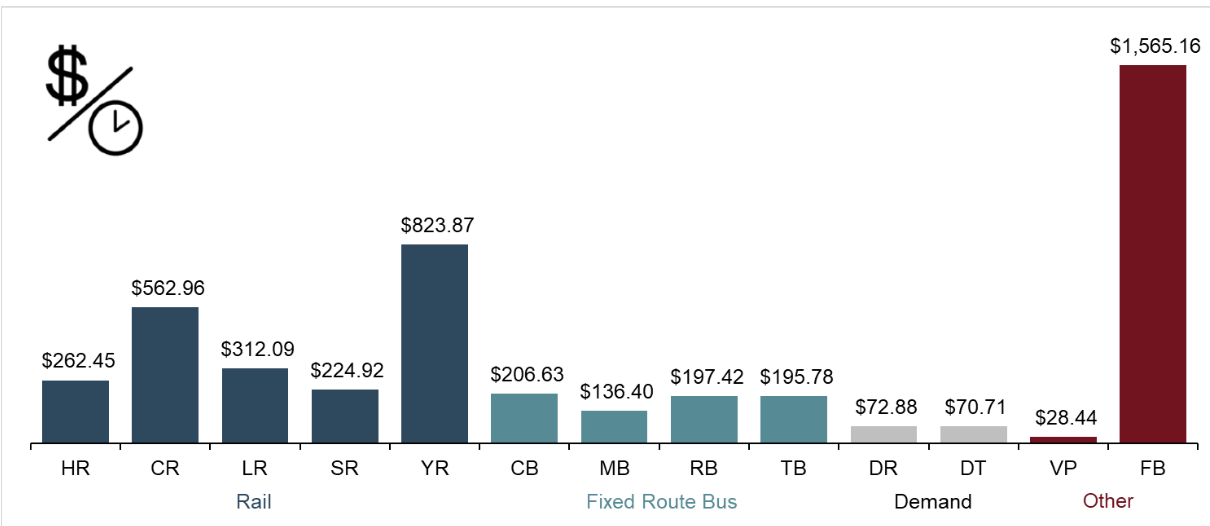

Exhibit 3. ***2018 Cost per Vehicle Revenue Hour***

By contrast, demand-based modes (demand response (DR) and demand response taxi (DT)) are relatively inexpensive per vehicle hour. per passenger trip on these modes is higher than other transit modes. However, the productivities of demand-based services are very low with an average of 1.2 to 1.3 passengers onboard a demand-based vehicle. Therefore, the cost per passenger is much higher than other modes ranging from $28 to $40 per passenger. Vanpool is the least expensive per vehicle hour, mainly due to the absence of employed drivers.

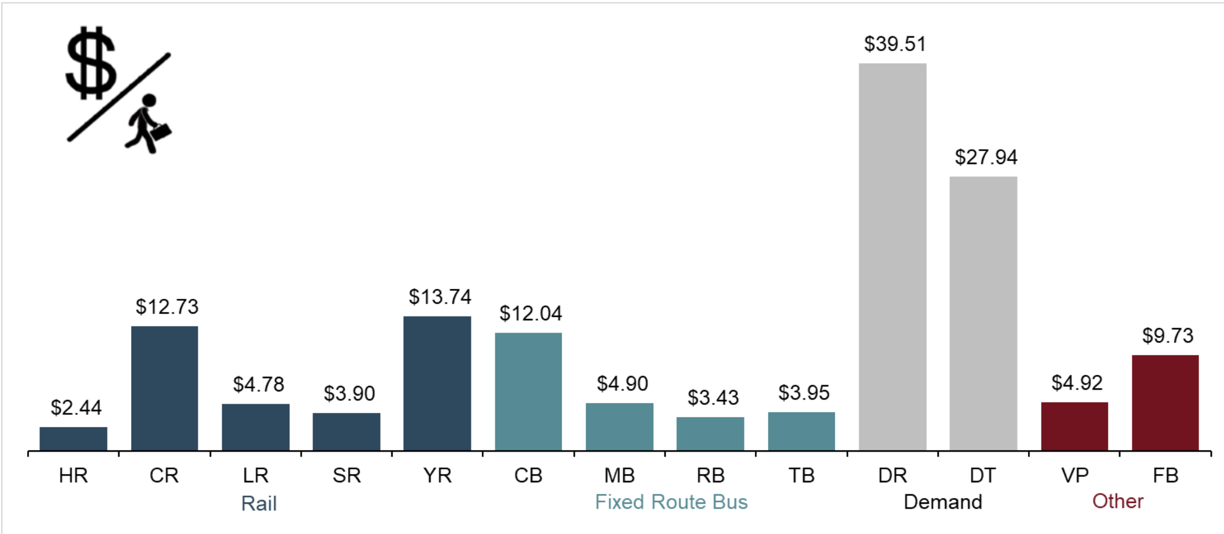

Exhibit 4. ***2018 Cost per Unlinked Passenger Trip***

Unlinked Passenger Trips (UPT) is one way to measure service consumed by the riding public. It gives equal weight to passengers making short and long trips. Passenger Miles Traveled (PMT) gives more weight to longer trips than shorter trips. When travel distances are considered, the relative operating costs among modes can be different. Vanpool (VP) service, for example, may carry, on average, fewer people on a van, but it carries them a consistently longer distance per trip (37 miles). The opposite is true of trolleybuses (TB) and streetcars (SR), which carry many people (12 to 16 per vehicle) but not very far (less than 2 miles).

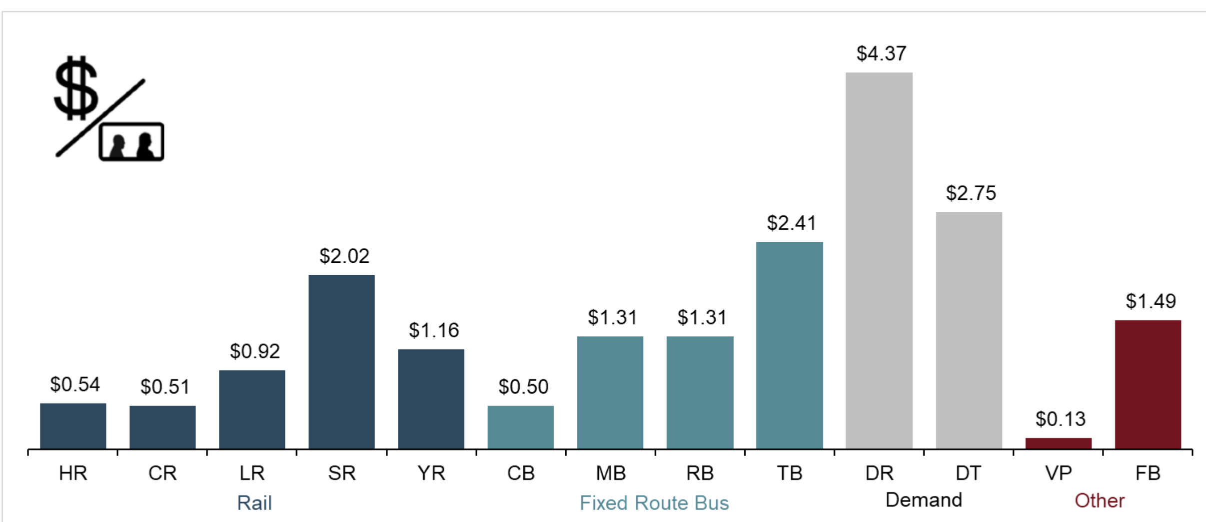

Exhibit 5. ***2018 Cost per Passenger Mile***

Transit Service Providers: Organization Type

Transit providers indicate their organization type on the NTD Annual Report. City/County organizations and transit authorities comprise over 80 percent of transit providers. City and county organizations are departments of local government and make up 53.5 percent of transit providers. Transit authorities are independent public agencies led by boards focused on providing public transit and make up 29.1 percent of transit providers.

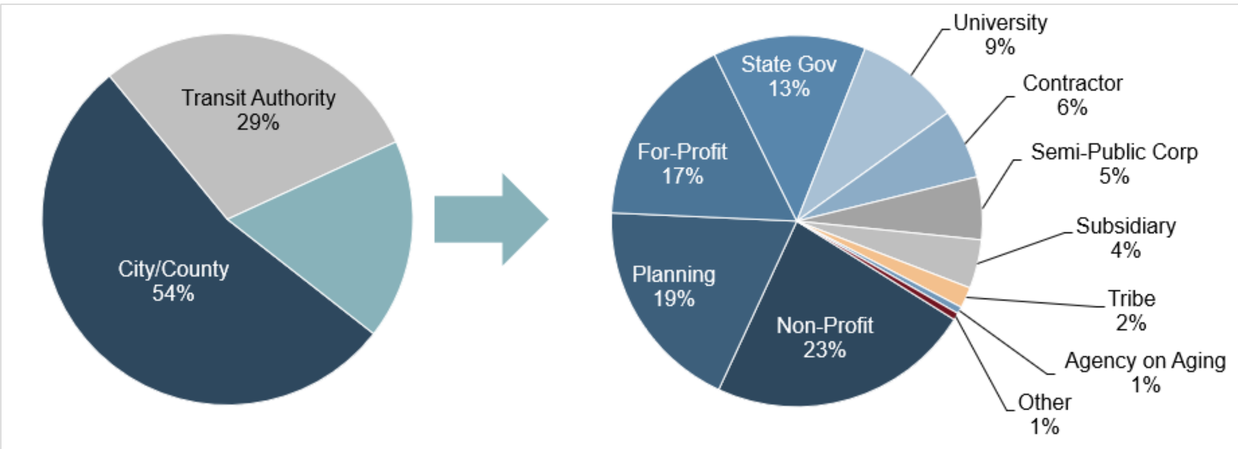

Exhibit 6. ***2018 Transit Provider Organization Types***

Transit Funding

The Federal Transit Administration's Annual Budget

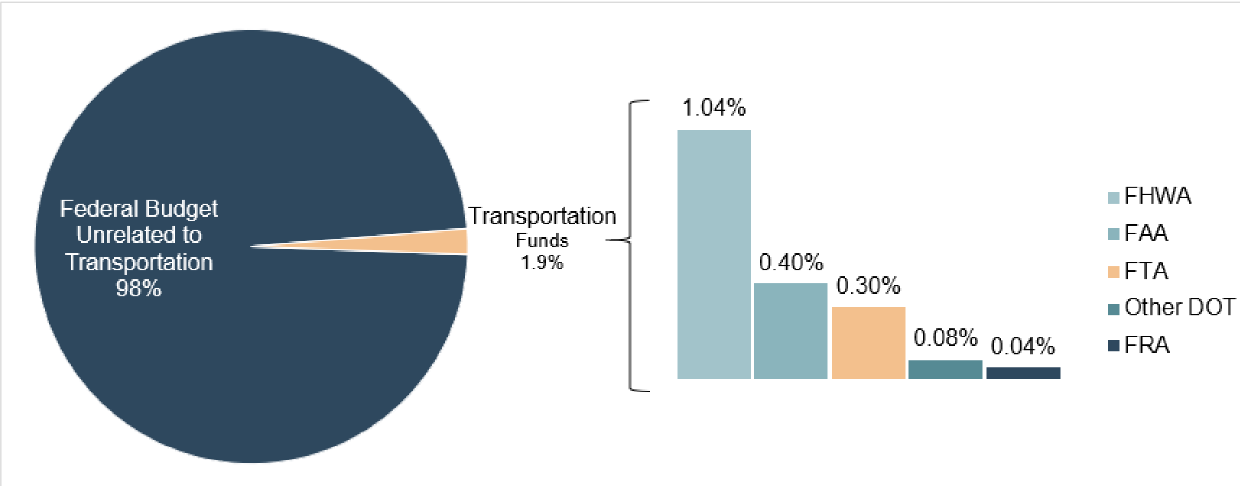

Exhibit 7. *2018 Transportation as a Percentage of the Total Federal Budget*

The FTA budget is a small portion of the U.S. Federal Government's total annual budget. During 2018, Congress appropriated 1.9 percent ($77 billion) of the total federal budget ($4.03 trillion) for transportation needs in the entire country. Congress appropriated $12.3 of the transportation funds to the FTA, which represents 0.30 percent of the total federal budget.

Operating Expense Funding Sources

On average, directly generated revenues, including passenger fares, fund 36.2 percent of public transit operating expenses in the United States. Local and State sources fund 33.2 percent and 22.8 percent, respectively; Federal Government sources fund the remaining 7.8 percent.

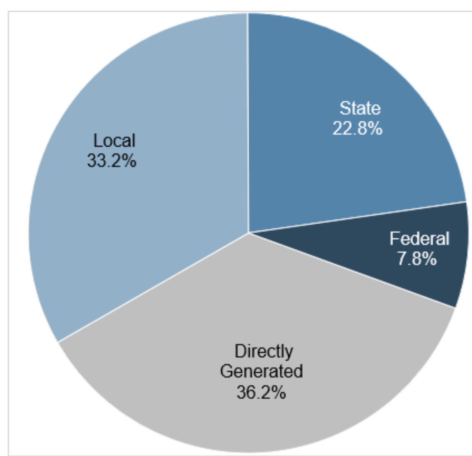

Exhibit 8. *2018 Funding Sources for Transit Operations*

Capital Expenditure Funding Sources

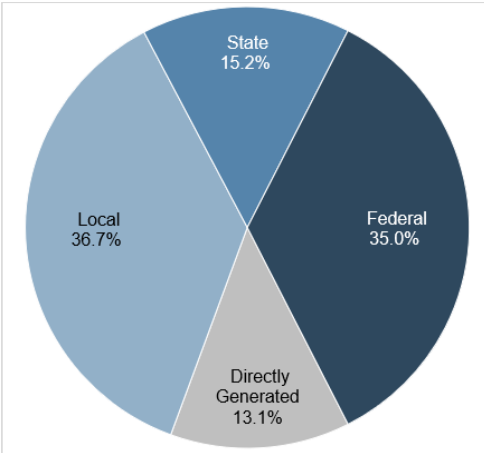

Exhibit 9. *2018 Funding Sources for Capital Expenses*

Transit operators spend resources not only on operations but also on constructing, acquiring, and improving the systems and equipment used to operate transit service. These improvements are called Capital Expenses.

The funding support for capital expenses differs from operational expenditures. In 2018, 35.0 percent of all capital funds came from federal sources. Directly generated funds from transit agencies, including fares, now account for about 13.1 percent of all capital purchases. Local and state governments make up the remaining 51.9 percent of capital funding.

Farebox Recovery

Transit agencies do not establish passenger fares simply based on the cost of each trip. For each dollar spent in operating costs per trip across all modes and all transit systems, 33 cents are recovered through fares. The fare box recovery ratio is the percent of a trip's operating costs recovered through passenger fares. This ratio varies by mode and each transit operator. It is typical, for example, to see low recovery ratios on demand response services (DR and DT) due to a lower average passengers per hour and ADA fare regulations prohibiting ADA fares from being more than twice regular transit fares.

Vanpool transit, however, operates by scheduling passengers ahead of time, with one passenger driving the van to and from a specified destination. Vanpools also traditionally have been funded by rider fees with limited or no government subsidies. The combination of efficient scheduling, unpaid drivers, and limited government support results in a high fare box recovery ratio (73.6 percent in 2018).

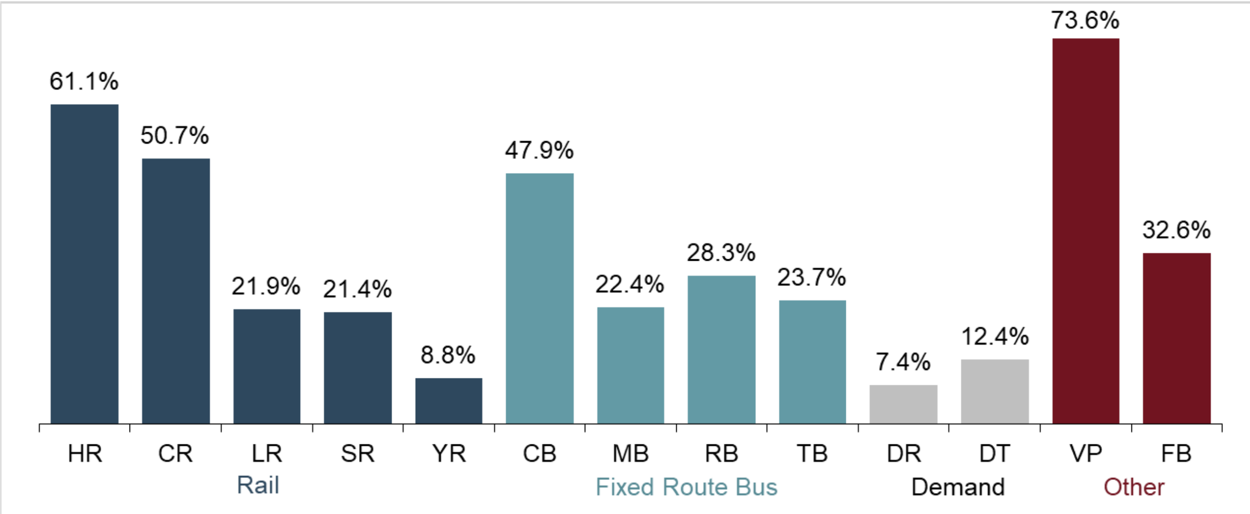

Exhibit 10. *2018 Fares as a Proportion of Operating Costs*

Modal Differences

Service Data by Factor

Exhibits 11, 12, and 13 compare transit operation statistics across transit modes. **Average Trip Length** (passenger miles per trip) estimates the average distance a passenger travels on public transit, and **Trips per Vehicle Revenue Hour** indicates the average volume of passengers carried in an equivalent period on a vehicle. **Passenger Miles Traveled per Vehicle Revenue Miles, or Load Factor,** estimates the average number of passengers on board a vehicle at any given time.

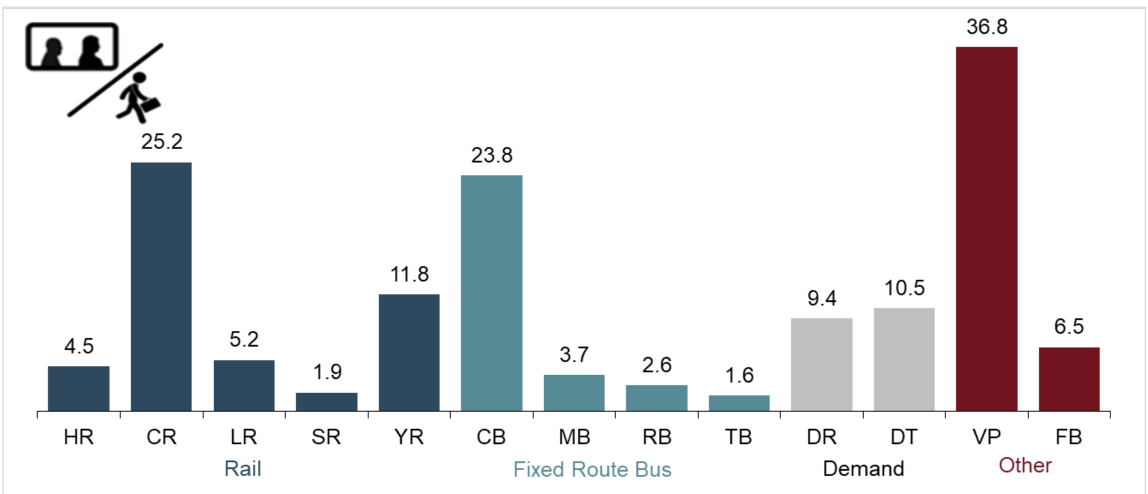

Exhibit 11. ***2018 Passenger Miles per Unlinked Passenger Trip (Average Trip Length)***

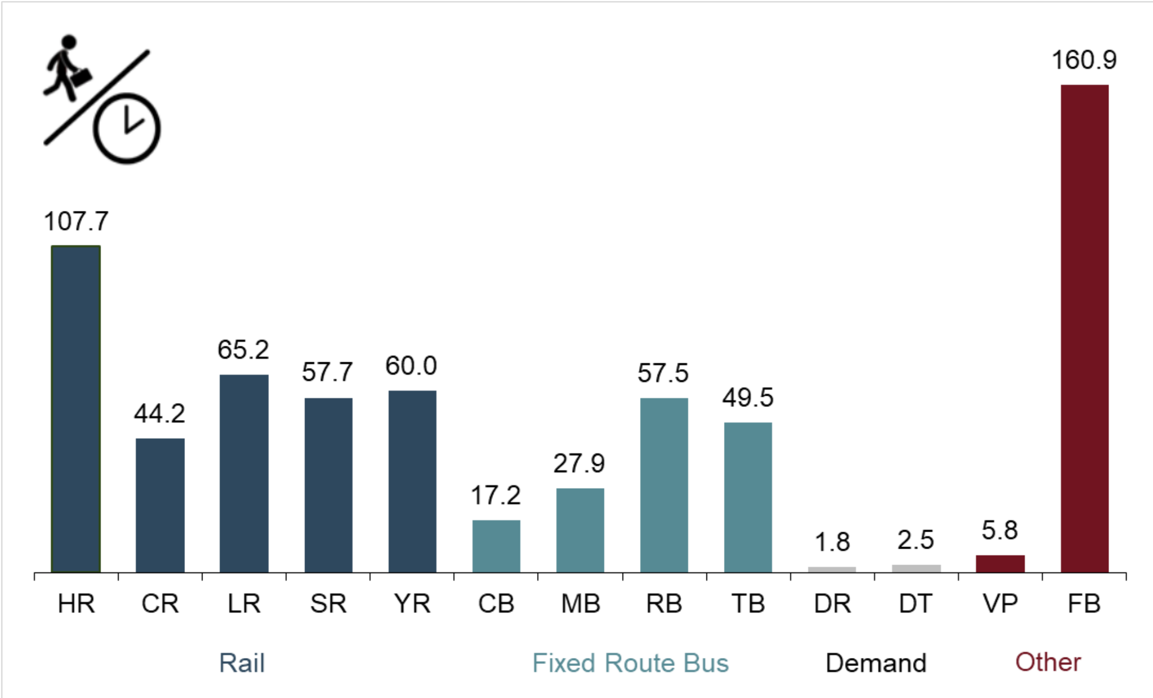

Exhibit 12. *2018 Unlinked Passenger Trips per Vehicle Revenue Hour*

Comparing average trips per hour and average trip length demonstrates how many passengers board a transit vehicle and how far they travel, respectively. Demand modes take small passenger loads a relatively long distance, often to meet the requirements of the ADA. Ferry boats move the largest number of passengers, often by using very large vehicles. Commuter rail (CR), hybrid rail (YR), commuter bus (CB), and vanpool (VP) all transport commuters (typically) a longer distance per trip.

Intensive city transit modes such as heavy rail (HR), light rail (LR), streetcar rail (SR), bus rapid transit (RB), trolleybus (TB), and bus (MB) all tend to provide a larger number of trips for a much shorter distance compared to long distance commuter-related modes. Intensive city modes serve the short-distance travel market which includes a wide variety of trip purposes — work, school, recreation, shopping medical. These modes can have high turnover of seats on an individual vehicle trip. Commuter modes primarily serve the long-distance commuter work market. There is a very little turnover of seats on commuter modes — one person occupies one seat for the entire vehicle trip.

Ferryboats carry more passengers at a single time than any other mode, an average of 116 passengers. Demand modes often assist disabled passengers (as a part of the ADA compliance) and respond to single passenger trip requests, dropping their load factor to nearly one passenger at a time. For most of the other modes that run on schedules instead of requests, load factor does not take into account peak travel, such as rush hour, which can be more than twice the number of passengers in off-peak times.

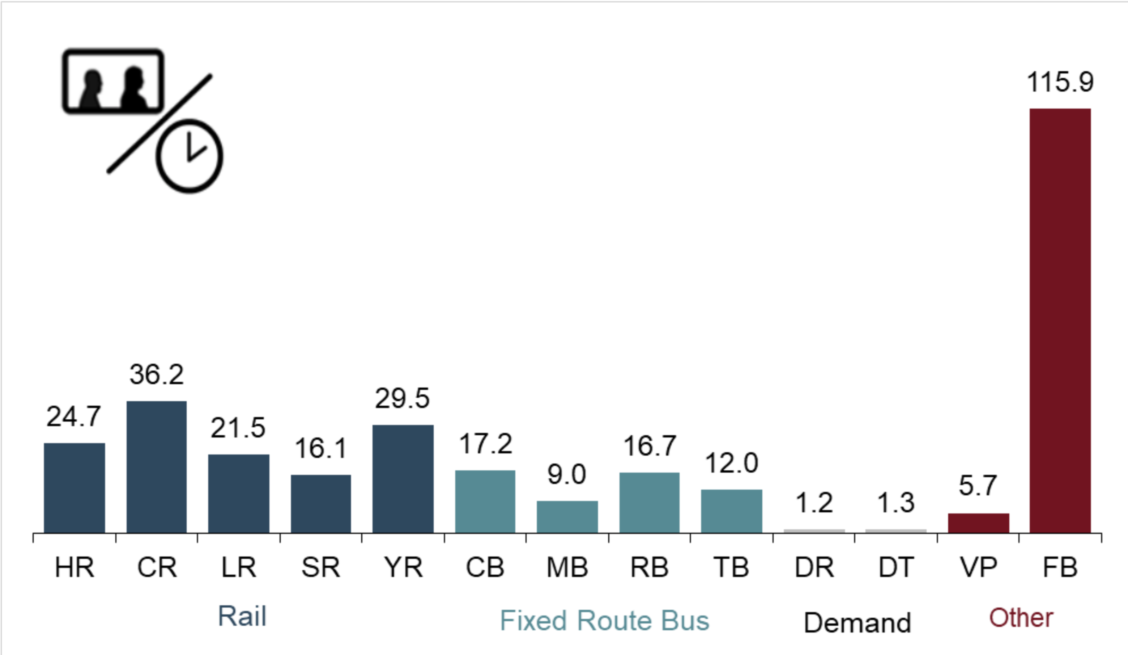

Exhibit 13. ***2018 Passenger Miles per Vehicle Mile***
(Average Number of Passengers per Vehicle)

Fixed Guideway and High Intensity Busway

Fixed Guideway Route Miles from 2009 to 2018

Public transit often operates on restricted guideway. The FTA separates restricted guideway into two categories: fixed guideway (FG) and high intensity busway (HIB). FG is a facility that uses separate right-of-way (ROW) or rail exclusively for public transportation. FG may be a fixed catenary system useable by multiple forms of public transit (e.g., trolleybus, light rail, etc.). HIB is roadway that is either exclusive to transit vehicles at some times and open to the general public at other times, or is restricted to high occupancy vehicles (HOV) at least part of the time.

All rail, catenary, and ferryboat (FB) systems operate over FG. Bus systems may operate over FG, HIB, or publicly available roadway (mixed traffic ROW).

The NTD collects directional route miles for FG, HIB, and mixed traffic. The total mileage in each direction that is part of a public transportation route is directional route miles. For example, if a transit provider operates one mile of revenue service in two directions, the NTD counts this as two directional route miles.

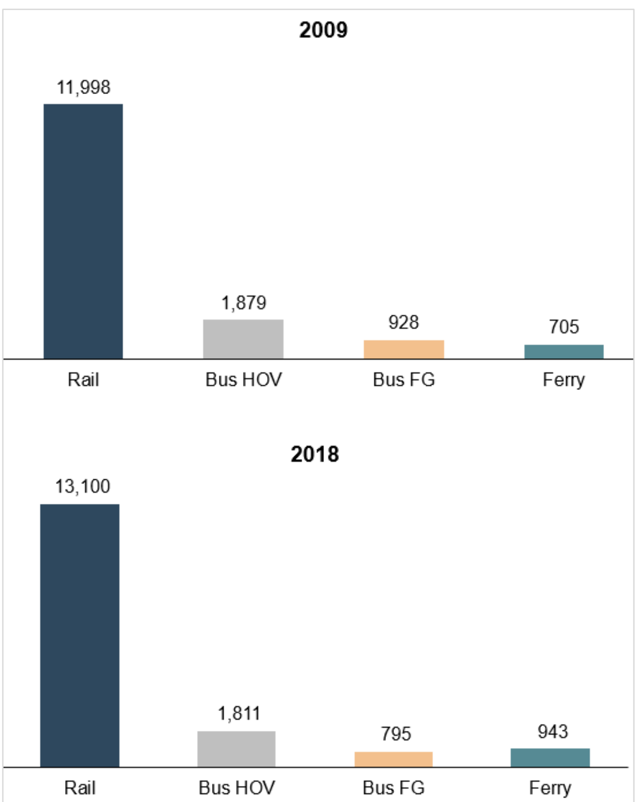

Exhibit 14. ***FG Route Miles, 2009–2018***

Since 2009, public transit agencies operate on 68.2 fewer miles of Bus HOV lanes. Bus FG miles have decreased by 132.5 miles. Bus HOV and FG now collectively account for 16.5 percent of all directional route miles of fixed guideway, a decrease from the 18.1 percent in 2009.

Public transit agencies operating rail have added 1,102.8 new miles of rail FG routes. In 2018, rail transit modes accounted for 78.7 percent of all fixed guideway directional route, up 1.3 percent from 2009.

Fixed Guideway Concentration

Building separate infrastructure for public transit is costly, and dedicated rail transit only makes sense in high density areas with congested transportation and high demand for travel alternatives. As a result, the most populous cities in the United States have built and maintained fixed guideway transit.

In 2018, the 5 urbanized areas with the most directional route miles of fixed guideway account for over 44 percent (6,371.0 miles) of all fixed guideway route miles, an average of 1,274.2 fixed guideway miles per UZA.

The UZAs in the exhibit below have all been among the top 15 in population in each Census since 1860. The remaining 87 urbanized areas (and rural Alaska) account for 8,049.9 fixed guideway miles, an average of 92.5 fixed guideway miles per UZA.

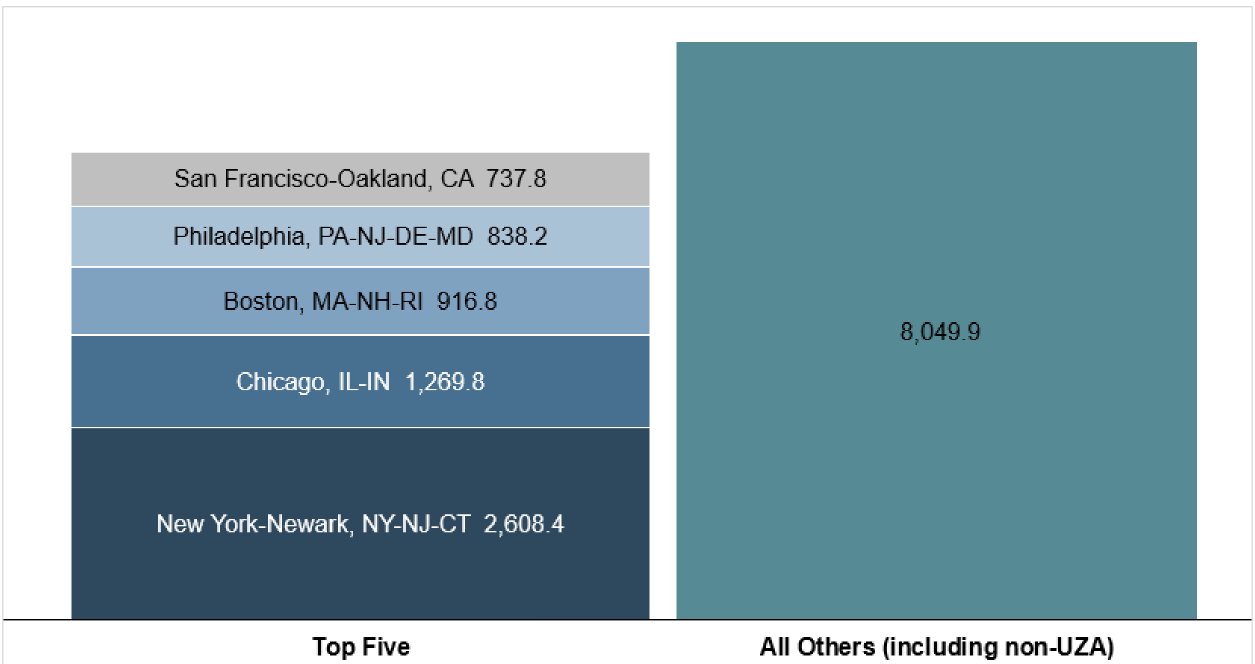

Exhibit 15. ***UZAs with Most Directional Route Miles***

The serviced consumed on fixed guideway systems varies significantly across the country. For example, Philadelphia had 838.2 fixed guideway route miles in 2018, which provided 1.0 billion passenger miles, an average of 1.2 million passenger miles per fixed guideway route mile. In comparison, Atlanta, GA, has 99.0 fixed guideway route miles and provided 450.4 million passenger miles, an average of 4.5 million passenger miles per fixed guideway route mile.

Safety and Security

Safety and Security (S&S) events include vehicle collisions on the roadway, assaults on transit property, train derailments, slips and falls, damage from fallen trees, and more. The NTD requires large transit agencies to report any safety or security events that meet any of the following criteria:

- A fatality resulting from the event occurs within 30 days;
- Injuries to one or more persons resulting from the event that require immediate transport for medical attention;
- The estimated property damage from the event is at least $25,000;
- Collisions involving transit vehicles that require towing away from the scene;
- An evacuation that is made due to potentially life-threatening conditions or damage to the rail right-of-way;
- Derailments, including both mainline and yard derailments, as well as non-revenue vehicle derailments;
- Rail transit vehicle collisions at rail grade crossing;
- Rail transit vehicle collision with an individual on the right-of-way; and
- Collision between a rail transit vehicle and a second rail transit vehicle or rail transit non-revenue vehicle.

Any of these events qualify as a Major Event that the agency must report within 30 days to help FTA more rapidly address safety and security issues in public transit.

Important Considerations for NTD Safety Data:

- All safety data presented on the following pages are sourced from Calendar Year 2018 NTD major event reports. At the time of this document's publication, NTD reporters can still add, modify, and delete major event data for Calendar Year 2018. As such, these data are considered "preliminary" and numbers may change based on ongoing validation activity.
- The analyses on the following pages use Calendar Year service data sourced from the NTD's Monthly Ridership data collection to calculate Calendar Year safety rates.

- The Federal Railroad Administration oversees safety for commuter rail (CR) systems and a select set of Hybrid Rail (YR) and Heavy Rail (HR) systems. These agencies do not report safety data to the NTD and are therefore excluded from any safety analyses in this document.

2018 NTD Safety Statistics by Mode

Mode	S&S Events per 100M VRM	Fatalities per 100M VRM	Injuries per 100M VRM	Fatalities per 100 Events	Injuries per 100 Events
CC	7,190.2	-	3,027.5	-	42.1
SR	5,015.6	14.8	1,528.4	0.3	30.5
RB	907.5	-	1,732.4	-	190.9
TB	326.2	-	447.4	-	137.1
MB	309.8	3.9	411.9	1.3	132.9
FB	187.4	53.5	80.3	28.6	42.9
MG	101.2	-	-	-	-
DR	128.7	0.4	122.1	0.3	94.9
DT	97.2	-	86.9	-	89.4
CB	78.9	4.1	82.2	5.2	104.2
PB	50.0	-	55.5	-	111.1
VP	19.8	-	9.9	-	50.0
Total Avg.	241.8	2.7	295.6	1.1	122.3

Exhibit 16. ***2018 NTD Safety and Security Major Event Rates by Mode***

Streetcar (SR) and Cable Car (CC) modes operate across short distances and within motor vehicle traffic and experience higher event rates than other modes. However, CC and SR modes also operate at lower speeds and report fewer injuries and fatalities per event. Ferryboat (FB), Motor Bus (MB), Bus Rapid Transit (RB), and Trolleybus (TB) modes operate over longer distances at higher speeds with more people aboard. These modes report fewer events per VRM, but more injuries and fatalities per event.

Non-Rail Safety Events

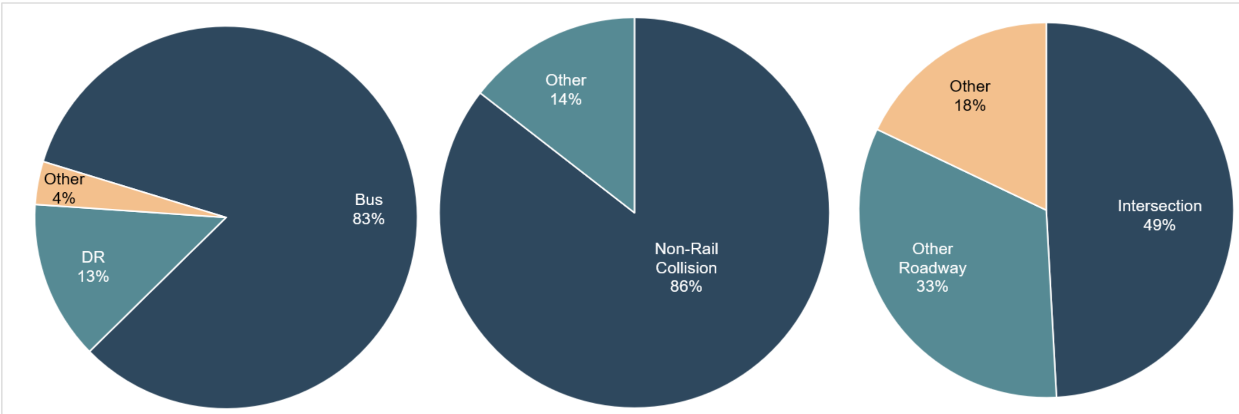

Exhibit 17. *Non-Rail Event Categories*

Between 2009 and 2018, transit agencies reported 68,963 major events, 79 percent of which involved non-rail transit modes. Of these non-rail events, 83 percent involved Motor Bus (MB) modes. Of the Motor Bus events, 86 percent were collisions, and of those MB collisions, 82 percent occurred in the roadway.

Rail Safety Events

Between 2009 and 2018, urban transit agencies reported 14,507 rail safety and security events to the NTD, 49 percent of which were on heavy rail (HR) modes.

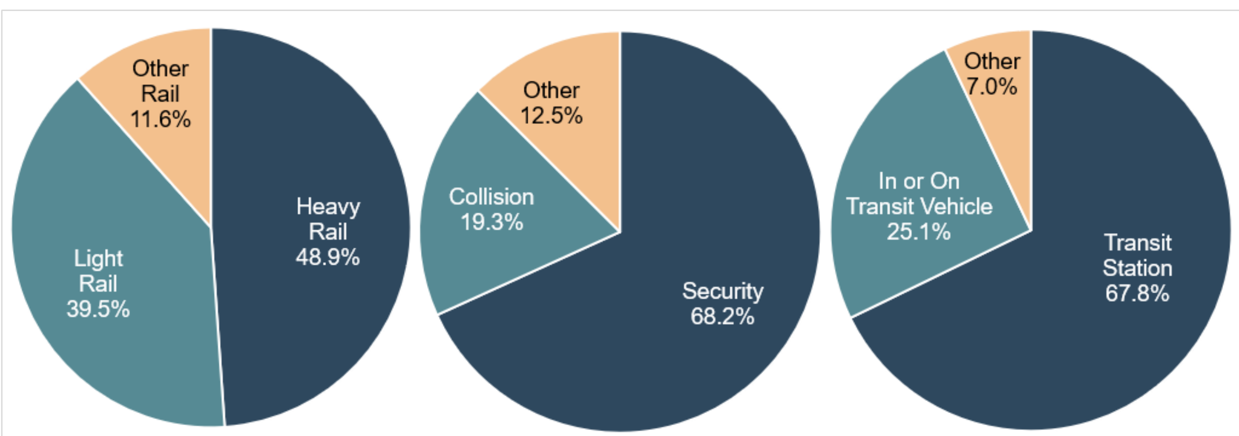

Exhibit 18. *Rail Events by Mode*

Of those HR events, 68 percent were security-related events, 68 percent of which occurred within a transit station. HR service interacts far less often with general vehicular traffic and pedestrians than bus modes and experiences fewer collisions. Over 46 percent of all HR events were security incidents occurring in the station.

Fatalities

In 2018, transit agencies reported 249 fatalities. The majority of these fatalities were members of the public, such as non-customer pedestrians, cyclists, and occupants of other vehicles. Rail security events (such as suicides and homicides) and non-rail collisions accounted for 57.8 percent of all fatalities in 2018.

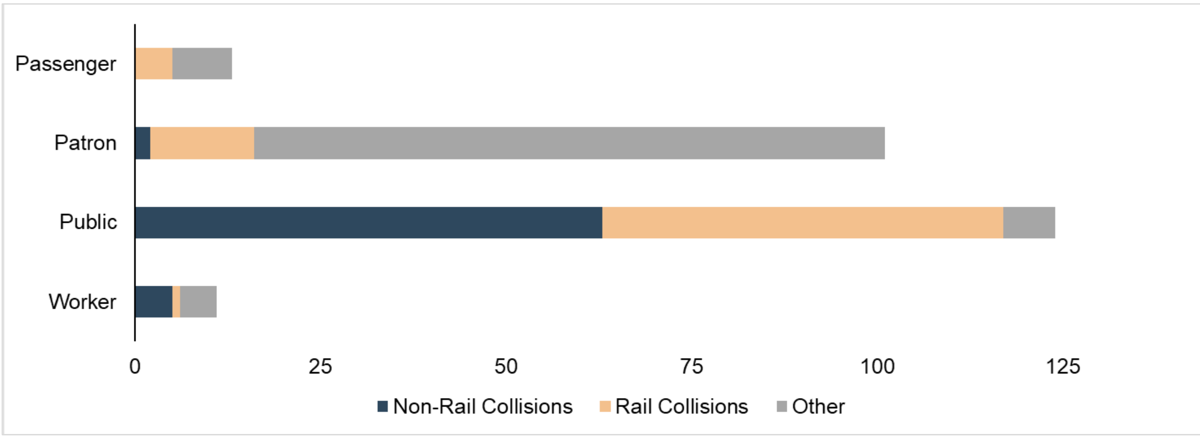

Exhibit 19. ***Fatalities by Person Type***

- Passenger – Transit customers that are on board a vehicle
- Patron – Transit customers that are not on board a vehicle
- Public – Individual who is not a transit customer
- Worker – Transit agency employee or contractor

Urbanized Areas Over and Under 1 Million People

Population and Transit Agencies

Public transit service depends on population density in order to function efficiently. In the United States, there are 42 UZAs with a population greater than 1 million in which 92.1 percent of all public transit is consumed, as measured by Passenger Miles Traveled.

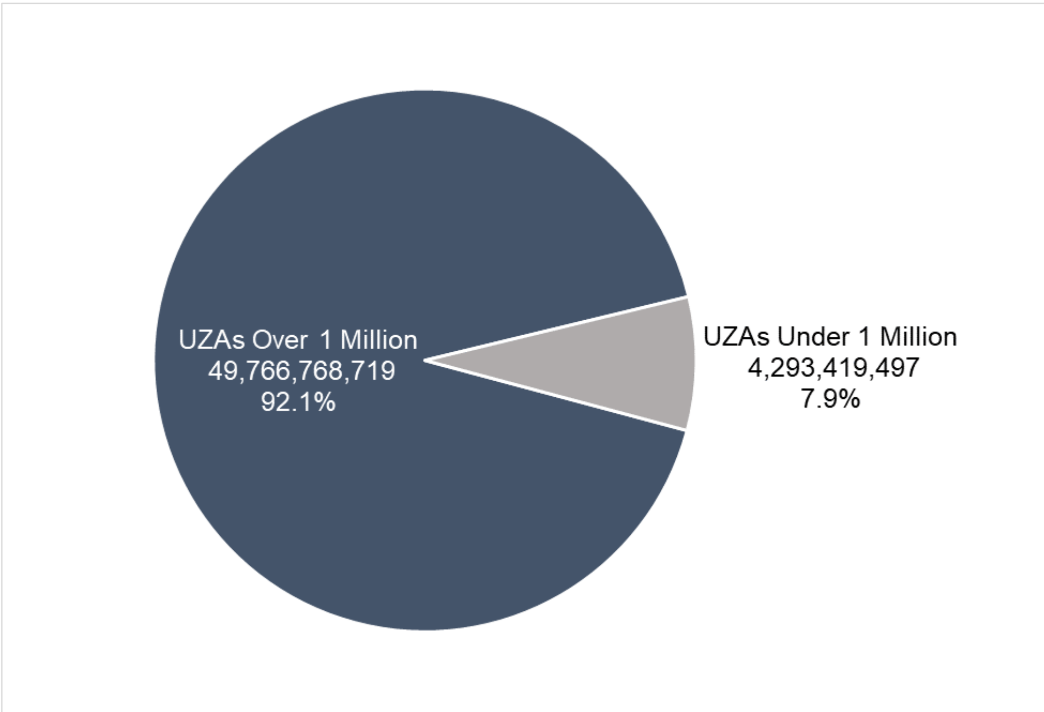

Exhibit 20. ***Total Passenger Miles Traveled per UZA Size***

Trips per Capita

UZAs over 1 million have more trips on public transit per capita. The median ridership density for UZAs under 1 million in 2018 is 5.88 trips per capita, whereas the median for UZAs over 1 million is 22.12.

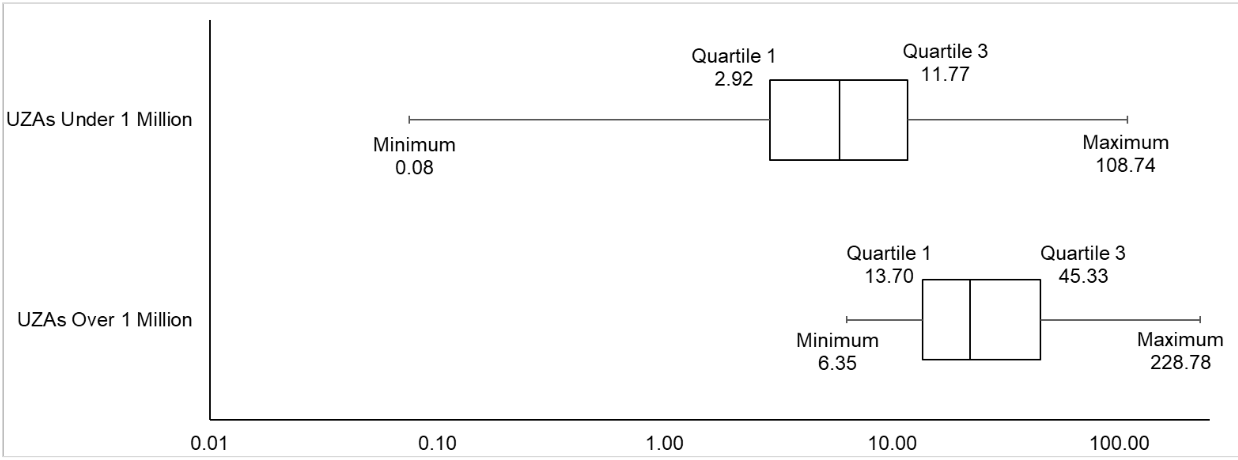

Exhibit 21. ***2018 Ridership Density (Passenger Trips per Capita)***

Operating Cost per Passenger Trip

Cost per trip varies widely in UZAs under 1 million, from $1.61 to $67.53. In UZAs over 1 million, the range is narrower, between $3.49 and $10.94 per trip. Additionally, the median cost per trip is $1.33 less in large UZAs. This is influenced by the fact that there are more than twice as many demand response services (comparatively expensive) in UZAs under 1 million than there are in UZAs over 1 million, 459 and 205, respectively. These demand response services on average carry the fewest number of passengers per trip. UZAs over 1 million more often have extensive fixed-route and fixed-guideway systems that carry more passengers per trip, dramatically dropping the average cost per trip.

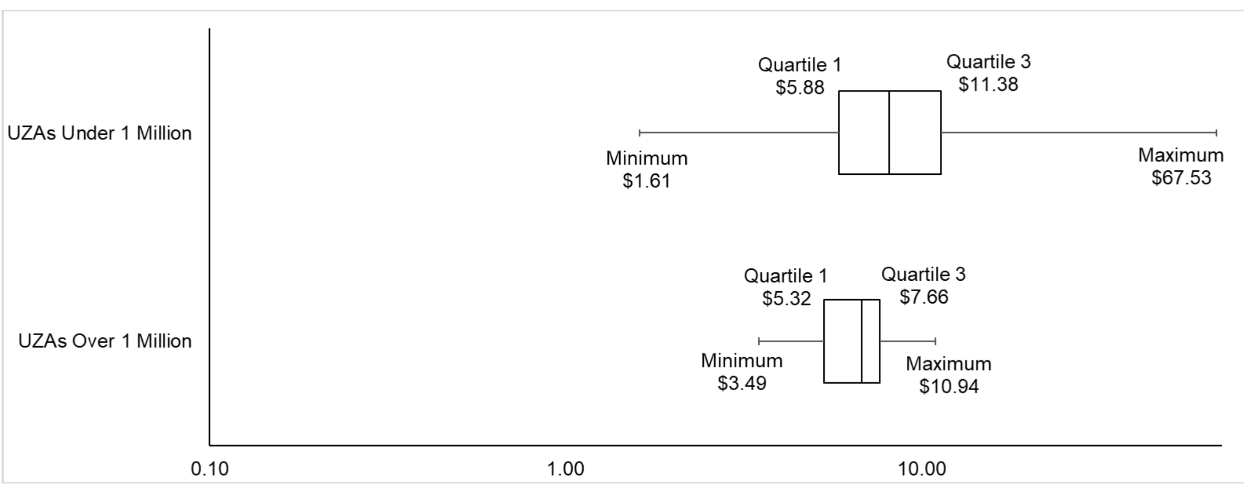

Exhibit 22. ***Operating Cost per Passenger Trip***

Operating Cost per Revenue Hour

UZAs over 1 million have a slightly lower cost per trip than UZAs under 1 million, but a higher average cost per hour. The lowest average cost per hour in UZAs over 1 million is $87.27, while the median for UZAs under 1 million is $78.68. Intensive urban transit carries significantly more passengers at a time, requiring more workers, equipment, and space. Additionally, prices are higher in dense cities as reflected in wages, property costs, and supply prices.

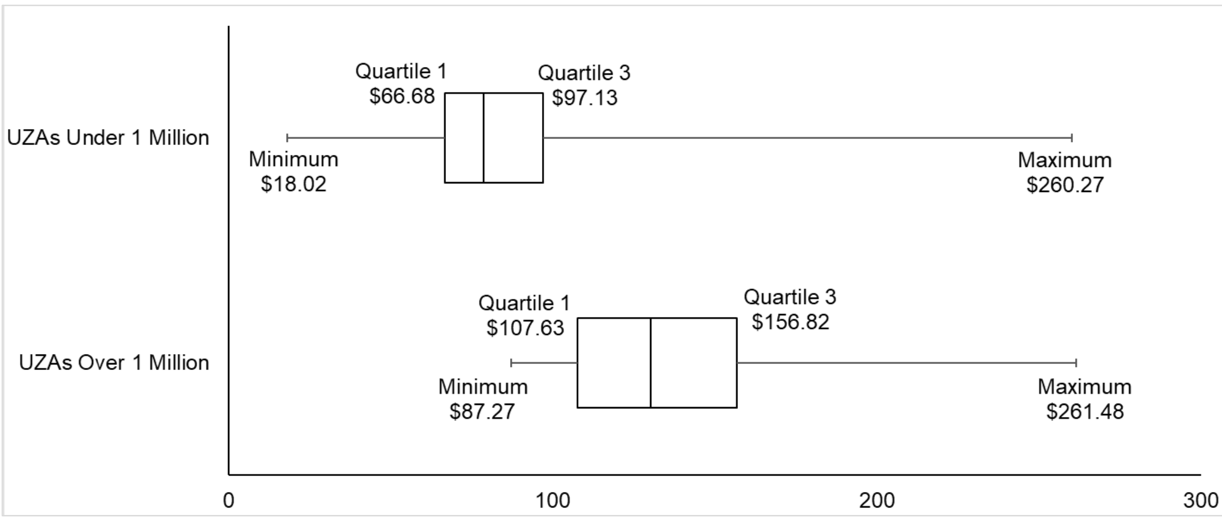

Exhibit 23. ***Operating Cost per Vehicle Revenue Hour***

Event Rate Comparison

In 2018, UZAs with populations over 1 million experienced 229.47 reportable Safety and Security events per 100 million Vehicle Revenue Miles (VRM). UZAs with populations less than 1 million people experienced S&S events at a lower rate, 167.58 events per 100 million VRM.

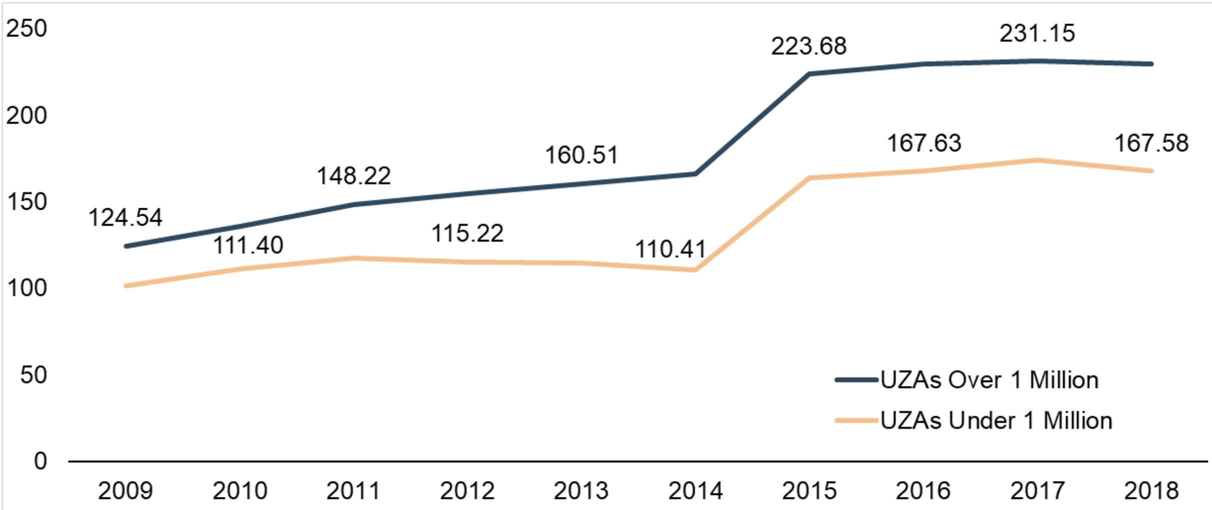

Exhibit 24. ***Total Reportable S&S Events per 100 Million VRM, by UZA Size***

Fixed Guideway Comparison

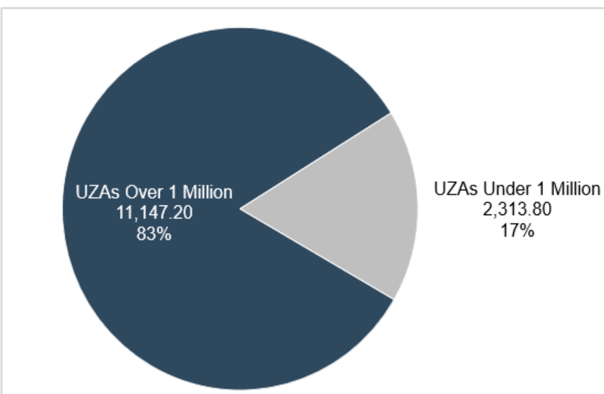

Exhibit 25. ***Rail, Bus, and Other Fixed Guideway Directional Route Miles Comparison***

UZAs with populations over 1 million operate over 83 percent of all fixed guideway directional route miles. Typically, each directional route mile is a mile of transit operation space where private transportation cannot operate. For example, the New York City Subway operates on rail track unavailable to Amtrak, CSX, and any other private trains. The Boston Silver Line is bus rapid transit with dedicated right-of-way, meaning that it operates similarly to rail transit: car traffic cannot trespass on the roadway reserved exclusively for the Silver Line. The exception is commuter rail and hybrid rail, where they may share track with private rail operators.

Alternative Fuel Use by State

Many agencies across the country are focusing on transit service that uses alternative energy sources. The U.S. Department of Energy identifies six alternative fuel sources: biodiesel, electricity, ethanol, hydrogen, natural gas, and propane. The following exhibits focus on hydrogen, renewable fuels (biodiesel and ethanol), and clean-burning fuels (natural gas and propane).

States with High Alternative Fuel Consumption

Many States have initiatives to incentivize the use of alternative fuels. In 2018, alternative fuel consumption amounted to 240,036,823 gallons and gallon equivalents. Compressed natural gas accounts for 74.3 percent (178,362,30 gallon equivalents) of the total alternative fuel consumed for public transit. Biodiesel comes next, accounting for 20.4 percent (49,072,263 gallons).

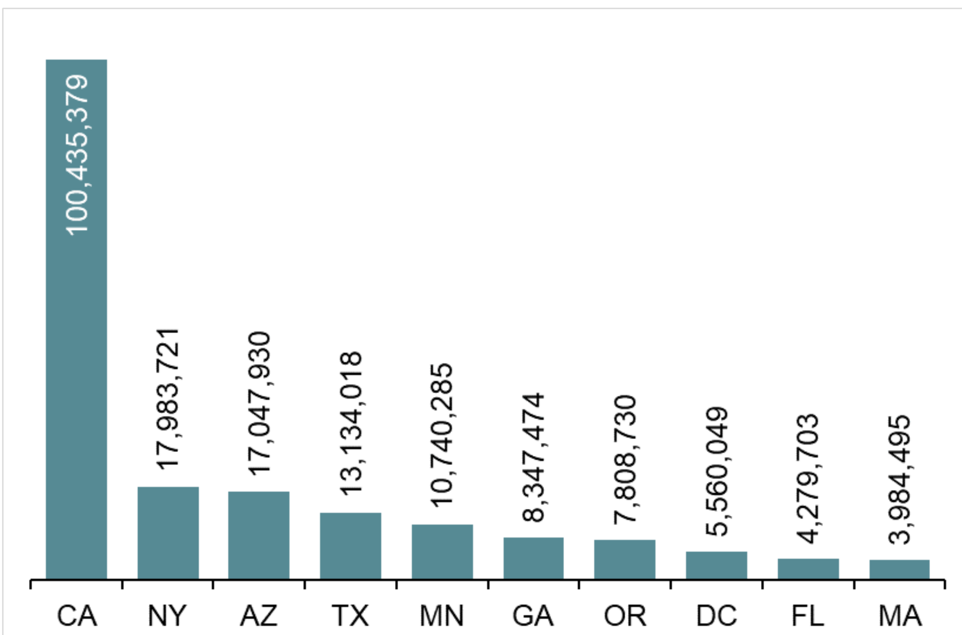

Exhibit 26. ***2018 Alternative Fuel Consumed, by State***

In 2018, California consumed by far the most alternative fuel, using 100,435,379 gallons and gallon equivalents. However, when viewed as a percentage of total fuel consumption, as shown in Exhibit 27, their consumption is similar to many other States using alternative fuels.

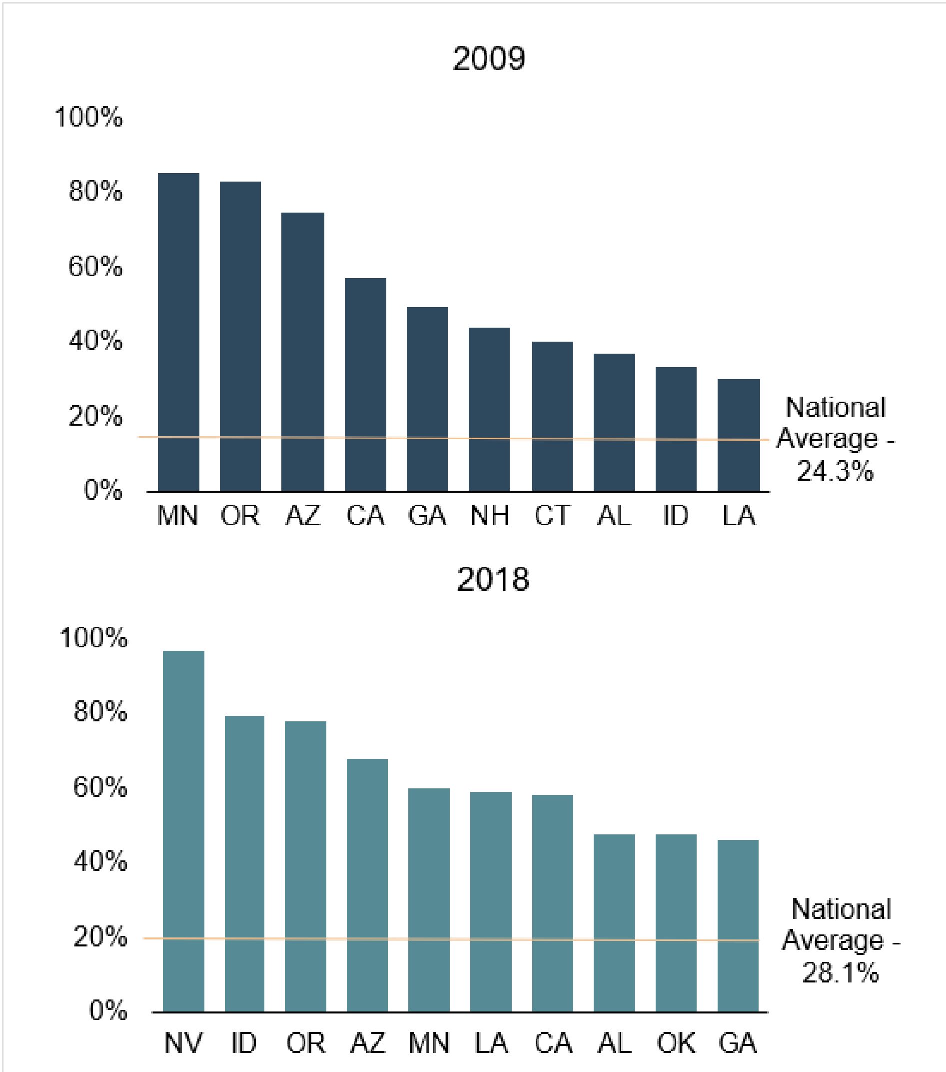

Exhibit 27. ***Alternative Fuel as a Percentage of Total Fuel, Top 10 States***

In 2018, transit agencies with alternative fuel vehicles reported, on average, that 28.1 percent of their total fuel consumption was alternative fuel. Over the past ten years, that average increased from 16 percent from 24.3 in 2009. The ten states with the highest alternative fuel consumption are well above the national average.

Although Nevada was not among the top ten of alternative fuel consumers in 2009, it currently reports the highest percentage of alternative fuel consumption of any State. This has been driven, in part, by lower taxes for alternative fuels and other incentive programs.

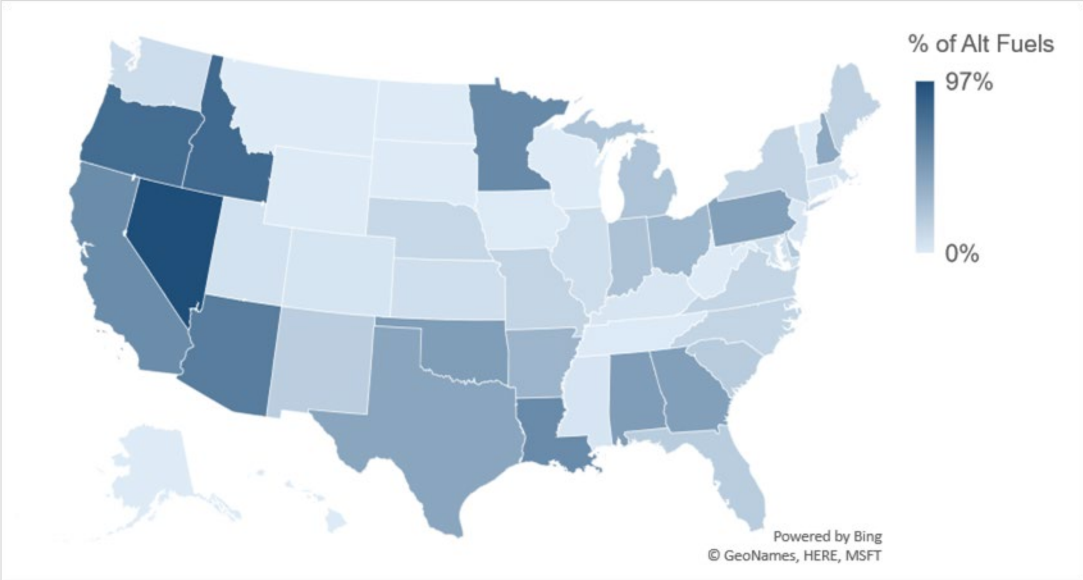

Exhibit 28. ***2018 Alternative Fuel Consumption, Heat Map***

Alternative Fuels by Vehicle Type

Across the country, buses represent the largest number of alternative vehicles with 18,815 vehicles (73.7 percent). Cutaway and articulated buses account for 11.2 and 10.6 percent of alternative vehicles, respectively. Double-decker buses, school buses, vans, and minivans make up the remaining 4.5 percent.

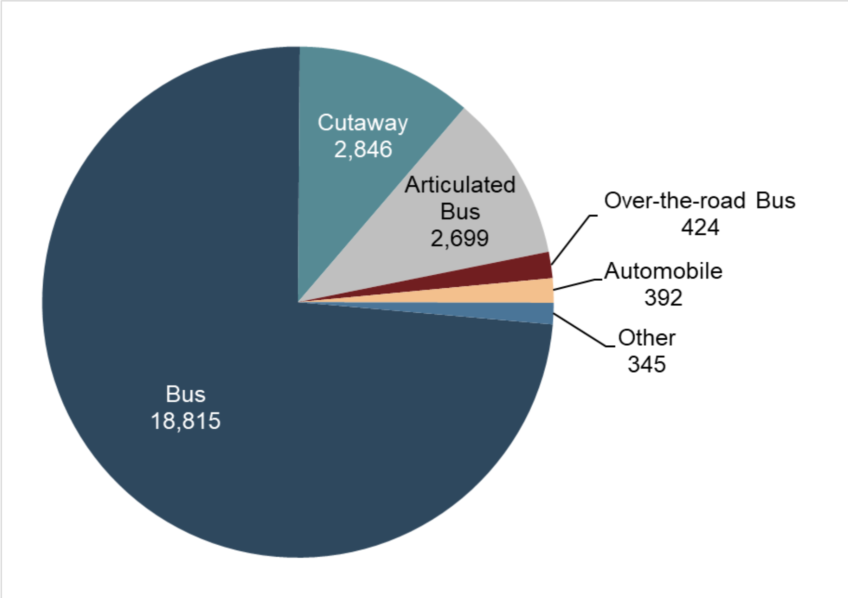

Exhibit 29. ***2018 Alternative Fuel Vehicle Types***

Some states are focusing on alternative fuel buses. For example, in Idaho's UZAs, 100 percent of the fixed route service buses now use alternative fuels.

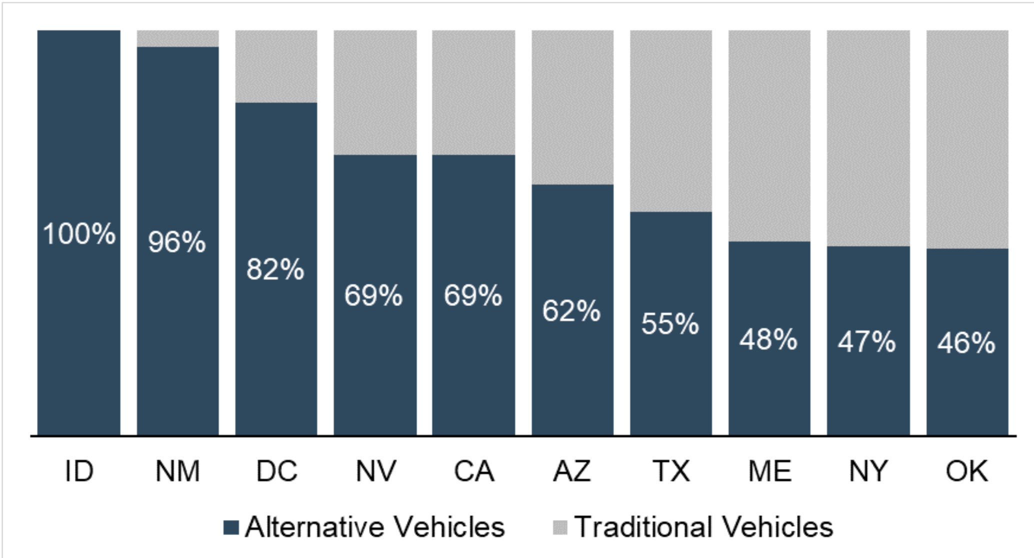

Exhibit 30. ***2018 Alternative Fuel Vehicles, Bus***

States have also been adding alternative fuel cutaways to their fleets. In Oklahoma, 74 percent of cutaway vehicles are alternative fuel vehicles and use compressed natural gas.

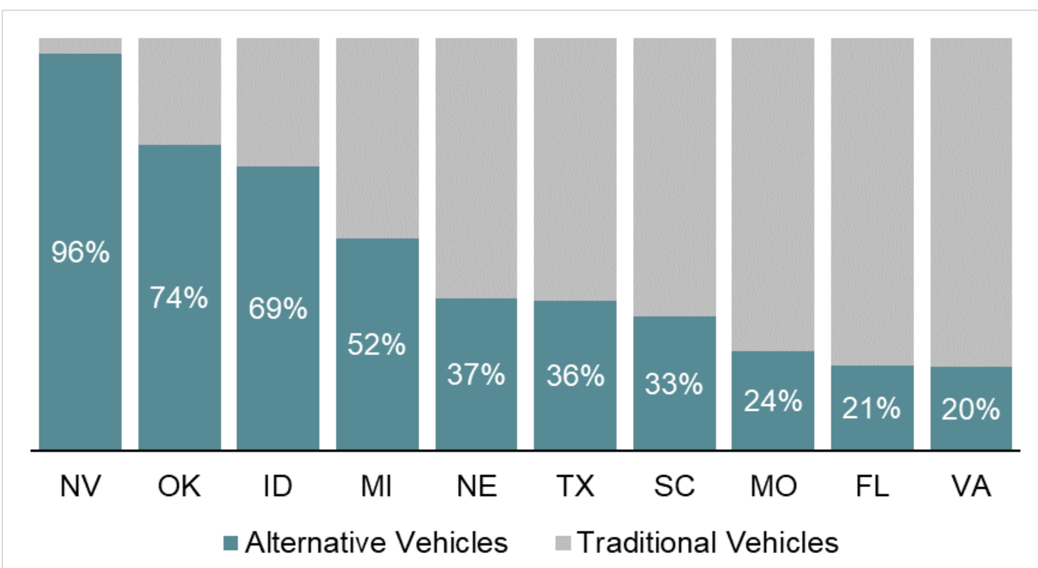

Exhibit 31. ***2018 Alternative Fuel Vehicles, Cutaway***

Bus Rapid Transit and Light Rail

In recent years bus rapid transit systems have been on the rise in the United States, with increased interest and investment each year. In 2012, the NTD added Bus Rapid Transit (RB) as a distinct mode. As of Report Year 2018, there are 14 operators of bus rapid transit service.

These systems are often compared to light rail systems as they typically serve similar functions. Both modes are surface-level services that operate predominantly in their own exclusive right-of-way, often with platform-level boardings and signal priority. Generally, bus rapid transit systems are thought to be lower cost alternatives to light rail since constructing the guideway is less expensive.

Modal Expenses

Cost per hour is calculated by dividing total modal operating expenses by total vehicle revenue hours. For the past five years, the cost per hour for light rail has remained above $250/ hour, whereas the cost per hour for bus rapid transit has consistently remained below $200/ hour. In 2018, light rail had an average cost per hour of $312.09 while bus rapid transit had an average cost per hour of $197.42.

Exhibit 32. *Cost Per Hour, 2014–2018*

The most expensive cost function across both modes is vehicle operations, at about $123 per hour in 2018. However, there are large differences in the vehicle maintenance and facility maintenance costs. In 2018, light rail vehicle maintenance was 225 percent more expensive than bus rapid transit, and light rail facility maintenance was 346 percent more expensive.

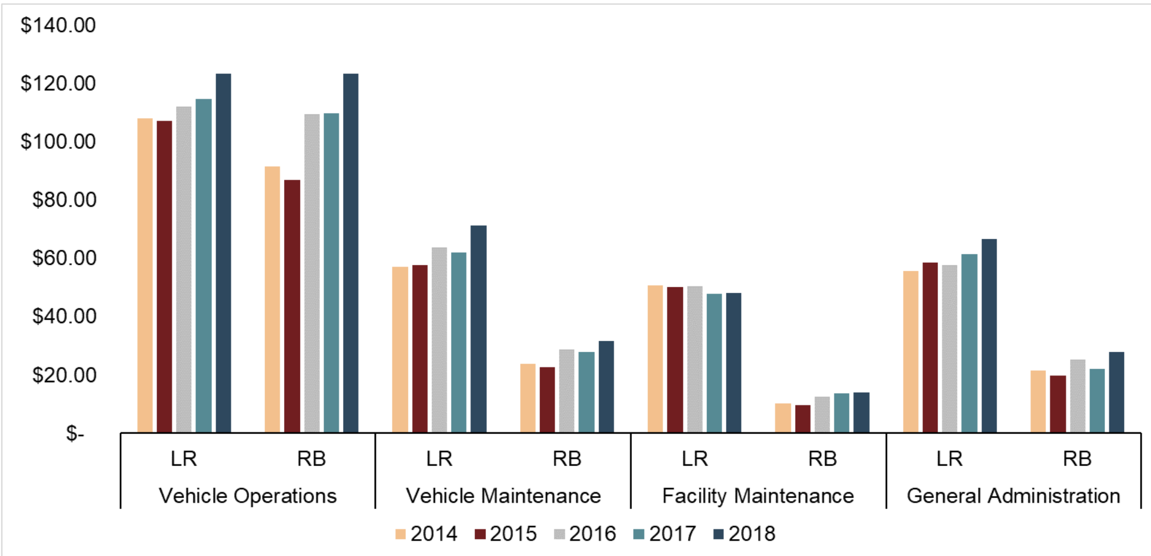

Exhibit 33. *Cost Per Hour by Function*

Cost per mile (total modal operating expenses divided by total vehicle revenue miles) shows that light rail costs more to operate per mile but also that there is a wider range of average cost per mile across light rail agencies.

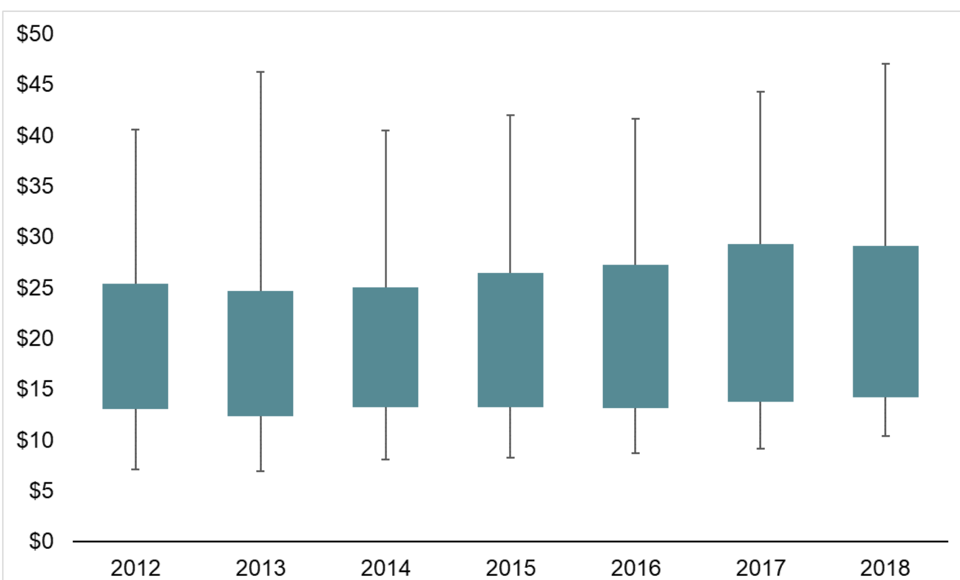

Exhibit 34. *Cost Per Mile, Light Rail*

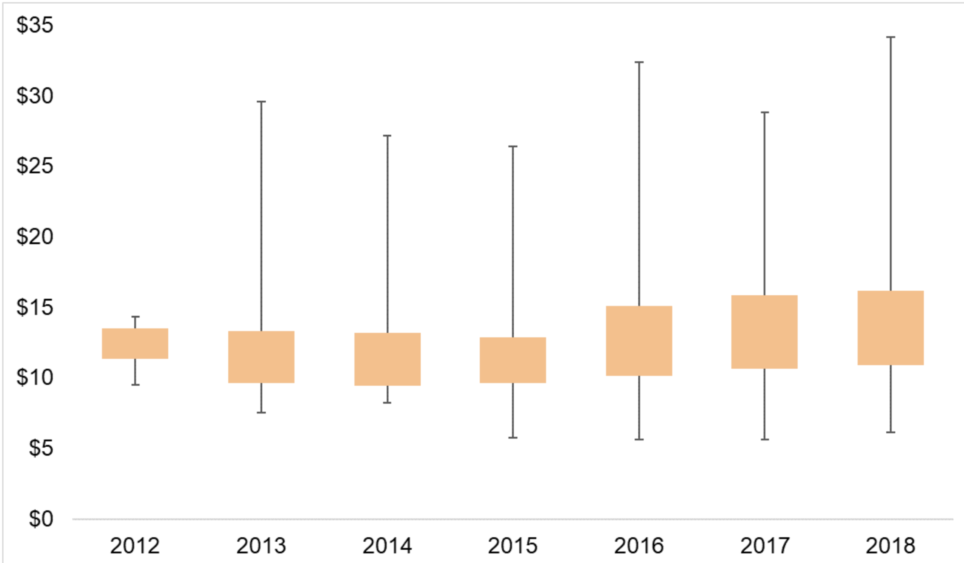

Exhibit 35. ***Cost Per Mile, Bus Rapid Transit***

Light rail and bus rapid transit systems also exhibit differences in capital expenditures. In 2018, the average capital expenditure for an existing light rail system was $30.6 million, compared to $1.1 million for an existing bus rapid transit system. Light rail capital expenses per agency have decreased 6.1 percent since 2014 when they were at about $32.6 million. Over the same time period, bus rapid transit capital expenses per agency decreased 12.8 percent.

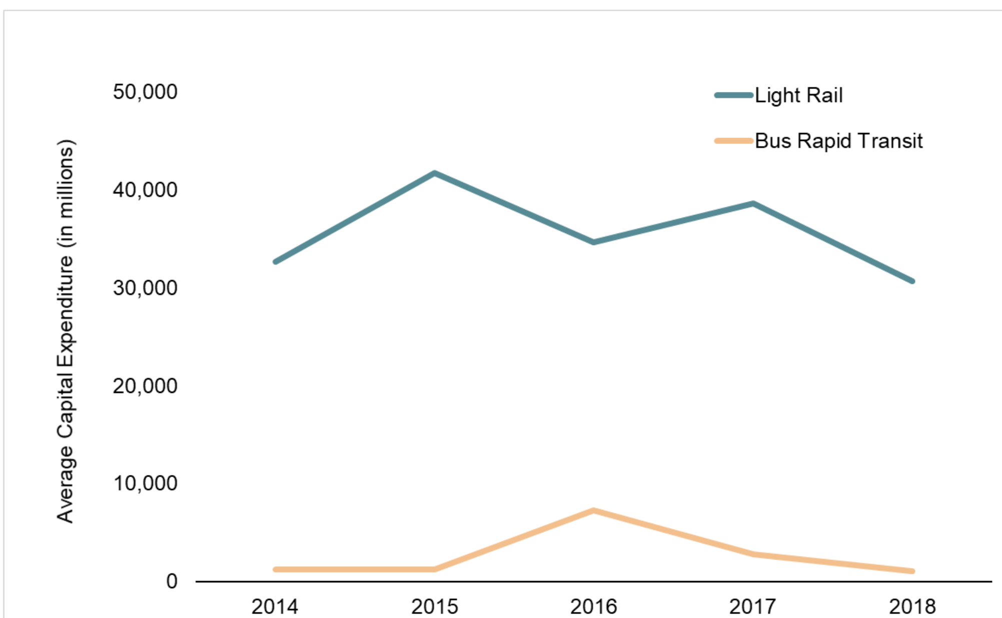

Exhibit 36. ***Average Capital Expenditure, Existing Service***

Average Revenue Speed

Light rail revenue service operates at speeds greater than those of bus rapid transit. Revenue speed is calculated by dividing vehicle revenue miles by vehicle revenue hours. Since 2014, light rail revenue speeds have ranged from 15.7 to 15.9 miles per hour; bus rapid transit revenue speeds have ranged from 9.0 to 9.5 miles per hour. Light rail vehicles are generally able to maintain higher revenue speeds since they typically have signal prioritization and operate exclusively within their own guideway. While bus rapid transit systems also typically have signal prioritization, these systems will operate a portion of their service in mixed traffic (roadways used by the general public), making them susceptible to traffic issues.

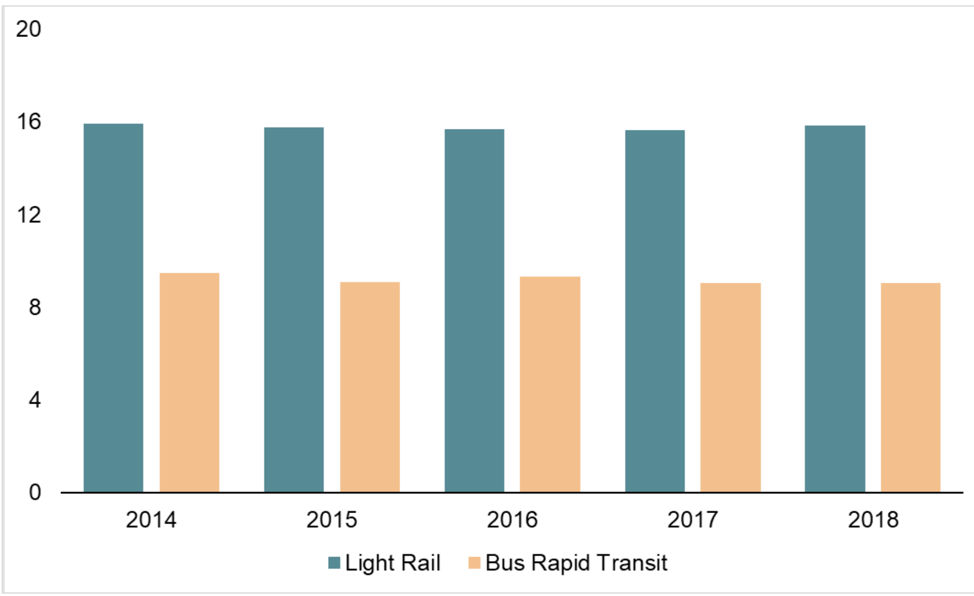

Exhibit 37. *Average Revenue Speed*

Modal Capacity and Ridership

Load factor (total passenger miles traveled divided by total vehicle revenue miles) is the average number of passengers on board a vehicle or passenger car. In 2018, the average load factor for a light rail system was 21.5, while the average load factor for a bus rapid transit system was 16.7. Both modes have seen decreases in average load factor over the past five years.

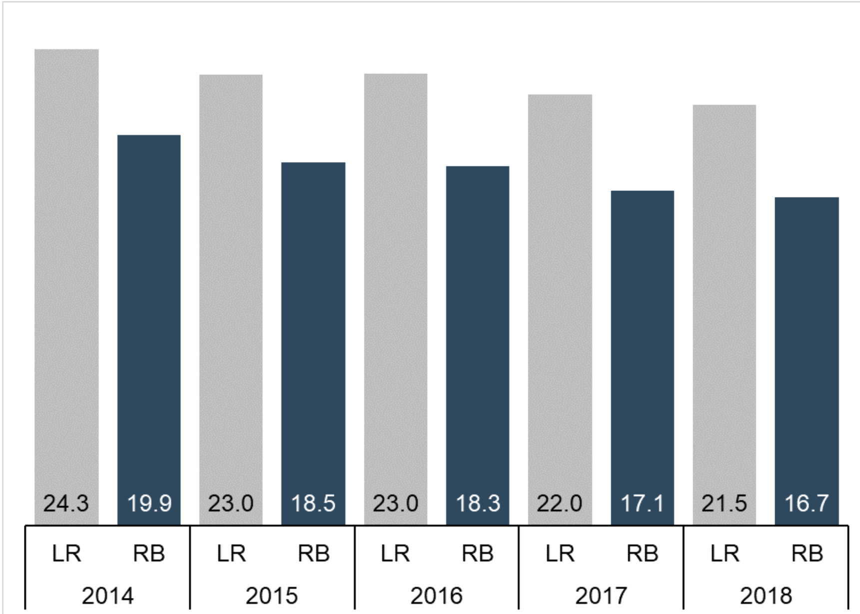

Exhibit 38. ***Average Load Factor***

While the load factor figures are similar, the significantly larger capacity (seating plus standing capacity) of light rail vehicles results in bus rapid transit systems having a larger percentage of the available seats filled. In 2018, light rail vehicles had an average maximum capacity of 186.4, more than double the average maximum capacity for bus rapid transit of 85.9.

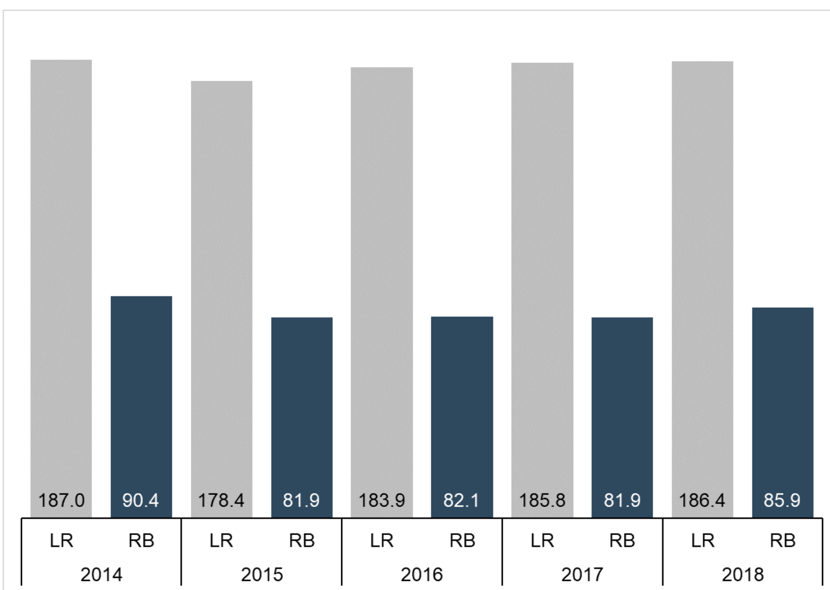

Exhibit 39. ***Average Vehicle Capacity***

Unique Transit Modes

One group of modes — the "unique" modes — are not included in the analyses of the previous sections. This is because a limited number of urbanized areas operate these modes. They include:

- Aerial Tramways (TR)
- Alaska Railroad (AR)
- Cable Car (CC)
- Inclined Plane (IP)
- Monorail/Automated Guideway (MG)
- Públicos (PB)

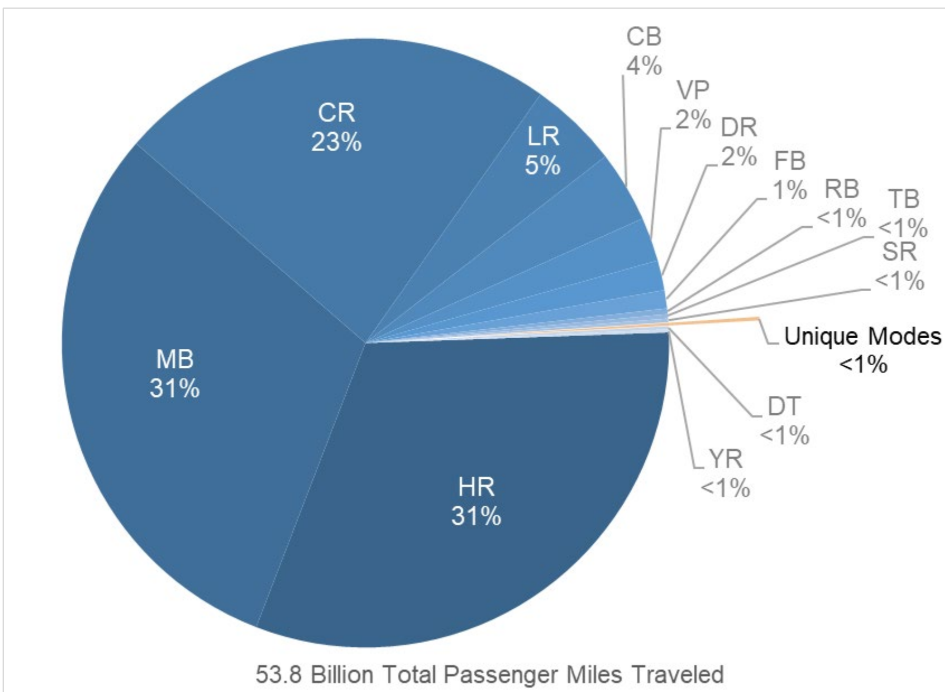

Exhibit 40. ***Full Reporters' Passenger Miles Traveled, 2018***

Collectively, these modes represent less than one percent of Passenger Miles Traveled (PMT), Vehicle Revenue Miles (VRM), and Operating Expenses. The following sections examine these unique modes.

Aerial Tramway

Exhibit 41. *Portland Aerial Tram*

Aerial tramway (TR) is a transit mode where vehicles shuttle along suspended cables between two tram terminals at differing heights. In most cases, one or two fixed cables support the vehicle while the vehicle's electrically powered wheels roll up and down a third cable, or haulage rope. This propulsion method and cable setup enables aerial trams to move forward or backwards as needed.

Different variations of tramways have been in use for hundreds of years, especially for industrial cargo and in mountainous regions to carry ore in mining operations. As time passed, aerial trams began to carry passengers instead of exclusively cargo.

However, as electric power became more widely used in transit services in the 1930s – 1940s, aerial tramways became obsolete. Since then, tramways have been largely used for recreational purposes such as ski lifts. However, there has been a recent interest in operating tramways in the urban market. There now are two aerial tramways that provide mass transit service in the country. The Roosevelt Island Tramway connects Roosevelt Island to the upper east side of Manhattan in New York City, but does not report to the NTD.

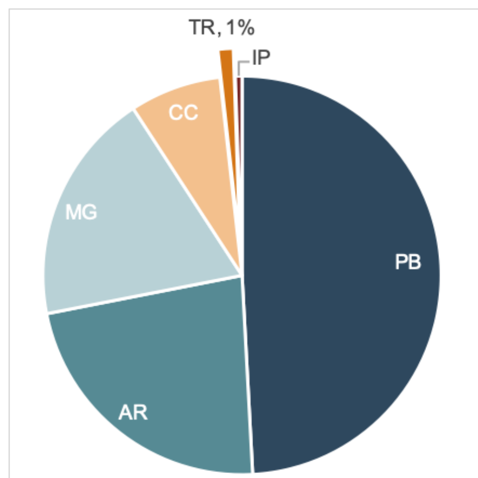

Exhibit 42. *Aerial Tramway PMT (Unique Modes)*

The City of Portland is the only NTD reporter that reports aerial tramway service. The Portland Aerial Tram opened in 2006 and operates a two-vehicle line service that can carry 78 passengers per cabin. The tramway connects the Oregon Health & Science University (OHSU) campus with the South Waterfront district of Portland.

While an aerial tramway does not operate on rails or roadway, it operates in exclusive air space. For the purposes of NTD reporting, the NTD considers aerial tramway a non-rail, fixed route mode operating exclusively on fixed guideway.

Alaska Railroad

Alaska Railroad (AR) is a transit mode designated solely for the Alaska Railroad Corporation. This railroad provides both freight and passenger services and uses more than 500 miles of track across the state of Alaska.

Exhibit 43. *Alaska Railroad Corporation*

This railroad has been in operation since the early 1900s. The Alaska Central Railway constructed the railroad to provide an all-weather route to take advantage of the natural resources in the interior of the Alaska Territory. Alaska Central Railway began laying the first railroad in Seward, Alaska, in 1903, which eventually extended 50 miles north. In 1914, Congress approved the construction of 470 miles of track to Fairbanks that was completed in 1923.

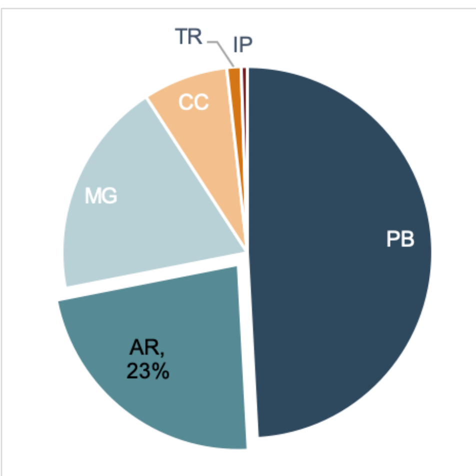

Exhibit 44. *Alaska Railroad PMT (Unique Modes)*

In 1984, Governor Bill Sheffield signed legislation creating the Alaska Railroad Corporation. Shortly thereafter, the State of Alaska purchased the railroad from the Federal government. The Alaska Railroad continues to provide freight and passenger services today.

The Alaska Railroad Corporation provided 24.2 million passenger miles of service in Report Year 2018. This service accounted for approximately 23 percent of the total unique mode PMT.

Cable Car

The cable car (CC) mode operates on a railway propelled by underground cables. While several cities operated cable cars in the past, the San Francisco cable car system is the last system in operation in the country today and has received recognition as a National Historic Landmark. This system is one of two National Historic Landmarks that move — the other is New Orleans' St. Charles Streetcar line.

Exhibit 45. ***San Francisco Cable Car***

Andrew Smith Hallidie created the first cable railway in San Francisco known as the Clay Street Hill Railroad. Clay Street provided the template for San Francisco's cable car system that exists today.

Prior to cable cars, people used horses to move passengers and supplies up and down San Francisco's steep streets. Throughout the late 1800s, San Francisco converted from horse operations to cable cars, reaching 23 operating lines by 1890. There are three cable car lines still in operation today: Powell-Mason, Powell-Hyde, and California.

San Francisco's cable cars move using centralized, powerful electric motors that replaced the original steam powered engines. These engines move large wheels that pull the underground cables through the streets. Each car requires two operators on board in order for the cable car to move safely and efficiently — a grip operator and a conductor.

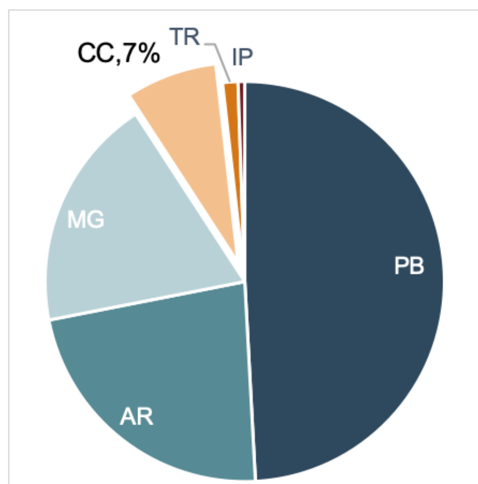

Exhibit 46. ***Cable Car PMT (Unique Modes)***

The cable car system employs "grips" that extend through the vehicle and directly clench and release the cable underground. This gripping action is performed by grip operators, or gripmen, through a ratchet lever. This procedure allows the cars to coast over crossing cables and brake whenever necessary. Conductors are responsible for fare collection, boarding management, and control over the rear wheel brakes. The San Francisco Municipal Railway operates the cable cars and reports the data to the NTD. In Report Year 2018, cable cars provided 7.9 million passenger miles of service, making up 7.4 percent of total unique modes PMT.

Inclined Plane

An inclined plane (IP), commonly referred to as a funicular railway, is a mode of transit that operates on a railway over steep slopes and grades. Moving cables power the vehicles, which have the ability to move both up and down the grade. An incline plane differs from a cable car in that the cable is permanently attached to the inclined plane vehicle.

Exhibit 47. *Monongahela Incline*

Inclined planes operate using two cars that attach to a cable. This cable runs through a pulley at the top of the grade. The two cars run simultaneously; one car moves up the incline while the other moves down. This procedure allows the cars to counterbalance, therefore minimizing the energy required to propel the car going up the incline.

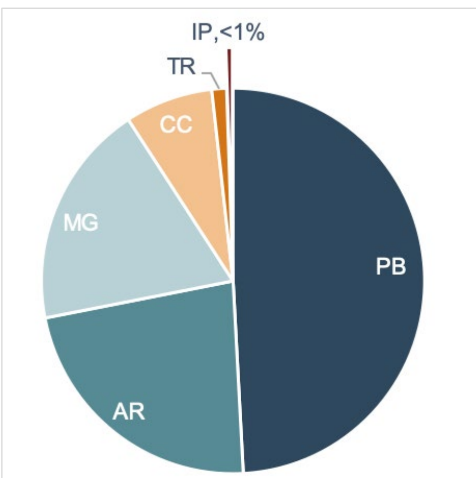

Exhibit 48. *Inclined Plane PMT (Unique Modes)*

There are three NTD reporters that provide information for inclined planes: Cambria County Transit Authority (CCTA), Port Authority of Allegheny County (PAAC), and Chattanooga Area Regional Transportation Authority (CARTA).

PAAC owns and operates the Monongahela Incline, also known as the Mon Incline, which is the oldest continuously operating inclined plane in the country. John Endres built the inclined plane in 1870 in response to the rapid expansion of Pittsburgh. As the factories and mills grew on flats near the river, people built houses nearby on top of Mount Washington. The construction of the incline facilitated further development and accessibility to the area.

CCTA owns and operates the Johnstown Inclined Plane, another transit service rich in history. This incline is 118 years old and carries nearly 100,000 riders each year.

Lookout Mountain Incline Railway is the inclined plane operated by CARTA. Located in Chattanooga, Tennessee, this incline began operation in 1895 and today is one of the word’s steepest passenger railways.

Monorail/Automated Guideway

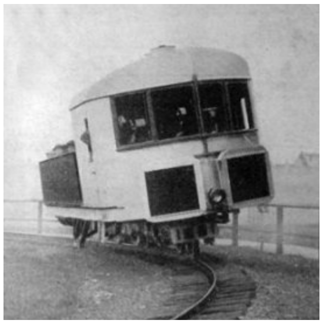

Exhibit 49. ***Brennan's Gyrocar and Miami-Dade Metromover***

In 1903, Louis Brennan patented a gyroscopically balanced monorail, or gyrocar, as shown to the left in Exhibit 49. While he intended to use this system for military purposes, it did not move past the prototype stage.

Automated Guideway (MG) is a type of public transit system where trains operate over a single electric rail. Automated guideway systems are typically above grade, or elevated, and may either operate over or suspend from the central beam. Many airports utilize automated guideway systems for transferring passengers to and from terminals, but these are not reported to NTD because they do not meet the definition of public transportation.

Henry Palmer invented and patented one of the earliest monorail designs in 1821. Since that time, many engineers experimented with a single rail system as a cheaper alternative to existing rail transport.

Since then, automated guideway systems have become significantly more modern. Today's automated guideway systems straddle center beams that support and guide the train, and use pneumatic, or air-filled, rubber tires. The electric motors use third rails or contact wires that power the straddle beam to propel the trains forward.

There are six agencies that reported data for MG services to the NTD: Seattle Center Monorail Transit, Morgantown Personal Rapid Transit, Miami-Dade Transit, Detroit Transportation Corporation, Jacksonville Transit Authority, and San Francisco.

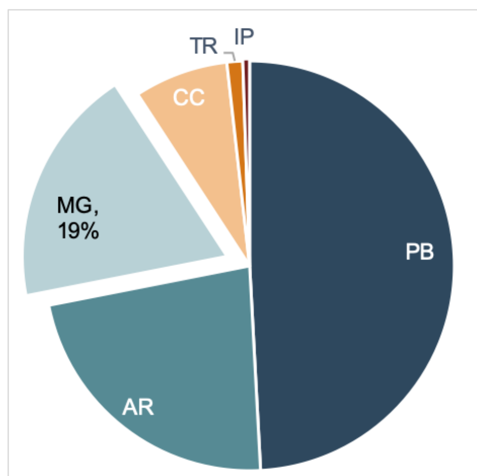

Exhibit 50. ***Monorail PMT (Unique Modes)***

Públicos

Exhibit 51. *Público*

The Público system (PB) is a transit mode unique to Puerto Rico and provides fixed route services predominantly in Puerto Rico's urbanized areas. The Público system is the largest public transportation system in Puerto Rico.

Públicos are similar to informal transport systems operated in developing countries. The biggest distinction between the Público service and other transit modes is the way in which Públicos operate. Drivers own their vehicle and are given exclusive rights to the route where they provide service. The drivers, or route owners, are responsible for their service and operate as independent business units. Besides maintaining the vehicles and routes, drivers must determine their schedule and supply the funds to run the service.

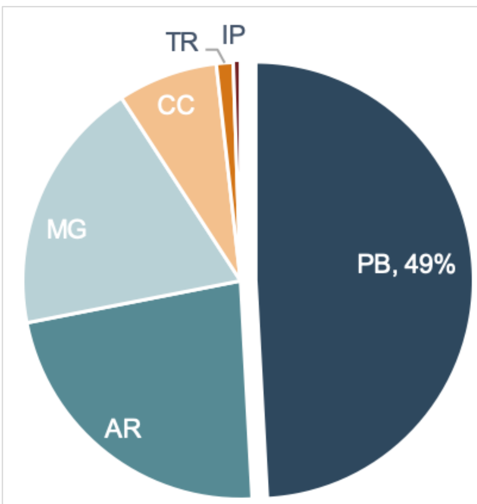

Exhibit 52. *Público PMT (Unique Modes)*

Puerto Rico Highway and Transportation Authority (PRHTA) manages the Público service and grants permission to potential drivers. PRHTA surveys the area and determines if there is a need for transit. If approved, PRHTA franchises the rights for that particular route to the prospective operator.

Drivers collect and report their financial and service data to PRHTA, who subsequently reports it to the NTD under the Público mode.

Públicos account for 49 percent of the passenger miles traveled by unique transit modes in the U.S. This translates to 52.1 million out of the 106.1 million unique modes' PMT.[1]

[1] Photograph sources:
Aerial tramway: Wikimedia Commons, Another Believer (CC BY-SA 3.0)
Alaska Railroad: Alaska Railroad Corporation website
Cable Car: Wikimedia Commons, Fred Hsu (CC BY-SA 3.0)
Inclined Plane: Wikimedia Commons, S. Clery (CC BY-SA 3.0)
Miami-Dade Metromover: Miami-Dade County Metromover website