RAIL SAFETY DATA REPORT

Rail Transit Safety Data 2007–2018

September 2021

U.S. Department of Transportation

Federal Transit Administration

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14. ABSTRACT

This Rail Safety Data Report analyzes event data collected through the State Safety Oversight program and provides a snapshot of the safety performance of the rail transit industry for the twelve-year period of calendar year (CY) 2007 through CY 2018. This report focuses on the types of events that occurred, their consequences in terms of fatalities and injuries, and their likely causes. The report standardizes event, fatality, and injury numbers by 100 million vehicle revenue miles as reported to the National Transit Database. By identifying and analyzing this information, the Federal Transit Administration can develop and conduct research, training, and evaluations targeted at the situations and conditions that pose the greatest risk of harm to passengers, patrons, employees, and members of the public.

15. SUBJECT TERMS

Rail Transit; State Safety Oversight Program; Industry Trends; Collision Type; Event Type; Fatalities by Mode; Injuries by Mode; Heavy Rail; Light Rail; Streetcar; Events by Probable Cause

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Executive Summary

The Rail Safety Data Report (RSDR) is a data analysis prepared by the Federal Transit Administration (FTA) to illustrate rail transit safety outcomes and present trends and patterns in rail safety and security event data. This RSDR focuses on events that occurred between 2007 and 2018, their consequences in terms of fatalities and injuries, and their likely causes. By reviewing this data analysis, FTA can identify areas where it may conduct research, improve training, or perform assessments targeted at improving the conditions that pose the greatest risk of harm to transit customers, employees, and members of the public.

The data presented in this RSDR come from State Safety Oversight Agencies (SSOAs), in accordance with 49 CFR § 659.39(c) (Part 659) and 49 CFR § 674.39(a) (Part 674). FTA oversees SSOAs through the State Safety Oversight (SSO) program. The SSOAs, in turn, oversee safety at rail transit agencies that receive federal funding. See Appendix A for more details on the agencies included in the SSO community.

Throughout this report, analyses are presented using raw counts of events, fatalities, and injuries, along with rates standardized per 100 million vehicle revenue miles traveled (100M VRM). These rates provide a better comparison across different modes and years because standardization accounts for the different service levels provided by each rail mode and varying levels of service provided by the rail transit industry each year. VRM data come from the National Transit Database (NTD).

From 2007 to 2017, FTA required SSOAs to submit reports for all events that resulted in a fatality, two or more injuries, $25,000 or more in property damage, a life safety evacuation, a mainline derailment, a collision at a grade crossing, a collision between a train and a person, or a collision between two rail transit vehicles. Starting in 2018, FTA began transitioning to a new SSO regulation (Part 674), which resulted in changes to these thresholds for some SSOAs. Due to this transition, 2018 data is not always comparable to 2007–2017 data. Therefore, this RSDR sometimes presents 2007–2017 data trends and 2018 outcomes separately. See Appendices B and C for more details on changes to thresholds and their implications.

In addition, collision reporting requirements changed between the 2010 and 2011 reporting year, and for that reason the RSDR limits some analyses to trends from the 2011–2017 period and outcomes from 2018.

The following pages (iv–xii) present summary data from the RSDR. The report introduction and the presentation of detailed safety data begin on page 1, after the Executive Summary.

Events, Fatalities, and Injuries

SSOA event reporting from 2018 is not entirely comparable to previous years, since some SSOA's reporting criteria changed for all or part of that year.*

Nevertheless, in 2018, SSOAs reported

- **1,211 events** that resulted in
  - 188 fatalities and
  - 558 injuries.

Not all events resulted in a fatality or injury. Please see Appendix C for more details on event reporting thresholds.

Below are trends for the 2007–2017 period.

- **Events** increased 6.7% per year on average.
- **Fatalities** increased 1.9% per year on average.
- **Injuries** increased 3.7% per year on average.

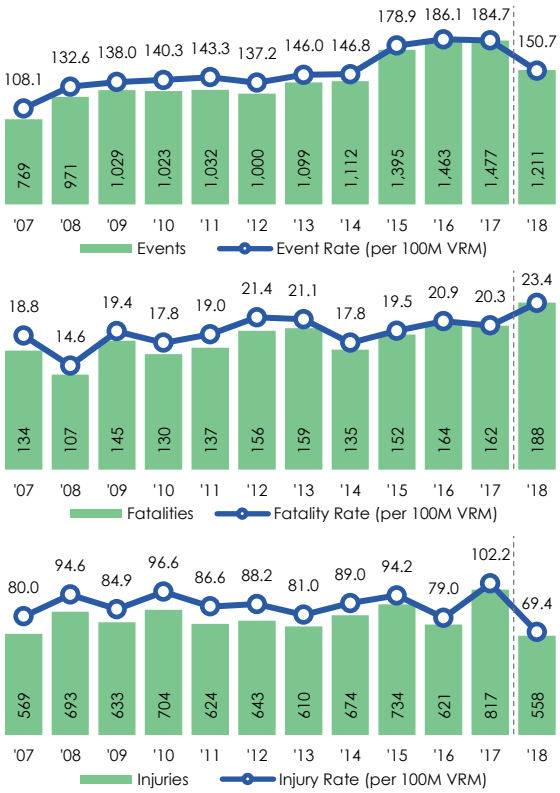


Figure 1. Events, Fatalities, Injuries, and Rates per 100M VRM, 2007–2018

The charts above take into account increasing rail service levels by standardizing event, fatality, and injury totals by 100M VRM to calculate rates (shown by the blue line). Rates have also increased but at a lower percentage because the service levels have increased. In the eleven-year period from 2007 to 2017,

- Events per 100M VRM increased at an average of 5.5% per year;
- Fatalities per 100M VRM increased at an average of 0.7% per year; and
- Injuries per 100M VRM increased at an average of 2.5% per year.

*2018 data is not comparable to previous years because they include events reported under both Part 659 and Part 674 thresholds. See Appendix C for more details on how the rule change affected event, fatality, and injury data.

Reporting Criteria in Transition in 2018

In 2018, some SSOAs started reporting under Part 674 requirements. The following charts show events, fatalities, and injuries by the SSO regulation in force when the event occurred.

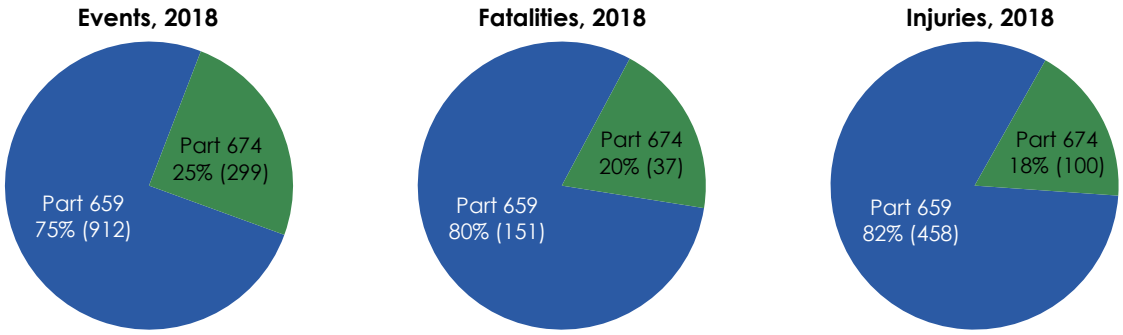


Figure 2. Events, Fatalities, and Injuries by SSO Regulation in Force, 2018

- Certain events that exceeded Part 659 thresholds, such as bomb threats, homicides, and some grade-crossing collisions, were no longer reported under Part 674. At the same time, certain events, including rail yard derailments, runaway trains, and events resulting in a single serious injury, began to be reported. These changes affected the overall number of events, fatalities, and injuries reported.
- Detailed analyses that follow in this Executive Summary do not include 2018 data. This is to ensure changes in data distribution and trends resulting from new reporting criteria are not mistaken for changes in safety performance. Separate detailed analyses of 2018 data are available in the main body of the report beginning on page 14.

Fatalities and Injuries by Probable Cause

The following charts show fatalities and injuries by probable cause for years 2007–2017. See Appendix A for precise definitions of the probable causes shown.

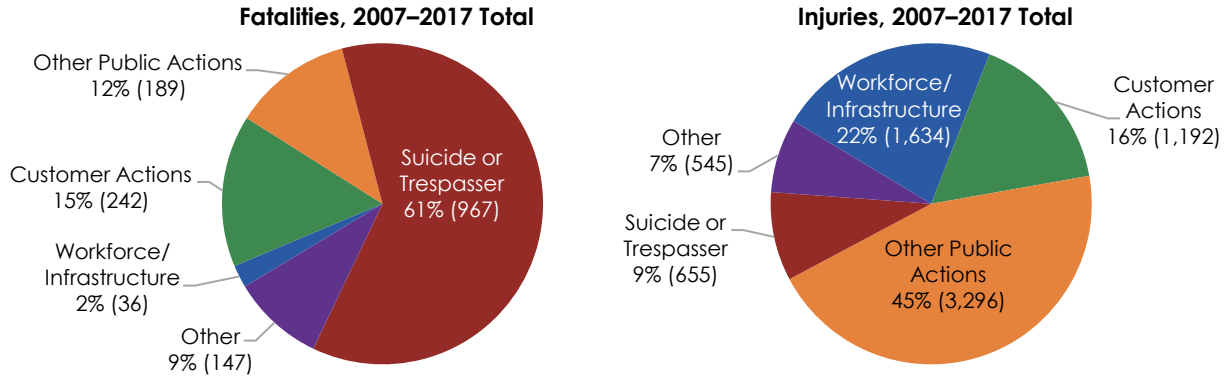


Figure 3. Rail System Fatalities and Injuries by Probable Cause, 2007–2017*

- Suicide and trespassing caused most (61%) rail transit fatalities and 9% of rail transit injuries from 2007 to 2017.
- Once suicide attempts and trespassing are excluded, customers† accounted for 56% of fatalities and 65% of injuries in the 2007–2017 period. The public, which includes occupants of private vehicles, bicyclists, and pedestrians, accounted for 39% of fatalities and 27% of injuries.

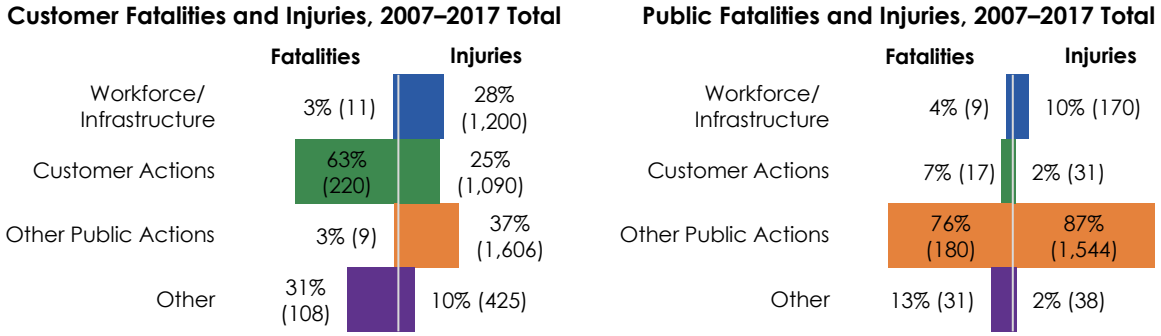


Figure 4. Distribution of Customer and Public Fatalities and Injuries, Excluding Suicides and Trespassing, 2007–2017*

- Customer actions caused most (63%) customer* fatalities, and public actions caused most (76%) public fatalities. Public actions also caused most (87%) public injuries, while the causes of customer injuries were more diverse.

*2018 data include events reported under both Part 659 and Part 674 thresholds. These data are therefore not comparable to previous years and have been excluded. See Appendix C for details on rule changes.
†Customers include passengers on trains and patrons in stations or other transit agency property.

Fatalities by Rail Transit Mode

The following charts show fatalities by rail transit mode for years 2007–2017. The 2018 data show a similar distribution. See Appendix B for precise definitions of these modes.

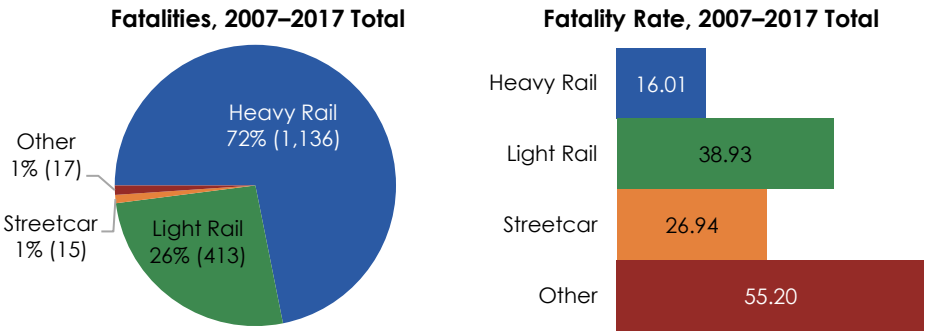


Figure 5. Rail System Fatalities and Rates per 100M VRM by Mode, 2007–2017*

- SSOAs reported the majority (72%) of fatalities at heavy rail systems; however, fewer heavy rail fatalities occurred per 100M VRM than at other modes, once differing levels of service are taken into account.

Injuries by Rail Transit Mode

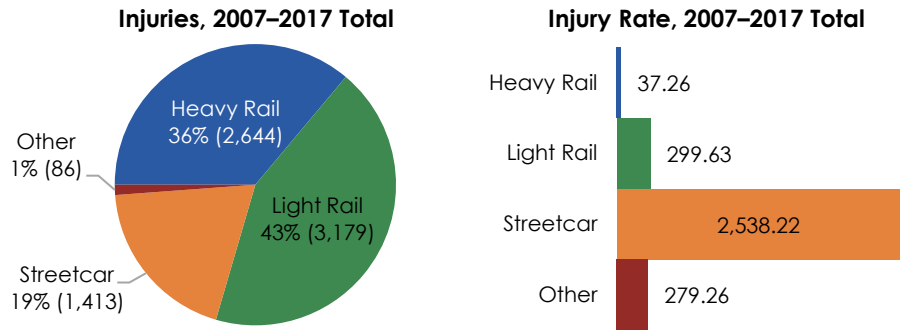


Figure 6. Rail System Injuries and Rates per 100M VRM by Mode, 2007–2017*

- SSOAs reported more injuries at light rail systems than at any other mode. Heavy rail and streetcar modes also accounted for a substantial portion of all reported injuries.
- After differing levels of service have been taken into account, SSOAs reported more injuries at streetcar modes per revenue mile than at any other mode.

*2018 data include events reported under both Part 659 and Part 674 thresholds. These data are therefore not comparable to previous years and have been excluded. See Appendix C for details on rule changes.

Heavy Rail Fatalities and Injuries by Event Type

The charts below show fatalities and injuries reported at heavy rail systems by event type from 2007 to 2017. See Appendix B for precise definitions of these event types.

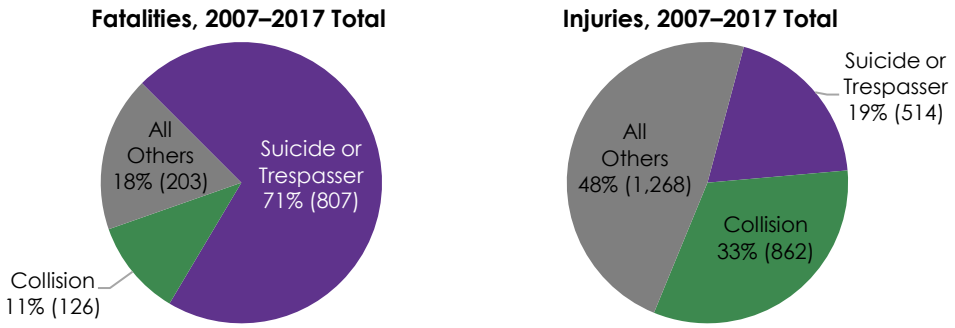


Figure 7. Heavy Rail Fatalities and Injuries by Event Type, 2007–2017*

- The majority (71%) of heavy rail fatalities from this period resulted from suicides and trespassing. One in five heavy rail injuries resulted from these events as well.
- Collisions accounted for an additional 11% of fatalities and 33% of injuries reported at heavy rail systems.
- Almost half (48%) of heavy rail injuries and 18% of fatalities resulted from events other than collisions, suicides, and trespassing.

Light Rail and Streetcar Fatalities and Injuries by Event Type

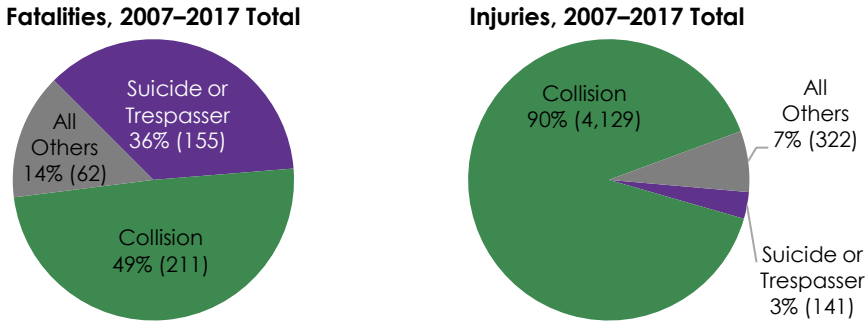


Figure 8. Light Rail and Streetcar Fatalities and Injuries by Event Type, 2007–2017*

- Nearly half (49%) of light rail and streetcar fatalities from the analyzed period resulted from collisions, as did nine out of ten light rail and streetcar injuries.

*2018 data include events reported under both Part 659 and Part 674 thresholds. These data are therefore not comparable to previous years and have been excluded. See Appendix C for details on rule changes.

- Suicide attempts and trespassing accounted for 36% of fatalities and 3% of injuries SSOAs reported at light rail and streetcar systems during this same time frame.

Collision Fatalities and Injuries by Mode and Type

The charts below show collision fatalities and injuries by collision type and mode. Comprehensive collection of collision type data began in 2011, so this analysis begins in that year. See Appendix B for precise definitions of collision types.

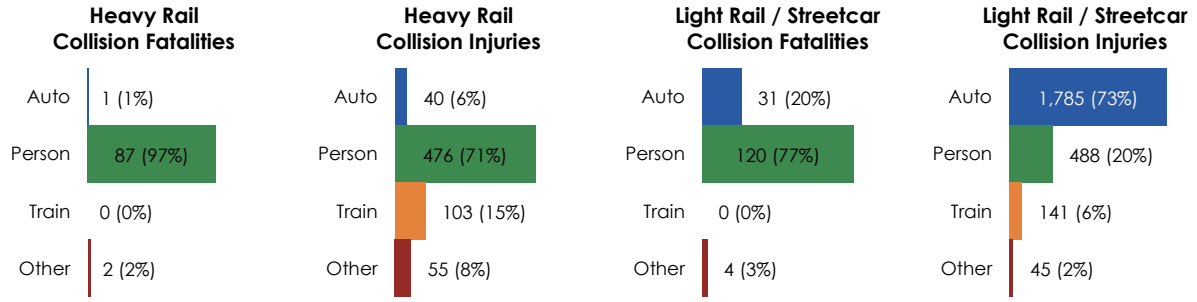


Figure 9. Total Collision Fatalities and Injuries by Mode and Type, 2011–2017*

- Nearly all (97%) heavy rail collision fatalities resulted from train-to-person collisions between 2011 and 2017. The majority (71%) of heavy rail collision injuries reported during this time period also resulted from these collisions.

- The majority (77%) of light rail and streetcar collision fatalities resulted from train-to-person collisions between 2011 and 2017. The majority (73%) of light rail and streetcar collision injuries reported during this time period resulted from train-to-auto collisions.

*2018 data include events reported under both Part 659 and Part 674 thresholds. These data are therefore not comparable to previous years and have been excluded. See Appendix C for details on rule changes.

Heavy Rail Suicide and Trespasser Events

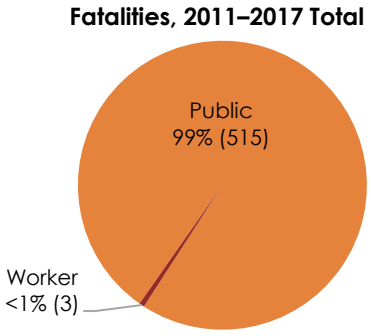


Figure 10. Heavy Rail Suicide and Trespasser Fatalities by Person Type, 2011–2017*[*]

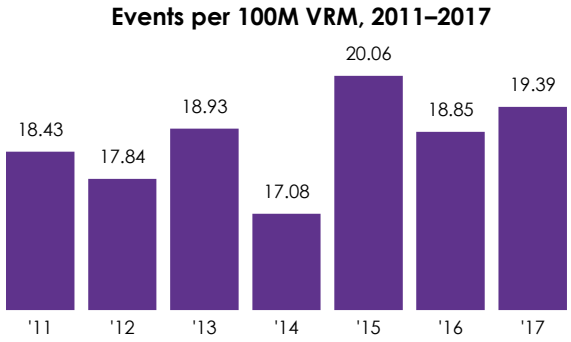


Figure 11. Heavy Rail Suicide and Trespasser Events per 100M VRM, 2011–2017*[*]

- Members of the public accounted for nearly all (99%) fatalities resulting from heavy rail suicide and trespasser events from 2011 to 2017. SSOAs also reported three suicide and trespasser event worker fatalities.
- The number of reported heavy rail suicide and trespasser events per 100M VRM increased by an average of 0.9% per year from 2011 to 2017.

Heavy Rail Train-to-Person Collisions

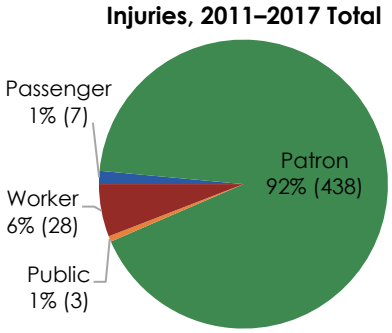


Figure 12. Heavy Rail Train-to-Person Collision Injuries by Person Type, 2011–2017*[*]

Figure 13. Heavy Rail Train-to-Person Collisions per 100M VRM, 2011–2017*[*]

- Patrons accounted for the majority (92%) of injuries resulting from heavy rail train-to-person collisions from 2011 to 2017. SSOAs also reported injuries to 7 passengers, 28 workers, and 3 members of the public during this seven-year period.

*2018 data include events reported under both Part 659 and Part 674 thresholds. These data are therefore not comparable to previous years and have been excluded. See Appendix C for details on rule changes.

- The annual rate of heavy rail train-to-person collisions per 100M VRM increased by an average of 19.3% per year from 2011 to 2017. However, when the unusually low annual rate recorded in 2011 is excluded, these collisions increased at a 3.3% average annual rate.

Light Rail and Streetcar Train-to-Person Collisions

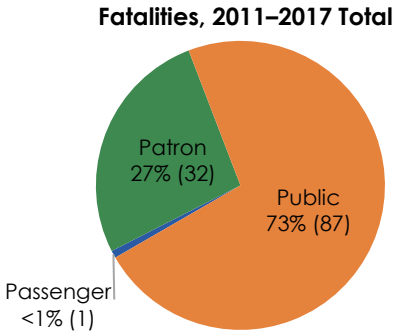


Figure 14. Light Rail and Streetcar Train-to-Person Collision Fatalities by Person Type, 2011–2017*[*]

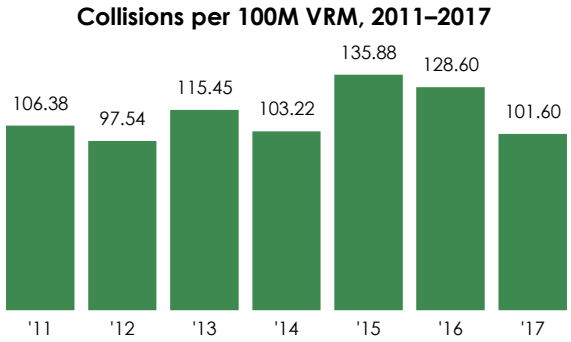


Figure 15. Light Rail and Streetcar Train-to-Person Collisions per 100M VRM, 2011–2017*[*]

- Members of the public accounted for the majority (73%) of fatalities resulting from light rail and streetcar train-to-person collisions from 2011 to 2017. SSOAs also reported 32 patron fatalities and one passenger fatality as a result of these events.
- The annual rate of reported light rail and streetcar train-to-person collisions per 100M VRM decreased by an average of 0.8% per year during the seven-year analyzed period.

*2018 data include events reported under both Part 659 and Part 674 thresholds. These data are therefore not comparable to previous years and have been excluded. See Appendix C for details on rule changes.

Light Rail and Streetcar Train-to-Auto Collisions

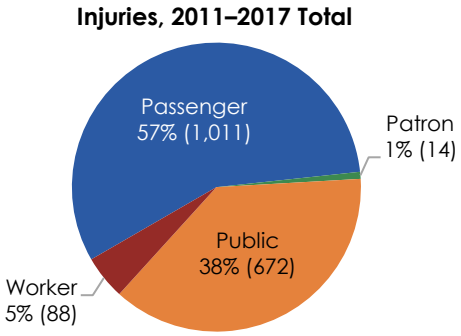


Figure 16. Light Rail and Streetcar Train-to-Auto Collision Injuries by Person Type, 2011–2017*[*]

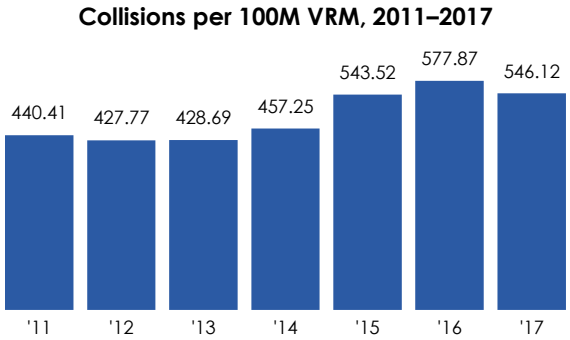


Figure 17. Light Rail and Streetcar Train-to-Auto Collisions per 100M VRM, 2011–2017*[*]

- Passengers accounted for the majority (57%) of light rail and streetcar train-to-auto collision injuries reported in the 2011–2017 period. Public injuries accounted for another 38% of injuries from these collisions.
- During this seven-year period, SSOAs also reported 88 worker injuries (5%) and 14 patron injuries (1%) resulting from light rail and streetcar train-to-auto collisions.
- The annual rate of reported light rail and streetcar train-to-auto collisions increased by an average of 3.7% per year from 2011 to 2017.

*2018 data include events reported under both Part 659 and Part 674 thresholds. These data are therefore not comparable to previous years and have been excluded. See Appendix C for details on rule changes.

Introduction

The Rail Safety Data Report (RSDR) is a data analysis prepared by the Federal Transit Administration (FTA). The goal of the RSDR is to present and summarize rail transit safety and security event data with a focus on patterns and trends in event frequency, fatality, and injury data within the report's period of study. This RSDR presents data reported through the State Safety Oversight (SSO) program for the years 2007 through 2018. The report provides data trends across the 2007–2017 period, which is the longest period of consistent event reporting available. This report also highlights totals and rates from 2018, the most recent year of data available or analysis, and the year that event reporting requirements began to transition.* FTA plans to publish additional RSDRs as future annual transit safety data become available.

Overview of the State Safety Oversight Program

FTA oversees State Safety Oversight Agencies (SSOAs) to ensure a broad, systems-oriented safety strategy for the rail fixed guideway public transportation industry. Through audits, training, and outreach, FTA supports compliance with the SSO regulation at 49 CFR Part 674 (Part 674); professional development of rail transit and State safety managers and staff; and the advancement of system safety principles in the design, engineering, construction, operations, and maintenance of rail transit systems. In accordance with § 674.39(a), SSOAs report a variety of information to FTA, including the rail transit agency (RTA) event data analyzed in this report. This information gives FTA greater insight into rail transit safety performance across the country.

The SSO program excludes rail transit systems that do not meet FTA's definition of public transportation. Specific exclusions by law (49 U.S.C. §§ 5302 and 5329) include sightseeing services, intra-terminal or intra-facility shuttle services (such as airport people movers), and the commuter rail systems subject to the safety jurisdiction of the Federal Railroad Administration (FRA). The SSO program also excludes those rail transit systems that do not receive FTA funding and that do not report their data to the National Transit Database (NTD) for inclusion in the apportionment of formula grants.

State Safety Oversight Community

There are currently 31 SSOAs designated to oversee the safety of 64 rail transit agencies (RTAs) in operation and under construction nationwide. Of these RTAs, this report includes the 58 that were operational between 2007 and 2018. Figure 18 on page 2 and Appendix A identify the SSOAs subject to Part 674 and list the regulated RTAs.

* More details on the changes to reporting criteria in 2018 are available in Appendix C.

State Safety Oversight Community Map

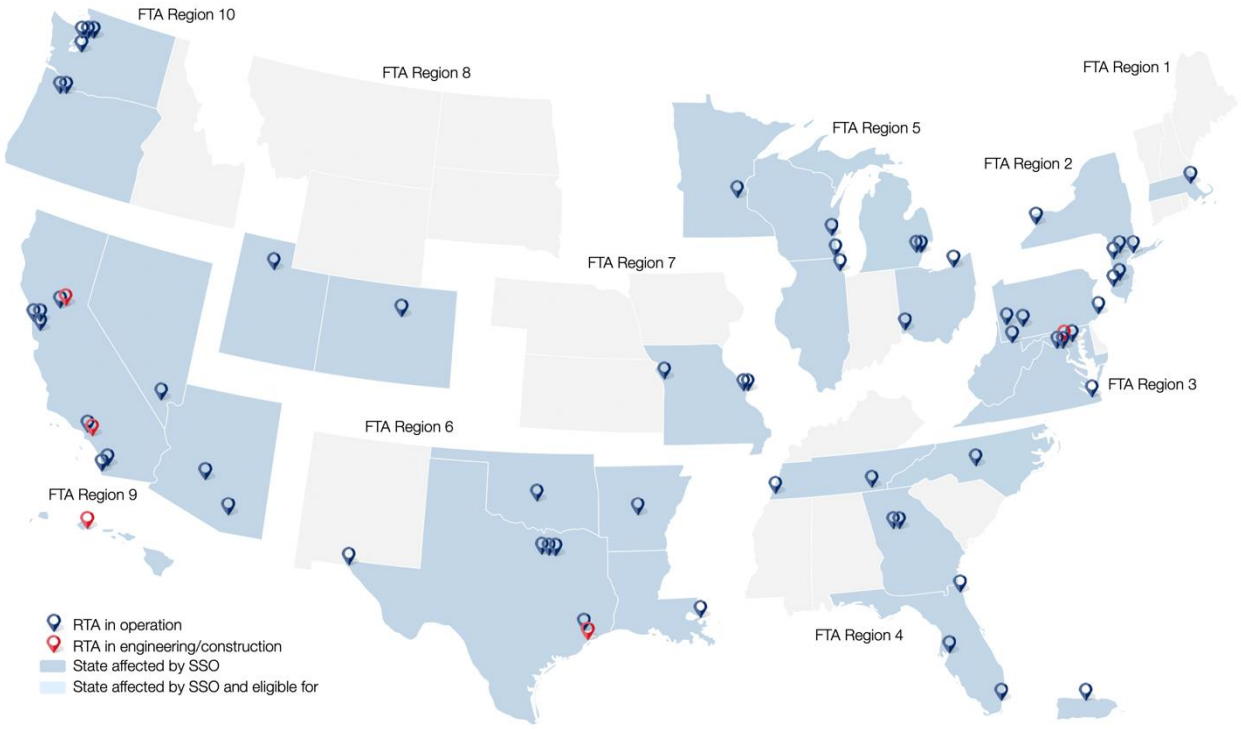


Figure 18. RTA Locations by Region

Operating Rail Transit Agencies

As of the date of this report, there are 58 RTAs in operation across the country and an additional 6 in engineering or under construction. Of these 64 RTAs,

- 14 operate heavy rail,
- 24 operate light rail,
- 3 operate hybrid rail (included in the light rail totals in this analysis),
- 27 operate streetcars,
- 10 operate other rail modes, including
    - 6 automated guideway systems,
    - 3 inclined plane systems, and
    - 1 cable car system.

Ten agencies operate 2 rail modes and 2 agencies (the San Francisco Municipal Railway and San Francisco Bay Area Rapid Transit) operate 3 rail modes, accounting for the difference in total agencies and the sum of modes operated. See Appendix A for a full list of agencies and the modes they operate.

Purpose and Use of This Analysis

Intended Uses

This RSDR analyzes event data collected from SSOAs to provide a snapshot of the safety performance of the rail transit industry (the 64 regulated RTAs) for the twelve-year period of calendar years (CY) 2007 through 2018. Specifically, this report focuses on the types of events that occurred, their consequences in terms of fatalities and injuries, and their likely causes.

This report also standardizes event, fatality, and injury numbers by 100 million vehicle revenue miles (100M VRM), as reported to the NTD, to account for varying service levels in each reporting year and the different levels of service provided by each rail transit mode.

FTA presents these data in this way to provide the general public with an accurate picture of safety performance at RTAs under its oversight. In addition, the data presented in this report may also allow FTA and the industry to identify and analyze areas that could benefit from research, training, and assessments targeted at the situations and conditions that pose the greatest risk of harm to passengers, patrons, employees, and members of the public.

Furthermore, RTAs developing a Public Transportation Agency Safety Plan compliant with 49 CFR Part 673 may find that the analysis methodologies used in this report serve as useful models for some hazard identification and performance measurement activities (once analyses have been tailored to the circumstances of an individual agency).

Limitations

The analyses in this report provide descriptive statistics that show the distribution and trends in rail transit safety outcomes between 2007 and 2018. This report does not draw conclusions on safety outcomes beyond 2018, as the methodologies used are not designed to estimate outcomes outside of the analyzed period.

FTA issued the current SSO regulation, Part 674, on March 16, 2016. At different points of time during the 2018 reporting year, some SSOAs began to report events using Part 674 thresholds once FTA certified the agency under the new regulation. Until that time, each SSOA continued to report event data using the thresholds specified in the previous

SSO regulation at 49 CFR Part 659 (Part 659). Figure 19 below summarizes this transition in reporting requirements.*

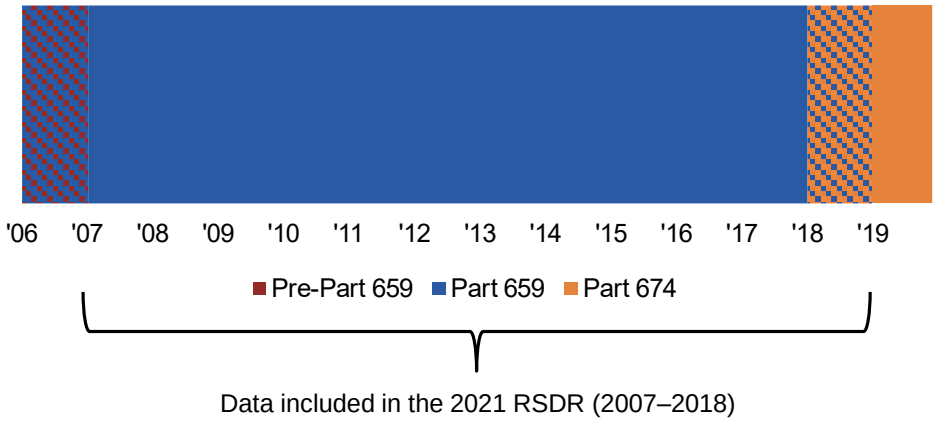


Figure 19. Transitions in Data Reporting Requirements

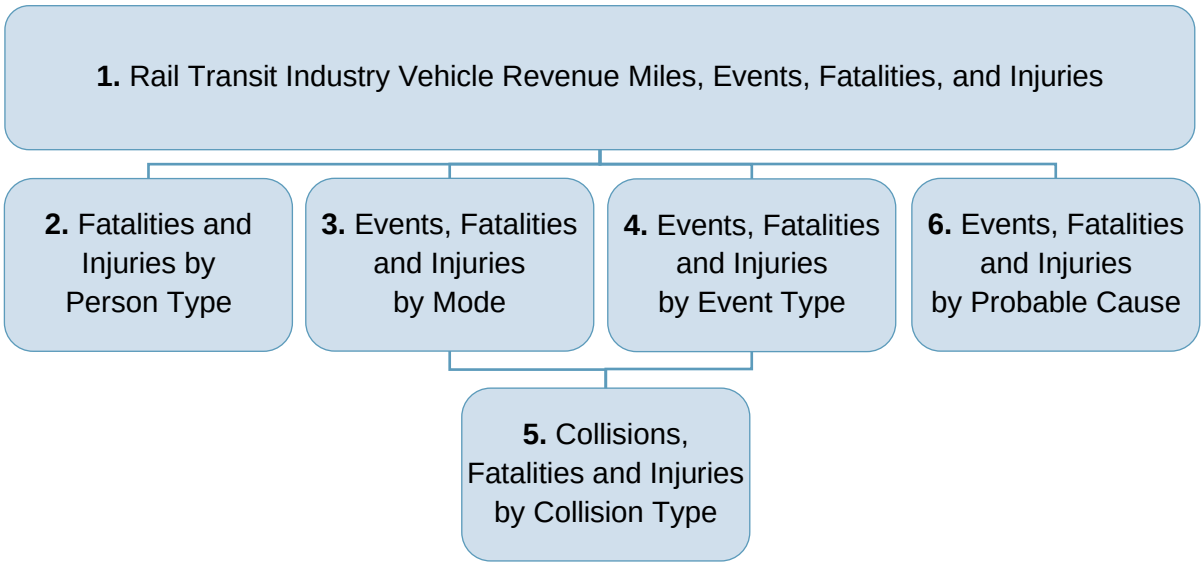
As such, data from 2018 are generally not comparable to previous years due to changes in reporting thresholds for SSOAs certified under Part 674 throughout that year. To account for that transition, this report presents detailed analysis of 2018 data separately from analysis of 2007–2017 data. Time-series presentations do not include 2018 data. This approach ensures that incomparable data are not presented in a manner that would suggest they are comparable and that changes in data distribution and trends due to changes in reporting criteria are not mistaken for changes in safety performance.

The RSDR presents safety performance distributions and trends of the rail transit industry as a whole. For that reason, analyses contained in this RSDR may not be unequivocally entirely comparable to similar analyses conducted at an individual agency or set of agencies, where operational characteristics and other factors may vary.

* More details on the changes to reporting criteria in 2018 are available in Appendix C.

Report Structure

The RSDR begins with an analysis of industry-wide service and safety data trends across the 2007–2018 period. This is followed by more specific analyses where event, fatality, and injury data are analyzed according to person type, rail transit mode, event type, probable cause, and combinations of these categories. The illustration below shows the order in which these analyses appear.



1. Rail Transit Industry Data and Annual Trends

1-1. 2007–2018 VRM (Millions) for Regulated Rail Transit Agencies

VRM (Millions)

'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	'18	Avg	Trend
711.1	732.2	745.8	729.1	720.4	728.7	752.9	757.6	779.6	786.3	799.8	803.5	753.9	

Figure 20. Total VRM (Millions), 2007–2018[1]

- On average, total rail transit industry VRM increased 1.1% per year from 2007 to 2018.

1-2. 2007–2018 Events and Rates per 100M VRM

Events

'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	'18*	Avg†	Trend
769	971	1,029	1,023	1,032	1,000	1,099	1,112	1,395	1,463	1,477	1,211	1,125	

Event Rate per 100M VRM

'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	'18*	Avg†	Trend
108.1	132.6	138.0	140.3	143.3	137.2	146.0	146.8	178.9	186.1	184.7	150.7	150.1	

*2018 data includes events reported under Part 659 and Part 674 reporting thresholds
†Annual average for years 2007–2017

Figure 21. Total Events and Rates per 100M VRM, 2007–2018

- After changes in service levels are adjusted for, the annual event rate increased from 108.1 to 184.7 events per 100M VRM from 2007 to 2017, or a 6.7% average yearly increase. The 2018 event rate of 150.7 events per 100M VRM was not comparable to the 2007–2017 rates due event reporting threshold changes.

1-3. 2007–2018 Fatalities and Rates per 100M VRM

Fatalities

'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	'18*	Avg†	Trend
134	107	145	130	137	156	159	135	152	164	162	188	144	

Fatality Rate per 100M VRM

'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	'18*	Avg†	Trend
18.8	14.6	19.4	17.8	19.0	21.4	21.1	17.8	19.5	20.9	20.3	23.4	19.2	

*2018 data includes events reported under Part 659 and Part 674 reporting thresholds
†Annual average for years 2007–2017

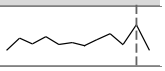
Figure 22. Total Fatalities and Rates per 100M VRM, 2007–2018

[1] This analysis uses rates based on vehicle revenue miles instead of passenger miles because vehicle revenue miles are a more accurate measure of exposure.

- During the 2007–2017 period, the annual fatality rate fluctuated between 14.6 and 21.4 fatalities per 100M VRM. However, the rate was 7.5% higher in 2017 (20.3 per 100M VRM) than in 2007 (18.8).
- In 2018, some SSOAs transitioned to Part 674, which no longer required reporting homicides and some other fatal security events. Despite this fact, the 2018 fatality rate was higher than in any year from 2007 to 2017 (23.4 fatalities per 100M VRM).

1-4. 2007–2018 Injuries and Rates per 100M VRM

Injuries

'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	'18*	Avg†	Trend
569	693	633	704	624	643	610	674	734	621	817	558	666	

Injury Rate per 100M VRM

'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	'18*	Avg†	Trend
80.0	94.6	84.9	96.6	86.6	88.2	81.0	89.0	94.2	79.0	102.2	69.4	88.8	

*2018 data includes events reported under Part 659 and Part 674 reporting thresholds
†Annual average for years 2007–2017

Figure 23. Total Injuries and Rates per 100M VRM, 2007–2018

- The annual injury rate fluctuated during the 2007–2017 period but was 27.7% higher in 2017 (102.2 per 100M VRM) than in 2007 (80.0).
- Part 674 significantly changed the definition of reportable injuries, so the 2018 injury rate (69.4 injuries per 100M VRM) was not comparable to previous years.

1-5. 2018 Rail Transit Industry Data

As mentioned above, event reporting thresholds began to transition in 2018. The table below shows how much of 2018 data was reported under each regulation in force.

	Total Reported	Reported Under Part 659 (%)	Reported Under Part 674 (%)
Events	**1,211**	**912 (75%)**	**299 (25%)**
Fatalities	**188**	**151 (80%)**	**37 (20%)**
Injuries	**558**	**458 (82%)**	**100 (18%)**

Figure 24. 2018 Events, Fatalities, and Injuries by SSO Regulation in Force

- Events no longer reported under Part 674 include homicides; bomb threats; some grade-crossing collisions and collisions with people that did not result in a fatality or serious injury; and non-serious slips, trips, and falls with multiple non-serious injuries.

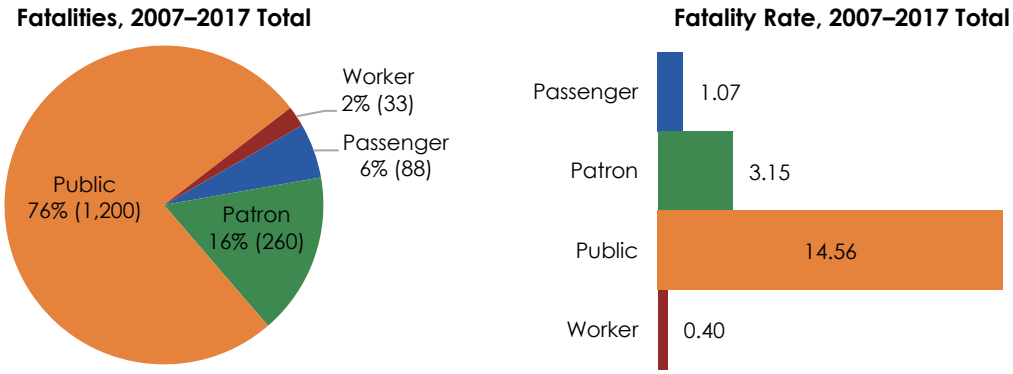
- Newly reportable events under Part 674 included runaway train events, rail-yard derailments, and events that resulted in one serious injury.
- When SSOAs stopped reporting events due to transitions in reporting criteria, they also stopped reporting fatalities and injuries resulting from those events. Conversely, when SSOAs began to report events based on new reporting criteria, they began reporting fatalities and injuries from these events as well.
- Time-series presentations that span these kinds of reporting-criteria transitions may show increases or decreases in reported events, fatalities, or injuries driven entirely by criteria changes. Therefore, detailed analyses in this report do not include 2018 so changes in data distribution and trends resulting from reporting-criteria changes are not mistaken for changes in safety performance.

2. Fatalities and Injuries by Person Type

SSOAs provide categorical data on fatalities and injuries in event reports to FTA. This report analyzes fatality and injury data grouped by the following types of individuals:

- **Passengers** aboard railcars or in the process of boarding or alighting;
- **Patrons**, including all other customers on transit agency property;
- **Workers**, including RTA employees and contractors; and
- **Public**, including pedestrians, automobile drivers, suicides, and trespassers.

2-1. 2007–2017 Fatalities and Rates per 100M VRM by Person Type



Fatalities	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	Avg	Trend
Passenger	7	1	13	9	3	8	6	5	10	16	10	8	
Patron	20	11	13	19	26	35	26	24	18	35	33	24	
Public	105	92	115	97	107	112	119	106	120	111	116	109	
Worker	2	3	4	5	1	1	8	0	4	2	3	3	
All Person Types	134	107	145	130	137	156	159	135	152	164	162	144	

Fatality Rate	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	Avg	Trend
Passenger	1.0	0.1	1.7	1.2	0.4	1.1	0.8	0.7	1.3	2.0	1.3	1.1	
Patron	2.8	1.5	1.7	2.6	3.6	4.8	3.5	3.2	2.3	4.5	4.1	3.2	
Public	14.8	12.6	15.4	13.3	14.9	15.4	15.8	14.0	15.4	14.1	14.5	14.6	
Worker	0.3	0.4	0.5	0.7	0.1	0.1	1.1	0.0	0.5	0.3	0.4	0.4	
All Person Types	18.8	14.6	19.4	17.8	19.0	21.4	21.1	17.8	19.5	20.9	20.3	19.2	

Figure 25. Fatalities and Rates per 100M VRM by Person Type, 2007–2017

- Public fatalities accounted for 76% of fatalities from 2007 to 2017. Public fatalities occurred over three times more frequently than passenger, patron, and worker fatalities combined.
- Patron fatalities accounted for another 16% of fatalities in the eleven-year period, more than passenger and worker fatalities put together.
- In an average year from 2007 to 2017, there were more than twice as many passenger fatalities as worker fatalities.

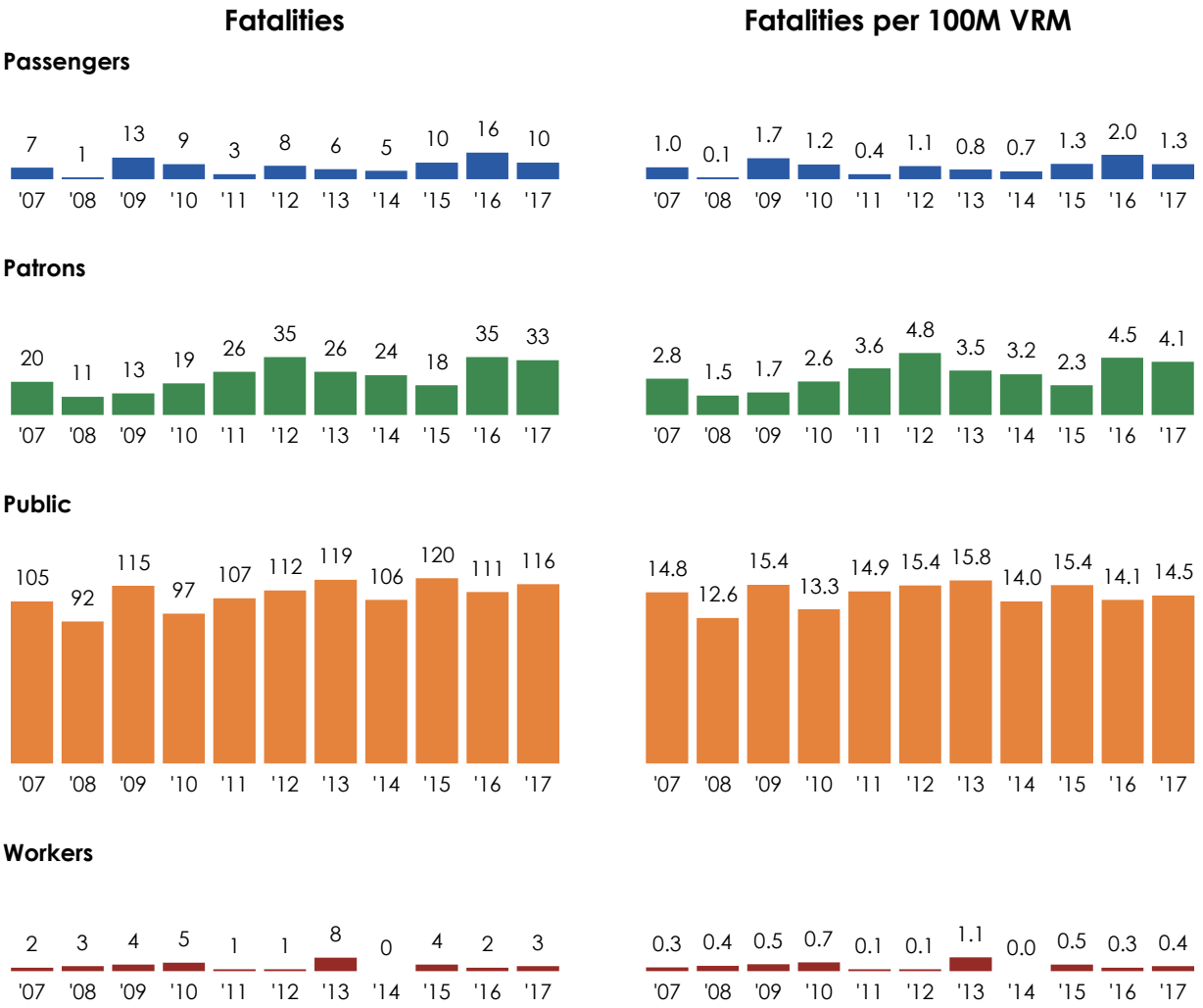
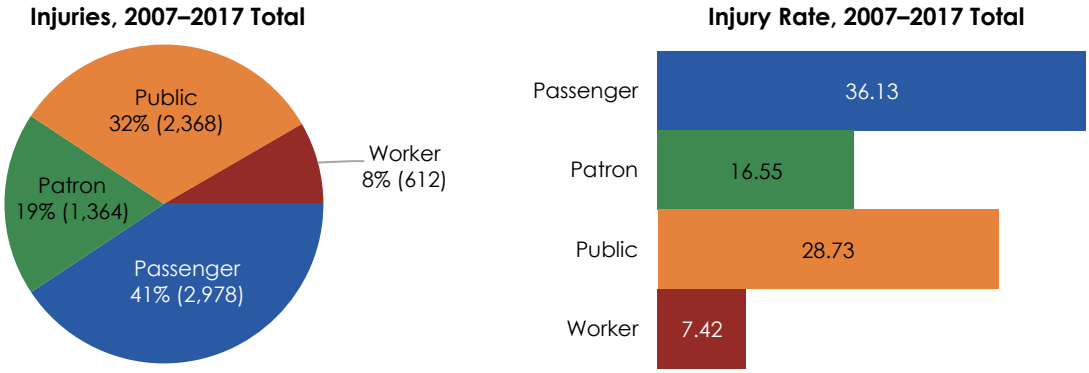


Figure 26. Fatality and Fatality Rate Trends by Person Type, 2007–2017

- The annual passenger fatality rate fluctuated between 0.1 and 2.0 fatalities per 100M VRM from 2007 to 2017.
- The patron fatality rate fluctuated between 1.5 and 4.8 fatalities per 100M VRM and the public fatality rate fluctuated between 12.6 and 15.8 fatalities per 100M VRM during this eleven-year period.
- Except for 2013, there were five or fewer worker fatalities reported in every year of the analyzed period. That was also the only year when SSOAs reported more than one worker fatality per 100M VRM of rail transit service.

2-2. 2007–2017 Injuries and Rates per 100M VRM by Person Type



Injuries	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	Avg	Trend
Passenger	326	318	342	319	262	219	246	238	246	180	282	271	
Patron	30	87	41	104	134	169	111	142	187	169	190	124	
Public	188	251	209	226	180	190	196	230	231	212	255	215	
Worker	25	37	41	55	48	65	57	64	70	60	90	56	
All Person Types	569	693	633	704	624	643	610	674	734	621	817	666	

Injury Rate	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	Avg	Trend
Passenger	45.8	43.4	45.9	43.8	36.4	30.1	32.7	31.4	31.6	22.9	35.3	36.1	
Patron	4.2	11.9	5.5	14.3	18.6	23.2	14.7	18.7	24.0	21.5	23.8	16.5	
Public	26.4	34.3	28.0	31.0	25.0	26.1	26.0	30.4	29.6	27.0	31.9	28.7	
Worker	3.5	5.1	5.5	7.5	6.7	8.9	7.6	8.4	9.0	7.6	11.3	7.4	
All Person Types	80.0	94.6	84.9	96.6	86.6	88.2	81.0	89.0	94.2	79.0	102.2	88.8	

Figure 27. Injuries and Rates per 100M VRM by Person Type, 2007–2017

- More than four of every ten injuries that SSOAs reported between 2007 and 2017 were passenger injuries. These injuries became less frequent over time—the passenger injury rate decreased 2.6% per year on average in the eleven-year period.
- Public injuries accounted for nearly one-third of all injuries from 2007 to 2017. During this time, the public injury rate fluctuated between 25.0 and 34.3 per 100M VRM.
- Patron injuries accounted for 19% of reported injuries and became more frequent in later years of the analyzed period. The annual patron injury rate increased 18.9% per year on average, from 4.2 per 100M VRM in 2007 to 23.8 in 2017.
- Worker injuries accounted for less than 10% of the total but became more frequent in between 2007 and 2017. The worker injury rate increased at an average annual rate of 12.3% in this time frame, from 3.5 injuries per 100M VRM in 2007 to 11.3 in 2017.

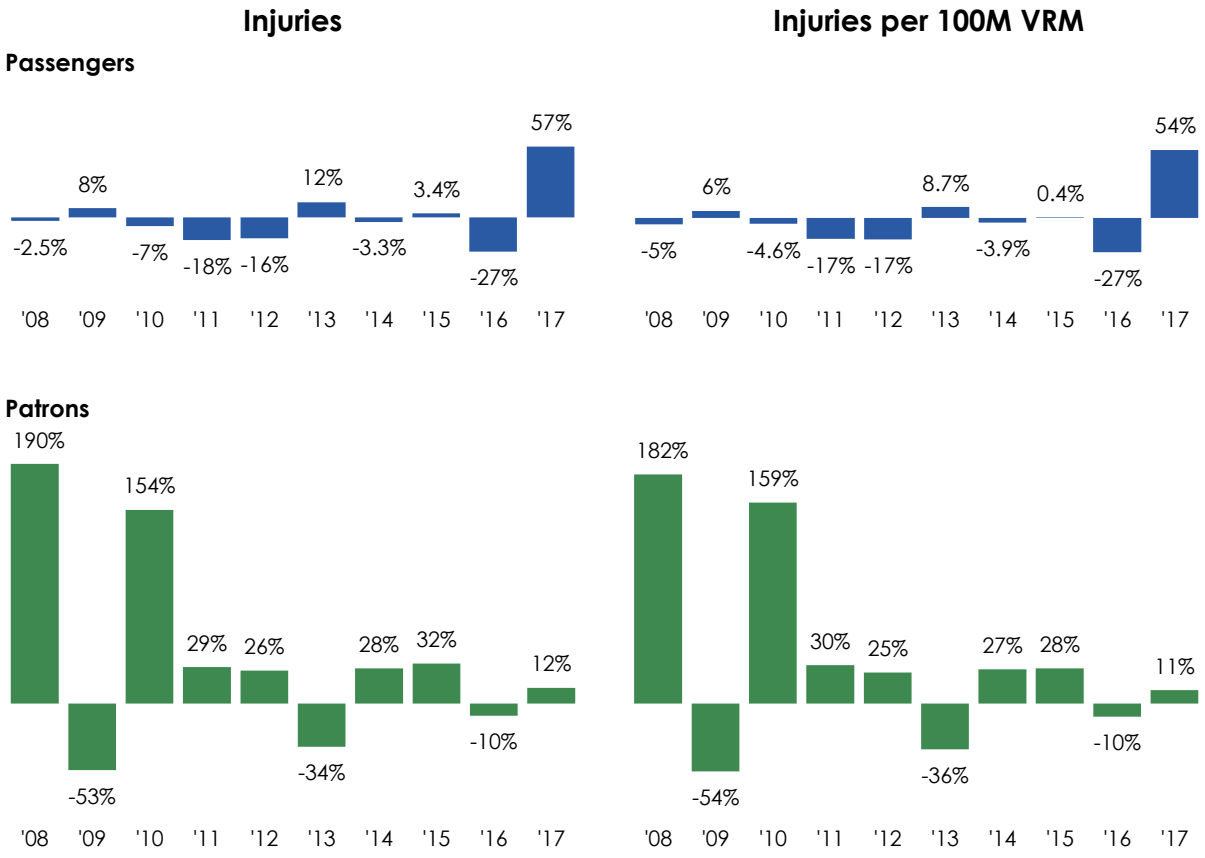


Figure 28. Annual Percent Change in Passenger and Patron Injuries and Injury Rates, 2008–2017

- Compared to the previous year, passenger injuries and the passenger injury rate decreased in six of the ten years prior to reporting-criteria changes (2008 to 2017).
- The passenger injury rate did not vary more than 17% from year to year between 2008 and 2015. This rate varied more after 2015.
- Patron injuries and the patron injury rate increased from the previous year in seven of the ten years from 2008 to 2017.
- Since 2011, the patron injury rate has not varied more than 36% year to year. The patron injury rate varied more in prior years.

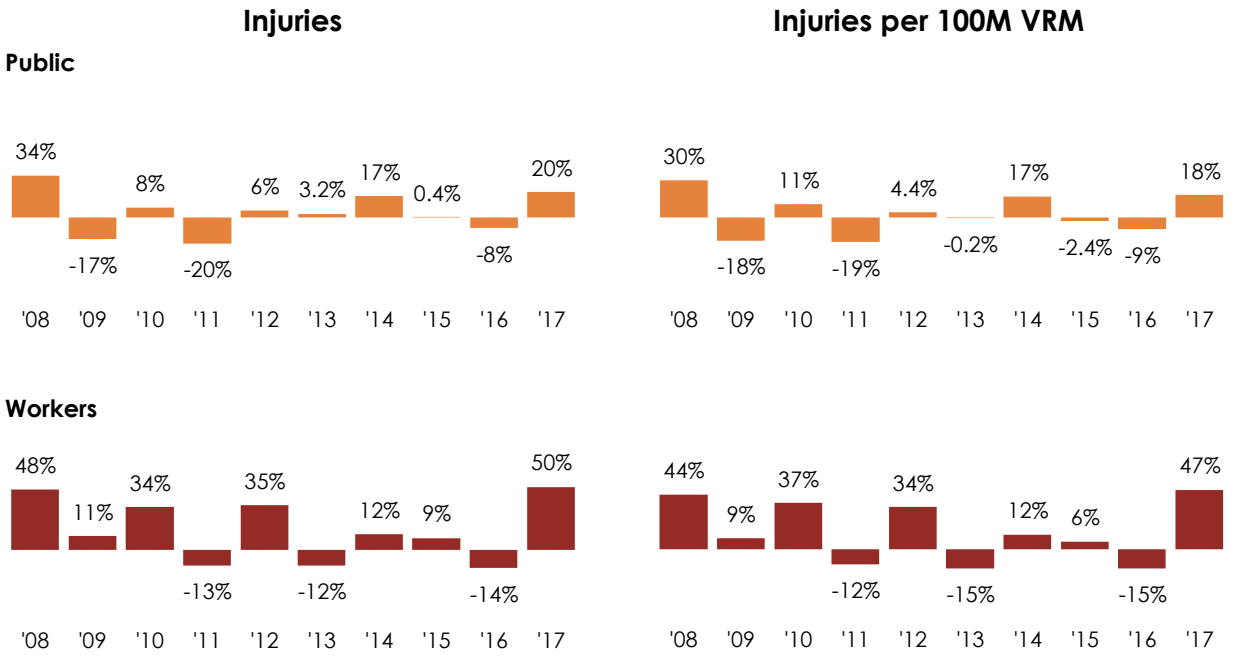


Figure 29. Annual Percent Change in Public and Worker Injuries and Injury Rates, 2008–2017

- The annual public injury rate varied less than 20% from year to year between 2009 and 2017. This rate varied more in earlier years of the analyzed period.
- Both worker injuries and the worker injury rate recorded annual increases for seven of the ten years from 2008 to 2017. In eight of those ten years, the worker injury rate changed at least 12%, either higher or lower, from the previous year.

2-3. 2018 Fatalities and Injuries by Person Type

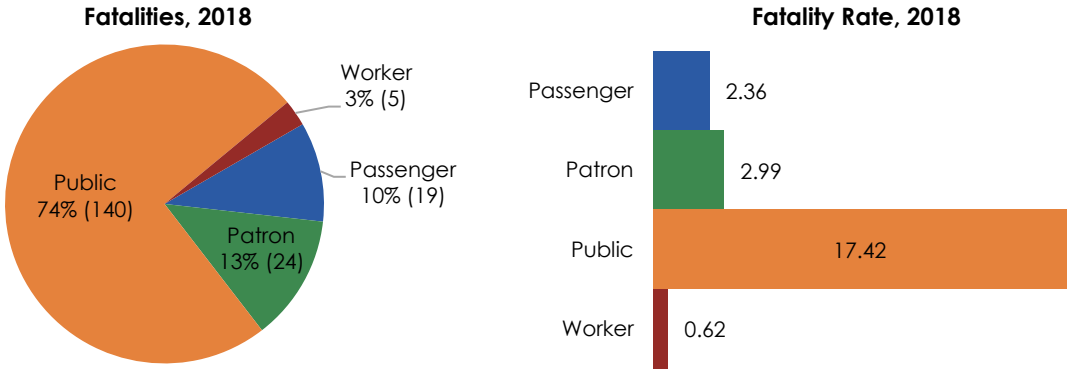


Figure 30. Fatalities and Rates per 100M VRM by Person Type, 2018

- The distribution of 2018 fatalities by person type is similar to that of the 2007–2017 distribution (shown in Figure 25 on page 9). Public fatalities accounted for nearly three out of every four fatalities. The next most common are patron fatalities, then passengers, and lastly workers.

- The 2018 public fatality rate (17.42 fatalities per 100M VRM) was higher than in any year from 2007 to 2017. This was also true of the 2018 passenger fatality rate (2.36 fatalities per 100M VRM).

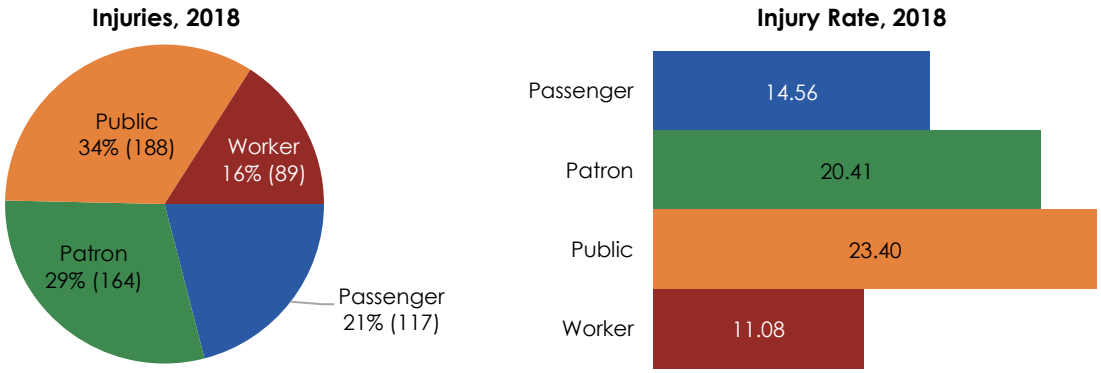


Figure 31. Injuries and Rates per 100M VRM by Person Type, 2018

- SSOAs reported more public injuries than injuries to any other person type in 2018. This only occurred once in the 2007–2017 period, as shown in Figure 27 on page 11.

- In 2018, the annual patron injury rate was 20.41 injuries per 100M VRM, 40% higher than the annual passenger injury rate (14.56). The passenger injury rate was higher than the patron injury rate each year from 2007 to 2017.

- SSOAs reported 89 worker injuries in 2018, or 11.08 per 100M VRM.

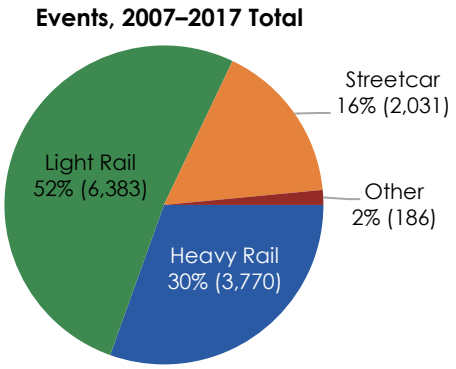
3. Events by Mode

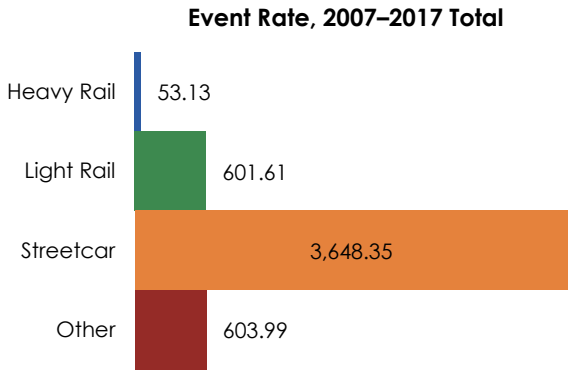
FTA divides rail transit service into nine distinct modes. Seven modes fall under the SSO program, while the FRA has safety oversight for the remaining two (commuter rail and Alaska railroad). This report groups the seven SSO-applicable modes into four modal categories for analysis purposes. See Appendix B for details on these modal groupings. The analyses in this section present the trend and distribution of events using the four modal categories shown below.

Mode	Description
Heavy Rail	Local rail service typically characterized by long trains, exclusive right-of-way (ROW), and powered by a third rail.
Light Rail	Local rail service typically characterized by shorter trains, a mix of street-running and exclusive ROW with grade crossings and powered by overhead wires.
Streetcar	Local rail service typically characterized by street running, single-car trains powered by overhead wires.
Other	Any other local rail services with unique operating characteristics (cable cars, inclined planes, monorails, and automated guideway systems.)

Table 1. Modal Categories

3-1. 2007–2017 Events and Rates per 100M VRM by Mode



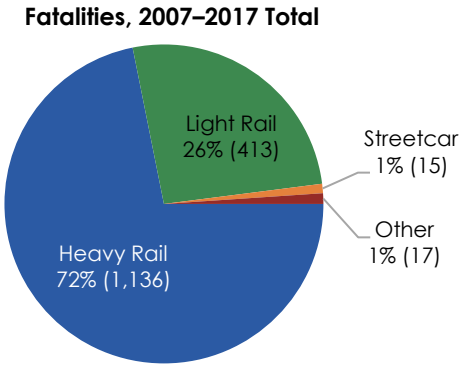


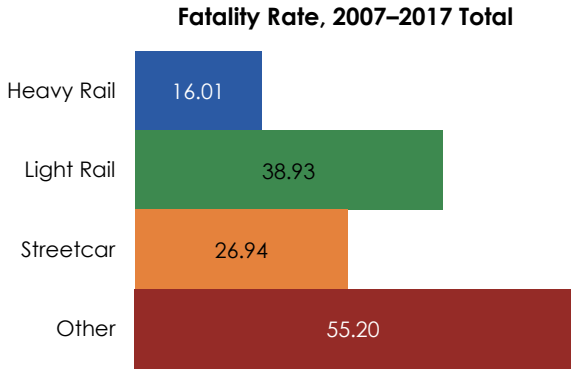
Events	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	Avg	Trend
Heavy Rail	250	229	265	362	369	349	360	328	434	401	423	343	
Light Rail	412	500	529	473	481	513	576	628	742	750	779	580	
Streetcar	96	237	232	168	165	120	145	132	197	282	257	185	
Other	11	5	3	20	17	18	18	24	22	30	18	17	
All Modes	769	971	1,029	1,023	1,032	1,000	1,099	1,112	1,395	1,463	1,477	1,125	
Event Rate	**'07**	**'08**	**'09**	**'10**	**'11**	**'12**	**'13**	**'14**	**'15**	**'16**	**'17**	**Avg**	**Trend**
Heavy Rail	39.9	35.6	40.5	57.0	59.1	55.6	55.8	50.9	65.5	60.5	63.1	53.1	
Light Rail	530.5	617.2	632.0	546.9	539.9	547.4	571.2	595.7	684.5	655.8	647.6	601.6	
Streetcar	2,039.8	4,448.9	4,486.9	3,286.5	3,361.6	2,550.1	3,002.4	2,667.3	4,039.6	5,229.7	4,515.4	3,648.3	
Other	450.9	188.5	124.9	843.7	728.5	754.7	704.6	717.7	648.3	856.7	526.6	604.0	
All Modes	108.1	132.6	138.0	140.3	143.3	137.2	146.0	146.8	178.9	186.1	184.7	150.1	

Figure 32. Events and Rates per 100M VRM by Mode, 2007–2017

- Heavy rail modes accounted for 30% of events reported from 2007 to 2017. During that eleven-year period, the annual number of heavy rail events reported per 100M VRM of service increased at a 4.7% annual average rate.
- Light rail modes accounted for another 52% of events reported from 2007 to 2017. The annual light rail event rate fluctuated between 530.5 and 684.5 events per 100M VRM during those eleven years.
- Streetcar modes accounted for 16% of 2007–2017 events, but annual streetcar event rates fluctuated between 2,039.8 and 5,229.7 events per 100M VRM during this time.
- In ten of the eleven years of the analyzed period, SSOAs reported fewer streetcar events than heavy rail or light rail events, but the streetcar mode had the highest event rate of all modes.

3-2. 2007–2017 Fatalities and Rates per 100M VRM by Mode





Fatalities	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	Avg	Trend
Heavy Rail	101	83	107	105	99	107	120	95	100	117	102	103	
Light Rail	29	16	37	21	36	47	38	38	49	45	57	38	
Streetcar	3	3	0	1	1	1	0	1	3	1	1	1	
Other	1	5	1	3	1	1	1	1	0	1	2	2	
All Modes	134	107	145	130	137	156	159	135	152	164	162	144	

Fatality Rate	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	Avg	Trend
Heavy Rail	16.1	12.9	16.3	16.5	15.9	17.0	18.6	14.8	15.1	17.6	15.2	16.0	
Light Rail	37.3	19.8	44.2	24.3	40.4	50.2	37.7	36.0	45.2	39.4	47.4	38.9	
Streetcar	63.7	56.3	0.0	19.6	20.4	21.3	0.0	20.2	61.5	18.5	17.6	26.9	
Other	41.0	188.5	41.6	126.6	42.9	41.9	39.1	29.9	0.0	28.6	58.5	55.2	
All Modes	18.8	14.6	19.4	17.8	19.0	21.4	21.1	17.8	19.5	20.9	20.3	19.2	

Figure 33. Fatalities and Rates per 100M VRM by Mode, 2007–2017

- Heavy rail modes accounted for 72% of all fatalities but had the lowest fatality rate among all modes shown during the 2007–2017 period.
- Light rail modes accounted for 26% of 2007–2017 fatalities. After different service levels among modes are accounted for, the light rail fatality rate for the eleven-year period—38.93 fatalities per 100M VRM—was higher than the comparable rates of heavy rail and streetcar fatalities.
- "Other" modes, including cable cars, monorails, and automated guideway systems, reported the most fatalities per 100M VRM of service in the 2007–2017 period but accounted for only 1% of all fatalities reported during that time.
- Streetcar modes accounted for 1% of all fatalities during the 2007–2017 period.

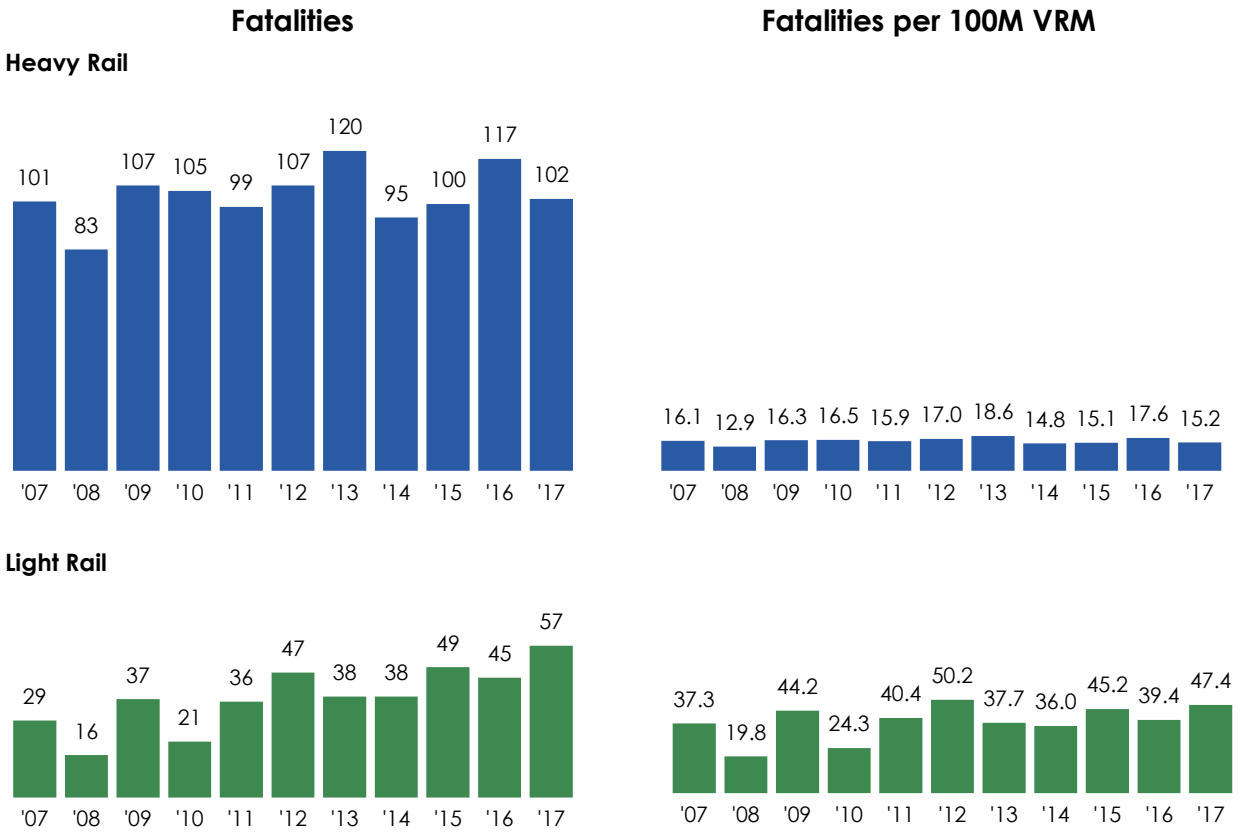


Figure 34. Heavy Rail and Light Rail Fatality and Fatality Rate Trends, 2007–2017

- The annual heavy rail fatality rate fluctuated between 12.9 and 18.6 fatalities per 100M VRM during the 2007–2017 period.
- The 57 light rail fatalities recorded in 2017 were higher than any other annual count during the eleven-year period. However, when normalized by service provided, the 2017 light rail fatality rate was lower than the 2012 rate.
- Despite fluctuations, the 47.4 light rail fatalities per 100M VRM recorded in 2017 reflected a 2.4% annual average increase from 2007.

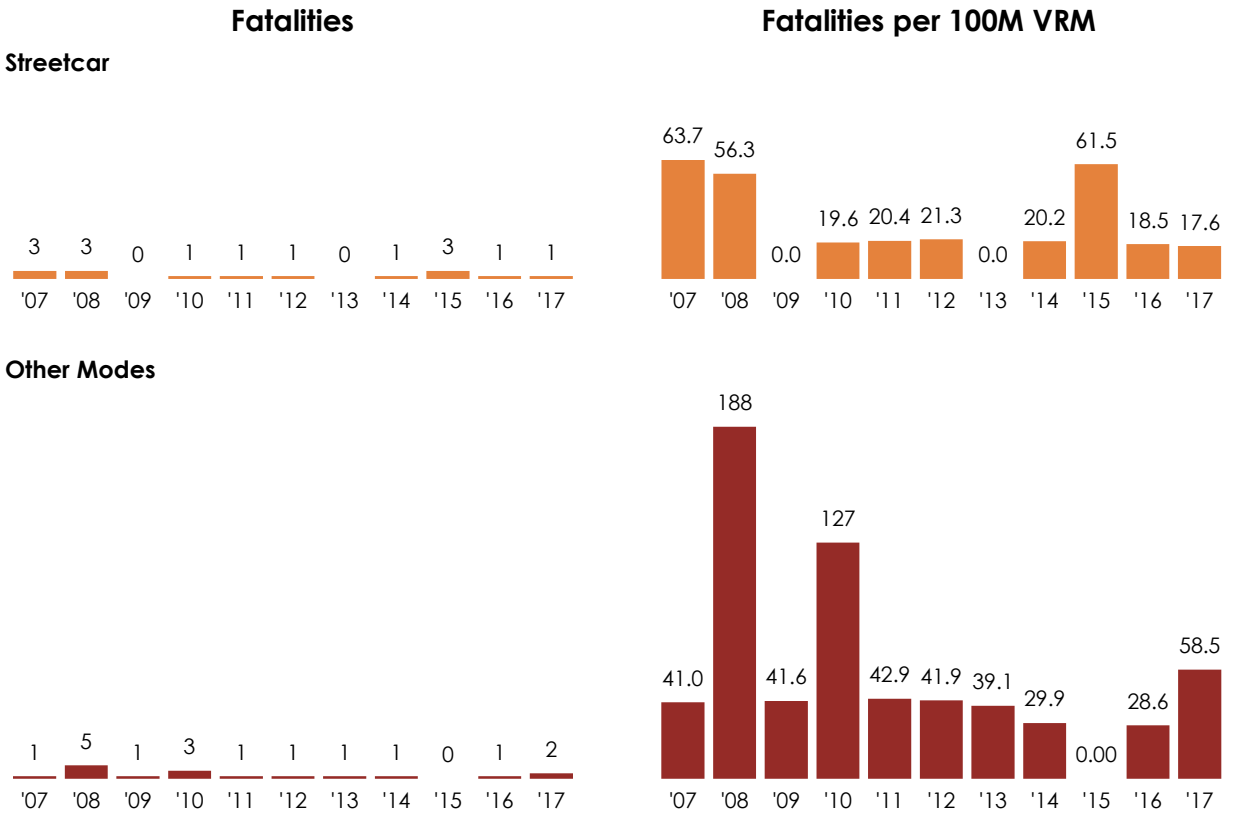
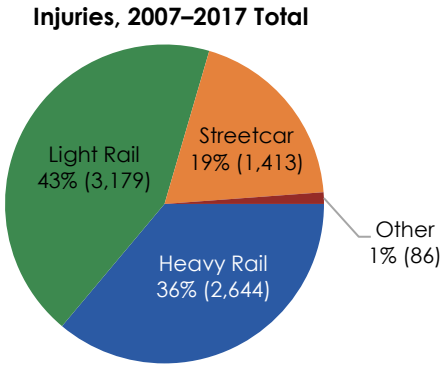
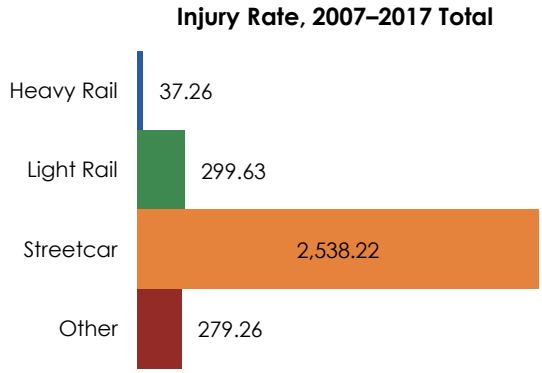


Figure 35. Streetcar and "Other" Modes Fatality and Fatality Rate Trends, 2007–2017

- SSOAs reported at least one streetcar fatality in nine of the eleven years in the analyzed period, but never more than three fatalities in a single year.
- SSOAs reported at least one fatality for "other" modes in ten of the eleven years in the analyzed period. Except for 2008, SSOAs reported three or fewer "other" mode fatalities each year of the analyzed period.

3-3. 2007–2017 Injuries and Rates per 100M VRM by Mode





Injuries	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	Avg	Trend
Heavy Rail	138	180	189	246	210	233	225	238	354	247	384	240	
Light Rail	247	297	305	289	254	316	252	346	278	293	302	289	
Streetcar	182	216	139	142	156	81	121	83	94	76	123	128	
Other	2	0	0	27	4	13	12	7	8	5	8	8	
All Modes	569	693	633	704	624	643	610	674	734	621	817	666	

Injury Rate	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	Avg	Trend
Heavy Rail	22.0	28.0	28.9	38.7	33.7	37.1	34.9	37.0	53.4	37.3	57.3	37.3	
Light Rail	318.0	366.6	364.4	334.1	285.1	337.2	249.9	328.2	256.5	256.2	251.1	299.6	
Streetcar	3,867.1	4,054.7	2,688.2	2,777.9	3,178.3	1,721.3	2,505.4	1,677.2	1,927.5	1,409.4	2,161.1	2,538.2	
Other	82.0	0.0	0.0	1,139.0	171.4	545.1	469.7	209.3	235.7	142.8	234.1	279.3	
All Modes	80.0	94.6	84.9	96.6	86.6	88.2	81.0	89.0	94.2	79.0	102.2	88.8	

Figure 36. Injuries and Rates per 100M VRM by Mode, 2007–2017

- Light rail modes accounted for 43% of all rail injuries reported from 2007 to 2017. Once the different service levels between modes are accounted for, there were 299.63 light rail injuries for every 100M VRM of service during this eleven-year period.
- Heavy rail modes accounted for 36% of rail injuries during the analyzed period. There were 37.26 injuries reported for every 100M VRM of heavy rail service from 2007 to 2017, less than the comparable rate for any other mode.
- Streetcar modes accounted for 19% of rail injuries reported from 2007 to 2017. After normalizing by streetcar service levels, this came to 2,538.22 injuries per 100M VRM.
- In nine of the eleven years from 2007 to 2017, SSOAs reported fewer injuries at streetcar modes than at heavy rail and light rail modes, but the streetcar injury rate was higher than the injury rates reported by the other two modes.

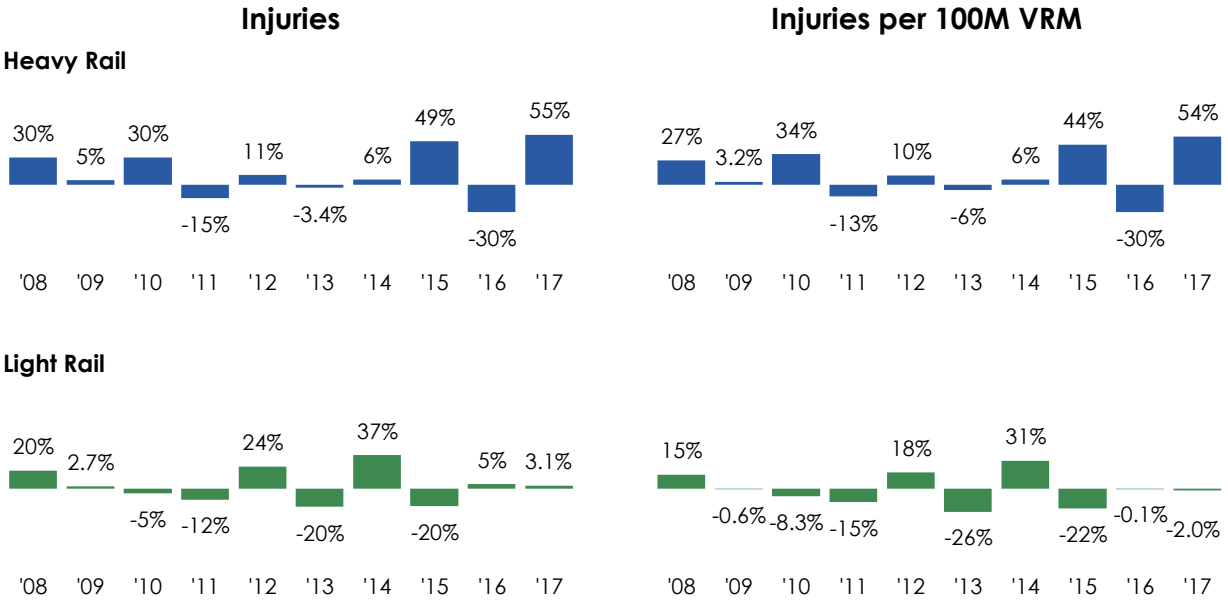


Figure 37. Annual Percent Change in Heavy Rail and Light Rail Injuries and Injury Rates per 100M VRM, 2008–2017

(a change from 0 is represented as a 100% increase in the charts above)

- During the analyzed period, the yearly heavy rail injury count and the annual heavy rail injury rate increased from the previous year seven times and decreased three times.
- From 2007 to 2017, the heavy rail injury rate increased at an average rate of 10% per year.
- The annual light rail injury rate decreased from the previous year seven times during the 2007–2017 period and increased three times.
- During the 2007–2017 period, the light rail injury rate decreased at an average rate of 2.3% per year.

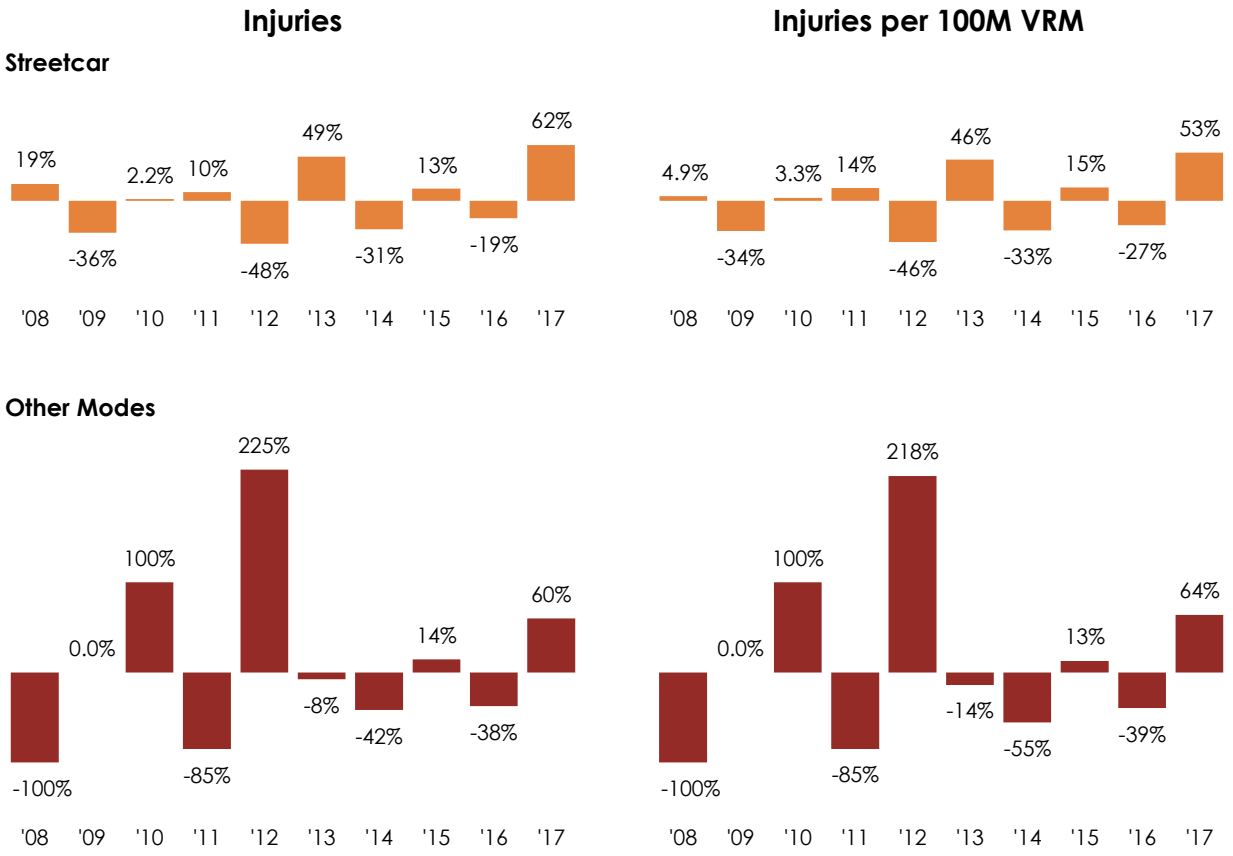


Figure 38. Annual Percent Change in Streetcar and "Other" Mode Injuries and Injury Rates per 100 VRM, 2008–2017

(a change from 0 is represented as a 100% increase in the charts above)

- The annual streetcar injury count and rate increased from the previous year six times and decreased four times, during the analyzed period.
- The 2,161.1 streetcar injuries reported per 100M VRM in 2017 reflected a 5.7% average annual decrease since 2007.
- The "other" mode injury rate reached 1,139.0 injuries reported per 100M VRM in 2010, which was the peak year in the analyzed period. Despite fluctuations, the "other" mode injury rate did not reach even half this level in the following years of the analyzed period (2011 to 2017).

3-4. 2018 Events, Fatalities, and Injuries by Mode

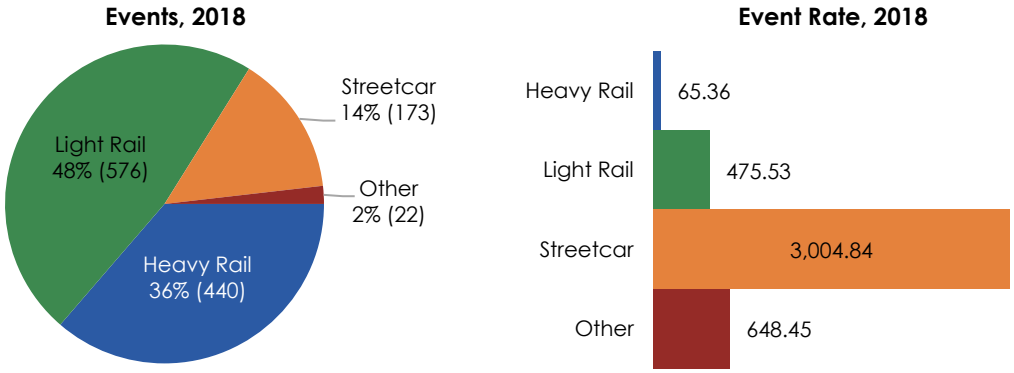


Figure 39. Events and Rates per 100M VRM by Mode, 2018

- The distribution of 2018 events by mode is similar to that of the 2007–2017 period. Light rail modes reported 48% of all events, with heavy rail modes reporting the next highest proportion (36%). Also similar to the 2007–2017 period, streetcar modes reported more events for every 100M VRM of service than any other mode in 2018.

- The 2018 heavy rail event rate of 65.36 events per 100M VRM was higher than any year in the 2007–2017 period. In contrast, the 475.53 events reported per 100M VRM of light rail service was fewer than in any of the previous eleven years.

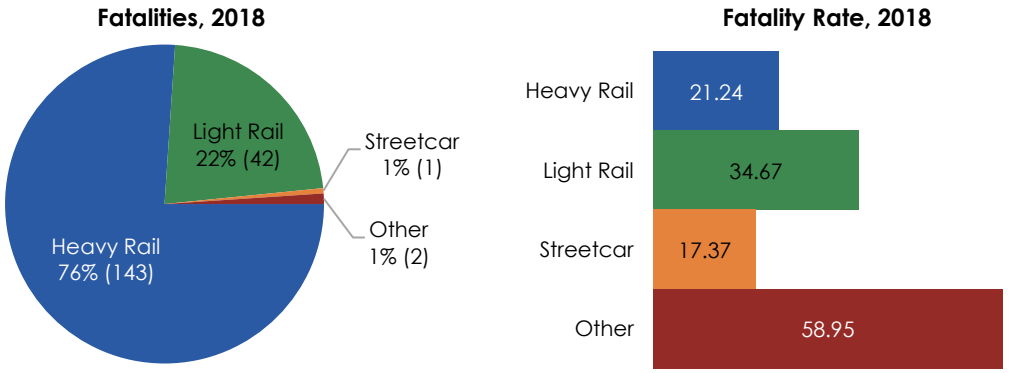


Figure 40. Fatalities and Rates per 100M VRM by Mode, 2018

- Most fatalities in 2018 were heavy rail fatalities, similar to the 2007–2017 period. However, the 21.24 heavy rail fatalities per 100M VRM of service in 2018 was more than the previous eleven years.

- Light rail fatalities accounted for 22% of all fatalities reported in 2018, slightly less than the 26% that was typical in the 2007–2017 period (see Figure 33 on page 17).

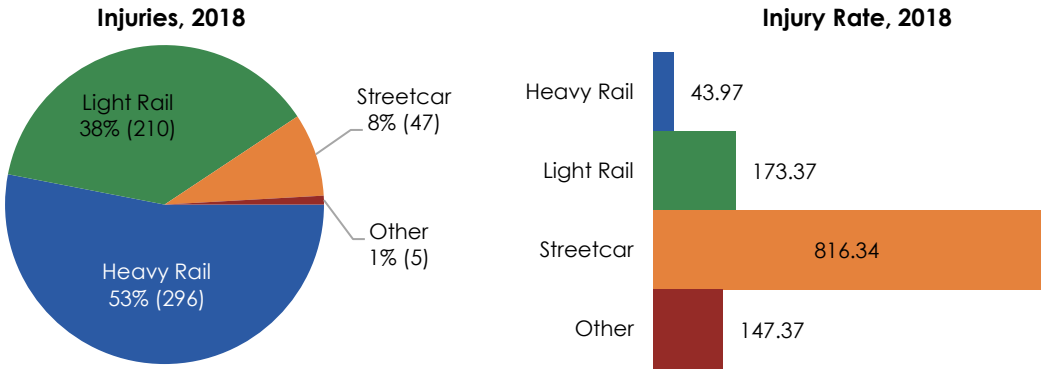


Figure 41. Injuries and Rates per 100M VRM by Mode, 2018

- Heavy rail injuries accounted for 53% of injuries reported by SSOAs in 2018, a larger proportion than the 36% this mode accounted for in the 2007–2017 period. However, the 43.97 heavy rail injuries per 100M VRM was less than the 57.3 reported in 2017, the peak of that eleven-year period.
- Together, light rail and streetcar injuries accounted for 46% of 2018 injuries, a smaller share of all injuries than in the 2007–2017 period, when these modes accounted for 62% of injuries.
- The light rail and streetcar injury rates recorded in 2018 (173.37 and 816.34 injuries per 100M VRM respectively) were lower than the corresponding rates for every year from 2007 to 2017.

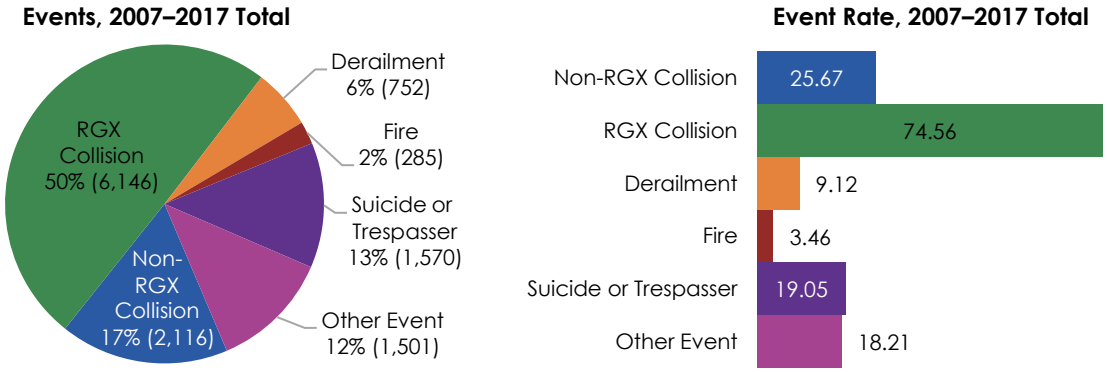
4. Events by Event Type

During the analyzed period, SSOAs reported all events that met at least one threshold defined in 49 CFR § 674.33(a), or previously defined in 49 CFR § 659.33(a). These events include collisions between trains, pedestrian strikes, derailments, and evacuations, among others. SSOAs characterize each event reported to FTA using a variety of type and cause categories. Based on these submissions, analysts then group events into the six categories shown below. (See Appendix B for more details on event type grouping.) The analyses present the trend and distributions of events, fatalities, and injuries by these six event types.

Event Type	Description
Collision: Rail Grade Crossing (RGX)	A collision between a rail transit train and any object or person that occurs at a grade crossing or street intersection. Suicide and trespassing events are excluded.
Collision: Non-Rail Grade Crossing (Non-RGX)	A collision between a rail transit train and any object or person that does not occur at a grade crossing or street intersection. Suicide and trespassing events are excluded.
Derailment	Derailment of a rail transit train.
Fire	Fires on transit agency property.
Suicide or Trespasser	All events resulting from suicide attempts and trespassing, including events involving collisions with a rail transit train.
Other Event	Any other event, including but not limited to security events, slips, falls, and medical events, that surpasses a reporting threshold.

Table 2. Event Types

4-1. 2007–2017 Events and Rates per 100M VRM by Event Type



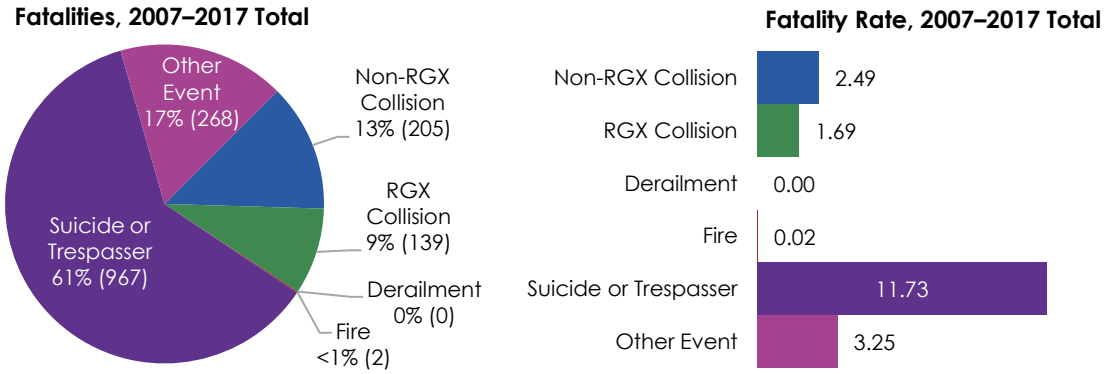
Events	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	Avg	Trend
Non-RGX Collision	99	125	168	178	189	201	210	204	248	236	258	192	
RGX Collision	342	537	518	490	462	458	519	577	696	786	761	559	
Derailment	67	71	71	48	60	52	59	57	80	87	100	68	
Fire	37	28	35	33	32	11	20	23	29	17	20	26	
Suicide or Trespasser	106	109	157	130	135	143	151	133	154	166	186	143	
Other Event	118	101	80	144	154	135	140	118	188	171	152	136	
All Event Types	769	971	1,029	1,023	1,032	1,000	1,099	1,112	1,395	1,463	1,477	1,125	

Event Rate	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	Avg	Trend
Non-RGX Collision	13.9	17.1	22.5	24.4	26.2	27.6	27.9	26.9	31.8	30.0	32.3	25.7	
RGX Collision	48.1	73.3	69.5	67.2	64.1	62.9	68.9	76.2	89.3	100.0	95.2	74.6	
Derailment	9.4	9.7	9.5	6.6	8.3	7.1	7.8	7.5	10.3	11.1	12.5	9.1	
Fire	5.2	3.8	4.7	4.5	4.4	1.5	2.7	3.0	3.7	2.2	2.5	3.5	
Suicide or Trespasser	14.9	14.9	21.1	17.8	18.7	19.6	20.1	17.6	19.8	21.1	23.3	19.0	
Other Event	16.6	13.8	10.7	19.7	21.4	18.5	18.6	15.6	24.1	21.7	19.0	18.2	
All Event Types	108.1	132.6	138.0	140.3	143.3	137.2	146.0	146.8	178.9	186.1	184.7	150.1	

Figure 42. Events and Rates per 100M VRM by Event Type, 2007–2017

- SSOAs reported collisions to FTA more often than any other type of event during this analyzed period. Collisions account for over two-thirds of all collisions reported during the analyzed period.
- Suicide and trespasser events accounted for another 13% of events reported by SSOAs from 2007 to 2017.
- Derailments and fires accounted for 6% and 2% of all 2007–2017 events.

4-2. 2007–2017 Fatalities and Rates per 100M VRM by Event Type



Fatalities	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	Avg	Trend
Non-RGX Collision	11	6	21	14	20	28	20	26	21	17	21	19	
RGX Collision	11	9	15	7	10	15	10	14	20	11	17	13	
Derailment	0	0	0	0	0	0	0	0	0	0	0	0	
Fire	0	0	0	0	0	1	1	0	0	0	0	0	
Suicide or Trespasser	87	72	95	81	88	84	98	85	91	95	91	88	
Other Event	25	20	14	28	19	28	30	10	20	41	33	24	
All Event Types	134	107	145	130	137	156	159	135	152	164	162	144	

Fatality Rate	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	Avg	Trend
Non-RGX Collision	1.5	0.8	2.8	1.9	2.8	3.8	2.7	3.4	2.7	2.2	2.6	2.5	
RGX Collision	1.5	1.2	2.0	1.0	1.4	2.1	1.3	1.8	2.6	1.4	2.1	1.7	
Derailment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Fire	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	
Suicide or Trespasser	12.2	9.8	12.7	11.1	12.2	11.5	13.0	11.2	11.7	12.1	11.4	11.7	
Other Event	3.5	2.7	1.9	3.8	2.6	3.8	4.0	1.3	2.6	5.2	4.1	3.3	
All Event Types	18.8	14.6	19.4	17.8	19.0	21.4	21.1	17.8	19.5	20.9	20.3	19.2	

Figure 43. Fatalities and Rates per 100M VRM by Event Type, 2007–2017

- Suicide and trespasser events resulted in 61% of fatalities in the 2007–2017 period.
- Collisions, which exclude suicide and trespasser events, resulted in 22% of fatalities in the eleven-year period. Less than half of these fatalities occurred at an RGX in every year from 2009 to 2017.
- Another 17% of fatalities in the 2007–2017 period resulted from “other” events, such as security events, slips, falls, and medical events.
- There were two fire fatalities and zero derailment fatalities reported from 2007 to 2017.

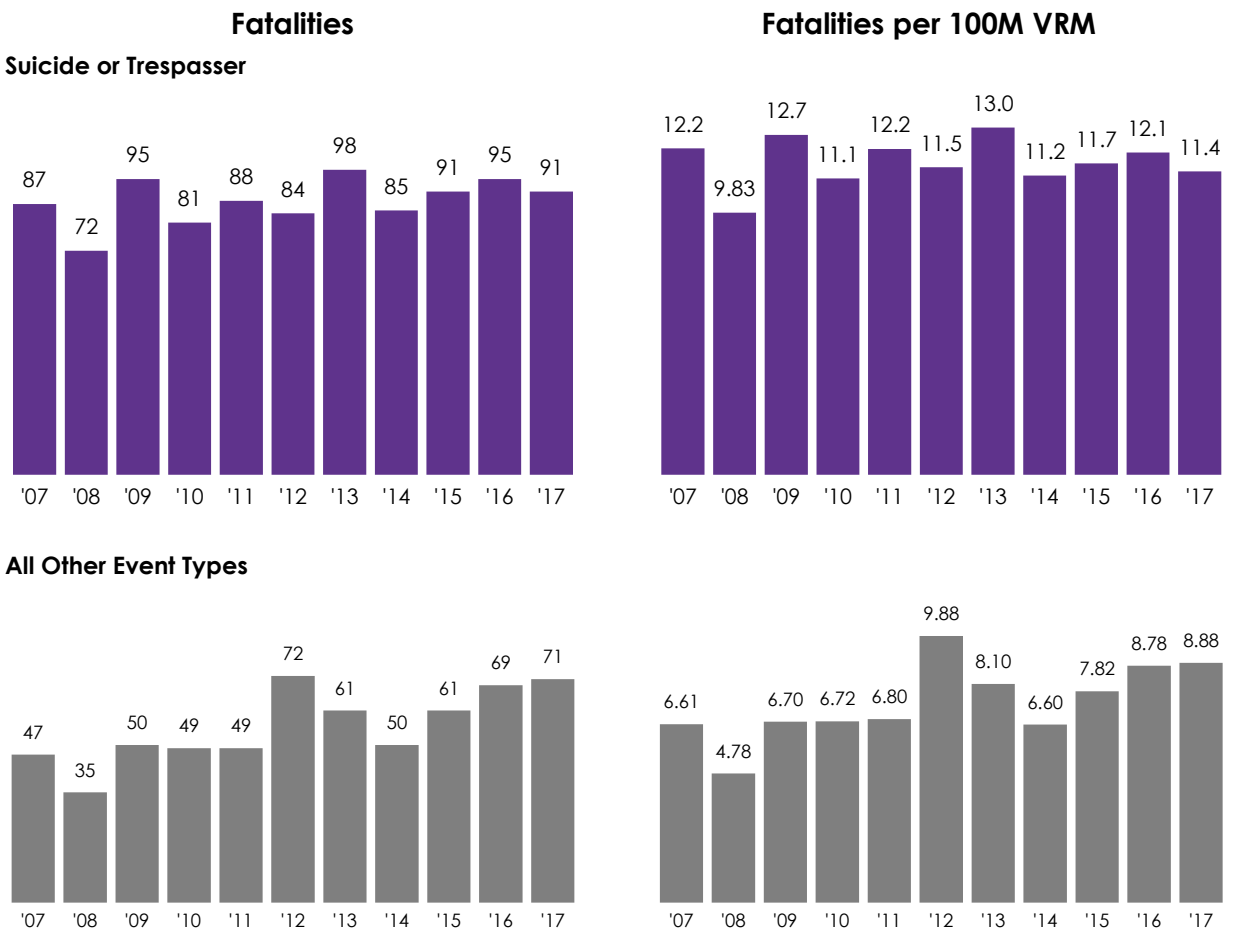
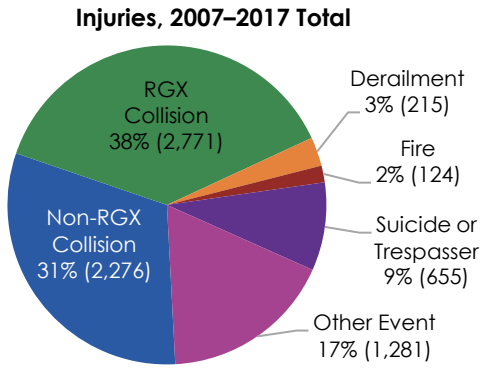
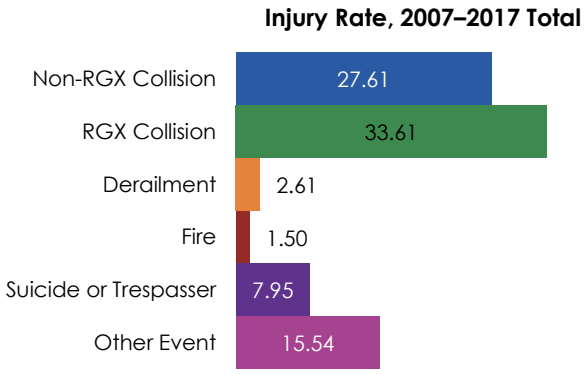


Figure 44. Fatality and Fatality Rate Trends by Event Type, 2007–2017

- Suicide and trespasser events accounted for the majority of fatalities in each year of the analyzed period.
- Excluding suicide and trespasser events, SSOAs reported an average of 7.45 fatalities per 100M VRM in the 2007–2017 period.
- The suicide or trespasser fatality rate fluctuated between 9.83 and 13.0 fatalities per 100M VRM during the eleven-year period from 2007 to 2017.
- The annual rate of rail fatalities, excluding suicide and trespasser events, fluctuated between 4.78 and 9.88 fatalities per 100M VRM during the same time frame.

4-3. 2007–2017 Injuries and Rates per 100M VRM by Event Type





Injuries	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	Avg	Trend
Non-RGX Collision	120	242	317	218	207	161	200	199	185	151	276	207	
RGX Collision	295	228	188	276	248	270	243	292	244	252	235	252	
Derailment	26	30	29	6	9	11	3	45	3	12	41	20	
Fire	3	15	4	41	8	3	17	8	9	6	10	11	
Suicide or Trespasser	22	41	66	50	50	60	61	49	69	78	109	60	
Other Event	103	137	29	113	102	138	86	81	224	122	146	116	
All Event Types	569	693	633	704	624	643	610	674	734	621	817	666	

Injury Rate	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	Avg	Trend
Non-RGX Collision	16.9	33.1	42.5	29.9	28.7	22.1	26.6	26.3	23.7	19.2	34.5	27.6	
RGX Collision	41.5	31.1	25.2	37.9	34.4	37.1	32.3	38.5	31.3	32.0	29.4	33.6	
Derailment	3.7	4.1	3.9	0.8	1.2	1.5	0.4	5.9	0.4	1.5	5.1	2.6	
Fire	0.4	2.0	0.5	5.6	1.1	0.4	2.3	1.1	1.2	0.8	1.3	1.5	
Suicide or Trespasser	3.1	5.6	8.8	6.9	6.9	8.2	8.1	6.5	8.9	9.9	13.6	7.9	
Other Event	14.5	18.7	3.9	15.5	14.2	18.9	11.4	10.7	28.7	15.5	18.3	15.5	
All Event Types	80.0	94.6	84.9	96.6	86.6	88.2	81.0	89.0	94.2	79.0	102.2	88.8	

Figure 45. Injuries and Rates per 100M VRM by Event Type, 2007–2017

- Collisions resulted in 69% of SSOA-reported injuries from 2007 to 2017. Over half of these collision injuries occurred at RGX in nine of these eleven years. The two exceptions were 2009 and 2017.

- SSOAs reported fewer injuries from derailments and fires than from other event types. Combined, these two event types accounted for 5% of reported injuries from 2007 to 2017.

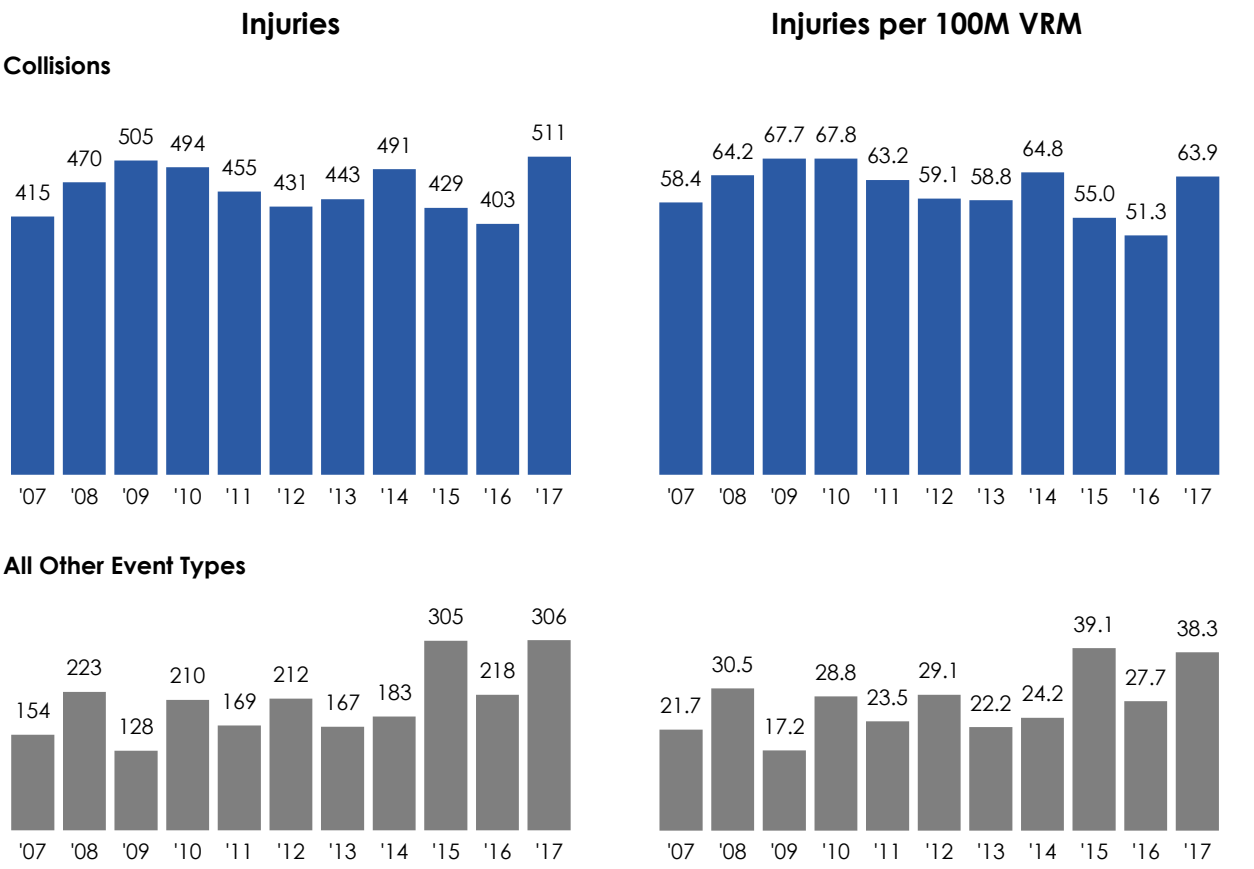


Figure 46. Injuries and Injury Rate Trends by Event Type, 2007–2017

- Over half of SSOA-reported injuries resulted from collisions each year of the analyzed period. The collision injury rate fluctuated during the eleven-year period with uniform reporting criteria (2007 to 2017).
- During this time period, the RGX collision injury rate per 100M VRM generally decreased, averaging a 3.4% annual decrease between 2007 and 2017.
- The rate of injuries from non-collision events per 100M VRM generally increased during the 2007–2017 period.
- On average, the suicide or trespasser injury rate increased 16.0% annually from 2007 (3.1 injuries per 100M VRM) to 2017 (13.6).

4-4. 2018 Events, Fatalities, and Injuries by Event Type

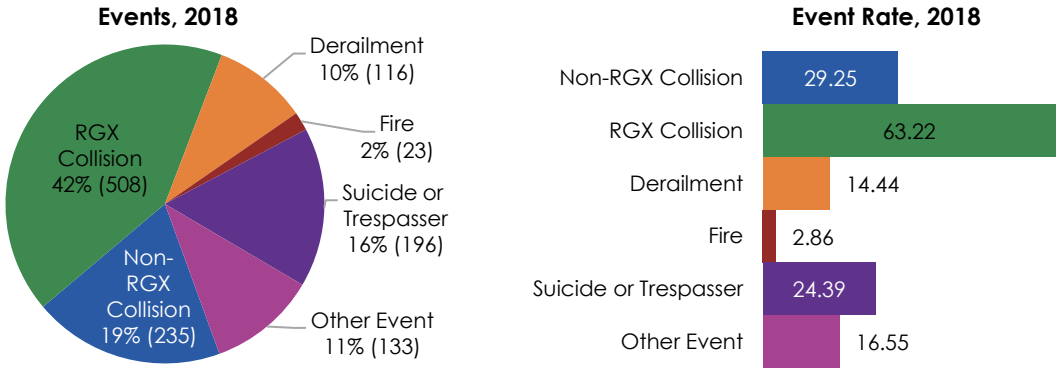


Figure 47. Events and Rates per 100M VRM by Event Type, 2018

- Collisions accounted for 61% of events from 2018. Most of these collisions were RGX collisions, which comprised 42% of all reported events. Non-RGX collisions comprised another 19%.

- Suicide attempts and trespassing accounted for another 16% of 2018 events. The 2018 suicide and trespasser event rate, 24.39 events per 100M VRM, was higher than any of the previous eleven years.

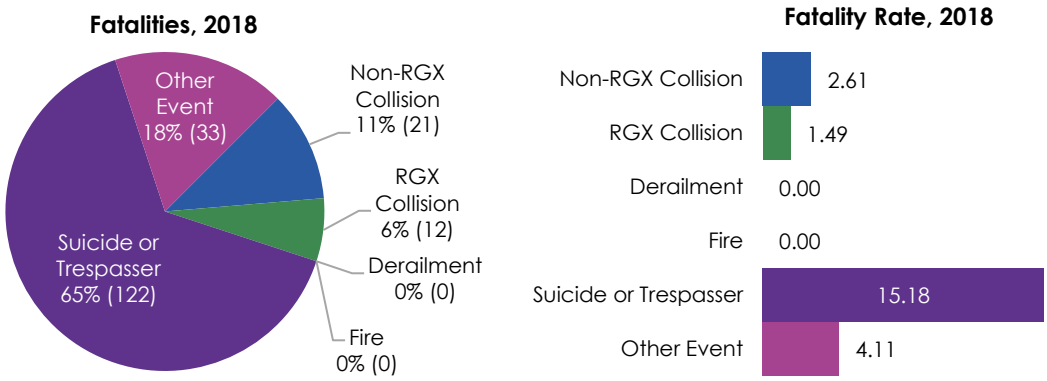


Figure 48. Fatalities and Rates per 100M VRM by Event Type, 2018

- Suicide and trespasser fatalities accounted for 65% of fatalities reported in 2018. The 2018 suicide and trespasser event fatality rate (15.18 fatalities per 100M VRM) was higher than any of the previous eleven years.

- Collisions and “other” events, including slips, falls, and medical events, each resulted in 33 fatalities in 2018. Twelve fatalities resulted from RGX collisions and 21 from non-RGX collisions.

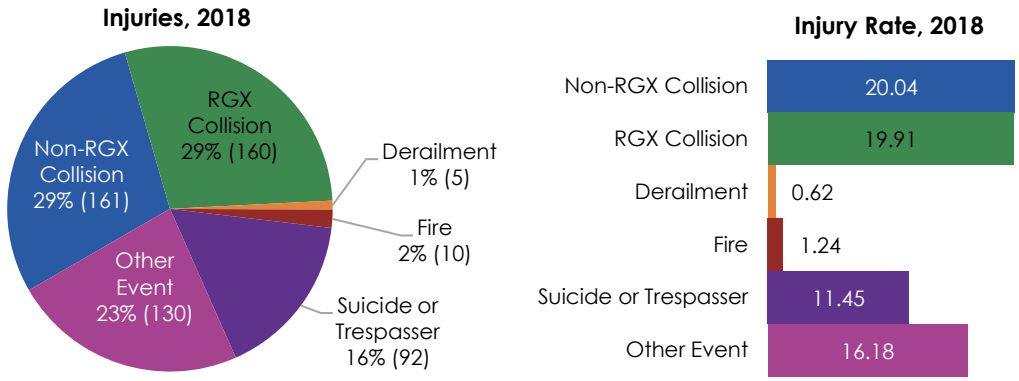


Figure 49. Injuries and Rates per 100M VRM by Event Type, 2018

- Collisions accounted for 58% of the injuries reported in 2018, with an almost even split between injuries from RGX collisions (160) and injuries from collisions at other locations (161).
- SSOAs reported 19.91 RGX collision injuries per 100M VRM in 2018. This is lower than the RGX collision injury rate for every year in the 2007–2017 period.
- The 11.45 injuries from suicide and trespasser events per 100M VRM reported in 2018 was higher than the rate reported in ten of the eleven years in the 2007–2017 period.

5. Collisions by Type

In 2011, SSOAs began reporting more detailed collision data to FTA, including the object(s) with which the train collided. SSOAs now report this using the categories shown in the table below. The analyses in this section present the trend and distributions of collisions, fatalities, and injuries by each collision type. These analyses begin with CY 2011 and the expansion of collision data collection.

Collision Type	Description
Auto	A collision between a rail transit train and a non-rail motor vehicle.
Person	A collision between a rail transit train and a human being who is not in a motor vehicle. This category includes bicyclists.
Train	A collision between a rail transit vehicle and another rail transit vehicle (including service and maintenance vehicles).
Other	A collision between a rail transit train and any object not fitting in any category above.

Table 3. Collision Types

Because the heavy rail mode operates almost entirely in an exclusive ROW, these systems face different challenges than light rail and streetcar modes that operate among motor vehicle traffic. To address this, the following analyses examine these two groups separately.

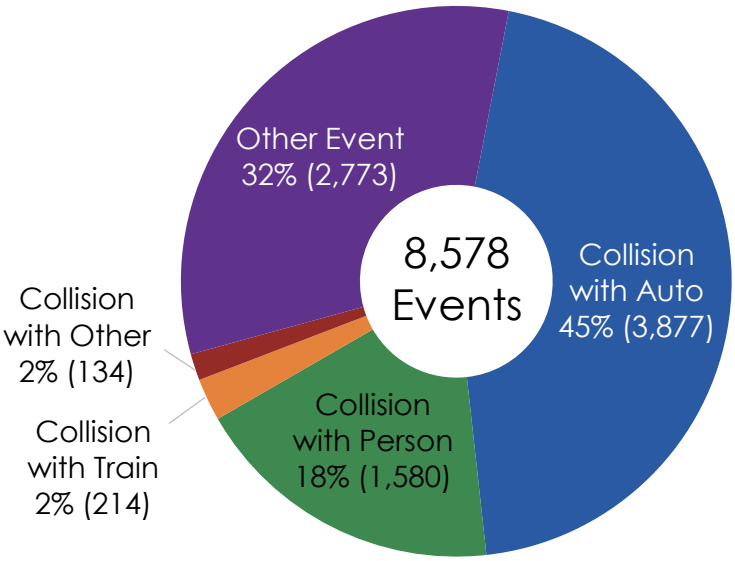
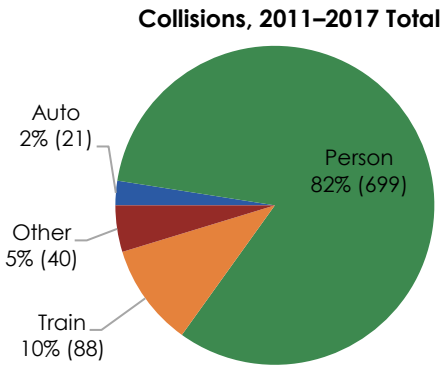
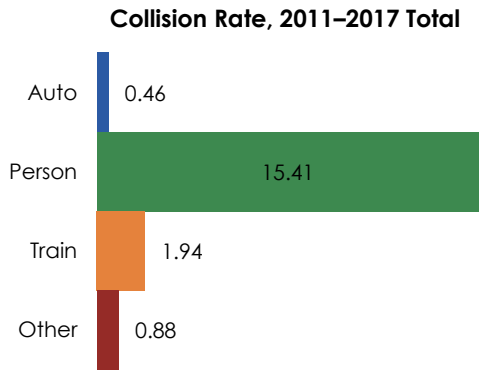


Figure 50. All 2011–2017 Events

5-1. 2011–2017 Heavy Rail Collisions and Rates per 100M VRM by Type





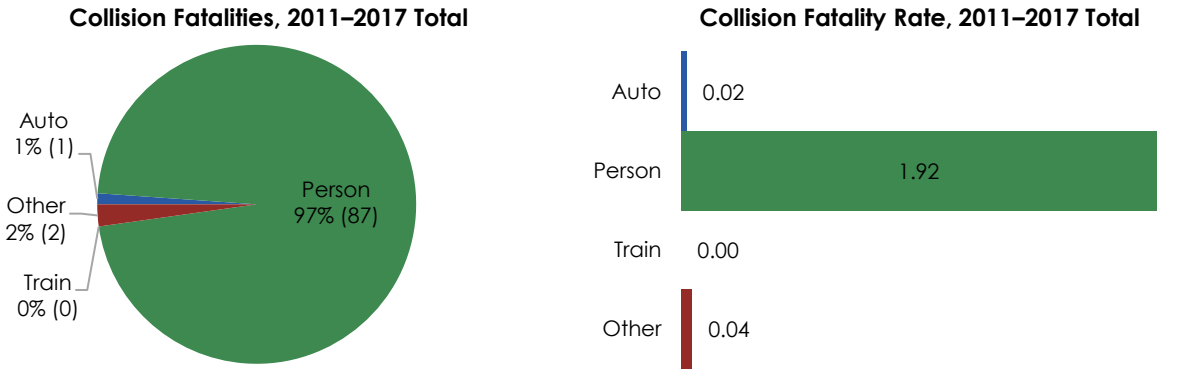
Collisions	2011	2012	2013	2014	2015	2016	2017	Avg	Trend
Auto	5	3	4	2	0	5	2	3	
Person	80	92	87	88	108	113	131	100	
Train	7	18	18	4	12	13	16	13	
Other	7	1	6	8	7	5	6	6	
All Collisions	99	114	115	102	127	136	155	121	

Collision Rate	2011	2012	2013	2014	2015	2016	2017	Avg	Trend
Auto	0.8	0.5	0.6	0.3	0.0	0.8	0.3	0.5	
Person	12.8	14.7	13.5	13.7	16.3	17.0	19.5	15.4	
Train	1.1	2.9	2.8	0.6	1.8	2.0	2.4	1.9	
Other	1.1	0.2	0.9	1.2	1.1	0.8	0.9	0.9	
All Collisions	15.9	18.2	17.8	15.8	19.2	20.5	23.1	18.7	

Figure 51. Heavy Rail Collisions and Rates per 100M VRM by Type, 2011–2017

- SSOAs reported train-to-person collisions more frequently than any other type of heavy rail collision during the analyzed period. Train-to-person collisions accounted for 82% of heavy rail collisions reported between 2011 and 2017.
- The next most common type of SSOA-reported heavy rail collisions were collisions between multiple rail transit vehicles. These collisions accounted for 10% of reportable heavy rail collisions from 2011 to 2017.
- During the seven-year period from 2011 to 2017, heavy rail train-to-person collisions per 100M VRM increased at a 7.3% annual rate on average.

5-2. 2011–2017 Heavy Rail Collision Fatalities and Rates per 100M VRM by Type



Fatalities	2011	2012	2013	2014	2015	2016	2017	Avg	Trend
Auto	0	0	0	0	0	1	0	0	
Person	6	19	12	13	11	14	12	12	
Train	0	0	0	0	0	0	0	0	
Other	2	0	0	0	0	0	0	0	
All Collisions	8	19	12	13	11	15	12	13	

Fatality Rate	2011	2012	2013	2014	2015	2016	2017	Avg	Trend
Auto	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	
Person	1.0	3.0	1.9	2.0	1.7	2.1	1.8	1.9	
Train	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Other	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
All Collisions	1.3	3.0	1.9	2.0	1.7	2.3	1.8	2.0	

Figure 52. Heavy Rail Collision Fatalities and Rates per 100M VRM by Type, 2011–2017

- Heavy rail train-to-person collisions account for 97% of all heavy rail collision fatalities.
- The only heavy rail collision fatalities resulting from other types of collisions were two fatalities from train-to-object collisions in 2011 and one from a train-to-auto collision in 2016.

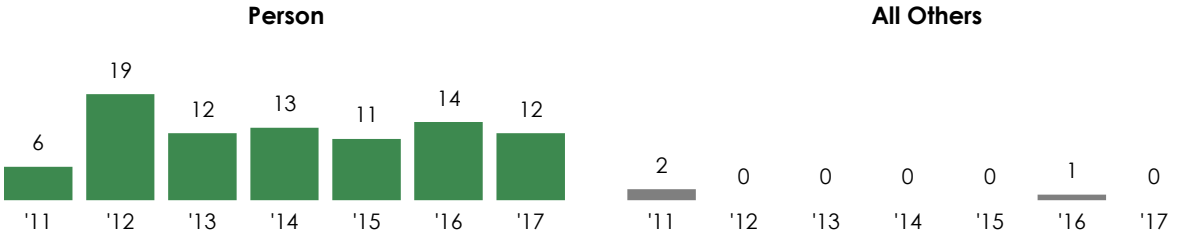
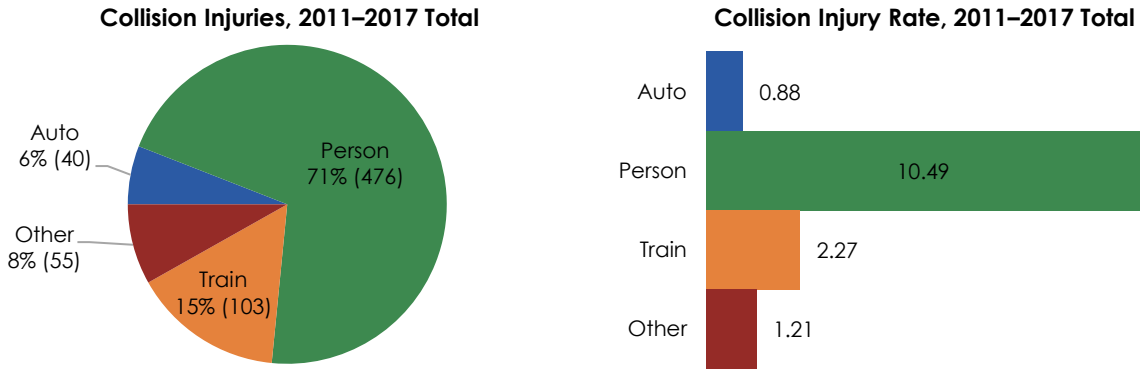


Figure 53. Heavy Rail Collision Fatality Trends by Type, 2011–2017

5-3. 2011–2017 Heavy Rail Collision Injuries and Rates per 100M VRM by Type



Injuries	2011	2012	2013	2014	2015	2016	2017	Avg	Trend
Auto	26	3	1	1	0	7	2	6	
Person	52	69	57	55	81	69	93	68	
Train	2	7	36	5	3	5	45	15	
Other	2	0	8	39	2	3	1	8	
All Collisions	82	79	102	100	86	84	141	96	

Injury Rate	2011	2012	2013	2014	2015	2016	2017	Avg	Trend
Auto	4.2	0.5	0.2	0.2	0.0	1.1	0.3	0.9	
Person	8.3	11.0	8.8	8.5	12.2	10.4	13.9	10.5	
Train	0.3	1.1	5.6	0.8	0.5	0.8	6.7	2.3	
Other	0.3	0.0	1.2	6.1	0.3	0.5	0.1	1.2	
All Collisions	13.1	12.6	15.8	15.5	13.0	12.7	21.0	14.9	

Figure 54. Heavy Rail Collision Injuries and Rates per 100M VRM by Type, 2011–2017

- From 2011 to 2017, collisions with people accounted for most (71%) reported heavy rail collision injuries.
- The 26 injuries from heavy rail collisions with autos in 2011 accounted for 65% of injuries from this type of collision in the 2011–2017 period.
- 36 injuries in 2013 and 45 injuries in 2017 resulted from collisions between heavy rail transit vehicles and accounted for 79% of reported injuries from this type of collision in the 2011–2017 period.
- The 39 injuries resulting from collisions between heavy rail trains and other objects in 2014 accounted for 71% of reported injuries from this type of collision in the 2011–2017 period.

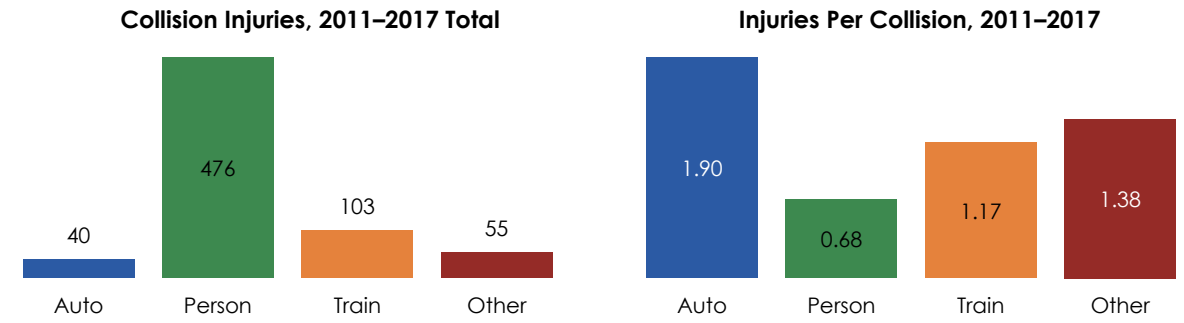


Figure 55. Heavy Rail Collision Injury Totals and Injuries per Collision by Type, 2011–2017

- SSOAs reported collisions between heavy rail trains and autos, other rail transit vehicles, and other objects much less frequently than collisions between heavy rail trains and persons between 2011 and 2017, as shown in Figure 51 on page 34.

- However, heavy rail collisions with autos, other rail transit vehicles, and other objects resulted in more reportable injuries per collision than collisions with persons, on average. Train-to-auto collisions had the highest number of injuries reported per collision (1.90) between 2011 and 2017.

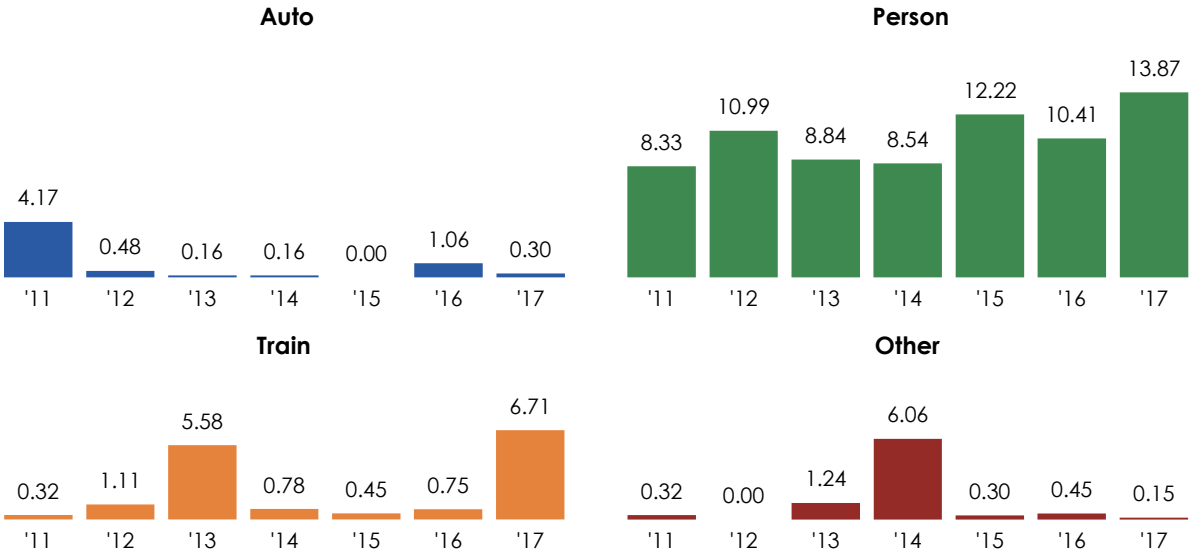


Figure 56. Heavy Rail Collision Injury Rate Trends by Collision Type, 2011–2017

- The 13.87 injuries per 100M VRM from collisions between heavy rail trains and persons in 2017 is the highest rate reported for such collisions in the analyzed period. This reflects an average increase of 8.9% per year during the period with uniform reporting criteria (2011–2017).

5-4. 2018 Heavy Rail Collisions, Fatalities, and Injuries by Type

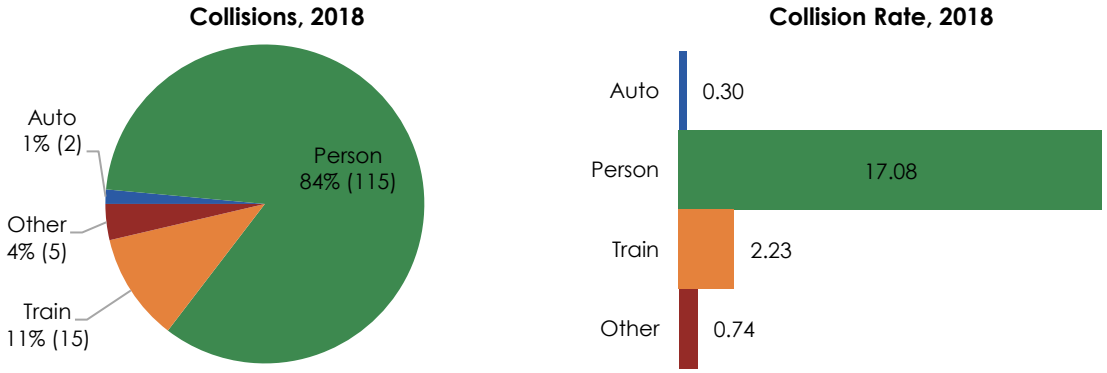


Figure 57. Heavy Rail Collisions and Rates per 100M VRM by Type, 2018

- Collisions with people accounted for 84% of heavy rail collisions in 2018. This is similar to the distribution of 2011–2017 heavy rail collisions by type, as shown in Figure 51 on page 34.
- Collisions between rail transit vehicles accounted for 11% of 2018 heavy rail collisions. There were 2.23 of these collisions per 100M VRM of heavy rail service in 2018.

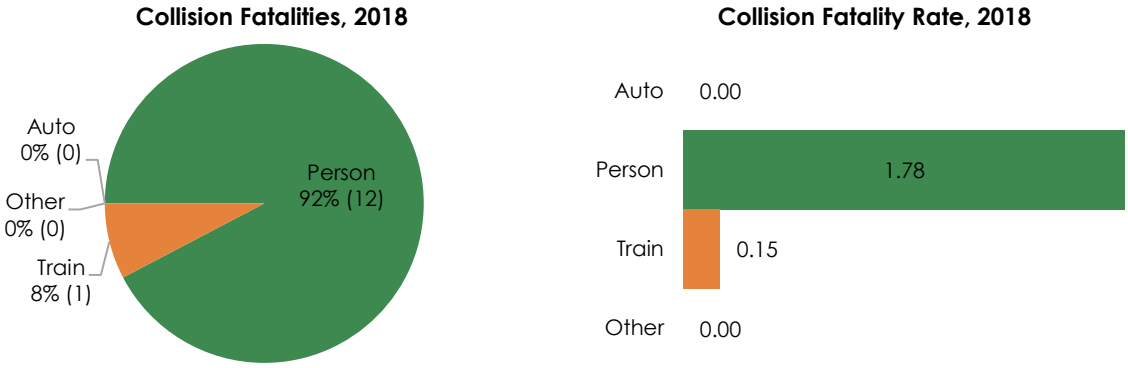


Figure 58. Heavy Rail Collision Fatalities and Rates per 100M VRM by Type, 2018

- Collisions with people accounted for 92% of heavy rail collision fatalities in 2018. This is similar to the distribution of 2011–2017 heavy rail collision fatalities by type shown in Figure 52 on page 35.
- There was one fatality resulting from a heavy rail collision between rail transit vehicles in 2018. That was the first fatality from this collision type category since at least 2011.

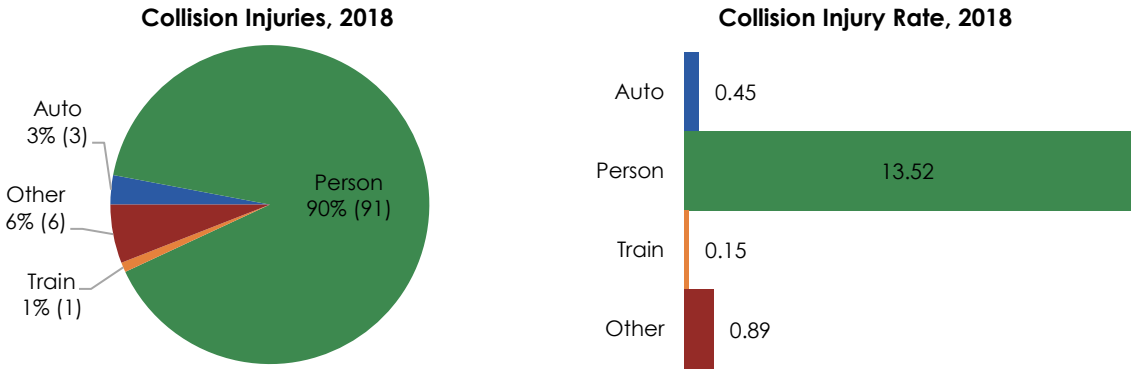
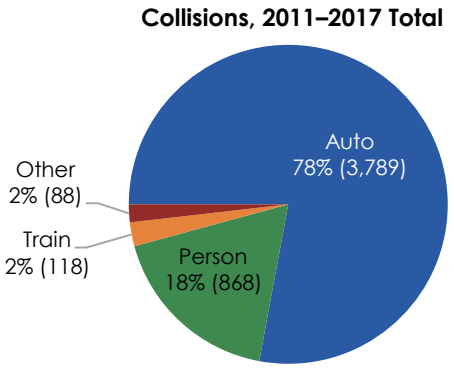
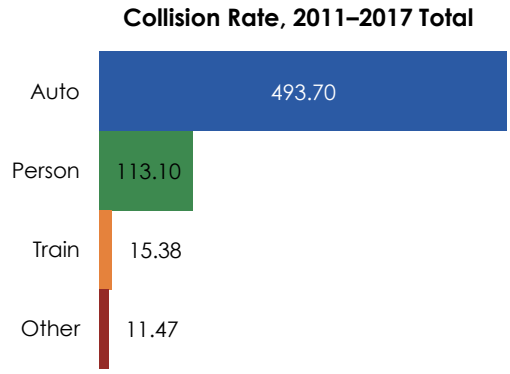


Figure 59. Heavy Rail Collision Injuries and Rates per 100M VRM by Type, 2018

- Collisions with people accounted for 90% of heavy rail collision injuries in 2018.
- In 2018, SSOAs reported ten injuries from heavy rail collisions that were not collisions with people. Three of these injuries resulted from collisions with autos, one resulted from collisions between rail transit vehicles, and six resulted from collisions with other objects.

5-5. 2011–2017 Light Rail and Streetcar Collisions and Rates per 100M VRM by Type





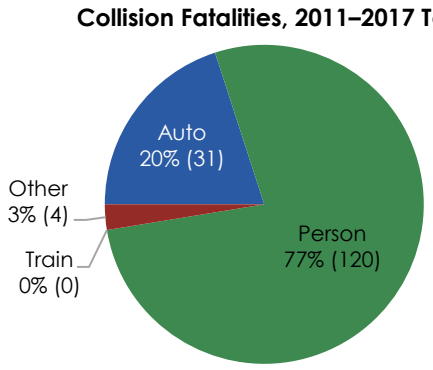
Collisions	2011	2012	2013	2014	2015	2016	2017	Avg	Trend
Auto	414	421	453	505	616	692	688	541	
Person	100	96	122	114	154	154	128	124	
Train	21	8	22	15	13	20	19	17	
Other	5	9	6	24	23	7	14	13	
All Collisions	540	534	603	658	806	873	849	695	

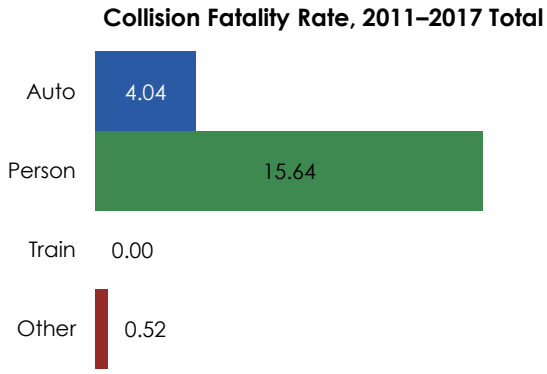
Collision Rate	2011	2012	2013	2014	2015	2016	2017	Avg	Trend
Auto	440.4	427.8	428.7	457.5	543.8	577.9	546.1	493.7	
Person	106.4	97.5	115.5	103.3	136.0	128.6	101.6	113.1	
Train	22.3	8.1	20.8	13.6	11.5	16.7	15.1	15.4	
Other	5.3	9.1	5.7	21.7	20.3	5.8	11.1	11.5	
All Collisions	574.4	542.6	570.6	596.1	711.6	729.0	673.9	633.6	

Figure 60. Light Rail and Streetcar Collisions and Rates per 100M VRM by Type, 2011–2017

- In the 2011–2017 period, 78% of all light rail and streetcar collisions that SSOAs reported were collisions between trains and motor vehicles.
- Train-to-person collisions were the second most commonly reported collision type in each year of the analyzed period, accounting for 18% of 2011–2017 light rail and streetcar collisions.
- During this period, the light rail and streetcar train-to-auto collision rate increased an average of 3.7% per year, from 440.4 collisions per 100M VRM in 2007 to 546.1 in 2017.
- The annual light rail and streetcar train-to-person collision rate fluctuated between 97.5 and 136.0 collisions per 100M VRM in the 2011–2017 period.

5-6. 2011–2017 Light Rail and Streetcar Collision Fatalities and Rates per 100M VRM by Type





Fatalities	2011	2012	2013	2014	2015	2016	2017	Avg	Trend
Auto	0	7	3	3	6	5	7	4	
Person	22	16	14	20	24	7	17	17	
Train	0	0	0	0	0	0	0	0	
Other	0	1	0	3	0	0	0	1	
All Collisions	22	24	17	26	30	12	24	22	

Fatality Rate	2011	2012	2013	2014	2015	2016	2017	Avg	Trend
Auto	0.0	7.1	2.8	2.7	5.3	4.2	5.6	4.0	
Person	23.4	16.3	13.2	18.1	21.2	5.8	13.5	15.6	
Train	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Other	0.0	1.0	0.0	2.7	0.0	0.0	0.0	0.5	
All Collisions	23.4	24.4	16.1	23.6	26.5	10.0	19.1	20.2	

Figure 61. Light Rail and Streetcar Collision Fatalities and Rates per 100M VRM by Type, 2011–2017

- Train-to-person collisions accounted for 77% of all light rail and streetcar collision fatalities in the 2011–2017 period, which was more than all other collision types combined.

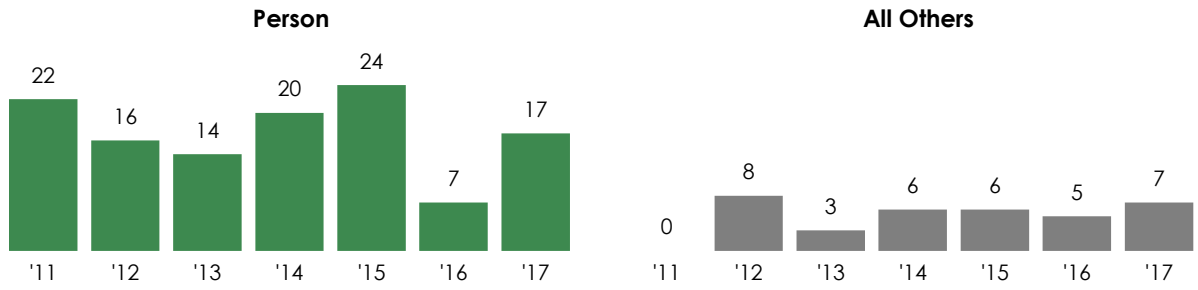
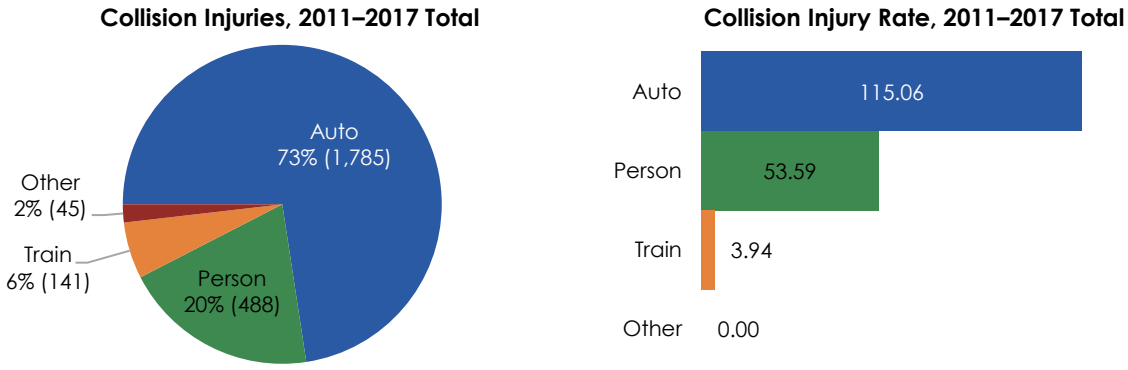


Figure 62. Light Rail and Streetcar Collision Fatality Trends by Type, 2011–2017

5-7. 2011–2017 Light Rail and Streetcar Collision Injuries and Rates per 100M VRM by Type



Injuries	2011	2012	2013	2014	2015	2016	2017	Avg	Trend
Auto	268	274	239	310	236	227	231	255	
Person	72	58	72	60	79	86	61	70	
Train	31	9	25	5	4	1	66	20	
Other	0	3	0	12	22	4	4	6	
All Collisions	371	344	336	387	341	318	362	351	

Injury Rate	2011	2012	2013	2014	2015	2016	2017	Avg	Trend
Auto	285.1	278.4	226.2	280.9	208.4	189.6	183.4	232.6	
Person	76.6	58.9	68.1	54.4	69.7	71.8	48.4	63.6	
Train	33.0	9.1	23.7	4.5	3.5	0.8	52.4	18.4	
Other	0.0	3.0	0.0	10.9	19.4	3.3	3.2	5.9	
All Collisions	394.7	349.5	318.0	350.6	301.0	265.6	287.3	320.4	

Figure 63. Light Rail Collision Injuries and Rates per 100M VRM by Type, 2011–2017

- Collisions between trains and autos accounted for 73% of reported light rail and streetcar collision injuries in the 2011–2017 period.
- Collisions with persons resulted in the second-highest number of light rail and streetcar collision injuries in six of the seven years in the analyzed period.
- SSOAs reported 22 injuries from collisions between light rail or streetcar trains and other objects in 2015, accounting for 49% of all reported injuries for this collision type during the analyzed period.
- Similarly, the 66 light rail and streetcar injuries from collisions between rail transit vehicles in 2017 accounted for 47% of all reported injuries for this collision type from 2011 to 2017.

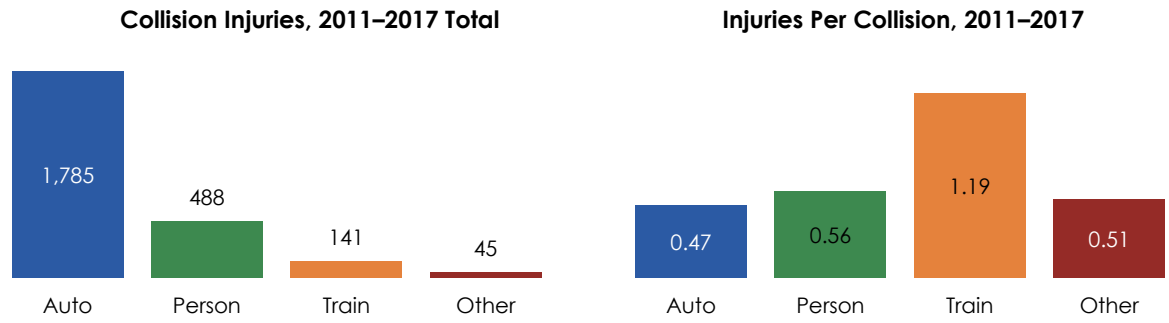


Figure 64. Light Rail and Streetcar Collision Injury Totals and Injuries per Collision by Type, 2011–2017

- SSOAs reported train-to-train collisions at light rail and streetcar modes relatively infrequently from 2011 to 2017 (as shown in Figure 60 on page 40). However, when these collisions occurred, SSOAs reported more injuries per event for this type of collision than for any other type of light rail or streetcar collision.

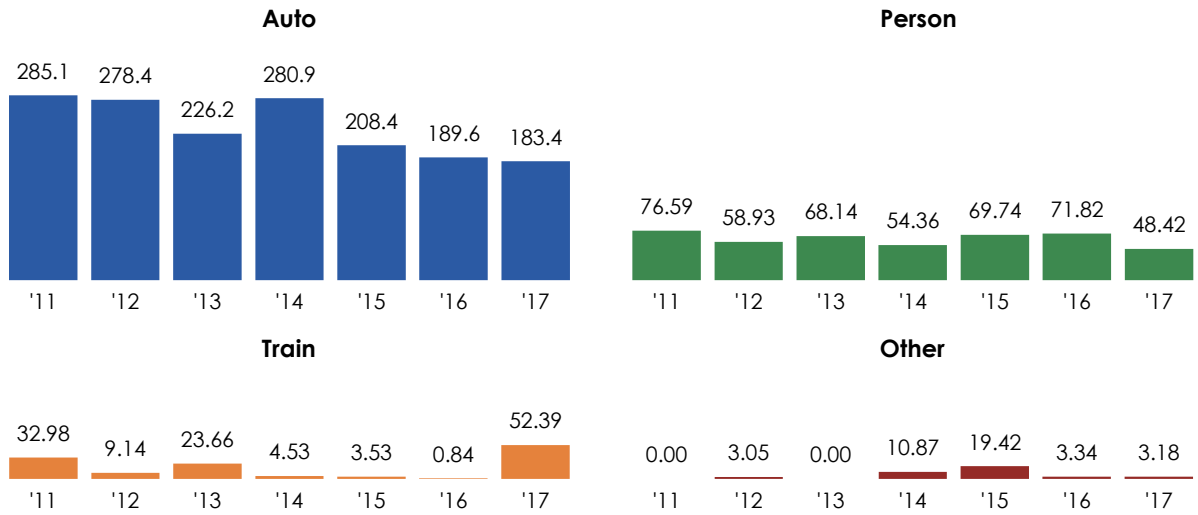


Figure 65. Light Rail and Streetcar Collision Injury Rate Trends by Type, 2011–2017

- The train-to-auto collision injury rate at light rail and streetcar modes decreased an average of 7.1% each year from 2011 to 2017. This rate decreased from 285.1 injuries per 100M VRM in 2011 to 183.4 in 2017.

- The annual injury rate from light rail and streetcar collisions with people fluctuated between 48.42 and 76.59 reported injuries per 100M VRM in the 2011–2017 period.

5-8. 2018 Light Rail and Streetcar Collisions, Fatalities, and Injuries by Type

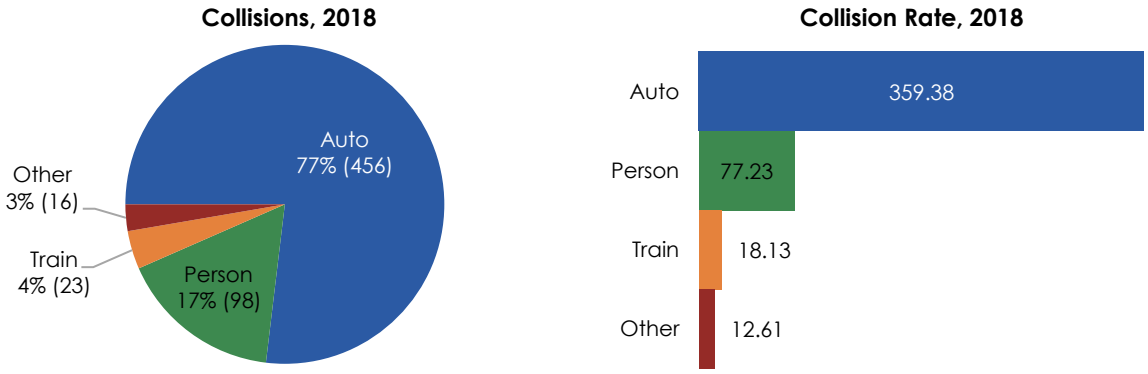


Figure 66. Light Rail and Streetcar Collisions and Rates per 100M VRM by Type, 2018

- In 2018, collisions with autos accounted for 77% of all reported light rail and streetcar collisions. Collisions with people accounted for another 17%. This is similar to the distribution of light rail and streetcar collisions during the 2011–2017 period.
- Collisions between rail transit vehicles accounted for 4% of all light rail and streetcar collisions reported in 2018.

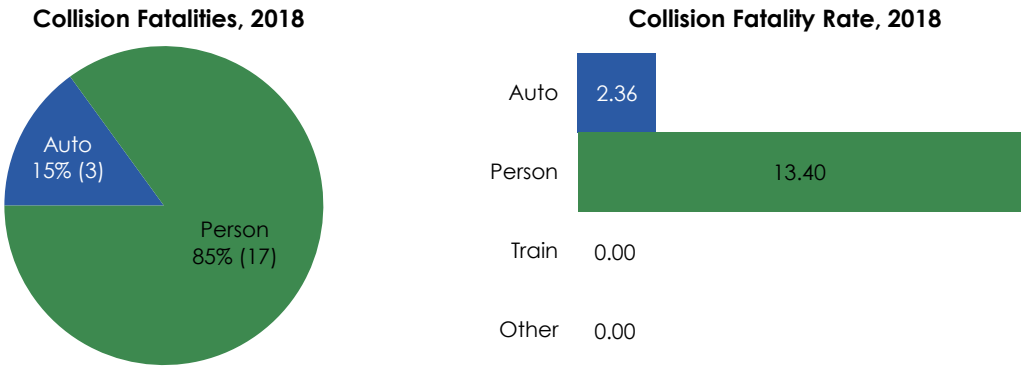


Figure 67. Light Rail and Streetcar Collision Fatalities and Rates per 100M VRM by Type, 2018

- Collisions with people accounted for 85% of light rail and streetcar collision fatalities in 2018.
- Collisions with autos accounted for the remaining 15%. The 2.36 fatalities per 100M VRM resulting from light rail and streetcar collisions with autos was the lowest fatality rate recorded from these collisions since 2011.

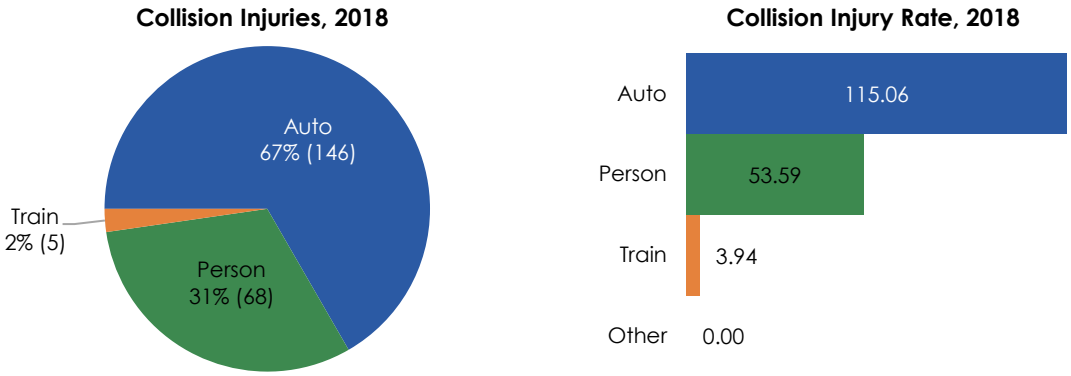


Figure 68. Light Rail and Streetcar Collision Injuries and Rates per 100M VRM by Type, 2018

- Collisions with autos accounted for 67% of light rail and streetcar collision injuries in 2018. Collisions with people accounted for an additional 31% of these injuries.

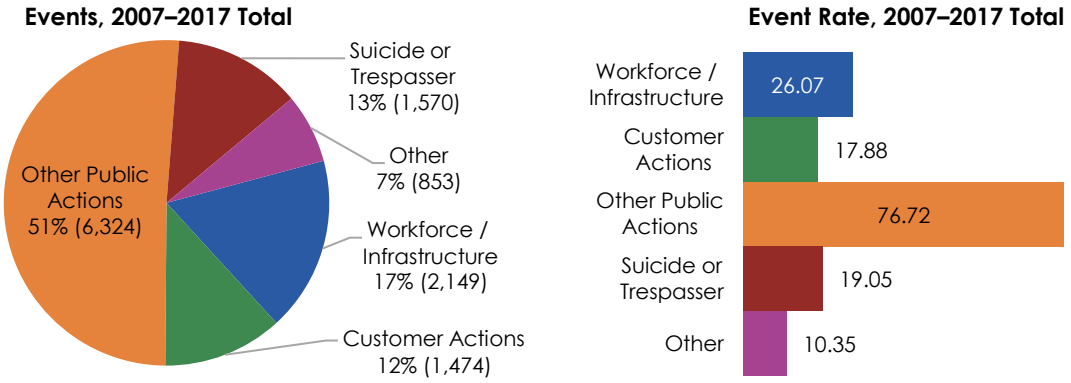
6. Events by Probable Cause

SSOAs report probable cause data with each event report, using one of eleven preset categories. FTA groups these data into the four categories shown in the table below (see Appendix B for more details). The following analyses present the trends and distribution of events, fatalities, and injuries for each causal category. Additional analyses present the distribution of fatalities and injuries by the causal category of the source event for each person type. Suicide and trespasser events are not included in the latter analyses, where indicated.

Probable Cause Type	Description
Workforce or Infrastructure	Events resulting from these causes are primarily due to substandard conditions of RTA vehicles and infrastructure or employee rules compliance.
Customer Actions	Events resulting from these causes are primarily due to the actions of customers, including risky behaviors and accidental slips, trips, and falls.
Suicide or Trespasser	Events resulting from suicide attempts and trespassing, including events involving collisions with a rail transit train.
Other Public Actions	Events resulting from these causes are primarily due to the actions of members of the public, other than suicide and trespassing, such as pedestrians or motor vehicle drivers.
Other	Events resulting from causes that do not fit into the categories above and cannot be attributed to the RTA.

Table 4. Probable Cause Categories

6-1. 2007–2017 Events and Rates per 100M VRM by Probable Cause



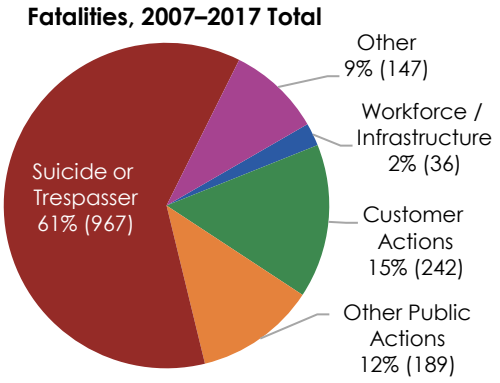
Events	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	Avg	Trend
Workforce / Infrastructure	195	218	210	149	148	126	185	172	265	243	238	195	
Customer Actions	71	65	66	128	128	137	152	155	184	181	207	134	
Other Public Actions	363	566	574	495	482	501	539	591	719	757	737	575	
Suicide or Trespasser	106	109	157	130	135	143	151	133	154	166	186	143	
Other	34	13	22	121	139	93	72	61	73	116	109	78	
All Probable Causes	769	971	1,029	1,023	1,032	1,000	1,099	1,112	1,395	1,463	1,477	1,125	

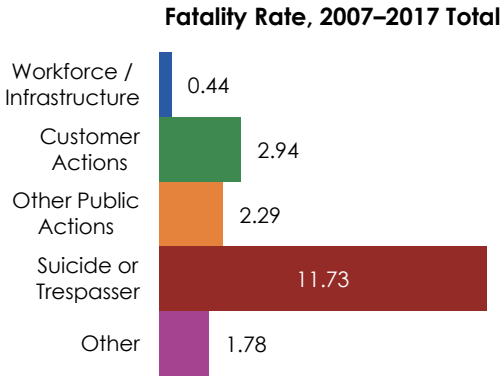
Event Rate	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	Avg	Trend
Workforce / Infrastructure	27.4	29.8	28.2	20.4	20.5	17.3	24.6	22.7	34.0	30.9	29.8	26.1	
Customer Actions	10.0	8.9	8.8	17.6	17.8	18.8	20.2	20.5	23.6	23.0	25.9	17.9	
Other Public Actions	51.0	77.3	77.0	67.9	66.9	68.8	71.6	78.0	92.2	96.3	92.2	76.7	
Suicide or Trespasser	14.9	14.9	21.1	17.8	18.7	19.6	20.1	17.6	19.8	21.1	23.3	19.0	
Other	4.8	1.8	2.9	16.6	19.3	12.8	9.6	8.1	9.4	14.8	13.6	10.3	
All Probable Causes	108.1	132.6	138.0	140.3	143.3	137.2	146.0	146.8	178.9	186.1	184.7	150.1	

Figure 69. Events and Rates per 100M VRM by Probable Cause, 2007–2017

- Public actions other than suicide or trespassing caused 51% of events reported from 2007 to 2017. The rate of events due to these public actions increased from 51.0 events per 100M VRM in 2007 to 92.2 in 2017, or 6.1% per year on average.
- Workforce behavior and infrastructure conditions caused 17% of reportable events from 2007 to 2017.
- Suicide attempts and trespassers caused 13% of events reported from 2007 to 2017.
- Customer actions caused 12% of events reported in the 2007–2017 period. The rate of events due to customer actions increased from 10.0 to 25.9 per 100M VRM in that period, a 10% average annual increase.

6-2. 2007–2017 Fatalities and Rates per 100M VRM by Probable Cause





Fatalities	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	Avg	Trend
Workforce / Infrastructure	6	7	12	2	0	1	1	0	3	2	2	3	
Customer Actions	22	13	17	17	14	34	26	26	21	26	26	22	
Other Public Actions	15	12	17	10	17	21	16	18	27	14	22	17	
Suicide or Trespasser	87	72	95	81	88	84	98	85	91	95	91	88	
Other	4	3	4	20	18	16	18	6	10	27	21	13	
All Probable Causes	134	107	145	130	137	156	159	135	152	164	162	144	

Fatality Rate	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	Avg	Trend
Workforce / Infrastructure	0.8	1.0	1.6	0.3	0.0	0.1	0.1	0.0	0.4	0.3	0.3	0.4	
Customer Actions	3.1	1.8	2.3	2.3	1.9	4.7	3.5	3.4	2.7	3.3	3.3	2.9	
Other Public Actions	2.1	1.6	2.3	1.4	2.4	2.9	2.1	2.4	3.5	1.8	2.8	2.3	
Suicide or Trespasser	12.2	9.8	12.7	11.1	12.2	11.5	13.0	11.2	11.7	12.1	11.4	11.7	
Other	0.6	0.4	0.5	2.7	2.5	2.2	2.4	0.8	1.3	3.4	2.6	1.8	
All Probable Causes	18.8	14.6	19.4	17.8	19.0	21.4	21.1	17.8	19.5	20.9	20.3	19.2	

Figure 70. Fatalities and Rates per 100M VRM by Probable Cause, 2007–2017

- Suicide attempts and trespasser events accounted for 61% of fatalities reported from 2007 to 2017. The annual suicide and trespasser fatality rate fluctuated between 9.8 and 13.0 fatalities per 100M VRM during this eleven-year period.
- SSOAs reported 7.45 fatalities per 100M VRM for the 2007–2017 period, when suicide attempts and trespasser events are excluded.
- With suicide attempts and trespassing excluded, more fatalities resulted from customer actions than any other reported cause during the analyzed period, with a rate of 2.94 per 100M VRM. The annual customer action fatality rate fluctuated between 1.8 and 4.7 fatalities per 100M VRM from 2007 to 2017.

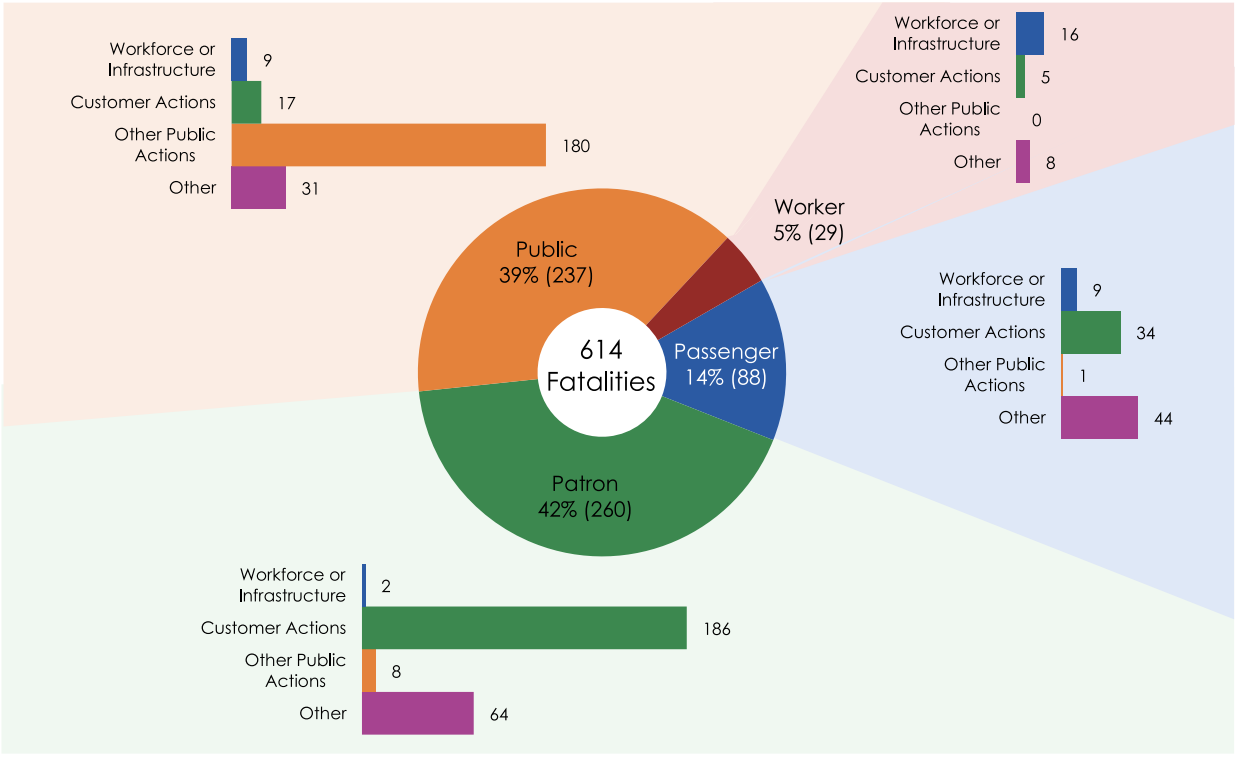
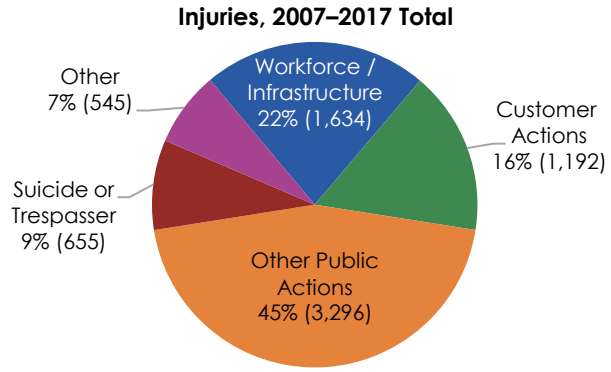
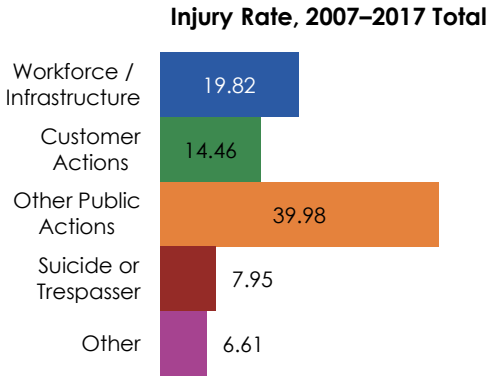


Figure 71. Fatalities by Person Type and Probable Cause Excluding Suicide and Trespasser Fatalities, 2007–2017

- Customer actions caused 72% of the patron fatalities and 39% of the passenger fatalities reported during the eleven-year period shown above.
- Public actions caused 76% of the public fatalities SSOAs reported from 2007 to 2017.
- Employee rules compliance and infrastructure conditions caused 55% of worker fatalities during this time period.

6-3. 2007–2017 Injuries and Rates per 100M VRM by Probable Cause





Injuries	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	Avg	Trend
Workforce / Infrastructure	144	226	257	177	78	105	155	146	148	51	147	149	
Customer Actions	74	84	35	96	91	106	105	102	174	140	185	108	
Other Public Actions	302	336	272	337	319	301	263	342	304	278	242	300	
Suicide or Trespasser	22	41	66	50	50	60	61	49	69	78	109	60	
Other	27	6	3	44	86	71	26	35	39	74	134	50	
All Probable Causes	569	693	633	704	624	643	610	674	734	621	817	666	

Injury Rate	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	Avg	Trend
Workforce / Infrastructure	20.2	30.9	34.5	24.3	10.8	14.4	20.6	19.3	19.0	6.5	18.4	19.8	
Customer Actions	10.4	11.5	4.7	13.2	12.6	14.5	13.9	13.5	22.3	17.8	23.1	14.5	
Other Public Actions	42.5	45.9	36.5	46.2	44.3	41.3	34.9	45.1	39.0	35.4	30.3	40.0	
Suicide or Trespasser	3.1	5.6	8.8	6.9	6.9	8.2	8.1	6.5	8.9	9.9	13.6	7.9	
Other	3.8	0.8	0.4	6.0	11.9	9.7	3.5	4.6	5.0	9.4	16.8	6.6	
All Probable Causes	80.0	94.6	84.9	96.6	86.6	88.2	81.0	89.0	94.2	79.0	102.2	88.8	

Figure 72. Injuries and Rates per 100M VRM by Probable Cause, 2007–2017

- Public actions other than suicide or trespassing caused 3,296 injuries from 2007 to 2017, the most of any cause. During that period, the annual rate of these injuries decreased an average of 2.2% per year, from 42.5 per 100M VRM to 30.3.
- Workforce behavior and infrastructure conditions caused 1,634 injuries during this eleven-year period, second only to ”other” public actions. The annual rate of these injuries decreased from 20.2 injuries per 100M VRM in 2007 to 18.4 in 2017.
- During the 2007 to 2017 period, the annual rate of customer action injuries increased an average of 8.3% per year, from 10.4 per 100M VRM in 2007 to 23.1 in 2017.

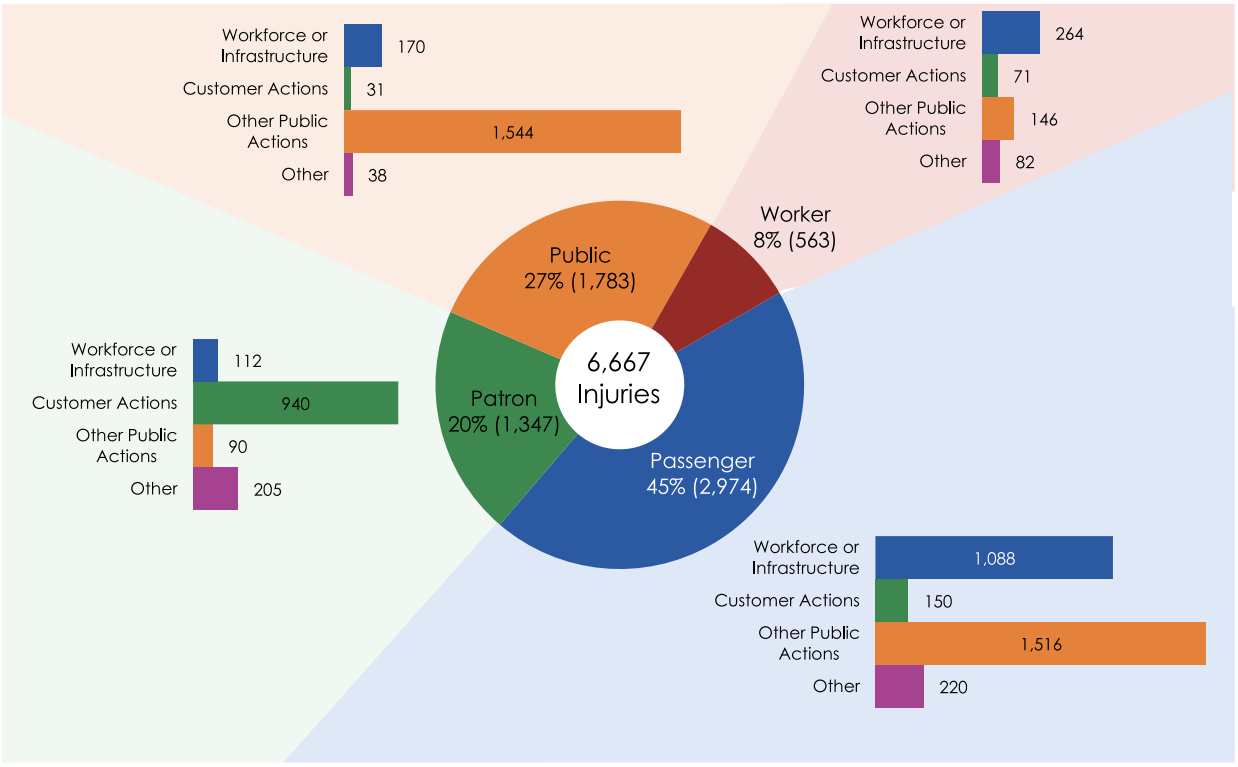


Figure 73. Injuries by Person Type and Probable Cause Excluding Suicide and Trespasser Injuries, 2007–2017

- During the eleven-year period from 2007 to 2017, employee rules compliance and infrastructure conditions caused 37% of passenger injuries and 47% of worker injuries reported by SSOAs.
- Public actions caused 87% of reported public injuries and 51% of reported passenger injuries during this time frame.
- Customer actions caused 70% of patron injuries, 13% of worker injuries, and 5% of passenger injuries reported by SSOAs from 2007 to 2017.

6-4. 2018 Events, Fatalities, and Injuries by Probable Cause

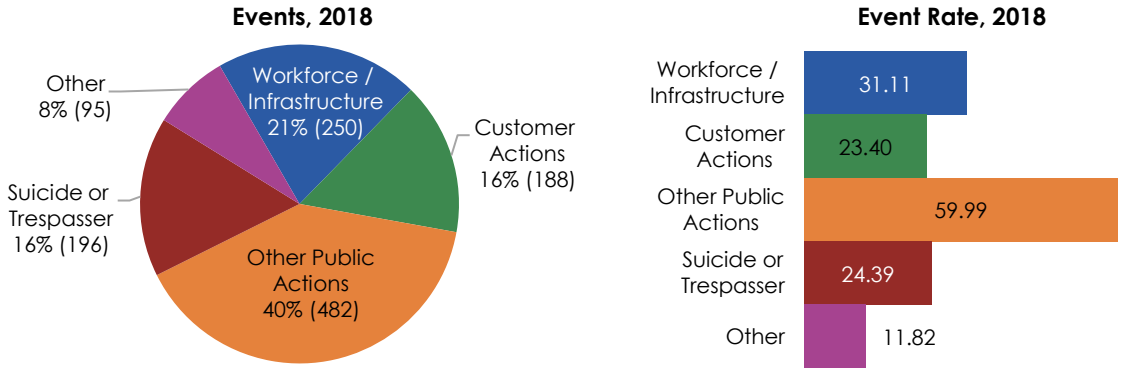


Figure 74. Events by Probable Cause, 2018

- Public actions other than suicide or trespassing, like the actions of drivers or pedestrians, caused 40% of 2018 events, more than any other cause. These actions caused 59.99 events for every 100M VRM of service provided in 2018.
- Employee behavior and infrastructure issues caused 21% of 2018 events, or 31.11 events per 100M VRM.

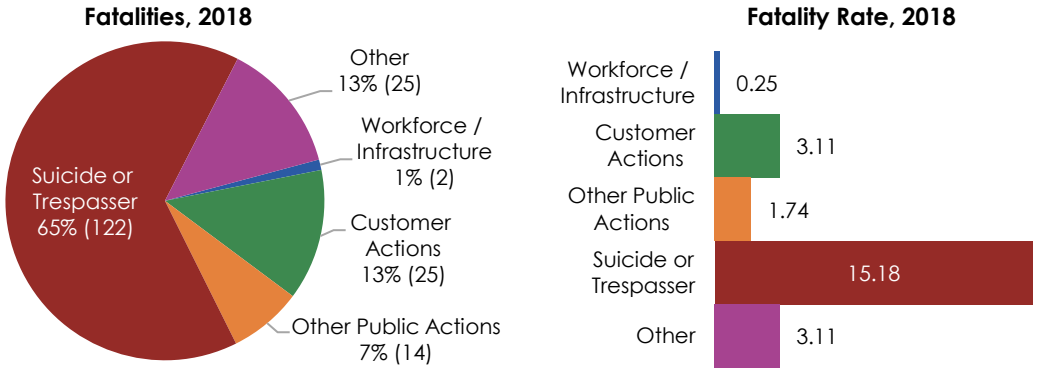


Figure 75. Fatalities by Probable Cause, 2018

- Suicide attempts and trespassing caused 65% of 2018 fatalities. There were 15.18 suicide and trespassing fatalities per 100M VRM of service provided in 2018.
- Customer actions caused 13% of 2018 fatalities. In 2018, 3.11 fatalities caused by customer actions occurred per 100M VRM of service.
- Workforce behavior and infrastructure conditions caused two fatalities in 2018, or 1% of all fatalities reported that year.

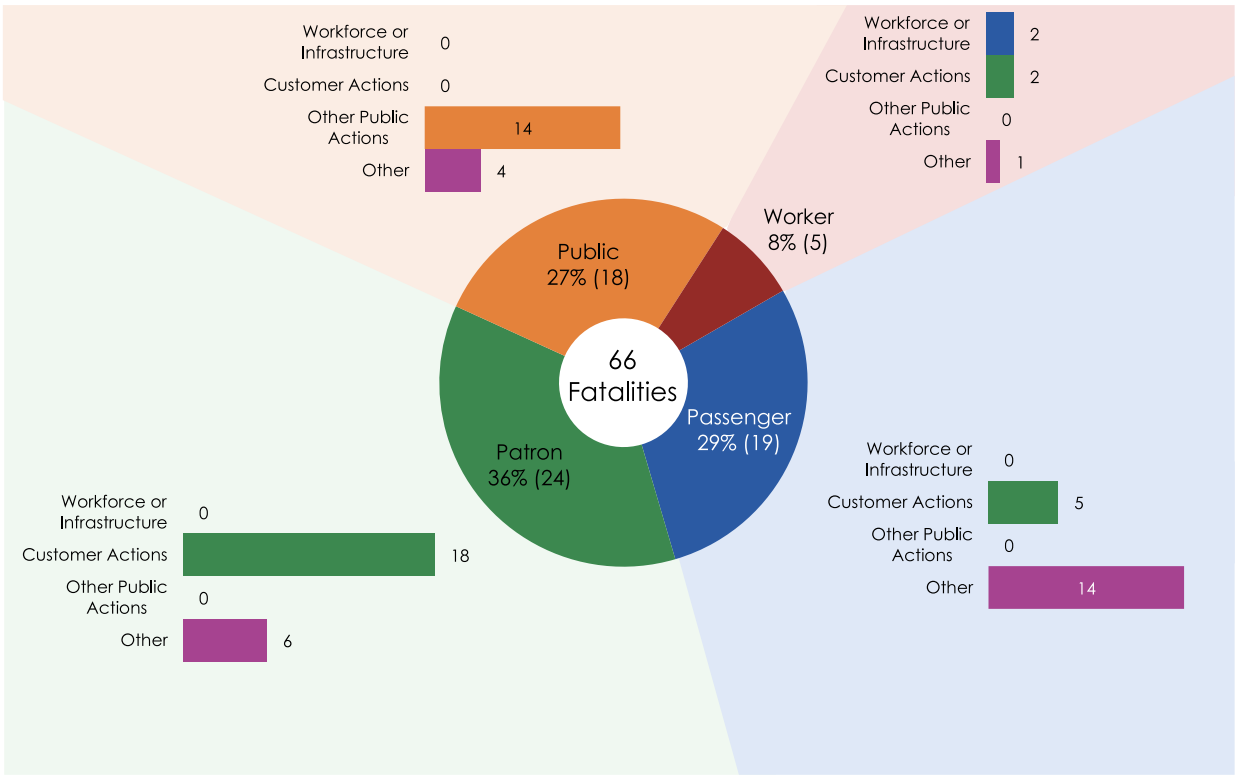


Figure 76. Fatalities by Person Type and Probable Cause Excluding Suicide and Trespasser Fatalities, 2018

- Customer actions caused 75% of patron fatalities and 26% of passenger fatalities in 2018.
- Public actions caused 78% of public fatalities in 2018.
- Two of the five worker fatalities reported in 2018 resulted from employee rules compliance or infrastructure conditions.

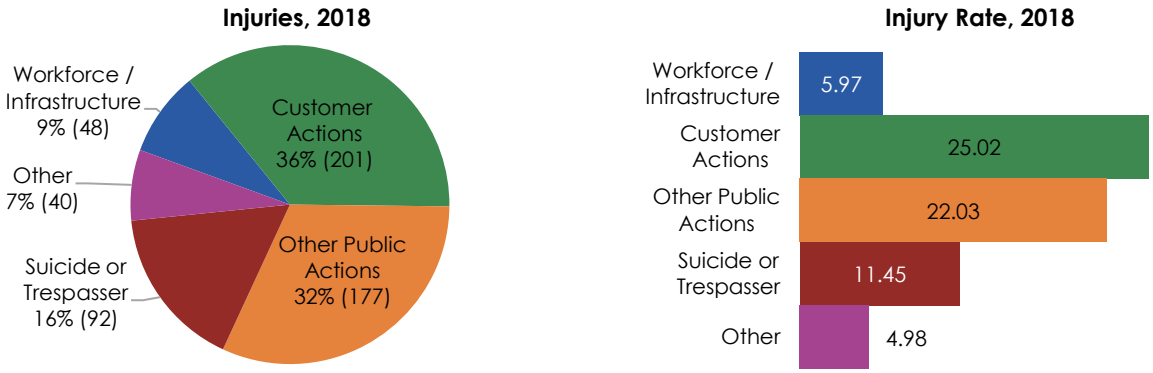


Figure 77. Injuries by Probable Cause, 2018

- Customer actions caused 36% of 2018 injuries, more than from any other cause. SSOAs reported 25.02 injuries due to customer actions for every 100M VRM of service provided in 2018.
- Public actions other than suicide or trespassing, such as the actions of drivers or pedestrians, accounted for another 32% of 2018 injuries. There were 22.03 injuries due to non-customer actions per 100M VRM in 2018.
- Suicide attempts and trespassing caused another 16% of 2018 injuries. Workforce behavior and infrastructure conditions caused 9% of injuries that year.

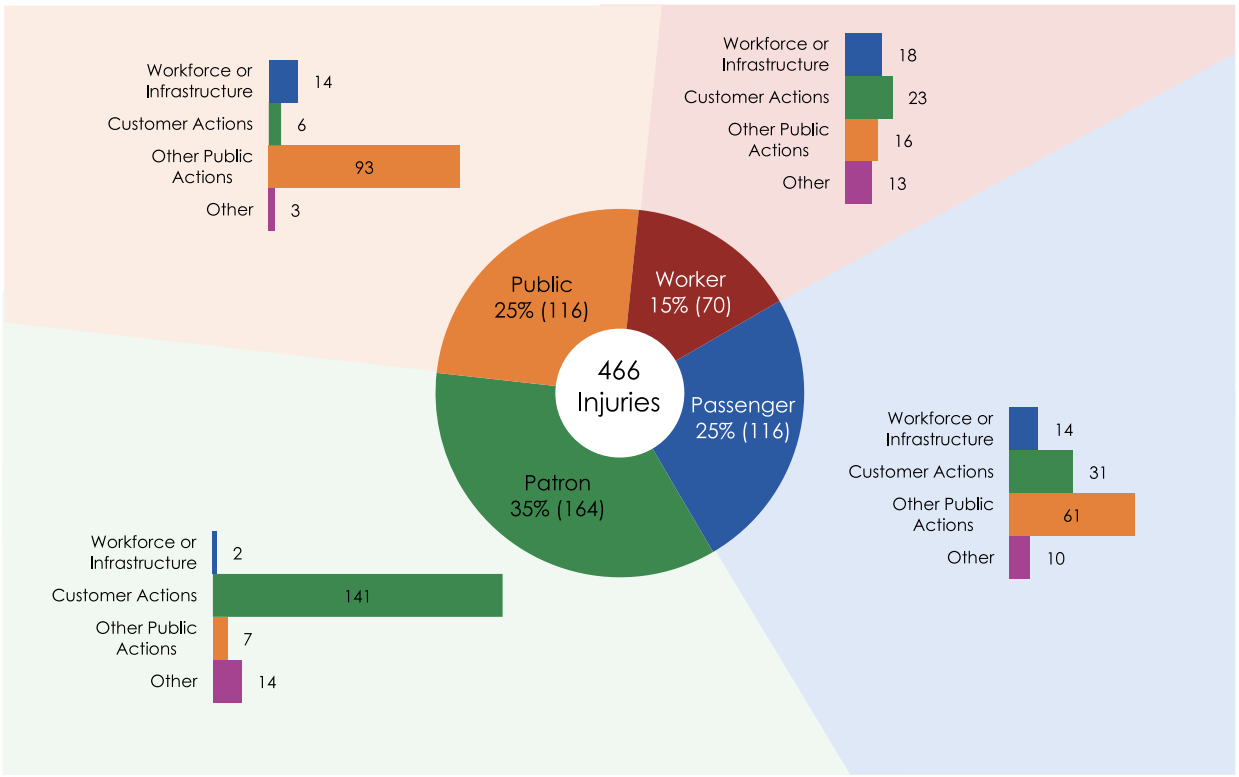


Figure 78. Injuries by Person Type and Probable Cause Excluding Suicide and Trespasser Injuries, 2018

- Employee rules compliance and infrastructure conditions caused 12% of passenger injuries and 26% of worker injuries reported by SSOAs in 2018.
- In 2018, public actions caused most reported public injuries (80%) and passenger injuries (53%).
- Customer actions caused 86% of patron injuries, 33% of worker injuries, and 27% of passenger injuries reported in 2018.

Appendix A. State Safety Oversight Program Community

The table below lists all current SSOAs and the RTAs they oversee, whether those agencies are currently in service or engineering.

State Safety Oversight Agency	Rail Transit Agency	Mode(s)
Arizona Department of Transportation	Valley Metro Rail (METRO)	Light Rail Streetcar*
	Sun Link Transit System (Tucson Streetcar)	Streetcar
Arkansas State Highway and Transportation Department	Rock Region Metro (River Rail Streetcar)	Streetcar
California Public Utilities Commission	Bay Area Rapid Transit District (BART)	Heavy Rail Automated Guideway Hybrid Rail
	Los Angeles County Metropolitan Transportation Authority (Metro Rail)	Heavy Rail Light Rail
	North County Transit District (SPRINTER)	Hybrid Rail
	Orange County Transportation Authority (OC Streetcar*)	Streetcar*
	Sacramento Regional Transit District (RTD)	Light Rail
	Sacramento Streetcar (Downtown Riverfront Streetcar*)	Streetcar*
	San Diego Trolley, Inc. (San Diego Trolley)	Light Rail

* System in Engineering/Construction

State Safety Oversight Agency	Rail Transit Agency	Mode(s)
	San Francisco Municipal Railway (MUNI)	Light Rail Cable Car Streetcar[1]
	Santa Clara Valley Transportation Authority (VTA)	Light Rail
Colorado Public Utilities Commission	Denver Regional Transit District (RTD)	Light Rail
District of Columbia Fire and Emergency Medical Services	District Department of Transportation (DC Streetcar)	Streetcar
Florida Department of Transportation	Miami-Dade Transit Authority (Miami-Dade Transit)	Heavy Rail Automated Guideway
	Jacksonville Transportation Authority (Skyway)	Automated Guideway
	Hillsborough Area Regional Transit Authority (TECO Line Streetcar)	Streetcar
Georgia Department of Transportation	Metropolitan Atlanta Rapid Transit Authority (MARTA)	Heavy Rail Streetcar
Hawaii Department of Transportation	Honolulu Authority for Rapid Transportation (HART*)	Heavy Rail*
Illinois Department of Transportation	Chicago Transit Authority (CTA)	Heavy Rail

[1] Prior to 2013, SSO annual reporting did not distinguish between events at light rail and streetcar modes. For this report, analysts classified data submitted for San Francisco Municipal Railway's streetcar mode as light rail in order to have consistent data for the 2007–2018 period.
* System in Engineering/Construction

State Safety Oversight Agency	Rail Transit Agency	Mode(s)
Louisiana Department of Transportation and Development	New Orleans Regional Transit Authority (St. Charles, Canal Street, and Riverfront Streetcar)	Streetcar
Maryland Department of Transportation	Maryland Transit Administration (MTA Light Rail and Metro Subway)	Heavy Rail Light Rail
	Maryland Transit Administration (Purple Line*)	Light Rail*
Massachusetts Department of Public Utilities	Massachusetts Bay Transportation Authority (The T)	Heavy Rail Light Rail
Michigan Department of Transportation	Detroit People Mover (DPM)	Automated Guideway
	M-1 Rail QLINE	Streetcar
Minnesota Department of Public Safety	Metro Transit (METRO)	Light Rail
Missouri Department of Transportation[2]	Loop Trolley Transportation Development District (The Loop Trolley)	Streetcar
	City of Kansas City, Missouri (KC Streetcar)	Streetcar
	St. Louis Metro (MetroLink)	Light Rail
New Jersey Department of Transportation	New Jersey Transit (Newark Light Rail)	Light Rail

* System in Engineering/Construction

[2] The Missouri and Illinois Departments of Transportation share oversight responsibilities for the St. Louis Metro system.

State Safety Oversight Agency	Rail Transit Agency	Mode(s)
	New Jersey Transit (Hudson-Bergen Light Rail)	Light Rail
	New Jersey Transit (River Line)	Hybrid Rail
	Port Authority Transit Corporation (PATCO)	Heavy Rail
New York Public Transportation Safety Board	Metropolitan Transportation Authority New York City Transit	Heavy Rail
	Niagara Frontier Transit Authority (Metro Rail)	Light Rail
North Carolina Department of Transportation	Charlotte Area Transit System (Lynx and Charlotte Streetcar)	Light Rail Streetcar
Ohio Department of Transportation	Greater Cleveland Regional Transit Authority (RTA Rapid Transit)	Heavy Rail Light Rail
	Southwest Ohio Regional Transit Authority (Cincinnati Streetcar)	Streetcar
Oklahoma Department of Transportation	Oklahoma City Streetcar (OKC Streetcar)	Streetcar
Oregon Department of Transportation	Portland TriMet (MAX)	Light Rail
	Portland Streetcar	Streetcar[3]

[3] Prior to 2011, the NTD received service data for Portland Streetcar via Portland TriMet's annual report, which combined data from the two RTAs. In order to have consistent data for the 2007–2018 period in this report, analysts classified Portland Streetcar as a light rail mode.

State Safety Oversight Agency	Rail Transit Agency	Mode(s)
Pennsylvania Department of Transportation	Cambria County Transit Authority (Johnstown Inclined Plane)	Inclined Plane
	Port Authority of Allegheny County (The T and Monongahela Incline and Duquesne Incline)	Light Rail Inclined Plane
	Southeastern Pennsylvania Transit Authority (Market Frankford Line and Broadstreet Subway, Subway Surface)	Heavy Rail Streetcar
Puerto Rico Emergency and Disaster Management Agency	Tren Urbano	Heavy Rail
Tennessee Department of Transportation	Chattanooga Area Regional Transportation Authority (Lookout Mountain Incline Railway)	Inclined Plane
	Memphis Area Transit Authority (MATA)	Streetcar
Texas Department of Transportation	Dallas Area Rapid Transit (DART)	Light Rail
	Galveston Island Transit (Galveston Island Trolley*)	Streetcar*
	McKinney Avenue Transit Authority (McKinney Avenue Trolley)[4]	Streetcar
	Metropolitan Transit Authority of Harris County (Houston Metro)	Light Rail

* System in Engineering/Construction
[4] Did not report event data for the 2013–2015 reporting years.

State Safety Oversight Agency	Rail Transit Agency	Mode(s)
	North Central Texas Council of Governments (Dallas Streetcar)	Streetcar
	Sun Metro (El Paso Streetcar)	Streetcar
Washington Metrorail Safety Commission	Washington Metropolitan Area Transit Authority (Metro/WMATA)	Heavy Rail
Utah Department of Transportation	Utah Transit Authority (TRAX)	Light Rail
Virginia Department of Rail and Public Transit	Hampton Roads Transit (The Tide)	Light Rail
Washington State Department of Transportation	Seattle Center Monorail (Seattle Monorail)	Automated Guideway
	Sound Transit (Link)	Light Rail
	Sound Transit (Tacoma Link)	Streetcar
	South Lake Union Streetcar (Seattle Streetcar)	Streetcar
West Virginia Division of Public Transit	Morgantown Personal Rapid Transit (PRT)[5]	Automated Guideway
Wisconsin Department of Transportation	Kenosha Area Transit (Kenosha Streetcar)	Streetcar
	City of Milwaukee (The Milwaukee Streetcar)	Streetcar

[5] Did not report event data for the 2013–2015 reporting years.

Appendix B. Definitions

Collision Type

For every reportable collision, state safety oversight agencies (SSOAs) identify the object that the rail transit train collided with using one of the following categories:

- *Auto:* A non-rail motor vehicle.
- *Person:* A human being who is not inside of a motor vehicle (this includes bicyclists).
- *Train:* Another rail transit vehicle (including nonrevenue vehicles).
- *Other:* Any other object.

Event

States require rail transit agencies (RTAs) to notify them within two hours of any event that meets the notification thresholds established in state safety oversight program (SSO) regulation.

Under 49 CFR Part 659 (Part 659), the following thresholds defined a reportable event:

- A fatality;
- Injuries to two or more individuals;
- Property damage to rail transit vehicles, non-rail transit vehicles, other rail transit property or facilities, or non-transit property that equals or exceeds $25,000;
- An evacuation for reasons of life safety;
- A mainline derailment;
- A collision at a grade crossing;
- A collision with an individual on a rail ROW; and
- A collision between a rail transit vehicle and a second rail transit vehicle or a rail transit nonrevenue vehicle.

Once FTA certified an SSOA under SSO regulation 49 CFR Part 674 (Part 674), RTAs notify them of

- safety events, and
- security events that result from an attempted suicide or trespassing and that involved a collision with a rail transit train.

The above events are reportable and require State investigation when any of the following thresholds are met:

- A fatality;
- A serious injury;
- An evacuation for reasons of life safety;
- A derailment of any rail vehicle at any location;
- A runaway train;
- A collision between a rail transit vehicle and a second rail transit vehicle or a rail transit non-revenue vehicle; and
- A collision involving a rail transit vehicle that resulted in substantial property damage.

See Appendix C for more details on this transition in reporting thresholds.

Event Type

SSOAs categorize every reportable event into one of the following five groups:

- *Rail Grade-Crossing (RGX) Collisions:* A reportable collision between a rail transit vehicle and any other object or person that occurs at a rail grade crossing, including street intersections where trains are running at-grade.
- *Non-RGX Collisions:* A reportable collision between a rail transit vehicle and any object or person that does **not** occur at a rail grade crossing or street intersection.
- *Derailments:* Derailment of a rail transit vehicle from mainline or nonrevenue track.
- *Fires:* Fires on transit agency property.
- *Other:* Any other event that meets the thresholds defined in the events section above.

Analysts have categorized all events in this report into distinct sets of event types based on the SSOA-submitted event type and probable causes defined below.

The categorization process is defined in the table below.

Reported Event Type	Reported Cause	RSDR Event Type	Included in Collision Analyses?
RGX Collision	Any, except for Suicide or Trespassing	RGX Collision	Yes
Non-RGX Collision	Any, except for Suicide or Trespassing	Non-RGX Collision	Yes
Derailment	Any	Derailment	No
Fire	Any	Fire	No
Other	Any, except for Suicide or Trespassing	Other Event	No
Any	Suicides Trespassing	Suicide or Trespasser	No

Fatality

Loss of life due to injuries sustained during a rail transit event, either confirmed at the scene of a rail transit event or within 30 days. (This threshold is defined in the 49 CFR § 674 appendix.)

Injury

While Part 659 was in effect, injuries were defined based on the thresholds stated in § 659.33(a). Namely, reportable injuries were those sustained during a rail transit event that require immediate medical attention away from the scene.

Once Part 674 came into effect, SSOAs began to report “serious” and “nonserious” injuries separately. Section 674.7 defines a serious injury as any injury that:

- Requires hospitalization for more than 48 hours, commencing within seven days from the date the injury was received;
- Results in a fracture of any bone (except simple fractures of fingers, toes, or nose);

- Causes severe hemorrhages or nerve, muscle, or tendon damage;
- Involves any internal organ; or
- Involves second- or third-degree burns, or any burns affecting more than five percent of the body surface.

Non-serious injuries include those that do not meet the above thresholds but do require immediate medical transportation away from the scene.

The data presented in this report include all injuries reported while Part 659 was in effect, and all serious and non-serious injuries resulting from events included in this report's analyses once Part 674 took effect.

Mode

A mode is a system for carrying passengers that is defined by a specific ROW, technology, and operational feature. As part of the SSO program, every SSOA identifies the modes operated by the transit agencies they oversee. For each reportable event, the SSOA identifies the applicable mode. Each mode is defined below:

- *Heavy Rail:* An electric railway that typically operates in long trains (six or more cars) on an exclusive ROW. (Note: One heavy rail system, the Port Authority Trans-Hudson, is regulated by the FRA and is not part of the SSO program.)
- *Light Rail:* An electric railway that typically operates in short trains (up to four cars) on a combination of mixed traffic and exclusive ROWs with grade crossings.
- *Streetcar:* A rail system that typically operates in single-car trains with electric propulsion on mixed traffic ROWs.
- *Hybrid Rail:* A rail system that typically operates in short trains (up to four cars) with either electric or diesel propulsion on the National system of railroads. (Note: Three hybrid rail systems, the Portland Tri-Met Westside Express, the Austin Capital MetroRail, and the Denton County A-Train, are regulated by the FRA and are not included in the SSO program.)
- *Cable Car:* A rail system that operates in single-car trains propelled by cables beneath the street on mixed traffic ROWs.
- *Inclined Plane:* A rail system operating on steep grades with vehicles powered by moving cables.

- *Monorail/Automated Guideway:* A rail system that typically operates in trains on a single rail guideway in an exclusive ROW.

This report groups modes into four categories for analysis, as shown below.

Modal Category	Mode Detail
Heavy Rail	Heavy Rail
Light Rail	Light Rail Hybrid Rail
Streetcar	Streetcar
Other	Cable Car Inclined Plane Monorail/Automated Guideway

Person Type

SSOAs categorize all fatalities and injuries that result from a reportable event into one of the following four groups:

- *Passengers:* Customers who are either onboard a railcar or in the process of boarding or alighting.
- *Patrons:* Customers waiting for or leaving rail transit at stations, in mezzanines, on stairs, escalators, elevators, in parking lots, or on other transit agency property.
- *Workers:* Rail transit agency employees or contractors.
- *Public:* People who come into contact with the rail transit system, excluding customers and transit workers, such as pedestrians, automobile drivers, and trespassers. This report categorizes all suicide and trespasser fatalities and injuries as *public*.

Probable Cause

SSOAs report a probable cause for all events by selecting from a predefined list of causes. These categories reflect the terms used in the rail transit industry to describe the proximate cause of an event. Each cause is identified below:

- *Equipment Failure:* Failure of a system component.

- *Rule Violations/Human Factors:* Employee error or organizational issues.
- *Poor Maintenance:* Failures arising due to inadequate maintenance.
- *Slips and Falls:* A person slipping or falling in a station or transit vehicle.
- *Action of Motorist:* Behavior of the driver of a non-transit vehicle.
- *Imprudent Patron Actions:* Inappropriate behavior by a transit customer.
- *Pedestrian Actions:* Behavior of a person who is not a transit employee or customer.
- *Suicides:* Suicide attempts that result in a reportable event.
- *Trespassing:* Behavior of a person trespassing on transit agency property.
- *Medically Related:* The medical condition of a person results in a reportable event, including a person found dead on transit agency property.
- *Other:* Acts of nature or unknown causes.

This report groups probable causes into five categories for analysis, as shown below.

RSDR Probable Cause	SSO Program Probable Cause
Workforce or Infrastructure	Equipment Failure Rule Violations/Human Factors Poor Maintenance
Customer Actions	Slips and Falls Imprudent Patron Actions
Suicide or Trespassing	Suicides Trespassing
Other Public Actions	Actions of Motorists Pedestrian Actions
Other	Medically Related Other

Data Coding Examples

The table below provides examples of how events would be captured in this report. See Appendix C for more details on which events are reportable under Part 659 and Part 674.

Event	Event Type	Fatality/Injury and Person Type	Probable Cause
A trespasser walking on the train tracks is hit from behind by a train and killed.	Suicide or Trespasser*	1 fatality (public*)	Trespassing
A track inspector on the ROW is struck and killed when a train ran a red signal.	Non-RGX Collision	1 fatality (worker)	Rule Violations/ Human Factors
A patron waiting for a train leans too far over the station platform and is struck by the train and left in a coma for a week.	Non-RGX Collision	1 injury† (patron)	Imprudent Patron Actions
A passenger on a train hits their head and has a short hospital visit after one train collides with another from a brake malfunction.	Non-RGX Collision	1 injury (passenger)	Equipment Failure
A member of the public commits suicide by intentionally jumping in front of a train from a station platform.	Suicide or Trespasser*	1 fatality (public*)	Suicides
A motor vehicle runs a red light and collides with a train at a grade crossing, killing the occupant of the motor vehicle. The train operator and a passenger have injuries and are treated as outpatients.	RGX Collision	1 fatality (public) 1 injury (worker) 1 injury (passenger)	Actions of Motorist

* Because these events are suicide or trespasser related, this report categorizes the event type as “suicide or trespasser” and the person type as “public,” even if SSOAs reported the event or person type differently.
† These injuries would be reported as serious injuries if the event was reported under Part 674 thresholds.

Event	Event Type	Fatality/Injury and Person Type	Probable Cause
A patron falls down a crowded station escalator and as a result four patrons are taken to the hospital for sprained ankles.	Other	4 injuries (patron)	Slips and Falls
A shop worker breaks their arm when a poorly secured service vehicle rolls into them.	Other	1 injury† (worker)	Rules Violations/ Human Factors
One patron stabs and robs another patron on a station mezzanine. The victim dies later that day.	Other	1 fatality (patron)	Imprudent Patron Actions

† These injuries would be reported as serious injuries if the event was reported under Part 674 thresholds.

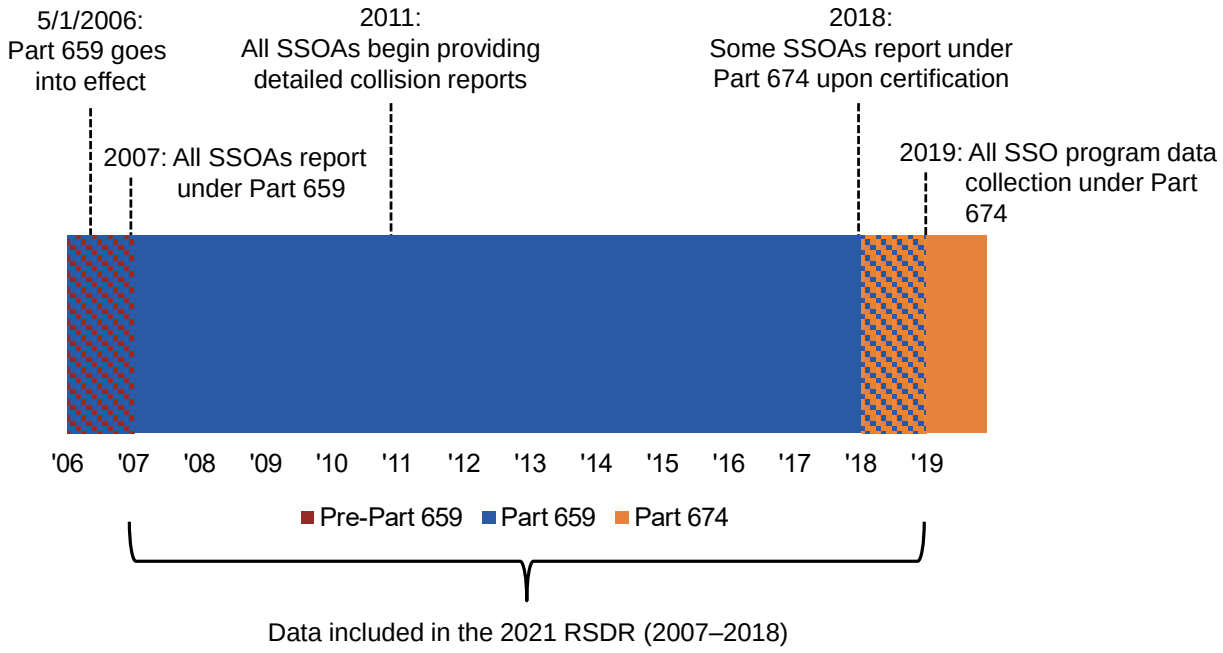
Appendix C. Changes to Event Reporting Thresholds

FTA requires SSOAs to investigate and report the probable causes of certain events that occur at the RTAs they oversee. SSOAs must report on all events that surpass the specific thresholds that are written into the SSO regulation that is in effect at that time. The SSO program transitioned from using the thresholds in the SSO regulation at 49 CFR Part 659 (Part 659) to those in the SSO regulation at 49 CFR Part 674 (Part 674) during the 2018 reporting year. This appendix discusses the impact of that change.

Timing of Regulation Changes

Part 659 went into effect on May 1, 2006, and included significant changes to event reporting thresholds. Some SSOAs reported under these thresholds for the entire 2006 reporting year, while others began to use these thresholds when the rule went into effect.

On March 16, 2016, FTA issued Part 674 for the oversight of the rail fixed guideway public transportation industry. Each SSOA transitioned to reporting events exceeding Part 674 thresholds once FTA certified that the SSOA met the new regulation's program requirements. Agencies certified prior to 2018 used Part 674 thresholds for the entire 2018 reporting year. Agencies certified during 2018 used Part 659 thresholds until certified, then switched to using Part 674 thresholds. Agencies certified in 2019 began using Part 674 thresholds starting with the 2019 reporting year. By April 2019, all SSOAs had received certification. The illustration below summarizes these reporting changes.



Because of the timing of these reporting-criteria changes, this RSDR presents 2007–2017 data and 2018 data separately in some analyses, as the former is an eleven-year period of uniform nationwide data collection, while the latter is a year when reporting requirements were in transition.

Comparison of Part 659 and Part 674 Thresholds

The table on the following pages details the differences between event reporting thresholds under Part 659 and Part 674 and illustrates potential impacts on which events require investigation.

Criterion or Threshold	Part 659 Reporting Requirement	Part 674 Reporting Requirement	Impact of Change
Universe of Reportable Events	Any incident involving a rail transit vehicle or taking place on rail-transit controlled property.	A safety event occurring on rail transit ROW or infrastructure, at a rail transit revenue facility, at a maintenance facility or rail yard, during a rail transit-related maintenance activity, or involving a rail transit revenue vehicle, OR A security event resulting from a suicide event or trespassing that involves a collision with a rail transit vehicle.	Security events not involving a rail transit vehicle no longer require investigation, regardless of whether or not a reporting threshold was met (e.g., a homicide in a station).
Loss of Life	A fatality at the scene or confirmed death within 30 days.	A fatality occurring at the scene or within 30 days.	No substantial change.

Criterion or Threshold	Part 659 Reporting Requirement	Part 674 Reporting Requirement	Impact of Change
Injuries	Injuries requiring immediate medical attention away from the scene for two or more individuals.	Injuries qualifying as serious injuries to one or more persons.	Events resulting in serious injury to only one person now require investigation. Events not resulting in serious injury to anyone, but that do result in non-serious injuries to two or more people, no longer require investigation.
Property Damage	Damage to transit and non-transit property exceeds $25,000.	Collisions involving a rail transit vehicle resulting in substantial damage to transit or non-transit property.	Collisions involving rail transit vehicles with substantial property damage but less than an estimated $25,000 now require investigation. Non-collision events resulting in more than $25,000 in property damage, but not meeting another reporting threshold, no longer require investigation.
Evacuations	Evacuations due to life safety reasons.	Evacuations for life safety reasons.	No substantial change.
Grade-Crossing Collisions	A collision at a grade crossing.	(No comparable threshold.)	Collisions at grade crossings no longer require investigation, unless another reporting threshold is met.

Criterion or Threshold	Part 659 Reporting Requirement	Part 674 Reporting Requirement	Impact of Change
Derailments	A mainline derailment.	Any derailment of a rail transit vehicle, at any location, at any time, whatever the cause.	Derailments not on the mainline now require investigation. Derailments of nonrevenue rail transit vehicles now require investigation.
Collisions with People	A collision with an individual on the rail ROW.	(No comparable threshold.)	Collisions with people on the ROW no longer require investigation, unless another reporting threshold is met.
Collisions Between Rail Transit Vehicles	A collision between a rail transit vehicle and another rail transit vehicle or a rail transit nonrevenue vehicle.	A collision between a rail transit vehicle and another rail transit vehicle.	No substantial change.
Runaway Train	(No comparable threshold.)	A runaway train.	Events involving runaway trains, but not meeting another reporting threshold, now require investigation.

Comparison of Part 659 and Part 674 Thresholds

The following table shows how the transition from Part 659 to Part 674 reporting thresholds could affect event reporting for the events described below.

Event	Meets Part 659 Thresholds?	Meets Part 674 Thresholds?
A trespasser walking on the train tracks is hit from behind by a train and killed.	Yes (fatal event, collision between person and rail vehicle on the rail ROW)	Yes (fatal security event involving train collision from trespassing)
A track inspector on the ROW is struck and killed when a train runs a red signal.	Yes (fatal event, collision between person and rail vehicle)	Yes (fatal safety event)
A patron waiting for a train leans too far over the station platform and is struck by the train and left in a coma for a week.	Yes (collision between person and rail vehicle on the rail ROW)	Yes (safety event resulting in serious injury)
A passenger on a train hits their head and has a short hospital visit after one train collides with another from a brake malfunction.	Yes (collision between rail vehicles)	Yes (collision between rail vehicles)
A member of the public commits suicide by intentionally jumping in front of a train from a station platform.	Yes (fatal event, collision between person and rail vehicle on the rail ROW)	Yes (fatal security event involving train collision from suicide)

Event	Meets Part 659 Thresholds?	Meets Part 674 Thresholds?
A motor vehicle runs a red light and collides with a train at a grade crossing, killing the occupant of the motor vehicle. The train operator and a passenger have injuries and are treated as outpatients.	Yes (fatal event, collision at grade crossing, injuries to 2 people)	Yes (fatal safety event)
A patron falls down a crowded station escalator and as a result four patrons are taken to the hospital for sprained ankles.	Yes (injuries to 4 people)	No (no serious injuries)
A shop worker breaks their arm when a poorly secured service vehicle rolls into them.	No (injuries to only 1 person, collision not on the rail ROW)	Yes (safety event resulting in serious injury)
One patron stabs and robs another on a station mezzanine. The victim dies later that day.	Yes (fatal event)	No (fatal security event does not involve collision with transit vehicle)

Appendix D. Methodology

Rationale for Study Period

The SSO regulation at 49 CFR Part 659 (Part 659) went into effect on May 1, 2006. Amendments to the regulation included significant changes to the thresholds that define reportable events and affect event reporting and investigation requirements. Though some SSOAs submitted their 2006 annual reports in compliance with Part 659 requirements, others had not tracked events that occurred before May 2006 in accordance with the new thresholds. As such, 2007 marks the first full year that the SSO community uniformly applied the revised Part 659 reporting criteria. Thus, data from 2007 are the first data available for use in this analysis.

While some SSOAs reported event data to FTA under requirements defined in the new SSO regulation at 49 CFR Part 674 (Part 674) for at least part of the 2018 reporting year, Part 659 requirements remained in force for others in 2018.[*] Because of this, annual reporting during the 2018 reporting year contains a mixture of events meeting either Part 659 thresholds and Part 674 thresholds. Thus, data presentations in this report contain either 2007–2017 data or 2018 data, to avoid any misinterpretation.

Data Collection

Part 659 required SSOAs to provide annual reports to FTA. For the 2007–2017 reporting years, these annual reports included data related to events defined by § 659.33(a), summarized in the event definition in Appendix B. While Part 674 came into effect for some SSOAs prior to or during the 2018 reporting year, for others, Part 659 was in effect for the entire year. Regardless of the regulation part in effect for the year, all SSOAs reported 2018 event data using equivalent procedures to those used for previous reporting years when Part 659 was in effect.

Ongoing Data Validation

Since 2010, FTA has used event data submitted to the NTD by RTAs to validate event data submitted by SSOAs. While the NTD data do not include causal information, FTA can use an RTA's NTD event report to validate event details reported by SSOAs.

Before the 2019 reporting year, FTA would evaluate each event submitted by an SSOA to ensure that the information did not conflict with data submitted by RTAs to the NTD, and FTA analysts would coordinate with SSOAs and RTAs to resolve discrepancies.

[*] While FTA issued Part 674 on March 16, 2016, it delayed changes to SSOA event reporting until the 2018 reporting year. In that year, each SSOA began to report events surpassing Part 674 thresholds once FTA certified it met the new rule's requirements.

Depending on the discrepancy, the RTA might have revised an NTD report. Alternatively, the SSOA might have resubmitted event data to the SSO program.

Starting with the 2019 reporting year, this validation process changed to accommodate new event reporting requirements for SSOAs and RTAs under Part 674 and to use new systems developed based on the new requirements.

Data Analysis

Once SSO program event data have been collected and validated, FTA analyzes the data using conventional techniques to characterize rail transit event trends across the industry, including:

- Fatalities
- Injuries
- Person type of fatalities and injuries
- Rail transit mode
- Event type (categorized based on a combination of an SSOA's event type and probable cause submissions)
- Object collided with (collision events for heavy rail, light rail, and streetcar mode categories only)
- Probable cause (in causal groups)

Unless otherwise noted, this report calculates annual average percentage change over multiple years as

$$r = \left(\frac{C_a}{C_b}\right)^{\frac{1}{y}} - 1,$$

which is a transformation of

$$C_a = C_b(1 + r)^y.$$

C_a is the count in the later year; C_b is the count in the earlier year; r is the annual average rate of change; and y is the number of years between the two counts.

In the calculation, r reflects a uniform annual change rate across a y year period, with the first-year count C_a and the last-year count C_b. This calculation method results in a number

that is more comparable to a single year percentage change than the results of other calculation methods.

Data Normalization

FTA normalizes data prior to some data analyses to account for the different amounts of service provided by each mode and the rail transit industry across time. FTA calculates a rate per 100M VRM for all normalization in these analyses.

FTA analysts obtain VRM data from the NTD's annual reporting service module. RTAs report these data on NTD Form S-10 for each reporting year.

Appendix E. List of Figures and Tables in the RSDR

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