Rail Safety Statistics Report

Rail Transit Safety Data
2007 – 2013
December 2016

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REPORT DOCUMENTATION PAGE

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14. ABSTRACT

This Rail Safety Statistics Report analyzes event data collected through the State Safety Oversight (SSO) program and provides a snapshot of the safety performance of the rail transit industry for the seven-year period of calendar year (CY) 2007 through CY 2013. 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 (100M VRM) as reported to the National Transit Database (NTD). By identifying and analyzing this information, FTA can develop and conduct research, training, and evaluation targeted at the situations and conditions that pose the greatest risk of harm to passengers, employees, station occupants, and 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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Introduction

Overview of the State Safety Oversight Program

The Federal Transit Administration (FTA) administers the State Safety Oversight Program to ensure a broad, systems-oriented safety strategy for the rail fixed guideway public transportation industry. Through audits, training, and outreach, FTA supports State Safety Oversight Agency (SSOA) compliance with the State Safety Oversight rule at 49 CFR Part 659); 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 49 CFR §659.39(c), SSOAs report a variety of information to FTA, including rail transit agency event data, which gives FTA greater insight into rail transit safety performance.

This *Rail Safety Statistics Report* analyzes event data collected through the SSOAs and provides a snapshot of the safety performance of the rail transit industry for the seven year period of calendar year (CY) 2007 through CY 2013. Specifically, 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 (100M VRM) as reported to the National Transit Database (NTD). By identifying and analyzing this information, FTA can develop and conduct research, training, and evaluation targeted at the situations and conditions that pose the greatest risk of harm to passengers, employees, station occupants, and the public.

Readers should please note: on March 16, 2016, FTA issued a new rule for State Safety Oversight of the rail fixed guideway public transportation industry which will replace the longstanding rule at 49 CFR Part 659 (see 51 Fed.Reg. 14230-62). The new rule, codified at 49 CFR Part 674, entails a very different regimen for rail transit system notification and reporting of accidents, incidents, and occurrences to FTA and the SSOAs. However, until SSOAs and rail transit agencies come into compliance with the new rule at Part 674 they will continue to comply with the rule at Part 659.

SSO Community

There are currently 31 SSOAs designated to oversee the safety of 61 rail fixed guideway public transportation systems (RFGPTS) nationwide. Of this total number of RFGPTS, the 47 that were operational between 2007 and 2013 are included in this study. The map on the following page and table in Appendix A identify the SSOAs subject to 49 CFR Part 659 and mark the location of each applicable RFGPTS as of the date of this publication.

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, 5329) include sightseeing services and 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 use FTA funding and that do not report their data to the NTD for inclusion in the apportionment of formula grants.

SSO Community Map
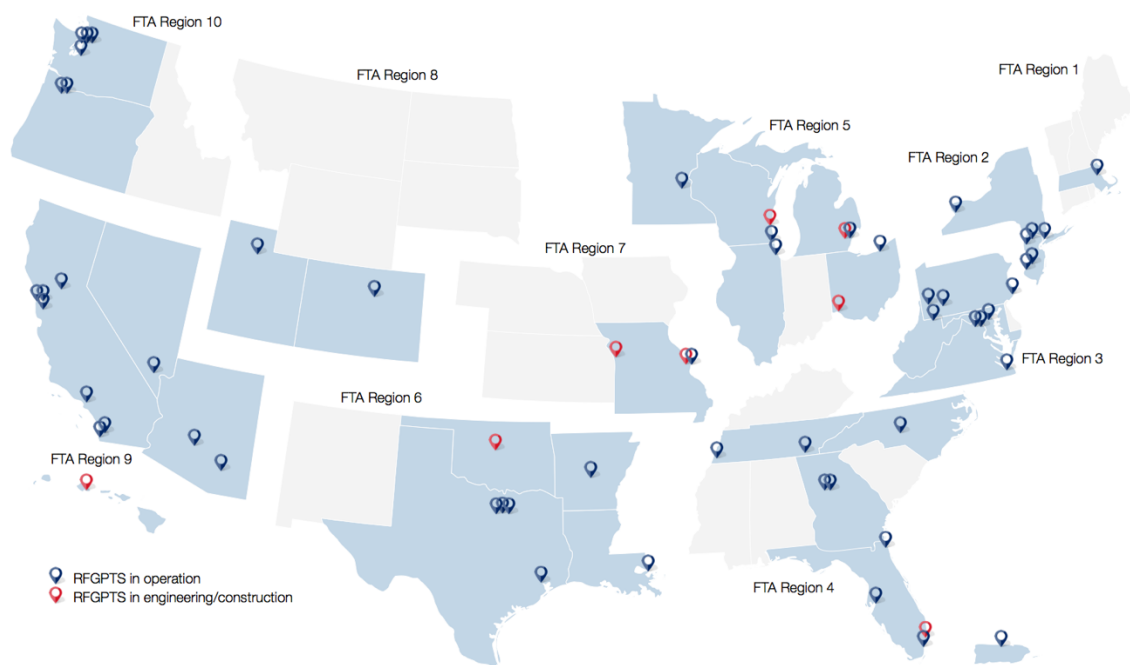
Figure 1 SSO Community Map by Region

As of 2016, there are 54 RFGPTS in operation across the country, with an additional 7 in engineering or under construction. Of these 54 RFGPTS, 13 operate heavy rail mode, 23 operate light rail mode, and 2 operate hybrid rail mode (included in the light rail totals in this analysis). Seventeen operate streetcar mode, and 10 operate other rail modes, including 6 automated guideway systems, 3 inclined plane systems, and 1 cable car system. Some agencies operate more than one rail mode, accounting for the difference in total agencies and the sum of the modes operated. The table below lists those systems with more than one mode in operation.

Rail Transit Agency	RFGPTS Modes
Bay Area Rapid Transit District	Heavy Rail, Automated Guideway
Los Angeles County Metropolitan Transportation Authority	Heavy Rail, Light Rail
San Francisco Municipal Railway	Light Rail, Streetcar, Cable Car
Miami-Dade Transit Authority	Heavy Rail, Automated Guideway
Maryland Transit Administration	Heavy Rail, Light Rail
Massachusetts Bay Transportation Authority	Heavy Rail, Light Rail
Greater Cleveland Regional Transit Authority	Heavy Rail, Light Rail
Port Authority of Allegheny County	Light Rail, Inclined Plane
Southeastern Pennsylvania Transit Authority	Heavy Rail, Streetcar

Table 1 Nationwide RFGPTS Systems with More Than One Mode in Operation

Key Takeaways

- The industry fatality rate[1] is increasing.
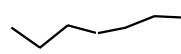
2007	2008	2009	2010	2011	2012	2013	Avg	Trend
18.84	14.61	19.44	17.83	19.02	21.41	21.12	18.91	

Figure 2 Increase in Industry Fatality Rates from 2007-2013

- Heavy Rail systems report the majority of fatalities, but standardizing by vehicle revenue miles reveals a heavy rail fatality rate lower than all other modes because heavy rail provides more service.

Fatalities, 2007-2013

Other 13, 1%

Streetcar 9, 1%

Heavy Rail 722, 75%

Light Rail 224, 23%
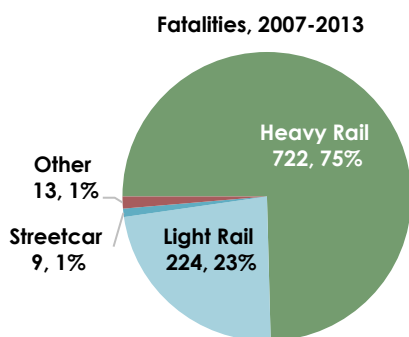
Figure 3 Rail System Fatalities by Mode 2007-2013

Fatality Rate, 2007-2013

Heavy Rail 16.20

Light Rail 36.57

Streetcar 25.89

Other 75.85
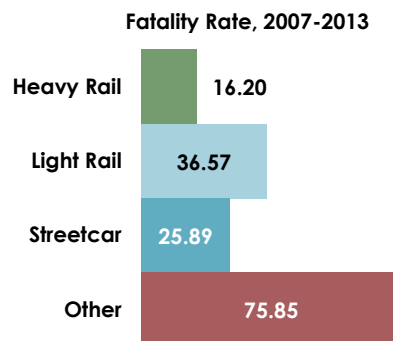
Figure 4 Rail System Fatality Rates Standardized by Vehicle Revenue Miles by Mode 2007-2013

- The majority (77%) of fatalities is comprised of members of the general public (not transit customers or employees) and the majority of these (81%) are trespassers or persons committing suicide.

Fatalities, 2007-2013

Passenger 47, 5%

Patron 150, 16%

Worker 24, 2%

Public 747, 77%
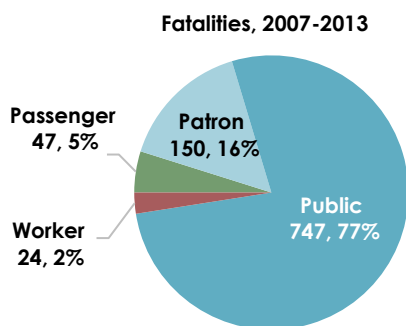
Figure 5 Percent of Rail System Fatalities by Demographics

Public Fatalities, 2007-2013

Suicides or Trespassers 603, 81%

Any Other Cause 144, 19%
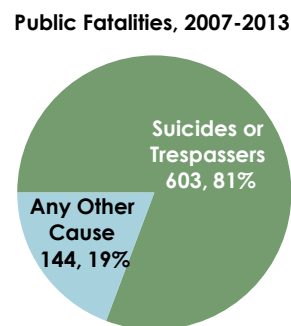
Figure 6 Percent of Rail System Fatalities by Cause

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[1] This analysis calculates all event, fatality, and injury rates by standardizing reported figures by 100 million vehicle revenue miles.

- Eliminating suicides and trespassing fatalities still reveals an increasing trend for all other types of fatalities.
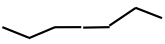
2007	2008	2009	2010	2011	2012	2013	Avg	Trend
6.61	4.78	6.70	6.72	6.80	9.88	8.10	7.09	

**Figure 7 Increasing Trend in All Types of Fatalities
per 100 Million Vehicle Revenue Miles (Excludes Suicides and Trespassing)**

- Passenger fatality rate is decreasing, but patron, public and worker fatality rates are increasing (suicides and trespassing excluded).
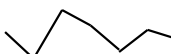
	'07	'08	'09	'10	'11	'12	'13	Avg	Trend
Passenger	0.98	0.14	1.74	1.23	0.42	1.10	0.80	0.92	
Patron	2.81	1.50	1.74	2.61	3.61	4.80	3.45	2.93	
Public	2.53	2.73	2.68	2.19	2.64	3.84	3.05	2.81	
Worker	0.28	0.41	0.54	0.69	0.14	0.14	0.80	0.43	

**Figure 8 Trends in Fatality Rates by Demographics
per 100 Million Vehicle Revenue Miles (Excludes Suicides and Trespassing)**

- SSOAs report the cause of fatalities:

  - Customer behavior (slips and falls and imprudent behavior) caused 39% of non-suicide and trespassing fatalities.

  - Public behavior (pedestrian actions and motorist actions) caused 30% of non-suicide and trespassing fatalities.

  - Other causes account for 23% of non-suicide and trespassing fatalities.

  - Workforce action and infrastructure issues caused 8% of non-suicide and trespassing fatalities.

Fatalities, 2007-2013

Public Behavior 108, 30%

Other 83, 23%

Workforce / Infrastructure 29, 8%

Customer Behavior 143, 39%
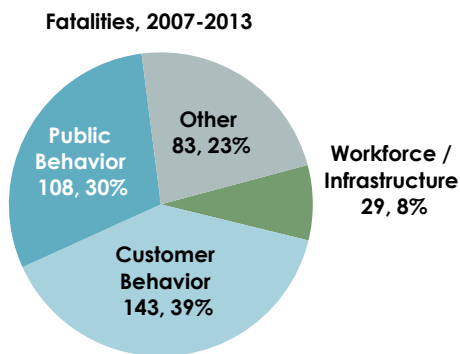
**Figure 9 Percent of Fatalities Due to Workforce / Infrastructure Issues
(excludes suicides and trespassing)**

- Fatality rates for events caused by workforce or infrastructure issues are decreasing while fatality rates for events caused by customer behavior and public behavior are increasing.

	'07	'08	'09	'10	'11	'12	'13	Avg	Trend
Workforce / Infrastructure	0.84	0.96	1.61	0.27	0.00	0.14	0.13	0.56	
Customer Behavior	3.09	1.78	2.28	2.33	1.94	4.67	3.45	2.78	
Public Behavior	2.11	1.64	2.28	1.37	2.36	2.88	2.13	2.10	
Other	0.56	0.41	0.54	2.74	2.50	2.20	2.39	1.62	

Figure 10 Fatality Rate (per 100 Million Vehicle Revenue Miles) Trends by Cause

Rail Transit Industry Trends

Total Vehicle Revenue Miles (millions) for Regulated RFGPTS

752.9

2007	2008	2009	2010	2011	2012	2013	Avg	Trend
711.1	732.2	745.8	729.1	720.4	728.7	752.9	731.5	
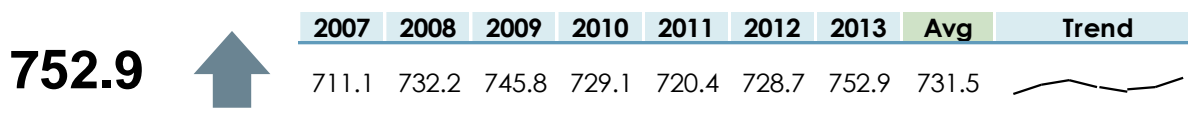
Figure 11 Total Vehicle Revenue Miles (Millions)[2]

- 2013 had the highest number of vehicle revenue miles (VRM) with 752.9 million, a 3.3% increase from 2012.

Total Events and Rates per 100M VRM

1,099

2007	2008	2009	2010	2011	2012	2013	Avg	Trend
769	971	1,029	1,023	1,032	1,000	1,099	989.0	

145.98

2007	2008	2009	2010	2011	2012	2013	Avg	Trend
108.14	132.61	137.97	140.30	143.25	137.23	145.98	135.21	
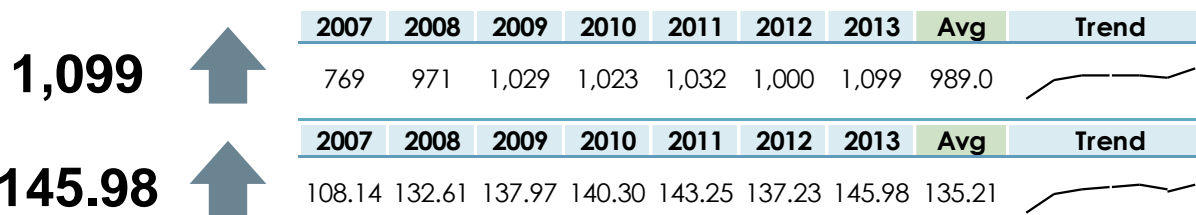
Figure 12 Total Events and Rates per 100M VRM

- 2013 had the highest event rate per 100M VRM for the analyzed period at 145.98, a 6.4% increase from 2012

Total Fatalities and Rates per 100M VRM

159

2007	2008	2009	2010	2011	2012	2013	Avg	Trend
134	107	145	130	137	156	159	138.3	

21.12

2007	2008	2009	2010	2011	2012	2013	Avg	Trend
18.84	14.61	19.44	17.83	19.02	21.41	21.12	18.91	
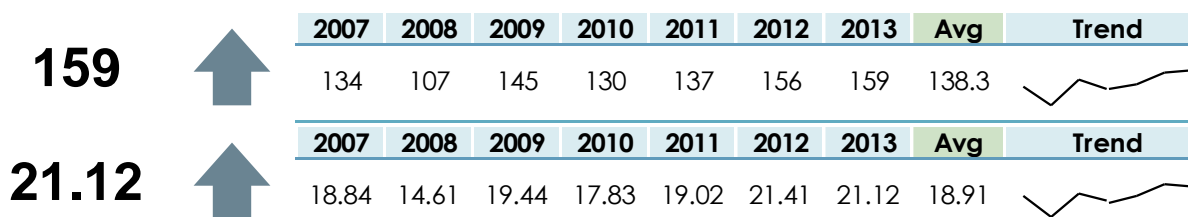
Figure 13 Total Fatalities and Rates per 100M VRM

- 2013 had the highest number of fatalities reported in the analyzed period (159), a 1.9% increase from 2012. However, when standardized by 100M VRM, the fatality rate in 2013 (21.12) was 1.3% lower than in 2012 (21.41).

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[2] This analysis uses rates based on vehicle revenue miles instead of passenger miles because it is a more accurate measure of risk exposure

Total Injuries and Rates per 100M VRM

610

2007	2008	2009	2010	2011	2012	2013	Avg	Trend
569	693	633	704	624	643	610	639.4	

81.02

2007	2008	2009	2010	2011	2012	2013	Avg	Trend
80.01	94.64	84.87	96.55	86.62	88.24	81.02	87.42	
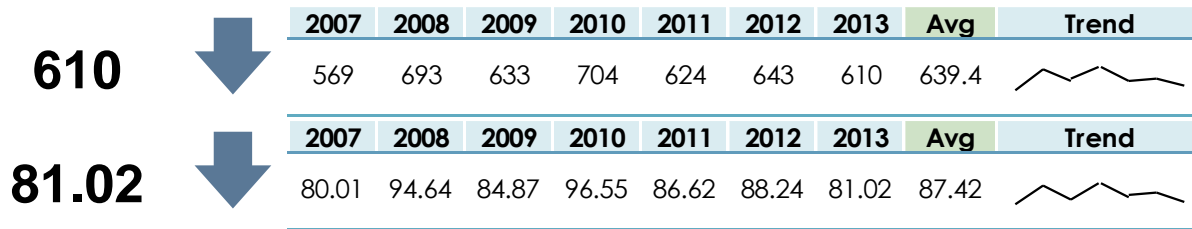
Figure 14 Total Injuries and Rates per 100M VRM

- The 81.02 injuries per 100M VRM reported in 2013 was the lowest rate since 2007.

Fatalities by Person Type and Rates per 100M VRM

Fatalities, 2013

Passenger 6, 4%
Patron 26, 16%
Public 119, 75%
Worker 8, 5%

	'07	'08	'09	'10	'11	'12	'13	Avg	Trend
Passenger	7	1	13	9	3	8	6	6.7	
Patron	20	11	13	19	26	35	26	21.4	
Public	105	92	115	97	107	112	119	106.7	
Worker	2	3	4	5	1	1	8	3.4	

Fatality Rate, 2013

Passenger 0.80
Patron 3.45
Public 15.81
Worker 1.06

	'07	'08	'09	'10	'11	'12	'13	Avg	Trend
Passenger	0.98	0.14	1.74	1.23	0.42	1.10	0.80	0.92	
Patron	2.81	1.50	1.74	2.61	3.61	4.80	3.45	2.93	
Public	14.77	12.56	15.42	13.30	14.85	15.37	15.81	14.59	
Worker	0.28	0.41	0.54	0.69	0.14	0.14	1.06	0.47	

Figure 15 Fatalities by Person Type and Rates per 100M VRM

- There has been a downward trend in passenger fatality rates since 1.74 passenger fatalities per 100M VRM were reported in 2009.

- In 2013, SSOAs reported the first decrease in the rate of patron fatalities since 2008. *Note: Patrons are customers not onboard a vehicle at the time of fatality or injury.*

- Public fatalities accounted for 74.8% of all fatalities reported in 2013. Public fatalities occurred over four times more frequently than fatalities to passengers, patrons, or workers. *Note: The Public category includes all suicide and trespassing-related fatalities.*

- Over the seven-year period, public fatalities made up 77% of all fatalities reported by the SSOAs.

- There were eight worker fatalities in 2013. This was the only year in the analyzed period with a worker fatality rate was greater than 1 fatality per 100M VRM.

Passenger

2007	2008	2009	2010	2011	2012	2013
7	1	13	9	3	8	6

Patron

2007	2008	2009	2010	2011	2012	2013
20	11	13	19	26	35	26

Public

2007	2008	2009	2010	2011	2012	2013
105	92	115	97	107	112	119

Worker

2007	2008	2009	2010	2011	2012	2013
2	3	4	5	1	1	8
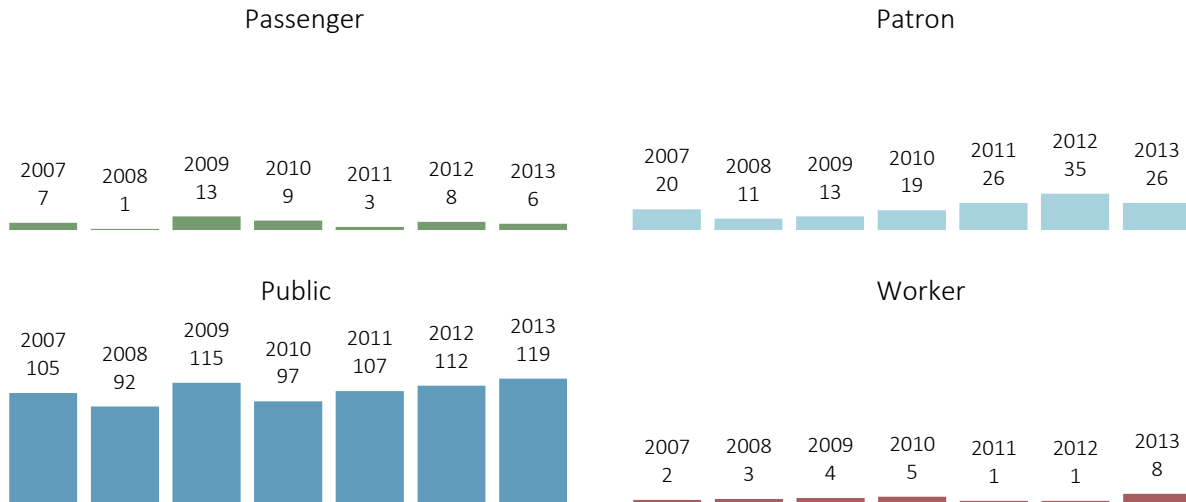
Figure 16 Fatalities by Person Type

Passenger

2007	2008	2009	2010	2011	2012	2013
0.98	0.14	1.74	1.23	0.42	1.10	0.80

Patron

2007	2008	2009	2010	2011	2012	2013
2.81	1.50	1.74	2.61	3.61	4.80	3.45

Public

2007	2008	2009	2010	2011	2012	2013
14.77	12.56	15.42	13.30	14.85	15.37	15.81

Worker

2007	2008	2009	2010	2011	2012	2013
0.28	0.41	0.54	0.69	0.14	0.14	1.06
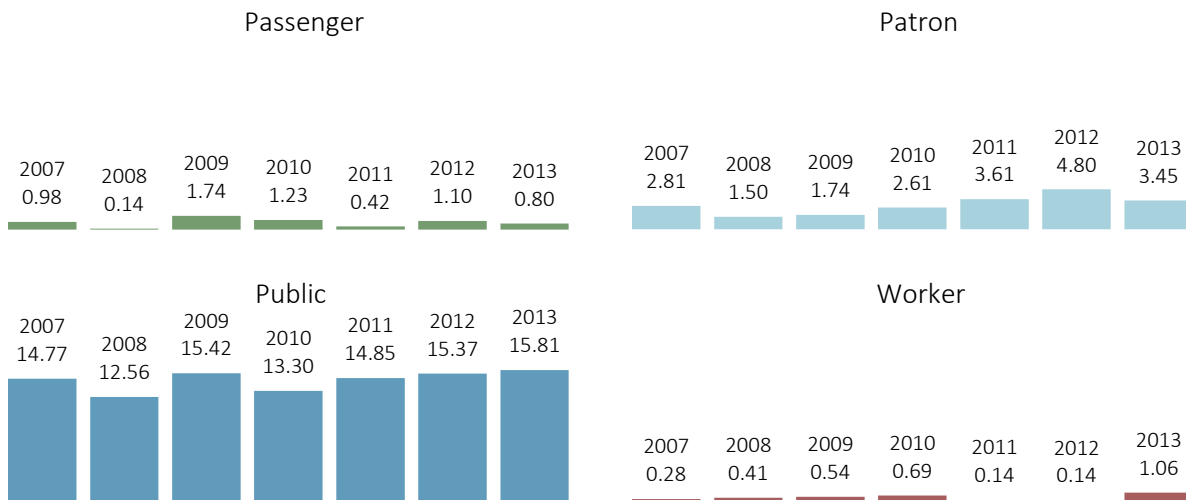
Figure 17 Fatalities per 100 Million VRM by Person Type

Injuries by Person Type and Rates per 100M VRM

Injuries, 2013

	'07	'08	'09	'10	'11	'12	'13	Avg	Trend
Passenger	326	318	342	319	262	219	246	290.3	
Patron	30	87	41	104	134	169	111	96.6	
Public	188	251	209	226	180	190	196	205.7	
Worker	25	37	41	55	48	65	57	46.9	

Injury Rate, 2013

	'07	'08	'09	'10	'11	'12	'13	Avg	Trend
Passenger	45.84	43.43	45.86	43.75	36.37	30.05	32.68	39.69	
Patron	4.22	11.88	5.50	14.26	18.60	23.19	14.74	13.20	
Public	26.44	34.28	28.02	31.00	24.99	26.07	26.03	28.12	
Worker	3.52	5.05	5.50	7.54	6.66	8.92	7.57	6.41	

Figure 18 Injuries by Person Type

- The passenger injury rate has declined at an average annual rate of 5.5% since 2007, with a low of 30.05 passenger injuries per 100M VRM reported in 2012.

- In 2013, SSOAs reported the first increase in the rate of passenger injuries since 2009.

- The 32.68 passenger injuries per 100M VRM reported in 2013 are below the seven-year average rate of 39.69, and represent the second lowest annual passenger injury rate over the entire period analyzed.

- Patrons (customers not onboard a transit vehicle) represent the largest average annual increase in injuries per 100M VRM, averaging a 23.2% increase per year since 2007.

- In 2013, SSOAs reported 14.74 patron injuries per 100M VRM, which is the first decrease in the patron injury rate since 2009.

- Public injuries continue to decline from the high of 34.28 per 100M VRM reported in 2008 to 26.03 in 2013.

- Though there was a decline in the worker injury rate in 2013, on average the rate has increased 13.6% per year since 2007.

Passenger

2008
-2.5%

2009
7.5%

2010
-6.7%

2011
-17.9%

2012
-16.4%

2013
12.3%

Patron

2008
190.0%

2009
-52.9%

2010
153.7%

2011
28.8%

2012
26.1%

2013
-34.3%

Public

2008
33.5%

2009
-16.7%

2010
8.1%

2011
-20.4%

2012
5.6%

2013
3.2%

Worker

2008
48.0%

2009
10.8%

2010
34.1%

2011
-12.7%

2012
35.4%

2013
-12.3%
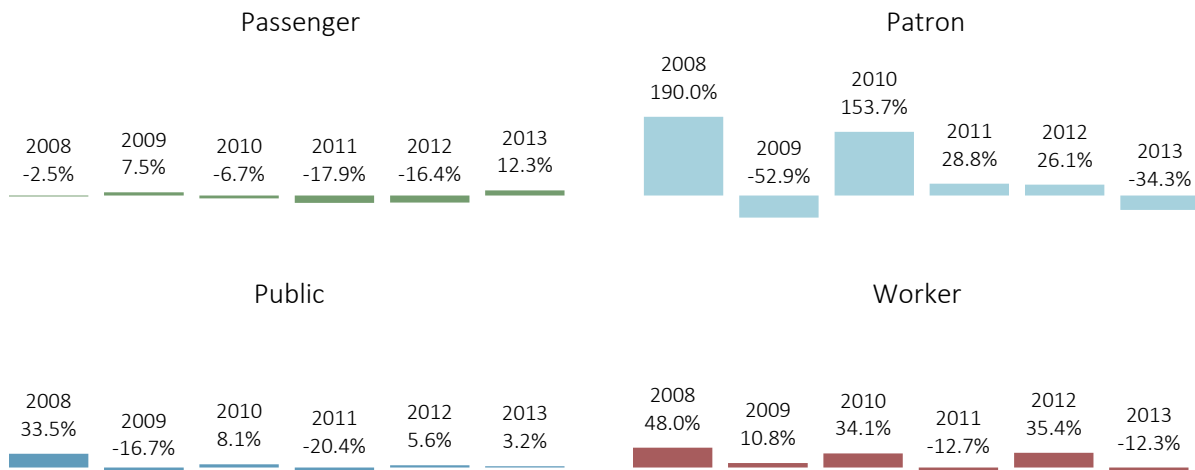
Figure 19 Percent Change in Injuries by Person Type

Passenger

2008
-5.3%

2009
5.6%

2010
-4.6%

2011
-16.9%

2012
-17.4%

2013
8.7%

Patron

2008
181.6%

2009
-53.7%

2010
159.5%

2011
30.4%

2012
24.7%

2013
-36.4%

Public

2008
29.7%

2009
-18.3%

2010
10.6%

2011
-19.4%

2012
4.4%

2013
-0.2%

Worker

2008
43.7%

2009
8.8%

2010
37.2%

2011
-11.7%

2012
33.9%

2013
-15.1%
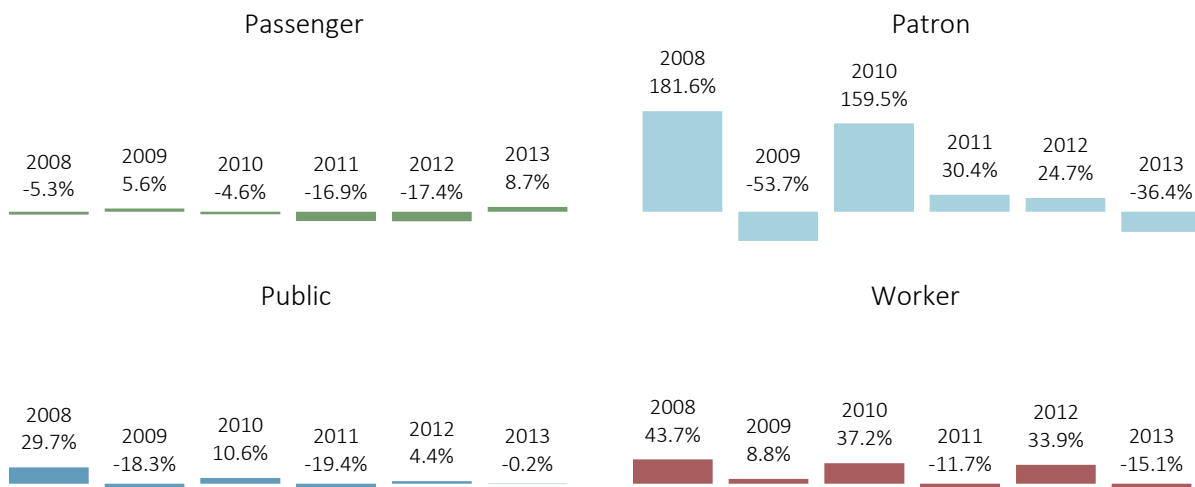
Figure 20 Percent Change in Injury Rates by Person Type (per 100M VRM)

Events by Mode

Rail transit is divided into several different modes. Each rail transit mode operating under the SSO program is defined in Appendix A. The table to the right identifies the four mode categories used in this analysis. The analyses below show the trend and distribution of events involving each of these four modes.

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, Inclines, Monorails, etc.).

Table 2 Events by Mode

Events by Mode and Rates per 100M VRM

Events, 2013

Heavy Rail 360, 33%
Other 18, 2%
Light Rail 576, 52%
Streetcar 145, 13%

	'07	'08	'09	'10	'11	'12	'13	Avg	Trend
Heavy Rail	250	229	265	362	369	349	360	312.0	
Light Rail	412	500	529	473	481	513	576	497.7	
Streetcar	96	237	232	168	165	120	145	166.1	
Other	11	5	3	20	17	18	18	13.1	

Event Rate, 2013

Heavy Rail 55.84
Light Rail 571.20
Streetcar 3,002.36
Other 704.59

	'07	'08	'09	'10	'11	'12	'13	Avg	Trend
Heavy Rail	39.92	35.60	40.49	56.99	59.13	55.58	55.84	49.01	
Light Rail	530.50	617.20	632.04	546.87	539.88	547.42	571.20	568.81	
Streetcar	2,039.8	4,448.9	4,486.9	3,286.5	3,361.6	2,550.1	3,002.4	3,345.8	
Other	450.93	188.47	124.87	843.72	728.52	754.74	704.59	536.81	

Figure 21 Events by Mode and Rates per 100M VRM

- Heavy rail service reported an increased event rate in 2010, which leveled off over the next three years.

- The 571.20 light rail events per 100M VRM reported in 2013 represent a 4.3% increase from 2012. This percentage is more than triple the 1.2% average annual increase in the rate since 2007.

- The streetcar event rate decreased between 2008 and 2013. On average, streetcar events per 100M VRM decreased 7.6% each year during that six-year period.

- SSOAs reported nearly 537 events per 100M VRM on "Other" rail modes during the analyzed period. These systems include automated guideways, monorails, inclines, and cable cars.

Fatalities by Mode and Rates per 100M VRM

	'07	'08	'09	'10	'11	'12	'13	Avg	Trend
Heavy Rail	101	83	107	105	99	107	120	103.1	
Light Rail	29	16	37	21	36	47	38	32.0	
Streetcar	3	3	0	1	1	1	0	1.3	
Other	1	5	1	3	1	1	1	1.9	

	'07	'08	'09	'10	'11	'12	'13	Avg	Trend
Heavy Rail	16.13	12.90	16.35	16.53	15.86	17.04	18.61	16.20	
Light Rail	37.34	19.75	44.21	24.28	40.41	50.15	37.68	36.57	
Streetcar	63.74	56.32	0.00	19.56	20.37	21.25	0.00	25.89	
Other	40.99	188.47	41.62	126.56	42.85	41.93	39.14	75.85	
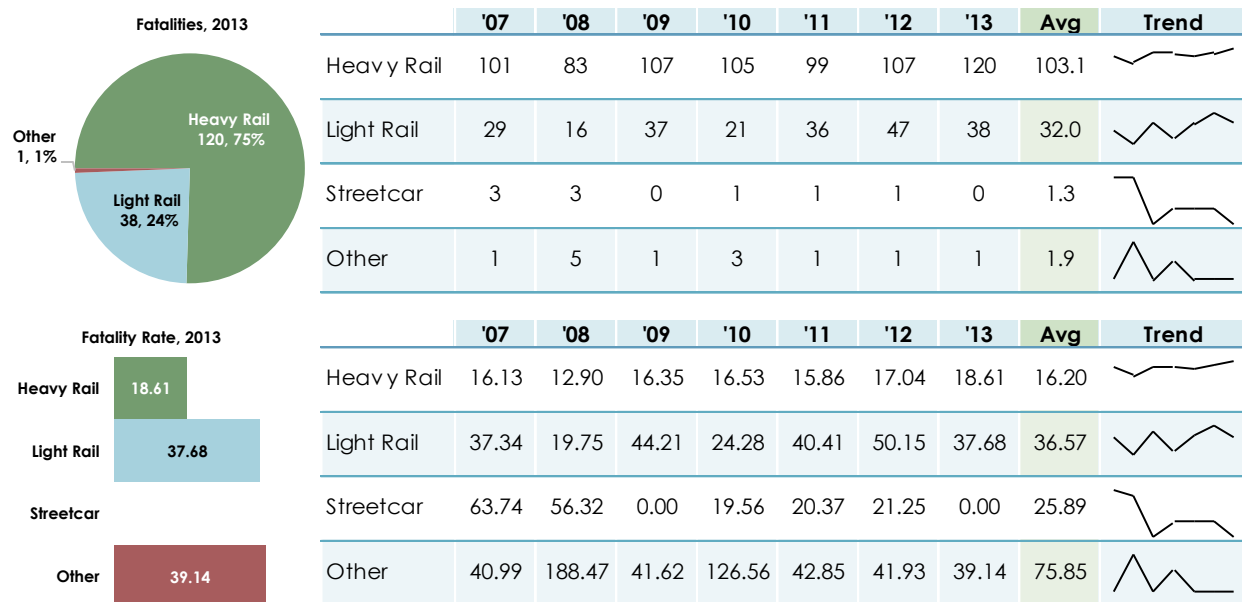
Figure 22 Fatalities by Mode and Rates per 100M VRM

- Since 2007, heavy rail has accounted for nearly 75% of all fatalities reported by SSOAs. However, when standardized, heavy rail modes reported fewer fatalities per 100M VRM than light rail, streetcar, or other modes during the analyzed period.

- At 18.61 fatalities per 100M VRM, the 2013 heavy rail fatality rate was the highest reported for the mode during the seven-year period. In contrast, light rail, streetcar, and other modes all reported a lower fatality rate in 2013 than in 2012.

- Since 2007, SSOAs have reported a varying fatality rate at light rail modes. The 37.68 fatalities per 100M VRM in 2013 is a 24.9% decrease from the highest rate reported for the period (50.15, reported in 2012), and is slightly higher than the average rate for the analyzed period (36.57).

- There were no fatalities resulting from streetcar events in 2013, continuing a downward trend from the high of 63.74 fatalities per 100M VRM in 2007.

- SSOAs reported 39.14 fatalities per 100M VRM at other modes in 2013, 48.4% lower than the average rate for the seven-year period.

Heavy Rail

2007 101
2008 83
2009 107
2010 105
2011 99
2012 107
2013 120

Light Rail

2007 29
2008 16
2009 37
2010 21
2011 36
2012 47
2013 38

Streetcar

2007 3
2008 3
2009 0
2010 1
2011 1
2012 1
2013 0

Other

2007 1
2008 5
2009 1
2010 3
2011 1
2012 1
2013 1
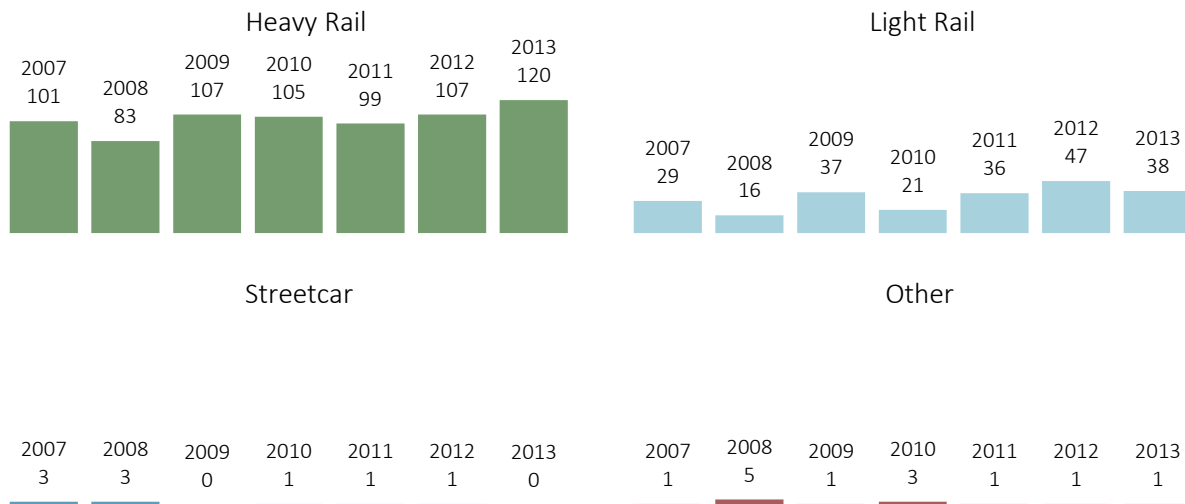
Figure 23 Fatalities Reported by Rail Mode

Heavy Rail

2007 16.13
2008 12.90
2009 16.35
2010 16.53
2011 15.86
2012 17.04
2013 18.61

Light Rail

2007 37.34
2008 19.75
2009 44.21
2010 24.28
2011 40.41
2012 50.15
2013 37.68

Streetcar

2007 63.74
2008 56.32
2009 0.00
2010 19.56
2011 20.37
2012 21.25
2013 0.00

Other

2007 40.99
2008 188.47
2009 41.62
2010 126.56
2011 42.85
2012 41.93
2013 39.14
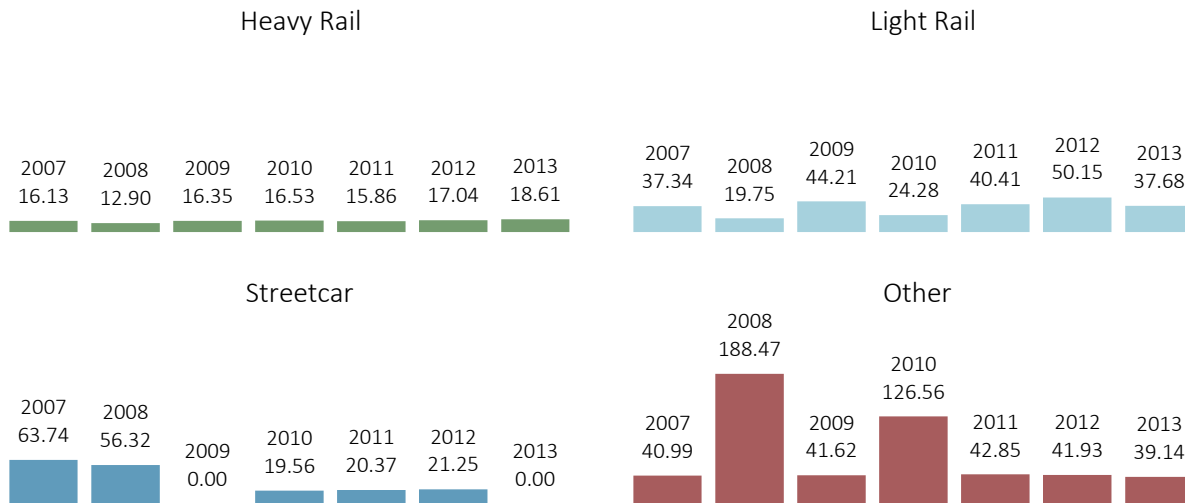
Figure 24 Fatality Rates by Rail Mode (per 100M VRM)

Injuries by Mode and Rates per 100M VRM

Injuries, 2013

	'07	'08	'09	'10	'11	'12	'13	Avg	Trend
Heavy Rail	138	180	189	246	210	233	225	203.0	
Light Rail	247	297	305	289	254	316	252	280.0	
Streetcar	182	216	139	142	156	81	121	148.1	
Other	2	0	0	27	4	13	12	8.3	

Pie chart: Injuries, 2013 — Heavy Rail 225, 37%; Light Rail 252, 41%; Streetcar 121, 20%; Other 12, 2%

Injury Rate, 2013

	'07	'08	'09	'10	'11	'12	'13	Avg	Trend
Heavy Rail	22.03	27.98	28.87	38.73	33.65	37.11	34.90	31.89	
Light Rail	318.04	366.61	364.41	334.13	285.09	337.21	249.90	319.99	
Streetcar	3,867.1	4,054.7	2,688.2	2,777.9	3,178.3	1,721.3	2,505.4	2,983.4	
Other	81.99	0.00	0.00	1,139.0	171.42	545.09	469.72	338.42	

Bar chart: Injury Rate, 2013 — Heavy Rail 34.90; Light Rail 249.90; Streetcar 2,505.41; Other 469.72

Figure 25 Injuries by Mode and Rates per 100M VRM

- In 2013, SSOAs reported the second decrease in the heavy rail injury rate since 2007.

- The light rail injury rate decreased 25.9% in 2013 from 337.21 injuries per 100M VRM in 2012 to 249.90 in 2013.

- Light rail service accounts for the highest injury total of all modes, however, when standardized, streetcar modes report the greatest number of injuries per VRM.

- Since 2007, streetcar modes report nearly 3,000 injuries per 100M VRM. This rate has decreased by 7% on average during the analyzed period.

- There were a large number of injuries resulting from events at other modes reported in 2010. The 27 injuries reported that year account for 46.6% of all injuries reported at this rail mode over the seven-year period.

Heavy Rail

| 2008 30.4% | 2009 5.0% | 2010 30.2% | 2011 -14.6% | 2012 11.0% | 2013 -3.4% |

Light Rail

| 2008 20.2% | 2009 2.7% | 2010 -5.2% | 2011 -12.1% | 2012 24.4% | 2013 -20.3% |

Streetcar

| 2008 18.7% | 2009 -35.6% | 2010 2.2% | 2011 9.9% | 2012 -48.1% | 2013 49.4% |

Other

| 2008 -100.0% | 2009 0.0% | 2010 100.0% | 2011 -85.2% | 2012 225.0% | 2013 -7.7% |
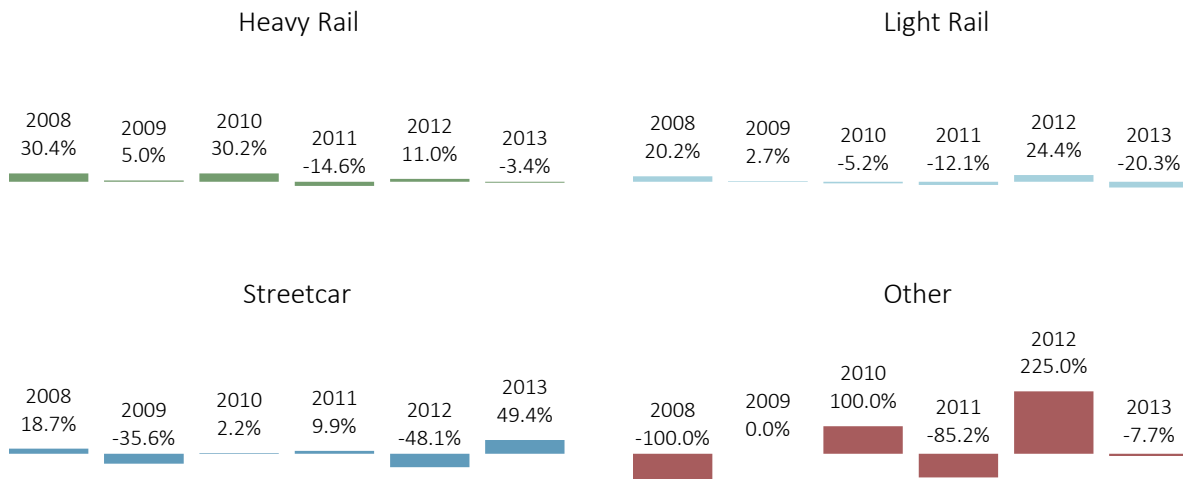
Figure 26 Percent Change in Injuries by Rail Mode
(a change from 0 is represented as a 100% increase on the charts above)

Heavy Rail

| 2008 27.0% | 2009 3.2% | 2010 34.1% | 2011 -13.1% | 2012 10.3% | 2013 -5.9% |

Light Rail

| 2008 15.3% | 2009 -0.6% | 2010 -8.3% | 2011 -14.7% | 2012 18.3% | 2013 -25.9% |

Streetcar

| 2008 4.9% | 2009 -33.7% | 2010 3.3% | 2011 14.4% | 2012 -45.8% | 2013 45.6% |

Other

| 2008 -100.0% | 2009 0.0% | 2010 100.0% | 2011 -85.0% | 2012 218.0% | 2013 -13.8% |
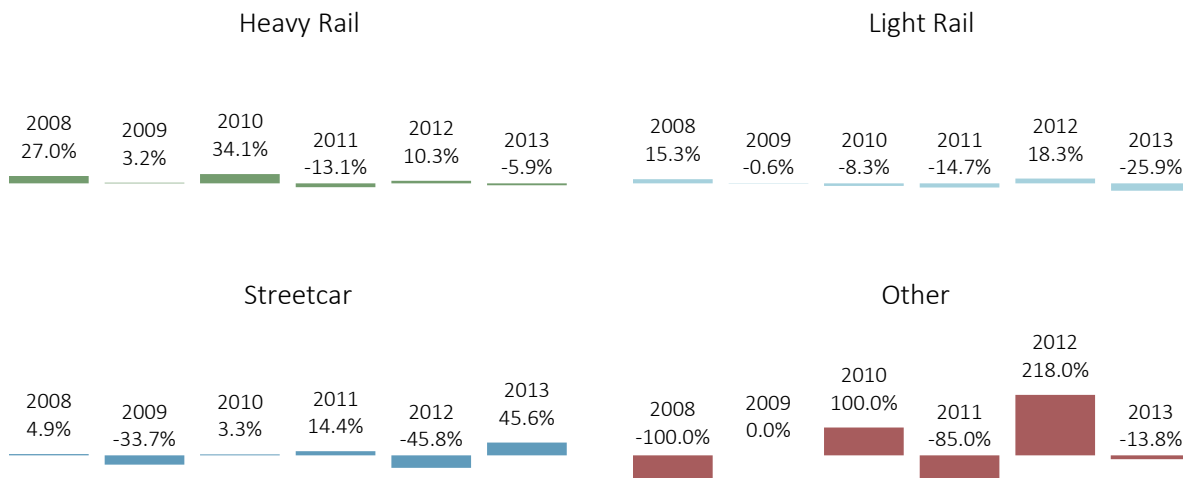
Figure 27 Percent Change in Injury rates by Rail Mode (per 100M VRM)
(a change from 0 is represented as a 100% increase on the charts above)

Events by Event Type

SSOAs report occurrences that surpass the event thresholds defined in 49 CFR §659.33(a). Many events fall under these thresholds. Examples include collisions between trains, pedestrian strikes, derailments, and evacuations. SSOAs use the categories to the right to identify each reportable event. The analyses that follow present the trend and distribution of events, fatalities, and injuries by each event type.

Collision: Non-Rail Grade Crossing (Non-RGX)	A collision between a rail transit train and any other object that does not occur at a grade crossing or street intersection. Suicide and trespassing events are excluded.
Collision: Rail Grade Crossing (RGX)	A collision between a rail transit train and any other object that occurs at a grade crossing or street intersection, except those related to suicide attempts or trespassing.
Derailments	Derailment of a rail transit train from mainline tracks.
Fires	Fires on transit agency property.
Other Events	Any other event that surpasses an event-reporting threshold, including all events related to suicide attempts and trespassing.

Table 3 Event Types

Events by Event Type and Rates per 100M VRM
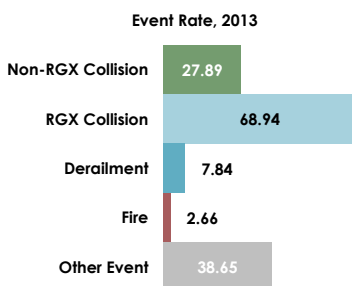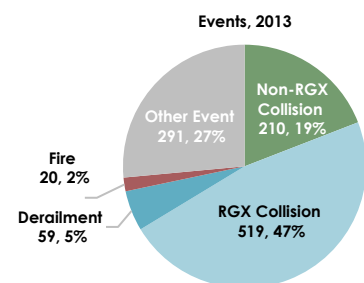
	'07	'08	'09	'10	'11	'12	'13	Avg	Trend
Non-RGX Collision	99	125	168	178	189	201	210	167.1	
RGX Collision	342	537	518	490	462	458	519	475.1	
Derailment	67	71	71	48	60	52	59	61.1	
Fire	37	28	35	33	32	11	20	28.0	
Other Event	224	210	237	274	289	278	291	257.6	

	'07	'08	'09	'10	'11	'12	'13	Avg	Trend
Non-RGX Collision	13.92	17.07	22.53	24.41	26.24	27.58	27.89	22.85	
RGX Collision	48.09	73.34	69.45	67.20	64.13	62.85	68.94	64.96	
Derailment	9.42	9.70	9.52	6.58	8.33	7.14	7.84	8.36	
Fire	5.20	3.82	4.69	4.53	4.44	1.51	2.66	3.83	
Other Event	31.50	28.68	31.78	37.58	40.12	38.15	38.65	35.21	

Figure 28 Events by Event Type and Rates per 100M VRM

- Collisions were reported more than ten times as often as derailments, more than twenty-two times as often as fires, and over twice as often as "Other" events (such as slips and falls or assaults) per 100M VRM during the seven-year period.

- RGX collisions represent the largest share of all events reported by SSOAs, accounting for 47% of all events in 2013.

- 2013 was the first year with an increase in the RGX collision rate since 2008.

- There has been an average 3.0% decrease in derailments per 100M VRM each year in the analyzed period.

- Fires represent the smallest number of events reported by SSOAs, with only 3.83 fires reported per 100M VRM during the seven-year period.

Fatalities by Event Type and Rates per 100M VRM

	'07	'08	'09	'10	'11	'12	'13	Avg	Trend
Non-RGX Collision	11	6	21	14	20	28	20	17.1	
RGX Collision	11	9	15	7	10	15	10	11.0	
Derailment	0	0	0	0	0	0	0	0.0	
Fire	0	0	0	0	0	1	1	0.3	
Other Event	112	92	109	109	107	112	128	109.9	

	'07	'08	'09	'10	'11	'12	'13	Avg	Trend
Non-RGX Collision	1.55	0.82	2.82	1.92	2.78	3.84	2.66	2.34	
RGX Collision	1.55	1.23	2.01	0.96	1.39	2.06	1.33	1.50	
Derailment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Fire	0.00	0.00	0.00	0.00	0.00	0.14	0.13	0.04	
Other Event	15.75	12.56	14.61	14.95	14.85	15.37	17.00	15.02	

Figure 29 Fatalities by Event Type and Rates per 100M VRM

- The rate of non-RGX collision fatalities per 100M VRM increased by 7.9% per year on average during the analyzed period.

- 2013 was the first year since 2010 in which the rate of fatalities resulting from non-RGX collisions decreased.

- In 2013, SSOAs reported a 35.5% decrease in the RGX collision fatality rate. The 1.33 fatalities reported per 100M VRM this year were slightly below the seven year average of 1.5 per 100M VRM.

- SSOAs have not reported a single derailment-related fatality since 2007.

- SSOAs reported only two fire-related fatalities since 2007.

- Fatalities resulting from "Other" events occurred six times more often than non-RGX collision fatalities, twelve times more often than RGX collision fatalities, and over one hundred times more often than fires per 100M VRM in 2013.

- 79% of the fatalities resulting from "Other" events are attributed to suicides or trespassers.

- Excluding suicides and trespassing events, rail transit reported an average of 7.09 fatalities per 100M VRM during the analyzed period.

Suicide and Trespasser

Year	Value
2007	87
2008	72
2009	95
2010	81
2011	88
2012	84
2013	98

All Other Causes

Year	Value
2007	47
2008	35
2009	50
2010	49
2011	49
2012	72
2013	61
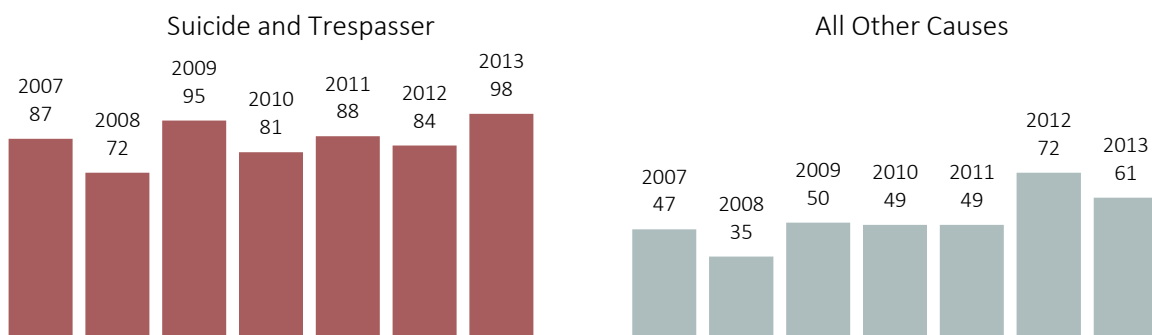
Figure 30 Fatalities by Cause

Suicide and Trespasser

Year	Value
2007	12.23
2008	9.83
2009	12.74
2010	11.11
2011	12.22
2012	11.53
2013	13.02

All Other Causes

Year	Value
2007	6.61
2008	4.78
2009	6.70
2010	6.72
2011	6.80
2012	9.88
2013	8.10
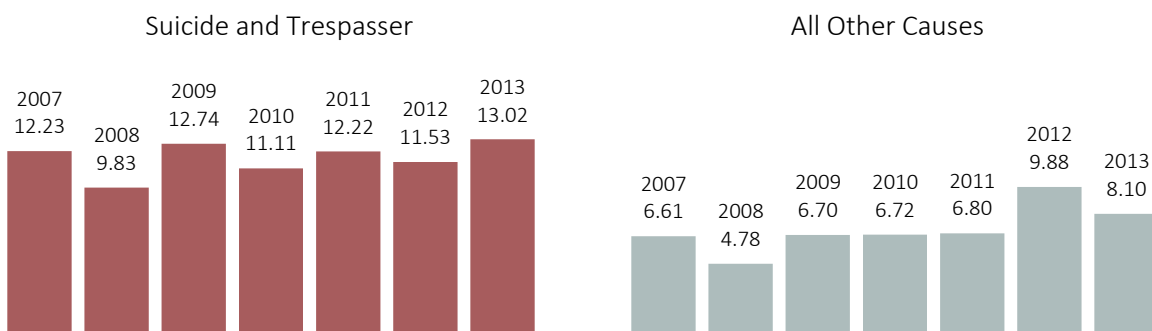
Figure 31 Fatalities per 100M VRM by Cause

Injuries by Event Type and Rates per 100M VRM

Injuries, 2013

	'07	'08	'09	'10	'11	'12	'13	Avg	Trend
Non-RGX Collision	120	242	317	218	207	161	200	209.3	
RGX Collision	295	228	188	276	248	270	243	249.7	
Derailment	26	30	29	6	9	11	3	16.3	
Fire	3	15	4	41	8	3	17	13.0	
Other Event	125	178	95	163	152	198	147	151.1	

Injury Rate, 2013

	'07	'08	'09	'10	'11	'12	'13	Avg	Trend
Non-RGX Collision	16.87	33.05	42.50	29.90	28.73	22.09	26.57	28.61	
RGX Collision	41.48	31.14	25.21	37.85	34.43	37.05	32.28	34.14	
Derailment	3.66	4.10	3.89	0.82	1.25	1.51	0.40	2.23	
Fire	0.42	2.05	0.54	5.62	1.11	0.41	2.26	1.78	
Other Event	17.58	24.31	12.74	22.36	21.10	27.17	19.53	20.66	

Figure 32 Injuries by Event Type and Rates per 100M VRM

- 72% of injuries during the period were the result of a collision (non-RGX or RGX).

- SSOAs reported a high of 42.50 injuries per 100M VRM due to non-RGX collisions in 2009.

- In 2013, RGX collision injuries per 100M VRM decreased by 12.9% from 2012.

- SSOAs reported a significant reduction in the derailment injury rate over the analyzed period from a high of 4.1 per 100M VRM in 2008 to a low of 0.4 in 2013.

- Agencies reported 2.26 injuries per 100M VRM from fires in 2013, the second highest rate for such injuries during the seven-year period.

- In 2010, SSOAs reported 41 injuries due to fires, accounting for 45% of all fire injuries over the seven-year period.

- The rate of reported injuries due to "Other" events decreased 26% from 2012 to 2013. The 19.53 injuries per 100M VRM from these events reported in 2013 was slightly below the average rate for the analyzed period (20.66).

Collision

2007 415 — 2008 470 — 2009 505 — 2010 494 — 2011 455 — 2012 431 — 2013 443

Non-Collision

2007 154 — 2008 223 — 2009 128 — 2010 210 — 2011 169 — 2012 212 — 2013 167
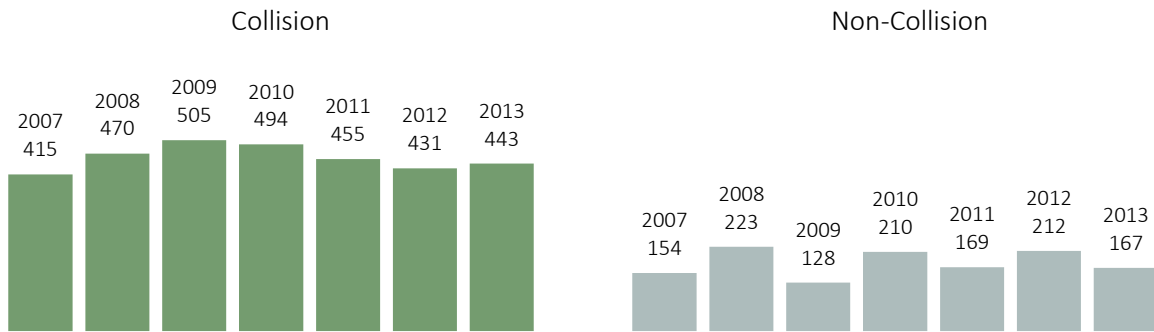
Figure 33 Injuries Reported by Event Type

Collision

2007 58.36 — 2008 64.19 — 2009 67.71 — 2010 67.75 — 2011 63.16 — 2012 59.15 — 2013 58.84

Non-Collision

2007 21.66 — 2008 30.46 — 2009 17.16 — 2010 28.80 — 2011 23.46 — 2012 29.09 — 2013 22.18

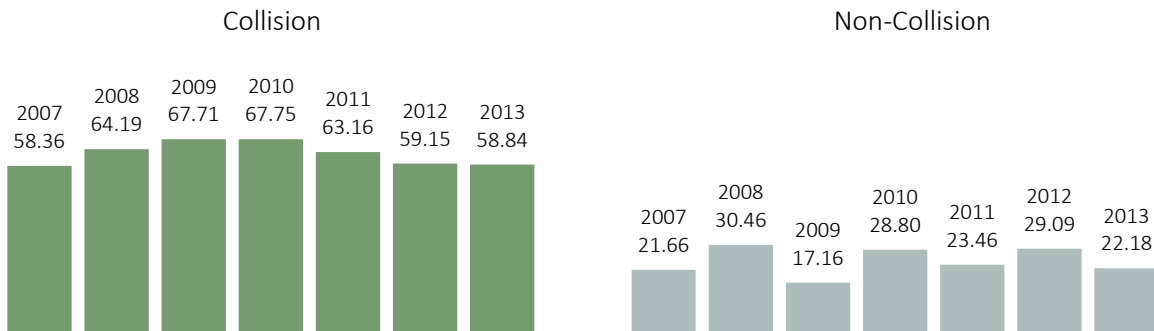**Figure 34 Injuries per 100M VRM by Event Type**

Collisions by Collision Type

In 2011 SSOAs began reporting additional details to FTA regarding collisions. SSOAs currently identify the object with which the train collided for each event. The analyses in this section begin with CY 2011 and the onset of collision detail collection. SSOAs can choose from the categories shown in the table to the right.

Auto	A collision between a rail transit train and a non-transit motor vehicle.
Person	A collision between a rail transit train and a human being who is not in a vehicle. This category includes bicyclists.
Train	A collision between a rail transit train and another rail transit train, or a rail transit non-revenue vehicle.
Other	A collision between a rail transit train and any object not fitting in any category above.

Table 4 Collision Types

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

Other Event 370, 34%

Collision with Other 13, 1%

Collision with Train 41, 4%

Collision with Person 210, 19%

1,099 Events

Collision with Auto 465, 42%
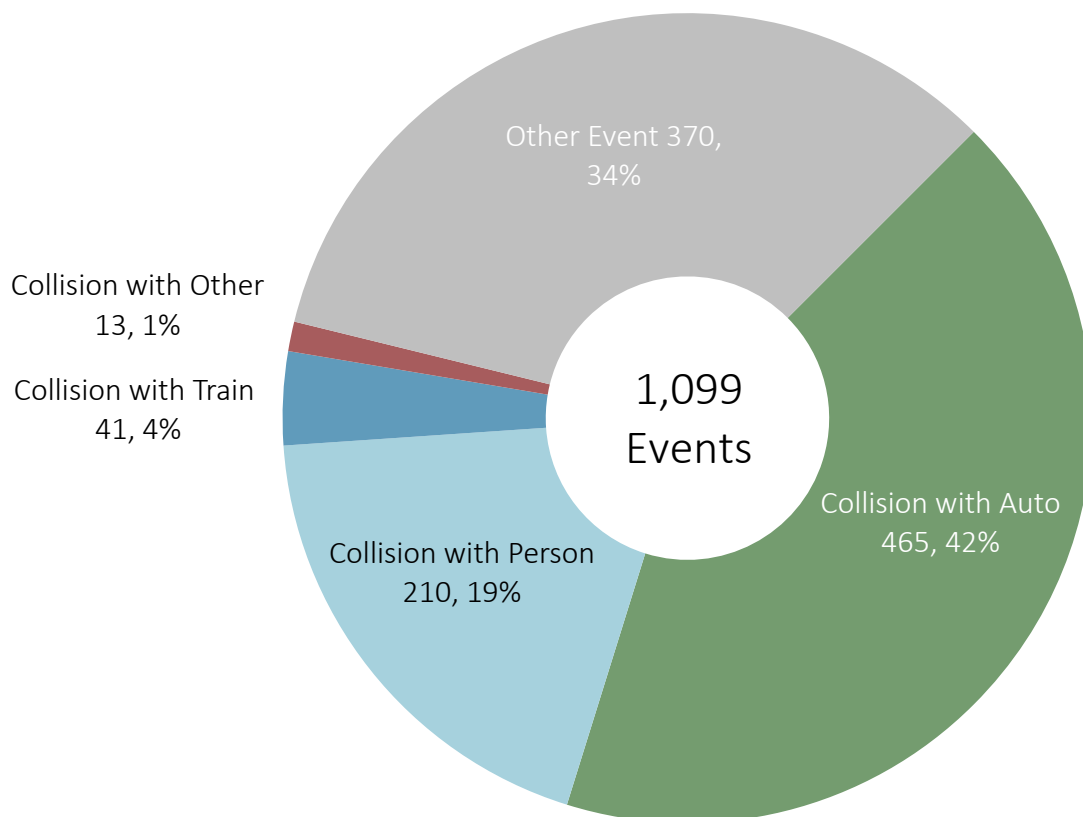
Figure 35 2013 Events

Heavy Rail Collisions by Collision Type and Rates per 100M VRM

Collisions, 2013

	'11	'12	'13	Avg	Trend
Auto	5	3	4	4.0	
Person	80	92	87	86.3	
Train	7	18	18	14.3	
Other	7	1	6	4.7	

Collision Rate, 2013

	'11	'12	'13	Avg	Trend
Auto	0.80	0.48	0.62	0.63	
Person	12.82	14.65	13.50	13.66	
Train	1.1	2.9	2.8	2.3	
Other	1.12	0.16	0.93	0.74	
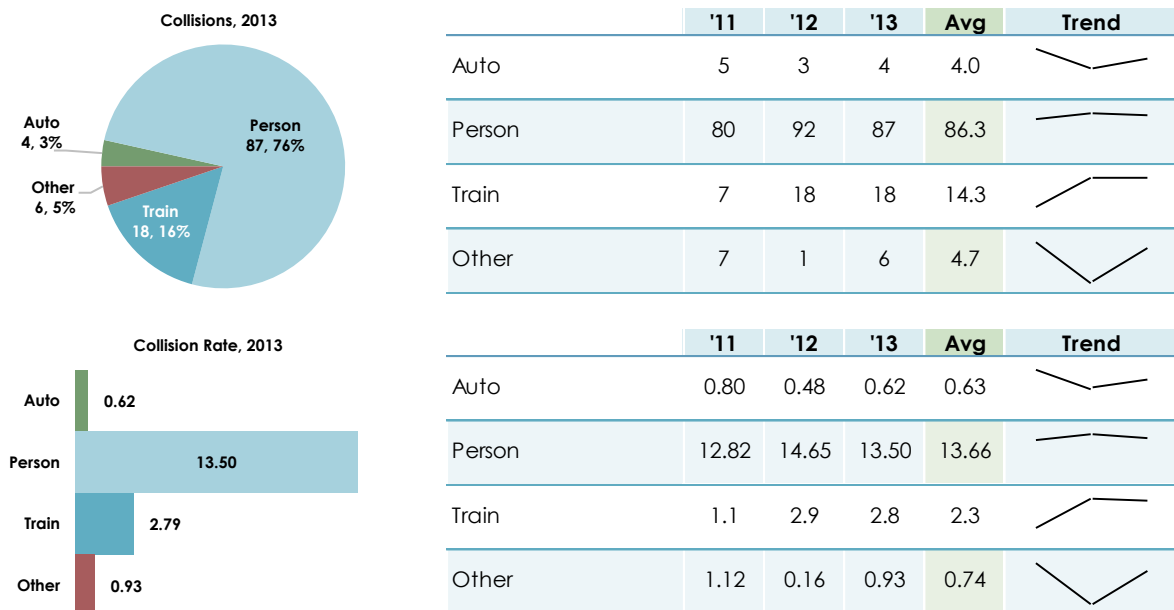
Figure 36 Heavy Rail Collisions by Collision Type and Rates per 100M VRM

- For heavy rail, train-to-person collisions happen most frequently, occurring over 21 times more often that train-to-auto collisions, over four times more often than train-to-train collisions, and over 14 times more often than other heavy rail collisions for every 100M VRM in 2013.

- SSOAs reported over twice the number of heavy rail train-to-train collisions per 100M VRM in 2012 and 2013 than were reported in 2011.

- Heavy rail service averaged 0.63 train-to-auto collisions per 100M VRM during the analyzed period. This relatively low number speaks to heavy rail's very limited interaction with vehicular traffic.

- SSOAs reported 0.93 collisions per 100M VRM between heavy rail trains and other objects in 2013. These objects may include work equipment, bumping posts, or debris on the right-of-way.

Heavy Rail Collision Fatalities by Collision Type and Rates per 100M VRM

Collision Fatalities, 2013

Person
12, 100%

	'11	'12	'13	Avg	Trend
Auto	0	0	0	0.0	
Person	6	19	12	12.3	
Train	0	0	0	0.0	
Other	2	0	0	0.7	

Collision Fatality Rate, 2013

Auto 0.00

Person 1.86

Train 0.00

Other 0.00

	'11	'12	'13	Avg	Trend
Auto	0.00	0.00	0.00	0.00	
Person	0.96	3.03	1.86	1.95	
Train	0.00	0.00	0.00	0.00	
Other	0.32	0.00	0.00	0.11	
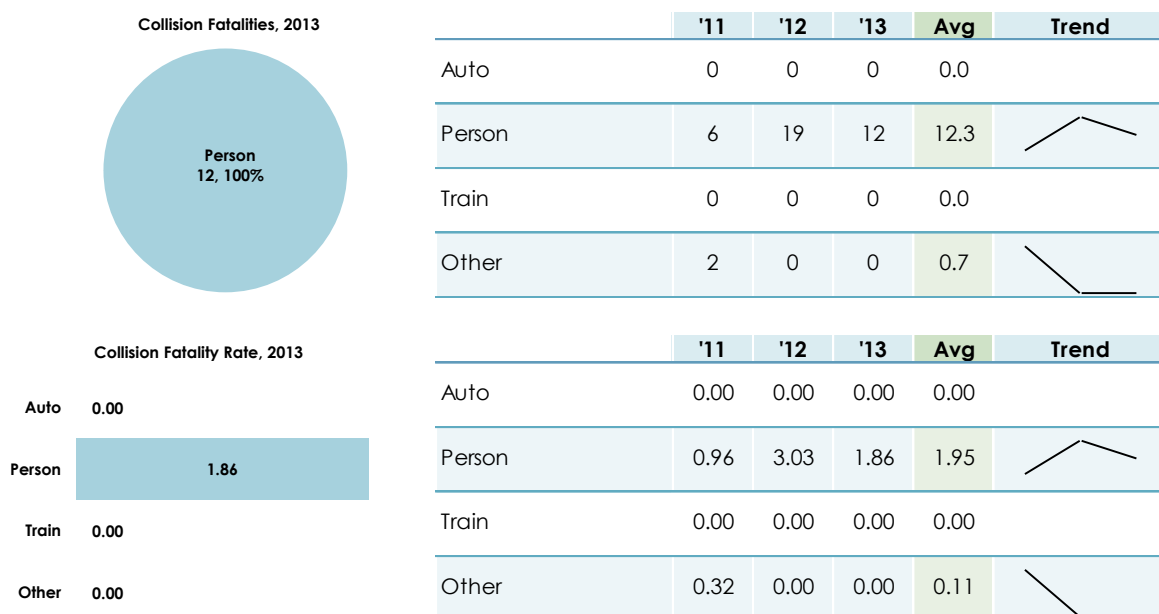
Figure 37 Heavy Rail Collision Fatalities by Collision Type and Rates per 100M VRM

- SSOAs did not report any fatalities resulting from train-to-auto or train-to-train heavy rail collisions from 2011 to 2013.

- The most recent train-to-train heavy rail collision with fatalities was the June 2009 Washington, DC, Metro collision. Although such collisions are rare, they have severe consequences.

- There were only 0.11 heavy rail train-to-other collision fatalities during the analyzed period. Fatalities resulting from these collisions occurred less than one-tenth as often as fatalities from heavy rail train-to-person collisions per 100M VRM.

Heavy Rail Collision Injuries by Collision Type and Rates per 100M VRM

Collision Injuries, 2013

	'11	'12	'13	Avg	Trend
Auto	26	3	1	10.0	
Person	52	69	57	59.3	
Train	2	7	36	15.0	
Other	2	0	8	3.3	

Collision Injury Rate, 2013

Auto 0.16
Person 8.84
Train 5.58
Other 1.24

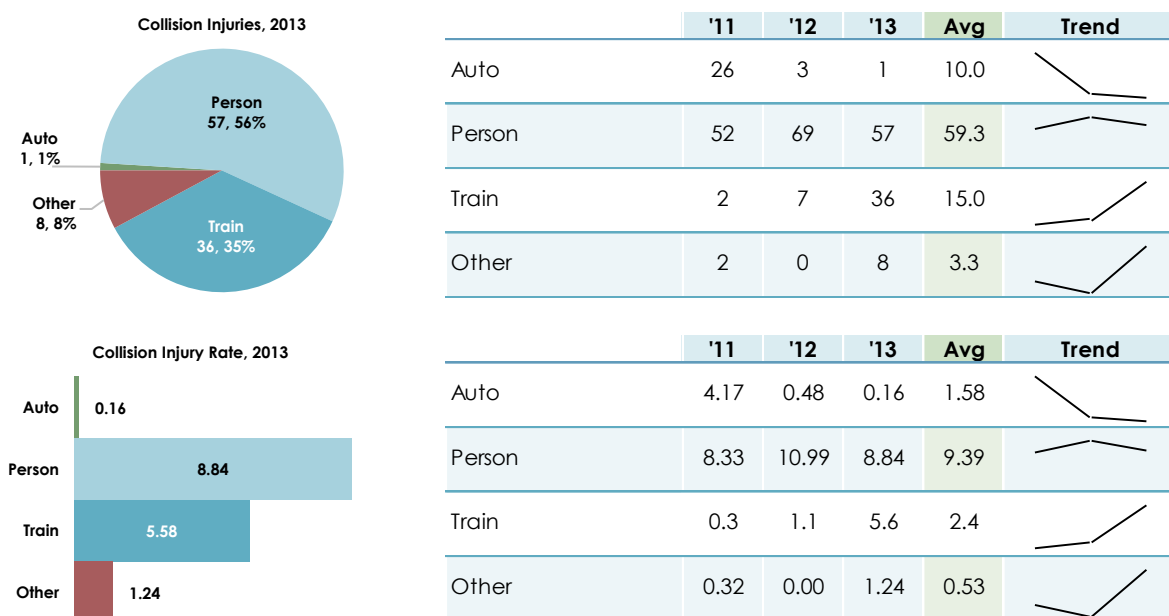|	'11	'12	'13	Avg	Trend
Auto	4.17	0.48	0.16	1.58	
Person	8.33	10.99	8.84	9.39	
Train	0.3	1.1	5.6	2.4	
Other	0.32	0.00	1.24	0.53	

Figure 38 Heavy Rail Collision Injuries by Collision Type and Rates per 100M VRM

- In 2013, 8.84 injuries per 100M VRM resulted from heavy rail train-to-person collisions. This is more all other heavy rail collisions types combined.

- SSOAs reported 5.58 injuries per 100M VRM resulting from train-to-train collisions at heavy rail modes in 2013, fewer than those resulting from train-to-person collisions, but 34 times more than those resulting from train-to-auto collisions and 4.5 times more than those resulting from other collisions.

- Injuries resulting from heavy rail train-to-auto collisions have decreased, from a high of 4.17 per 100M VRM in 2011 to 0.16 per 100M VRM in 2013.

- The rate of injuries resulting from heavy rail train-to-train collisions increased by 401% in 2013, from 1.11 per 100M VRM in 2012 to 5.58 per 100M VRM in 2013.

- SSOAs reported fewer injuries resulting from heavy rail train-to-other collisions than any other collision type during the three-year period, at 0.53 injuries per 100M VRM.

Auto

2011
5.20

2012
1.00

2013
0.25

Person

2011
0.65

2012
0.75

2013
0.66

Train

2011
0.29

2012
0.39

2013
2.00

Other

2011
0.29

2012
0.00

2013
1.33
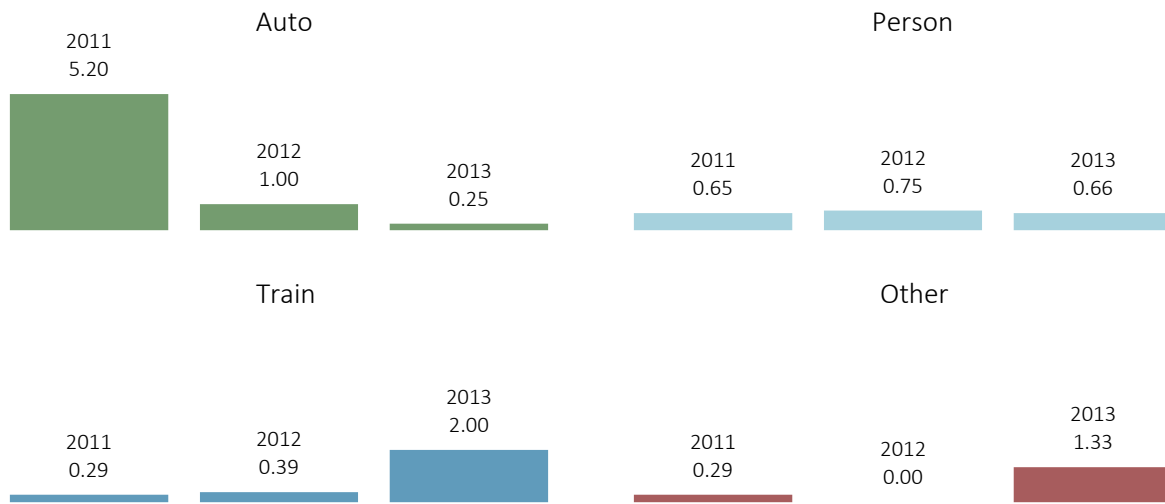
Figure 39 Injuries per Collision by Collision Type

Auto

2011
4.17

2012
0.48

2013
0.16

Person

2011
8.33

2012
10.99

2013
8.84

Train

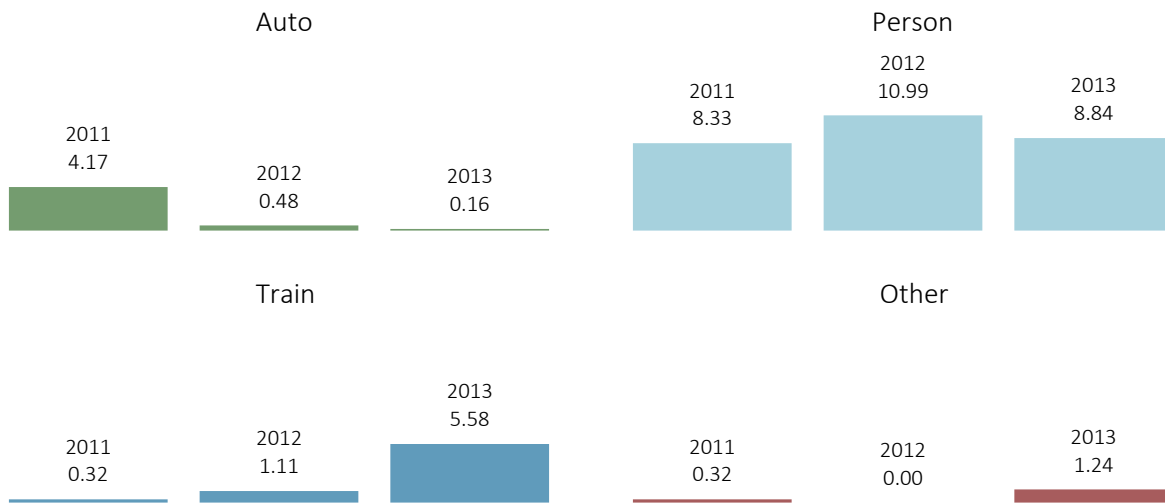2011
0.32

2012
1.11

2013
5.58

Other

2011
0.32

2012
0.00

2013
1.24

Figure 40 Injuries per 100M VRM by Collision Type

Light Rail and Streetcar Collisions by Collision Type and Rates per 100M VRM

Collisions, 2013

	'11	'12	'13	Avg	Trend
Auto	414	421	453	429.3	
Person	100	96	122	106.0	
Train	21	8	22	17.0	
Other	5	9	6	6.7	

Collision Rate, 2013

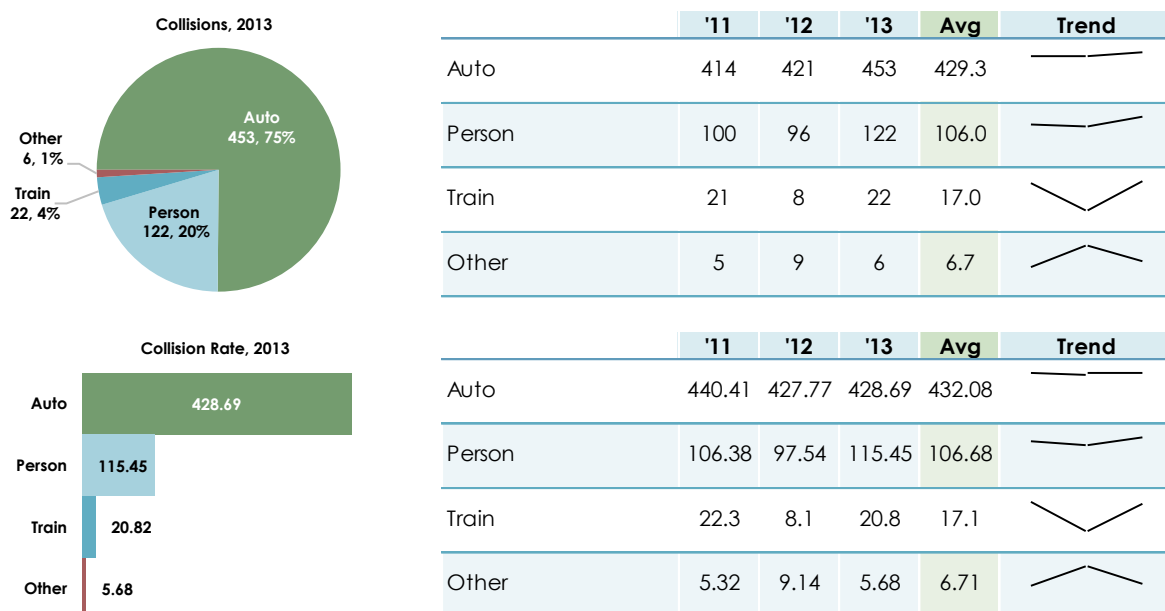|	'11	'12	'13	Avg	Trend
Auto	440.41	427.77	428.69	432.08	
Person	106.38	97.54	115.45	106.68	
Train	22.3	8.1	20.8	17.1	
Other	5.32	9.14	5.68	6.71	

Figure 41 Light Rail and Streetcar Collisions by Collision Type and Rates per 100M VRM

- In 2013, more light rail and streetcar collisions occurred with automobiles for every 100M VRM than any other type of collision combined.

- Collisions between automobiles and light rail or streetcar vehicles have increased over the past three years (by 4.6% on average annually between 2011 and 2013). However, when standardized to account for increased light rail and streetcar service, the rate of these collisions has decreased by an average of 1.3% per 100M VRM during this period.

- Train-to-person collisions are the second most common collision type, occurring less than one-third as often as train-to-auto collisions, but over five times more often than train-to-train collisions and over 15 times as often as other collisions for every 100M VRM of service in 2013.

Light Rail and Streetcar Collision Fatalities by Collision Type and Rates per 100M VRM
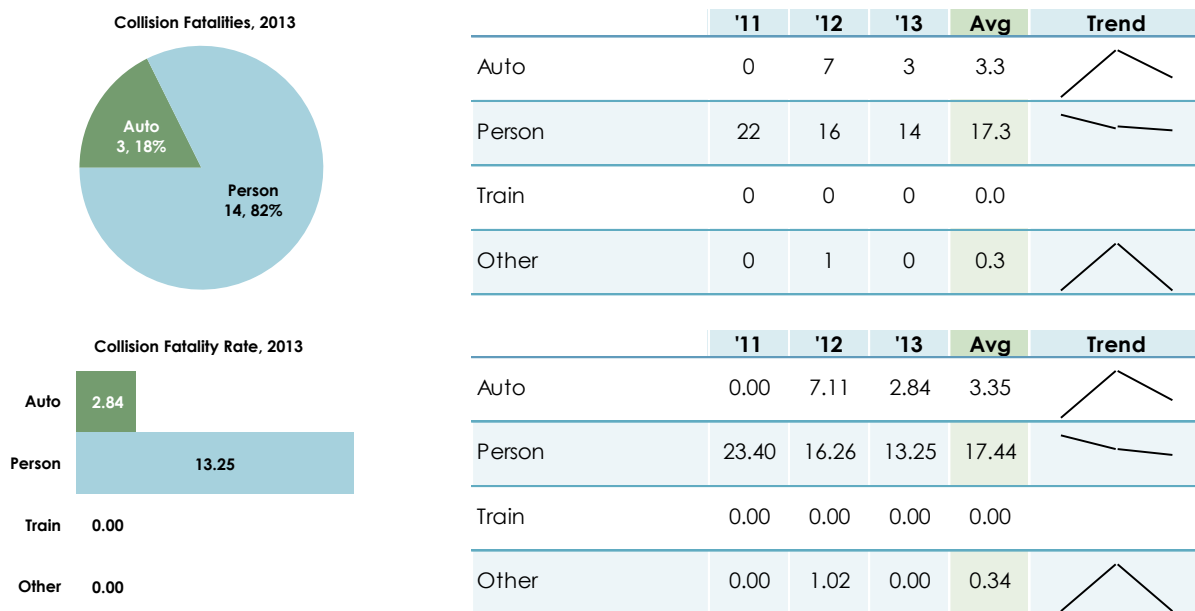
Collision Fatalities, 2013

	'11	'12	'13	Avg	Trend
Auto	0	7	3	3.3	
Person	22	16	14	17.3	
Train	0	0	0	0.0	
Other	0	1	0	0.3	

Pie chart: Auto 3, 18%; Person 14, 82%

Collision Fatality Rate, 2013

	'11	'12	'13	Avg	Trend
Auto	0.00	7.11	2.84	3.35	
Person	23.40	16.26	13.25	17.44	
Train	0.00	0.00	0.00	0.00	
Other	0.00	1.02	0.00	0.34	

Bar chart: Auto 2.84; Person 13.25; Train 0.00; Other 0.00

Figure 42 Light Rail and Streetcar Collision Fatalities by Collision Type and Rates per 100M VRM

- Though light rail and streetcar train-to-auto collisions are reported far more frequently than other types of collisions at these modes, only 2.84 fatalities resulted from these collisions for every 100M VRM in 2013.

- Light rail or streetcar train-to-person collisions account for 82% of all light rail and streetcar collision fatalities in 2013, and 83% of fatalities over the three-year period.

- SSOAs did not report any fatalities resulting from light rail or streetcar train-to-train collisions between 2011 and 2013.

- SSOAs reported the next fewest number of fatalities from light rail and streetcar train-to-other collisions. Only 0.34 such fatalities were reported per 100M VRM during the three-year period.

Light Rail and Streetcar Collision Injuries by Collision Type and Rates per 100M VRM
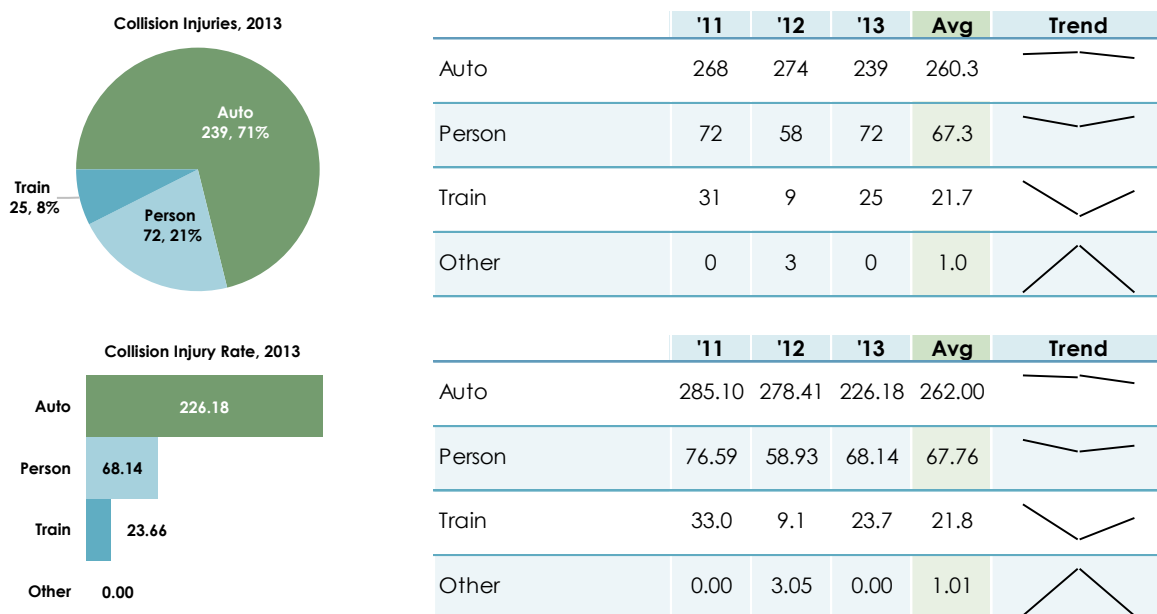
Collision Injuries, 2013

	'11	'12	'13	Avg	Trend
Auto	268	274	239	260.3	
Person	72	58	72	67.3	
Train	31	9	25	21.7	
Other	0	3	0	1.0	

Collision Injury Rate, 2013

	'11	'12	'13	Avg	Trend
Auto	285.10	278.41	226.18	262.00	
Person	76.59	58.93	68.14	67.76	
Train	33.0	9.1	23.7	21.8	
Other	0.00	3.05	0.00	1.01	

Pie chart (Collision Injuries, 2013): Auto 239, 71%; Person 72, 21%; Train 25, 8%.

Bar chart (Collision Injury Rate, 2013): Auto 226.18; Person 68.14; Train 23.66; Other 0.00.

Figure 43 Light Rail and Streetcar Collision Injuries by Collision Type and Rates per 100M VRM

- In 2013, SSOAs reported 226.18 injuries resulting from light rail or streetcar train-to-auto collisions for every 100M VRM, a decrease from the previous two years.

- Train-to-auto collisions accounted for 71% of all light rail and streetcar collision injuries in 2013, and 74% of all such injuries reported during the three-year period.

- SSOAs reported 68.14 injuries resulting from light rail or streetcar train-to-person collisions for every 100M VRM in 2013. This represents a 15.6% increase from 2012.

- SSOAs did not report an injury resulting from a collision between a light rail train or streetcar and an object in 2011 or 2013, and only reported 3.05 such injuries per 100M VRM in 2012.
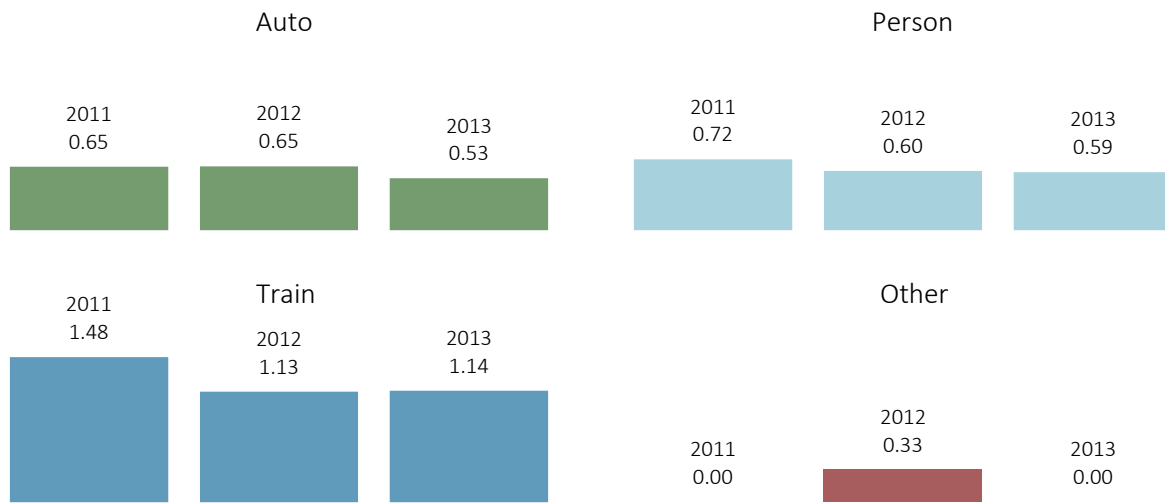
Auto

2011
0.65

2012
0.65

2013
0.53

Person

2011
0.72

2012
0.60

2013
0.59

Train

2011
1.48

2012
1.13

2013
1.14

Other

2011
0.00

2012
0.33

2013
0.00

Figure 44 Injuries per Collision by Collision Type

Auto

2011
285.10

2012
278.41

2013
226.18

Person

2011
76.59

2012
58.93

2013
68.14

Train

2011
32.98

2012
9.14

2013
23.66
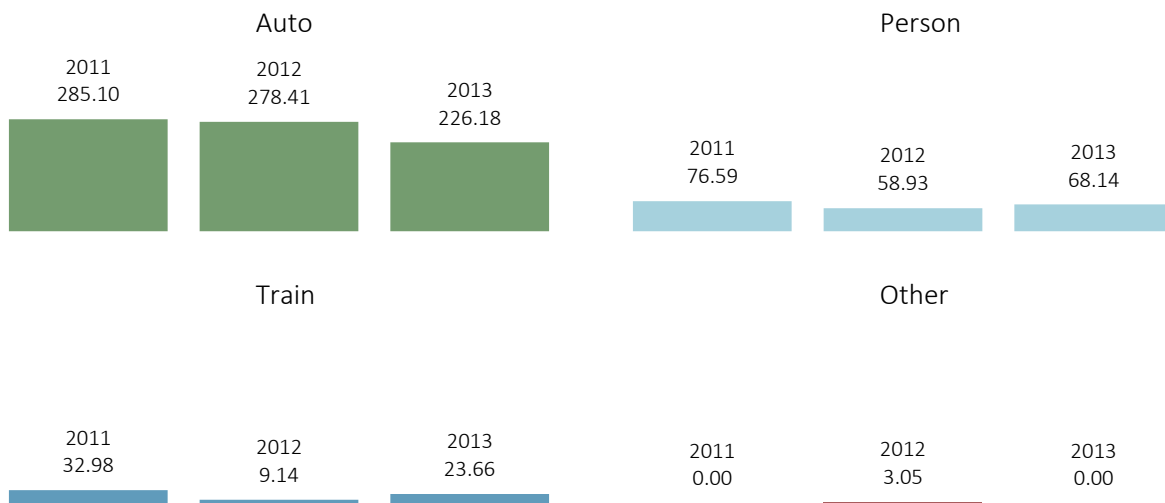
Other

2011
0.00

2012
3.05

2013
0.00

Figure 45 Injuries per 100M VRM by Collision Type

Events by Probable Cause

FTA groups probable cause into four main categories, each relating the causes within the category to a specific type of action. These causal categories are identified in the table below. The analyses on the following pages present the distribution and trend of events, fatalities, and injuries for each causal category and outlines risks due to specific causes for each person type. Events, Fatalities, and Injuries are shown with and without suicide and trespasser events included in the totals.

Workforce or Infrastructure	Events resulting from these causes are primarily due to either substandard condition of the RFGPTS vehicles and infrastructure or to employee rules compliances. This category includes Equipment Failure, Operating Rules Violation/Human Factor, and Poor Maintenance.
Customer Behavior	Events resulting from these causes are primarily due to actions of customers. This category includes Slips and Falls and Imprudent Customer Action.
Public Behavior	Events resulting from these causes are primarily due to actions of the public, either as pedestrians or in automobiles. This category includes Motorist Action, Pedestrian Action, Suicide, and Trespasser.
Other	Events resulting from these causes cannot be attributed to the RFGPTS, or do not meet the causal categories used for SSOA annual reporting. This category includes Medically Related, Other Cause, and Cause Not Provided.

Table 5 Events by Probable Cause

Events by Probable Cause and Rates per 100M VRM

Events, 2013

Suicide or Trespasser 151, 14%
Other 72, 6%
Workforce / Infrastructure 185, 17%
Customer Behavior 152, 14%
Public Behavior 539, 49%

	'07	'08	'09	'10	'11	'12	'13	Avg	Trend
Workforce / Infrastructure	195	218	210	149	148	126	185	175.9	
Customer Behavior	71	65	66	128	128	137	152	106.7	
Public Behavior	469	675	731	625	617	644	690	635.9	
Suicide or Trespasser	106	109	157	130	135	143	151	133.0	
Other	34	13	22	121	139	93	72	70.6	

Event Rate, 2013

Workforce / Infrastructure 24.57
Customer Behavior 20.19
Public Behavior 71.59
Suicide or Trespasser 20.06
Other 9.56

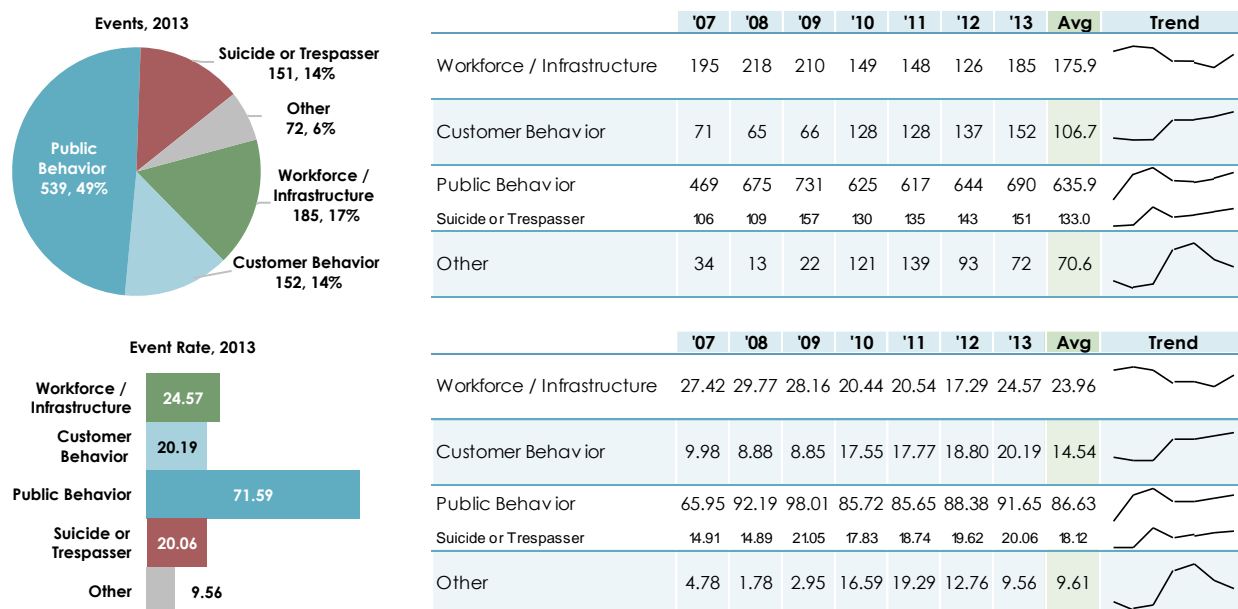|	'07	'08	'09	'10	'11	'12	'13	Avg	Trend
Workforce / Infrastructure	27.42	29.77	28.16	20.44	20.54	17.29	24.57	23.96	
Customer Behavior	9.98	8.88	8.85	17.55	17.77	18.80	20.19	14.54	
Public Behavior	65.95	92.19	98.01	85.72	85.65	88.38	91.65	86.63	
Suicide or Trespasser	14.91	14.89	21.05	17.83	18.74	19.62	20.06	18.12	
Other	4.78	1.78	2.95	16.59	19.29	12.76	9.56	9.61	

Figure 46 Events by Probable Cause and Rates per 100M VRM

- Public behavior, including suicides and trespasser events, caused 63% of all events in 2013.

- Public behavior other than suicide attempts and trespassing accounted for 49% of all reported events in 2013.
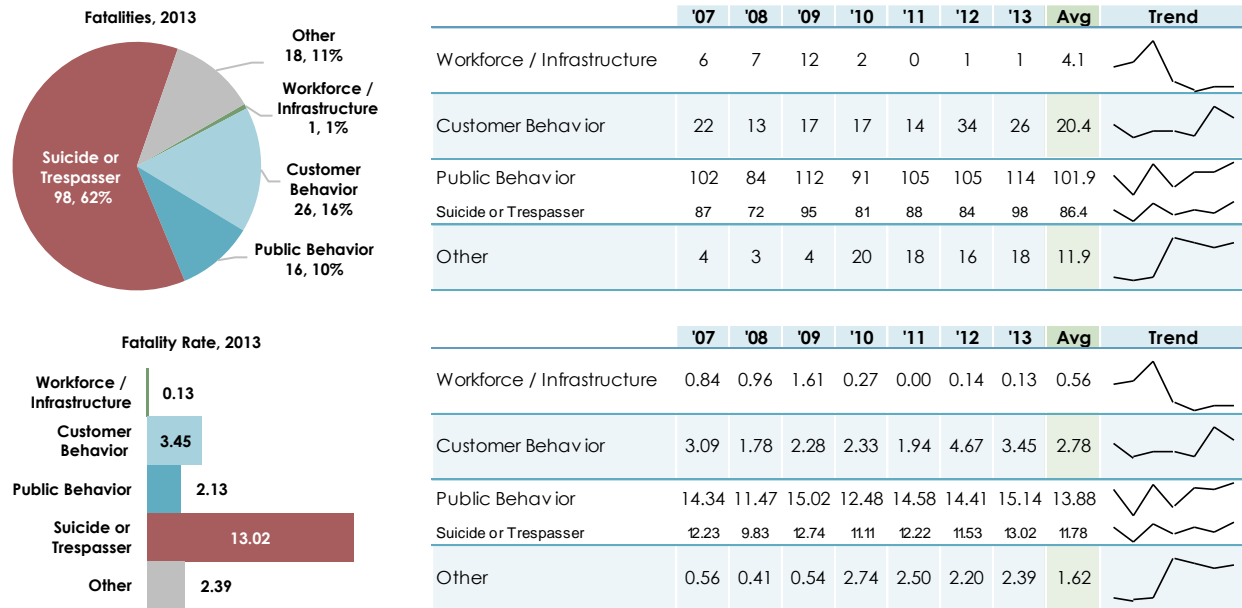
Fatalities by Probable Cause and Rates per 100M VRM

Fatalities, 2013 pie chart: Other 18, 11%; Workforce / Infrastructure 1, 1%; Customer Behavior 26, 16%; Public Behavior 16, 10%; Suicide or Trespasser 98, 62%

	'07	'08	'09	'10	'11	'12	'13	Avg	Trend
Workforce / Infrastructure	6	7	12	2	0	1	1	4.1	
Customer Behavior	22	13	17	17	14	34	26	20.4	
Public Behavior	102	84	112	91	105	105	114	101.9	
Suicide or Trespasser	87	72	95	81	88	84	98	86.4	
Other	4	3	4	20	18	16	18	11.9	

Fatality Rate, 2013 bar chart: Workforce / Infrastructure 0.13; Customer Behavior 3.45; Public Behavior 2.13; Suicide or Trespasser 13.02; Other 2.39

	'07	'08	'09	'10	'11	'12	'13	Avg	Trend
Workforce / Infrastructure	0.84	0.96	1.61	0.27	0.00	0.14	0.13	0.56	
Customer Behavior	3.09	1.78	2.28	2.33	1.94	4.67	3.45	2.78	
Public Behavior	14.34	11.47	15.02	12.48	14.58	14.41	15.14	13.88	
Suicide or Trespasser	12.23	9.83	12.74	11.11	12.22	11.53	13.02	11.78	
Other	0.56	0.41	0.54	2.74	2.50	2.20	2.39	1.62	

Figure 47 Fatalities by Probable Cause and Rates per 100M VRM

- Public behavior, including suicides and trespasser events, resulted in 15.14 fatalities for every 100M VRM of service in 2013. This is more fatalities than the total from all other events combined that year.

- Suicides and trespassing event fatalities occurred over five times as often as fatalities from events due to other public behavior over the seven-year period.

- Removing suicide and trespasser fatalities reduces the total fatality rate in the analyzed period from 18.84 per 100M VRM to 7.07.

- By excluding suicide and trespasser fatalities, the total number of fatalities caused by public behavior in 2013 falls from 15.14 per 100M VRM to 2.13. Excluding suicides and trespassers, the most common cause of fatalities is customer behavior, resulting in 3.45 fatalities per 100M VRM that year.

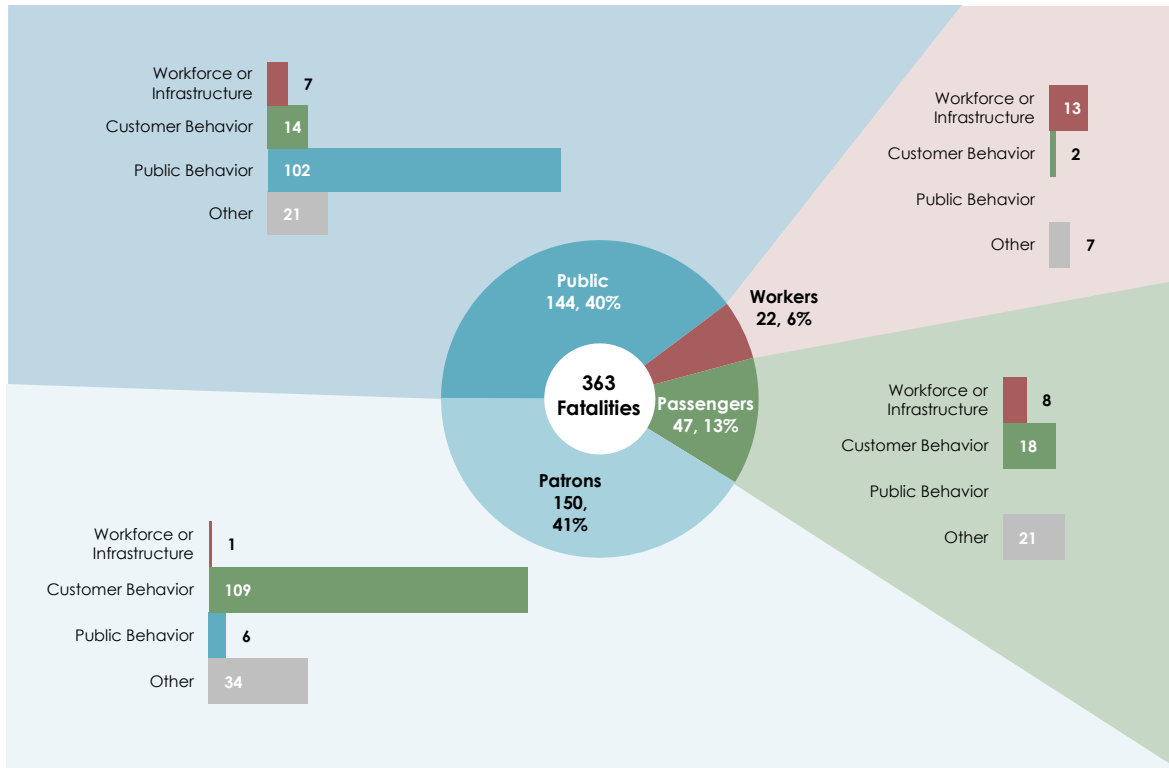- Customer behavior caused 73% of all patron fatalities reported during the seven-year period.

Figure 48 Fatality Risk by Person Type Excluding Suicide and Trespasser Fatalities

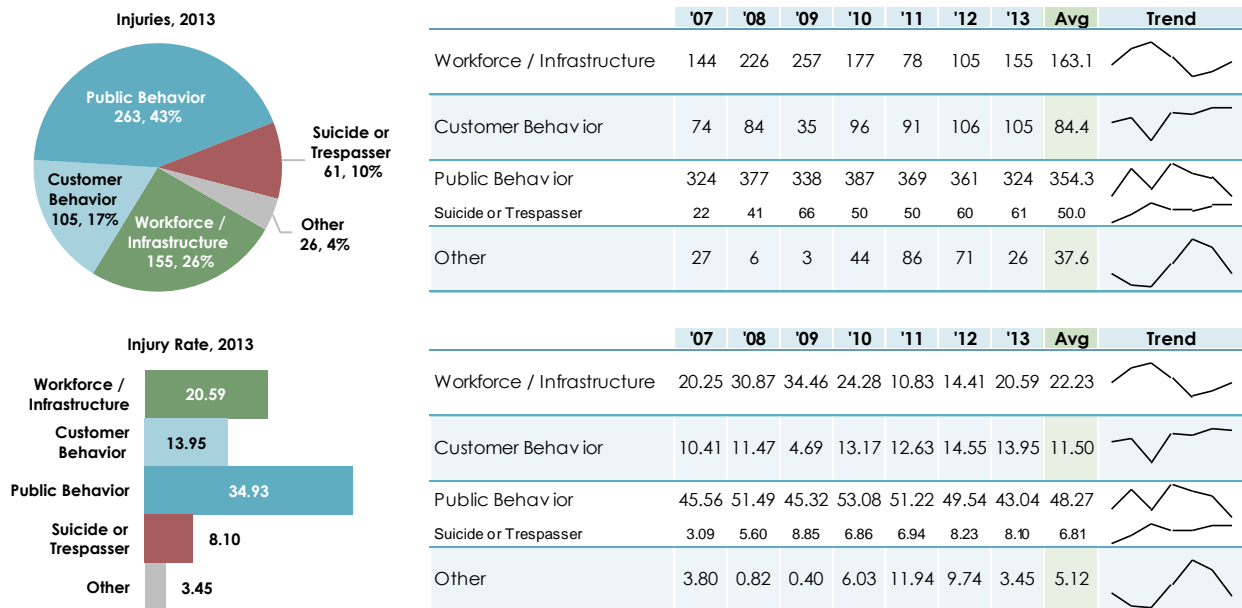## Injuries by Probable Cause and Rates per 100M VRM

	'07	'08	'09	'10	'11	'12	'13	Avg	Trend
Workforce / Infrastructure	144	226	257	177	78	105	155	163.1	
Customer Behavior	74	84	35	96	91	106	105	84.4	
Public Behavior	324	377	338	387	369	361	324	354.3	
Suicide or Trespasser	22	41	66	50	50	60	61	50.0	
Other	27	6	3	44	86	71	26	37.6	

	'07	'08	'09	'10	'11	'12	'13	Avg	Trend
Workforce / Infrastructure	20.25	30.87	34.46	24.28	10.83	14.41	20.59	22.23	
Customer Behavior	10.41	11.47	4.69	13.17	12.63	14.55	13.95	11.50	
Public Behavior	45.56	51.49	45.32	53.08	51.22	49.54	43.04	48.27	
Suicide or Trespasser	3.09	5.60	8.85	6.86	6.94	8.23	8.10	6.81	
Other	3.80	0.82	0.40	6.03	11.94	9.74	3.45	5.12	

Figure 49 Injuries by Probable Cause and Rates per 100M VRM

- Public behavior was the most common cause of injury and resulted in over twice as many injuries per 100M VRM as workforce or infrastructure issues, the next most common cause of injury during the seven-year period.

- Public behavior, including suicides and trespassers, caused 48.27 injuries per 100M VRM over the analyzed period.

- SSOAs reported that workforce or infrastructure issues caused 41% of passenger injuries during the period.
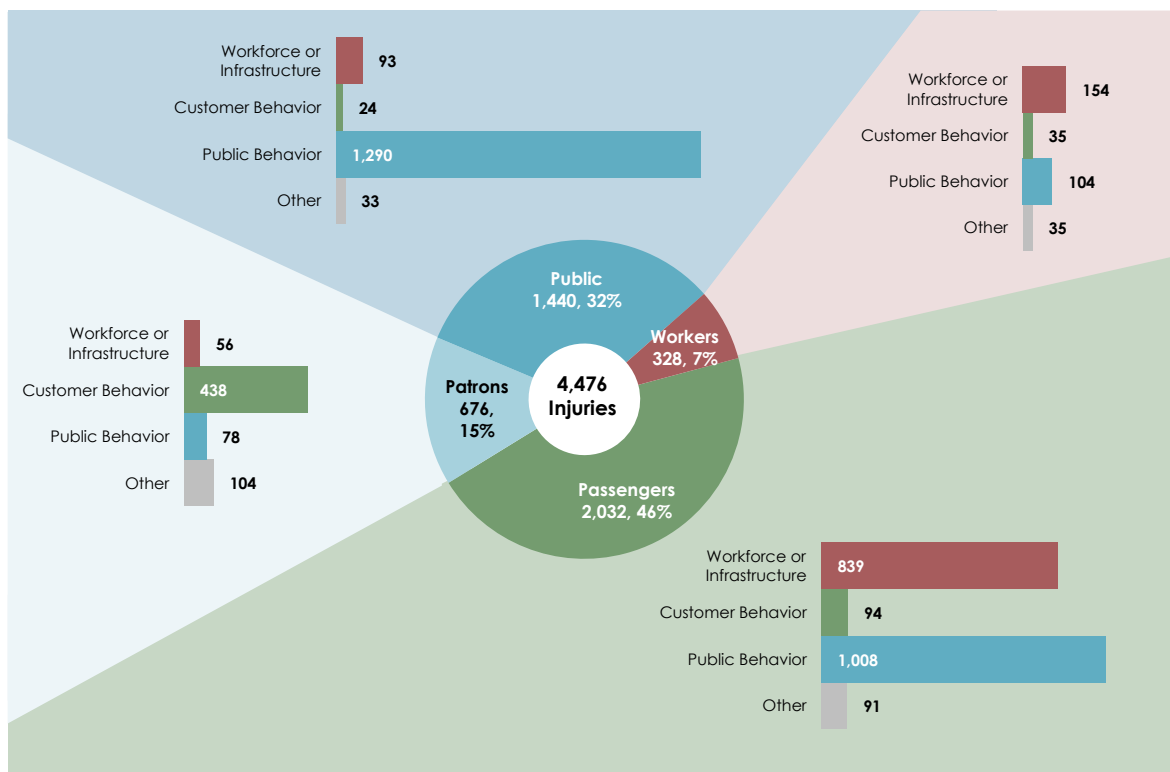
Figure 50 Injury Risk by Person Type

Appendix A: Definition of Terms

Collision Type

For every reportable collision, SSOAs identify the object the rail transit train collided with using one of the following categories:

- *Auto:* A non-transit motor vehicle

- *Person:* A human being who is not within a motor vehicle, including bicyclists

- *Train:* Another rail transit train, or a transit non-revenue vehicle

- *Other:* Any other object

Event

States require rail transit agencies to notify them within two hours of any event meeting the notification thresholds established at 49 CFR §659.33(a). The following thresholds define a reportable event:

- A fatality, as defined above

- Injuries, as defined above, are incurred by two or more individuals

- Property damage to rail transit vehicles, non-rail transit vehicles, other rail transit property or facilities and non-transit property equals or exceeds $25,000

- An evacuation due to life safety reasons occurs

- A collision occurs at a grade crossing

- A mainline derailment occurs

- A collision occurs with a person on a rail ROW

- A collision occurs between a rail transit vehicle and a second rail transit vehicle or a rail transit non-revenue vehicle

Event Type

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

- *Non-RGX Collisions:* A collision between a rail transit train and another train, another vehicle, a person, or another object that does NOT occur at a rail grade crossing. Collisions that occur as part of suicides or trespasser-related events are not included.

- *RGX Collisions:* A collision between a rail transit train and another train, another vehicle, a person, or another object that occurs at a rail grade crossing. Collisions that occur as part of suicides or trespasser-related events are not included.

- *Derailments:* Derailment of a rail transit train from mainline tracks.

- *Fires:* Fires on transit agency property.

- *Other:* Any other event that surpasses the thresholds defined in the events section above. This also includes any event caused by a suicide attempt or a trespasser.

Fatality

Confirmed loss of life either at the scene of a rail transit event or within 30 days due to injuries sustained during a rail transit event. This threshold is defined in 49 CFR §659.33(a).

Injury

Injuries sustained during a rail transit event that require immediate medical attention away from the scene. This threshold is defined in 49 CFR §659.33(a). While the data presented in this analysis are based on the definition of injury as defined in 49 CFR §659, FTA has since promulgated 49 CFR §674, which establishes a new definition of injury for the SSO Program and SSOAs. As States move under the new rule, the injury threshold for investigation will change from "injury" to "serious injury." 49 CFR §674.7 defines a serious injury as any injury which:

- 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, 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.

Mode

A mode is a system for carrying passengers described by a specific right-of-way, technology, and operational features. 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 and modal groupings are identified below:

- *Heavy Rail:* An electric railway that typically operates in long trains (6+ cars) on an exclusive right-of-way. (Note: One heavy rail system is regulated by the FRA and so is not included in this report).

- *Light Rail:* An electric railway that typically operates in short trains (up to 4 cars) on a combination of mixed traffic and exclusive rights-of-way with grade crossings.

- *Streetcar:* A rail system that typically operates in single-car trains with electric propulsion on mixed traffic rights-of-way.

- *Hybrid Rail:* A rail system that typically operates in short trains (up to 4 cars) with either electric or diesel propulsion on the national system of railroads. Note: Of the 5 hybrid rail systems in the NTD, 3 are regulated by the FRA, so only the remaining 2 are included in this report).

- *Cable Car:* A rail system that operates in single-car trains propelled by cables beneath the street on mixed traffic rights-of-way.

- *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 right-of-way.

Person Types

SSOAs categorize all fatalities and injuries resulting from reportable events into one of the following four groups:

- *Passengers:* Customers who are either onboard a rail transit vehicle or in the process of boarding or alighting.

- *Patrons:* Customers waiting for or leaving rail transit at stations, in mezzanines, on stairs, escalators, or elevators, in parking lots and other transit agency property.

- *Workers:* Rail transit agency employees or contractors.

- *Public:* People who come into contact with the rail transit system, including pedestrians, automobile drivers, and trespassers.

Probable Causes

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, as well as the causal groupings used by FTA for analysis purposes:

- *Equipment failure:* An event caused by the failure of a system component

- *Rules violations/Human factors:* An event caused by employee error or organizational issues

- *Poor maintenance:* An event caused by failures arising due to inadequate maintenance

- *Slips and falls:* An event caused by a person slipping or falling in a station or vehicle

- *Action of motorist:* An event caused by the driver of a non-transit vehicle

- *Imprudent customer actions:* An event caused by inappropriate behavior by a transit customer

- *Pedestrian actions:* An event caused by behavior of an individual who is not a transit employee or customer

- *Suicides:* An event caused by a suicide attempt

- *Trespassing:* An event caused by an individual trespassing on transit agency property

- *Medically related:* An event caused by a medical condition of a person (or a person found deceased)

- *Other:* An event due to unknown causes or acts of nature

Causal Group	Cause
Workforce / Infrastructure	Equipment Failure
	Rules Violations/Human Factors
	Poor Maintenance
Customer Behavior	Slips and Falls
	Imprudent Customer Actions
Public Behavior	Actions of Motorists
	Pedestrian Actions
	Suicides
	Trespassers
Other	Medically Related
	Other

Data Coding Examples

Event	Event Type	Fatality/Injury and Person Type	Cause
A trespasser walking on the train tracks is hit from behind by a train and killed.	Other	1 fatality (public)	Trespasser
A track inspector on the right-of-way is struck and killed by a train due to a driver not stopping at a signal.	Non-RGX Collision	1 fatality (worker)	Rules Violation/Human Factor
A rider waiting for a train leans too far over the station platform and is struck by the train and killed.	Non-RGX Collision	1 fatality (patron)	Imprudent Customer Action
A passenger on a train is killed when one train collides with another train due to a brake malfunction.	Non-RGX Collision	1 fatality (passenger)	Equipment Failure
A motor vehicle runs a red light and collides with a train at a rail grade crossing, killing the occupant of the motor vehicle, and injuring the train operator and a single train passenger.	RGX Collision	1 fatality (public) 1 injury (worker) 1 injury (passenger)	Action of Motorist
A person commits suicide by throwing himself in front of a train from a station platform.	Other	1 fatality (patron)	Suicide
Four people are injured in a pile-up at the bottom of a revenue facility escalator that began due to a person falling.	Other	4 injuries (patron)	Slip and Fall

List of Current RFGPTS Included in FTA's State Safety Oversight Program

State Safety Oversight Agency	Rail Transit System	Mode(s)
Arizona Department of Transportation	Valley Metro Rail (METRO)	Light Rail
	Sun Link Transit System (Tucson Streetcar)	Streetcar
Arkansas State Highway and Transportation Department	Central Arkansas Transit Authority (River Rail Streetcar)	Streetcar
California Public Utilities Commission	Bay Area Rapid Transit District (BART)	Heavy Rail
		Automated Guideway
	Los Angeles County Metropolitan Transportation Authority (Metro Rail)	Heavy Rail
		Light Rail
	North County Transit District (SPRINTER)	Hybrid Rail
	Sacramento Regional Transit District (RTD)	Light Rail

State Safety Oversight Agency	Rail Transit System	Mode(s)
	San Diego Trolley, Inc. (San Diego Trolley)	Light Rail
	San Francisco Municipal Railway (MUNI)	Light Rail
		Cable Car
		Streetcar
	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
	South Florida Regional Transportation Authority (*The Wave Streetcar**)	*Streetcar**
Georgia Department of Transportation	Metropolitan Atlanta Rapid Transit Authority (MARTA)	Heavy Rail
	Atlanta Streetcar	Streetcar
Hawaii Department of Transportation	Honolulu Authority for Rapid Transportation (*HART**)	*Heavy Rail**
Illinois Department of Transportation / Regional Transportation Authority[3]	Chicago Transit Authority (CTA)	Heavy Rail
Louisiana Department of Transportation and Development	New Orleans Regional Transit Authority (St. Charles, Canal Street, and Riverfront Streetcar)	Streetcar

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[3] The Regional Transportation Authority is responsible for meeting 49 CFR Part 659 requirements only; the Illinois Department of Transportation is responsible for meeting the requirements of MAP-21.

* System in Engineering/Construction

State Safety Oversight Agency	Rail Transit System	Mode(s)
Maryland Department of Transportation	Maryland Transit Administration (MTA Light Rail and Metro Subway)	Heavy Rail 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
	Southeastern Michigan Council of Governments (*Woodward Avenue Streetcar**)	*Streetcar**
Minnesota Department of Public Safety	Metro Transit (METRO)	Light Rail
Missouri Department of Transportation**/** St. Clair County Transit District[4]	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
	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**

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[4] The Missouri Department of Transportation and St. Clair County Transit District share oversight responsibilities for the St. Louis Metro system.

* System in Engineering/Construction

State Safety Oversight Agency	Rail Transit System	Mode(s)
Oregon Department of Transportation	Portland TriMet (MAX)	Light Rail
	Portland Streetcar	Streetcar
Pennsylvania Department of Transportation	Cambria County Transit Authority (Johnstown Inclined Plane)	Incline Plane
	Port Authority of Allegheny County (The T and Monongahela Incline and Duquesne Incline)	Light Rail
		Incline 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)	Incline Plane
	Memphis Area Transit Authority (MATA)	Streetcar
Texas Department of Transportation	Dallas Area Rapid Transit (DART)	Light Rail
	McKinney Avenue Transit Authority (McKinney Avenue Trolley)[5]	Streetcar
	Metropolitan Transit Authority of Harris County (Houston Metro)	Light Rail
	North Central Texas Council of Governments (Dallas Streetcar)	Streetcar
Tri-State Oversight Committee (FTA WMATA Safety Oversight)[6]	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

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[5] Did not report event data for the 2013 reporting year

[6] WMATA is overseen by the FTA WMATA Safety Oversight Office until such time as the three jurisdictions (the District of Columbia, the State of Maryland, and the Commonwealth of Virginia) stand up an oversight agency with adequate enforcement authorities and expertise.

* System in Engineering/Construction

State Safety Oversight Agency	Rail Transit System	Mode(s)
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)[7]	Automated Guideway
Wisconsin Department of Transportation	Kenosha Area Transit (Kenosha Streetcar)	Streetcar
	City of Milwaukee (*The Milwaukee Streetcar**)	*Streetcar**

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[7] Did not report event data for the 2013 reporting year

Appendix B: Data Management Practices

Since FTA's last publication of SSO rail safety performance data in 2010, the Government Accountability Office (GAO) and the USDOT Office of Inspector General (OIG) have both issued recommendations to FTA regarding safety and security data management practices. FTA has addressed the GAO and OIG concerns through actions to address safety data issues as follows.

FTA has executed the Legacy Data Project to resolve discrepancies between the older SSO and NTD datasets. FTA analysts have compared each safety and security event reported to the SSO program against all events reported to the NTD between 2007 and 2011. These efforts have provided FTA with a revised SSO Rail Event Database based on the cross-validation and subsequent data confirmation with SSOAs.

FTA reviewed the datasets to identify discrepancies, such as events reported in one database and not the other, as well as discrepancies in specific fields, including date, location, event type, injury/fatality count, person type, property damage, and collision details. FTA identified approximately 1,300 issues for reconciliation.

FTA conducted an outreach effort to review all identified issues with representatives at the responsible SSOAs. SSOAs resubmitted event information where applicable and FTA updated the SSO Rail Event Database based on these revised data.

In 2011, FTA revised its SSO Program Excel-based event data collection tool to include systematic internal controls and validation checks to prevent data submission errors. The data tool includes logic that informs users of data issues and notifies them when no issues remain in entered data and the report is ready for submission to FTA.

Beginning with 2012 data FTA has implemented a cross-comparison between NTD and SSO datasets to resolve discrepancies. FTA has executed changes to NTD reporting thresholds and definitions to support this capability. FTA also developed the SSO Rail Event Database revision procedures. These procedures strengthen the SSO Rail Event Database internal controls by strictly defining how records can be updated. Under these stricter procedures, FTA only updates SSO rail event data following a formal submission from an SSOA. FTA uses these procedures for any modifications of the dataset, including revisions resulting from the Legacy Data Project.

In 2014, FTA launched its web-based data collection module to streamline reporting for SSOAs, increase transparency, and enforce enhanced form-level data validation and controls.

Appendix C: Methodology

Rationale for Study Period

The current rules at 49 CFR Part 659 have been in effect since May 1, 2006. The amendments to those rules included significant changes to the thresholds used to define reportable events, which in turn affected event reporting and investigation requirements. Although some SSOAs submitted their 2006 annual reports in compliance with the new requirements, others had not tracked events that occurred prior to 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.

Data Collection

49 CFR Part 659 requires SSOAs to provide annual reports to FTA. These annual reports include data related to events defined by 49 CFR §659.33(a). Complete descriptions of event reporting thresholds are set forth in Appendix A and are summarized below:

- Any event resulting in a fatality, or transport for medical attention for at least two people

- Any event resulting in at least $25,000 in property damage

- Any collision occurring at a grade crossing, between a train and a person, or between two rail vehicles

- Any mainline derailment, or

- Any event resulting in an evacuation for life safety reasons

Ongoing Data Validation

Since 2010, FTA has used event data submitted to the National Transit Database (NTD) by rail transit agencies to validate event data submitted by SSOAs. While the NTD data does not include causal information, FTA can use a rail transit agency's NTD event report to validate event details reported by SSOAs.

FTA evaluates each event submitted by an SSOA to ensure that the information is not in conflict with data submitted by rail transit agencies to the NTD. FTA analysts coordinate with states and rail transit agencies to resolve discrepancies. Depending on the discrepancy, the rail transit agency may revise an NTD report, or alternatively, the SSOA may resubmit event data to the SSO program.

Data Analysis

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

- Fatalities

- Injuries

- Person type of fatalities and injuries

- Rail transit mode

- Event type

- Object collided with (collisions events at heavy rail and light rail/streetcar modes only)

- Probable cause (in causal groups)

Data Normalization

FTA normalizes data prior to some data analyses in order to account for the different amounts of service provided by each mode and the rail transit industry across time. FTA calculates a rate per 100 million vehicle revenue miles traveled (100M VRM) for every figure in these analyses.

FTA analysts obtain vehicle revenue miles data from NTD's annual reporting service module. Rail transit agencies report this data on NTD form S-10 for each reporting year.