CHAPTER 4

Safety

Highway Safety

Every agency within the U.S. Department of Transportation (DOT) is concerned with safety; however, three operating administrations have specific responsibilities for addressing highway safety. The Federal Highway Administration (FHWA) focuses on infrastructure safety design and operations. The National Highway Traffic Safety Administration (NHTSA) has responsibility for overseeing vehicle safety standards and administering driver behavior programs. The Federal Motor Carrier Safety Administration (FMCSA) has the mission to reduce crashes, injuries, and fatalities involving large trucks and buses. This section describes the safety of the Nation's highway system, with a focus on roadway factors and programs administered by FHWA.

Statistics in this section are primarily drawn from the Fatality Analysis Reporting System (FARS). FARS is maintained by NHTSA, which has a cooperative agreement with States to provide information on fatal crashes. FARS is a nationwide census providing DOT, Congress, and the American public data regarding fatal motor vehicle traffic crashes. Safety statistics in this section were compiled in early 2012 and represent a "snapshot in time" during the preparation of this report, which is why they may not precisely correspond to other reports completed during the past year.

2010 FARS Update

Recently, the Fatality Analysis Reporting System (FARS) and the National Automotive Sampling System General Estimates System (NASS GES) underwent a standardization effort. The effort began in 2006 and the second phase was implemented in the 2010 data-collection year. The definition and element attribute changes introduced in 2010 are the most substantive and most numerous 1-year changes in these systems.

Probably the most notable changes were the introduction of precrash information in FARS (already collected in NASS GES) and a change to how the groups of related data elements are organized. The precrash information represents not only a new coding form, but also, more important, a largely new concept for FARS: attempting to collect data about the conditions, events, and driver actions that preceded and may have contributed to the crash. Precrash data are intended to improve crash avoidance research and have been included in NASS GES since 1992. The new FARS Precrash form information consists of 23 data elements, nine of which were previously coded at the Crash level, three each at the Vehicle and Driver levels, and eight new elements. These elements provide details about the characteristics of the roadway selected for each vehicle.

The final phase of the FARS/NASS GES standardization will occur during the 2011 data collection year, at which point FARS and NASS GES, while remaining separate data systems, will share a single data-entry system and uniform set of data elements.

In addition to examining the progress of safety efforts to date, FHWA continues to pursue opportunities to improve safety programming. One example of this is FHWA's work within DOT and with appropriate stakeholders to prepare for the transition to a performance-based management framework for the Federal Highway Program. Transportation Performance Management will support the decision making process, increase accountability and oversight of the Federal-Aid Program, and inform the public on the condition and performance of the Nation's highway transportation system. The safety performance area is well positioned for performance management because FARS is a highly credible, broadly accepted national data source. The National Center for Statistics and Analysis at NHTSA also estimates serious injuries nationally through the National Automotive Sampling System General Estimates System. These national data sets offer a statistically produced annual estimate of the total number of serious injury crashes.

FHWA also recognizes that data are critical to the success of any highway safety program because data support problem identification, program development and implementation, evaluation, and performance

management. The Roadway Safety Data Program (RSDP) is a collaborative effort between FHWA and States to ensure that they are best able to develop robust data-driven safety capabilities. The RSDP focuses on four areas: collection, analysis, management, and expandability/linkability.

In 2011 and 2012, the RSDP State Roadway Safety Data Capability Assessment project assessed the capability level of each State's roadway safety data program. With participation from all 50 States and the District of Columbia, this project is a cornerstone for data improvement efforts at both the State and national levels. In addition to the results from the assessment, each State also receives an action plan outline to help them work toward improving their roadway safety data capabilities. Additionally, a national gap analysis and action plan will be developed based on common themes and identified needs across the States.

Overall Fatalities and Injuries

There were more than 5.2 million police-reported motor vehicle crashes in the United States in 2010. Fewer than 1 percent (0.6 percent or 30,196) of these crashes were severe enough to result in a fatality, while 27.9 percent (approximately 1.45 million) resulted in injuries and 71.5 percent (approximately 3.72 million) resulted in property damage without injury, as shown in *Exhibit 4-1*. The total economic cost of crashes in the United States was estimated at $230.6 billion in 2000. Motor vehicle crashes cost U.S. society an estimated $7,300 per second. These costs include medical-related costs, market and household productivity, insurance administration, workplace costs, legal costs, travel delay, and property damage. More information on the cost of crashes can be found in NHTSA's report *Economic Impact of Motor Vehicle Crashes 2000*.

Exhibit 4-1 Crashes by Severity, 2000–2010

	Crash Severity							
	Fatal		Injury		Property Damage Only		Total Crashes	
Year	Number	Percent	Number	Percent	Number	Percent	Number	Percent
2000	37,526	0.6	2,024,840	34.1	3,876,303	65.3	5,938,669	100.0
2001	37,862	0.6	1,949,680	32.0	4,100,041	67.4	6,087,583	100.0
2002	38,491	0.6	1,872,498	30.8	4,172,434	68.6	6,083,423	100.0
2003	38,477	0.6	1,869,084	30.7	4,174,298	68.6	6,081,859	100.0
2004	38,444	0.6	1,789,046	30.0	4,126,283	69.3	5,953,773	100.0
2005	39,252	0.7	1,753,835	29.6	4,132,826	69.7	5,925,913	100.0
2006	38,648	0.7	1,677,165	29.3	4,007,220	70.0	5,723,033	100.0
2007	37,435	0.6	1,651,565	28.6	4,076,939	70.7	5,765,939	100.0
2008	34,172	0.6	1,573,910	28.3	3,953,040	71.1	5,561,122	100.0
2009	30,862	0.6	1,460,500	27.7	3,782,288	71.7	5,273,650	100.0
2010	30,196	0.6	1,452,378	27.9	3,724,801	71.5	5,207,375	100.0

Source: Fatality Analysis Reporting System/National Center for Statistics and Analysis, NHTSA.

Exhibit 4-2 describes the considerable improvement in highway safety since Federal legislation first addressed the issue in 1966. In 1966, there were 50,894 traffic deaths. Fatalities reached their highest point in 1972 with 54,589 fatalities, then declined sharply to 39,250 fatalities in 1992; the implementation of a national speed limit is believed to have contributed to this decline. Between 1992 and 2006, there was more limited progress in reducing the number of fatalities. The number of fatalities generally increased year to year from 1992 (39,250 fatalities) to 2006 (42,708 fatalities). However, in 2010, a record low number of fatalities occurred (32,885), the lowest number in the post-1966 era.

Fatality rate per vehicle miles traveled (VMT) provides a metric that allows transportation professionals to consider fatalities in terms of the additional exposure associated with driving more miles. In 1966, the

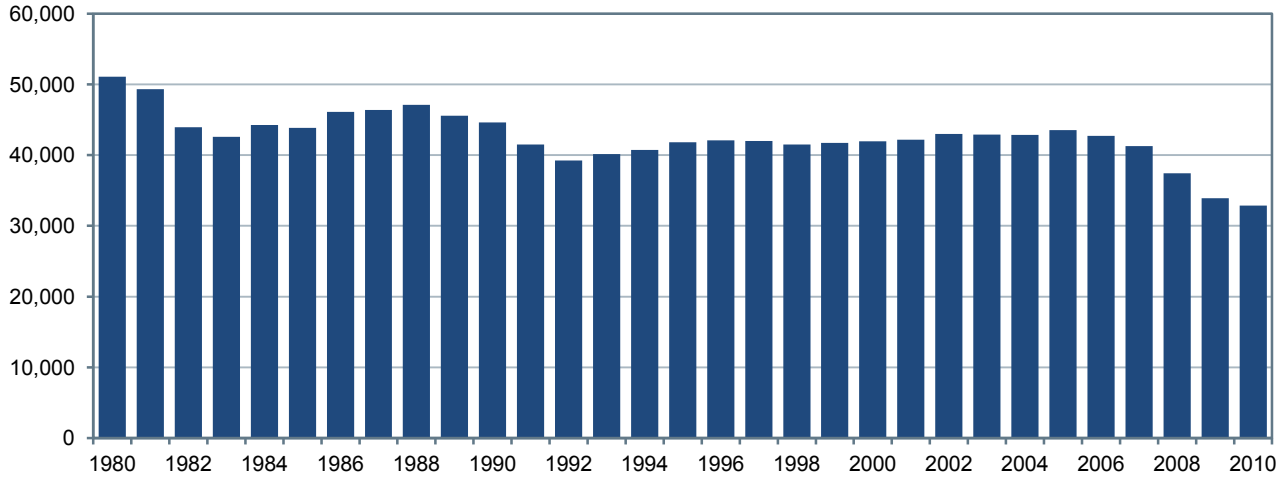
Exhibit 4-2 Summary of Fatality and Injury Rates, 1966–2010

Year	Fatalities	Resident Population (Thousands)	Fatalities per 100,000 Population	Licensed Drivers (Thousands)	Fatalities per 100 Million VMT	Injured	Injuries per 100,000 Population	Injuries per 100 Million VMT
1966	50,894	196,560	25.89	100,998	5.50			
1968	52,725	200,706	26.27	105,410	5.20			
1970	52,627	205,052	25.67	111,543	4.74			
1972	54,589	209,896	26.01	118,414	4.30			
1974	45,196	213,854	21.13	125,427	3.50			
1976	45,523	218,035	20.88	134,036	3.25			
1978	50,331	222,585	22.61	140,844	3.26			
1980	51,091	227,225	22.48	145,295	3.35			
1982	43,945	231,664	18.97	150,234	1.76			
1984	44,257	235,825	18.77	155,424	2.57			
1986	46,087	240,133	19.19	159,486	2.51			
1988	47,087	244,499	19.26	162,854	2.32	3,416,000	1,397	169
1990	44,599	249,439	17.88	167,015	2.08	3,231,000	1,295	151
1992	39,250	254,995	15.39	173,125	1.75	3,070,000	1,204	137
1994	40,716	260,327	15.64	175,403	1.73	3,266,000	1,255	139
1996	42,065	265,229	15.86	179,539	1.69	3,483,000	1,313	140
1998	41,501	270,248	15.36	184,861	1.58	3,192,000	1,181	121
2000	41,945	281,422	14.90	190,625	1.53	3,077,580	1,094	112
2002	43,005	288,369	14.91	194,296	1.51	2,813,502	976	99
2004	42,836	293,655	14.59	198,889	1.45	2,652,710	903	90
2006	42,708	299,398	14.26	202,810	1.42	2,453,369	819	81
2008	37,423	304,060	12.31	208,321	1.26	2,250,357	740	76
2009	33,883	307,007	11.04	209,618	1.15	2,117,613	690	72
2010	32,885	309,350	10.63	210,115	1.11	2,105,030	680	71

Source: Fatality Analysis Reporting System/National Center for Statistics and Analysis, NHTSA.

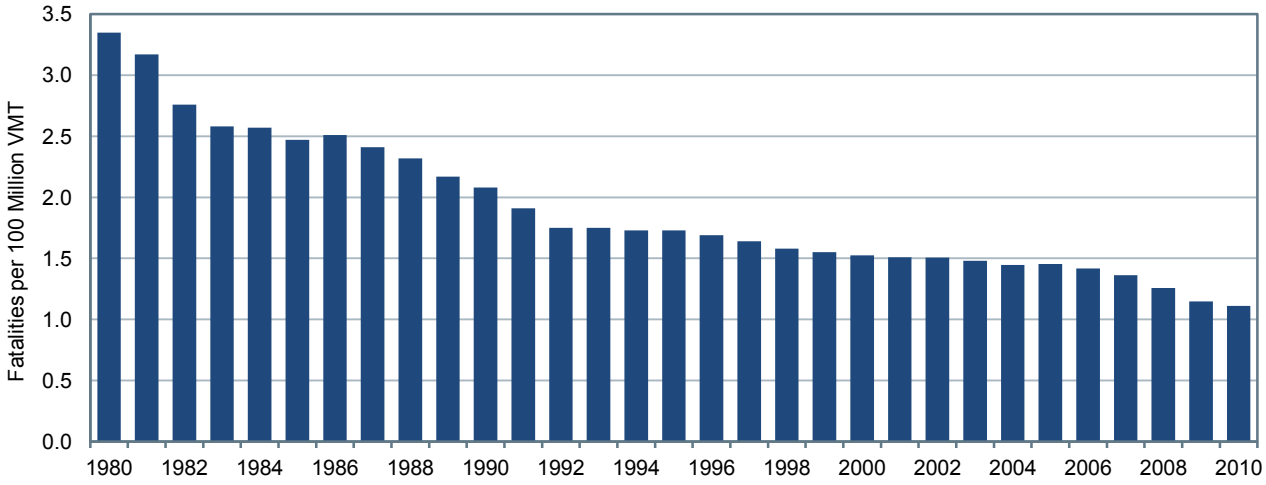
fatality rate was 5.50 fatalities per 100 million VMT. By 2010, the fatality rate had declined to 1.11 per 100 million VMT. *Exhibit 4-3* and *Exhibit 4-4* compare the number of fatalities with fatality rates per VMT between 1980 and 2010. It is also worth noting that the number of fatalities decreased by 23 percent

Exhibit 4-3 Fatalities Related to Motor Vehicle Operation, 1980–2010



Source: Fatality Analysis Reporting System/National Center for Statistics and Analysis, NHTSA.

Exhibit 4-4 Fatality Rates, 1980–2010



Source: Fatality Analysis Reporting System/National Center for Statistics and Analysis, NHTSA.

between 2006 and 2010, coinciding with the timing of the implementation of FHWA's Highway Safety Improvement Program.

Between 1990 and 2010, the overall number of fatalities dropped by more than 26 percent and the overall number of traffic-related injuries decreased by almost 35 percent (from 3.2 million to 2.1 million). Injuries increased between 1992 and 1996, but have steadily declined since then. In 1990, the injury rate was 151 per 100 million VMT; by 2010, the number had dropped (by almost 53 percent) to 71 per 100 million VMT.

Highway Fatalities: Roadway Contributing Factors

When a crash occurs, it is generally the result of numerous contributing factors. Roadway, driver, weather, and vehicle factors all have an impact on the safety of the Nation's highway system. Though FHWA focuses on roadway factors, it also recognizes the importance of collaborating with other agencies to better understand the relationship between all three areas of contributing factors and to address cross-cutting ones.

FHWA has three focus areas related to the roadway reduction of crashes: roadway departures, intersection, and pedestrian crashes. These three focus areas have been selected because they account for a noteworthy portion of overall fatalities and represent an opportunity to significantly impact the overall number of fatalities and serious injuries. In 2010, roadway departure, intersection, and pedestrian fatalities accounted for 52.9 percent, 20.3 percent, and 13.0 percent of all crash fatalities, respectively. *Exhibit 4-5* shows data for these crash types between 2000 and 2010.

Focus Area Safety Programs

These categories are not mutually exclusive; the fatalities shown in *Exhibit 4-5* can involve a combination of factors—intersection- and pedestrian-related, for example—so that some fatalities appear in more than one category. Because of this interdependence, FHWA has developed two programs that are targeted at collaborative and comprehensive efforts to address these areas.

First, the Focused Approach to Safety Program works to better address the most critical safety challenges by devoting additional efforts to high-priority States and targeting technical assistance and resources. After an evaluation in 2010, eligibility criteria were revised and lessons learned were incorporated to improve the program.

Exhibit 4-5 Highway Fatalities by Crash Type, 2000–2010

	2000	2002	2004	2006	2008	2010	Percent Change 2010 to 2000
Roadway Departures[1, 2]	23,046	25,415	22,340	22,665	19,878	17,389	-24.5%
Intersection-Related[1,3]	8,689	9,273	9,176	8,850	7,809	6,758	-22.2%
Pedestrian-Related[1]	4,763	4,851	4,675	4,795	4,414	4,280	-10.1%

[1] Some fatalities may overlap; for example, some intersection-related fatalities may involve pedestrians.
[2] Definition for roadway departure crashes was modified beginning in 2004.
[3] Definition for Intersection crashes was modified beginning in 2010.

Source: Fatality Analysis Reporting System/National Center for Statistics and Analysis, NHTSA.

Second, in January 2012, FHWA issued a "Guidance Memorandum on Promoting the Implementation of Proven Safety Countermeasures." This guidance takes into consideration the latest safety research to advance a group of countermeasures that have shown great effectiveness in improving safety. The nine countermeasures are targeted to address three focus areas: Roadway Departure Safety, Intersection Safety, and Pedestrian Safety. This combined approach is designed to provide consistency in safety programming, and to target limited resources to problem areas and safety countermeasures that are likely to yield the greatest results in reducing the number of crash-related fatalities and injuries.

Roadway Departures

In 2010, there were 17,389 roadway departure fatalities; this accounts for 52.9 percent of all fatalities. A roadway departure crash is defined as a non-intersection crash which occurs after a vehicle crosses an edge line or a center line, or otherwise leaves the traveled way. In some cases, a vehicle crossed the centerline

Roadway Departure Focus States and Countermeasures

FHWA currently offers roadway departure technical assistance to State highway agencies that have a particularly high number of roadway departure fatalities in the form of crash data analysis and implementation plan development. Roadway Departure Implementation Plans have been developed for Kentucky, North Carolina, Oregon, South Carolina, and Tennessee, with additional State plans for Louisiana, California, and Arizona at various stages of development. Each plan is designed to address State-specific roadway departure safety issues on both State and local roadways to the extent that relevant data can be obtained and as is appropriate based on consultation with State and local agencies and the FHWA Division Office.

FHWA works with participating roadway departure focus States to develop individual data analysis packages focused on crash history and roadway attributes, and identify a set of strategies that can be used to reduce roadway departure crashes. Using a systemic approach, the plans identify a set of cost-effective countermeasures, deployment levels, and funding needs to reduce the number and severity of roadway departure crashes in the State by a target amount consistent with Strategic Highway Safety Plan goals. The final plan quantifies the costs and benefits of a roadway departure-focused initiative and provides a step-by-step process for implementation.

Three proven safety countermeasures for reducing roadway departure crashes are:

- Longitudinal rumble strips and stripes on two-lane rural roads – Milled or raised elements on the pavement intended to alert inattentive drivers through vibration and sound that their vehicles have left the travel lane
- Enhanced delineation and friction for horizontal curves – Signs and pavement designed to warn the driver in advance of the curve, with pavement friction critical for changing a vehicle's direction and ensuring that it remains in its lane
- Safety Edge – Technology that shapes the edge of a paved roadway in a way that eliminates tire scrubbing, a phenomenon that contributes to losing control of a vehicle (see Chapter 12 for additional discussion of this technology).

and struck another vehicle, hitting it head-on or sideswiping it. In other cases, the vehicle left the roadway and struck one or more man-made or natural objects, such as utility poles, embankments, guardrails, trees, or parked vehicles.

Intersections

Of the 32,885 fatalities that occurred in 2010, about 20.3 percent (6,673) occurred at intersections, of which 38.3 percent were rural and 61.7 percent were urban, as shown in *Exhibit 4-6*.

There are more than 3 million intersections in the United States, both signalized (e.g., those controlled by traffic signals) and nonsignalized (e.g., those controlled by stop or yield signs); and many factors may contribute to unsafe conditions at these areas. Road designs or traffic signals may need to be upgraded to account for current traffic levels. Approximately one-third of signalized intersection fatalities (2,224 fatalities) involve red-light running, which indicates a need to raise enforcement in this area.

Exhibit 4-6 Intersection-Related Fatalities by Functional System, 2010

	Fatalities	
	Count	Percent of Total
Rural Areas (under 5,000 in population)		
Principal Arterials	706	10.6%
Minor Arterials	554	8.3%
Collectors (Major and Minor)	765	11.5%
Locals	530	7.9%
Subtotal Rural Areas	**2,555**	**38.3%**
Urban Areas (5,000 or more in population)		
Principal Arterials	1,840	27.6%
Minor Arterials	1,086	16.3%
Collectors (Major and Minor)	290	4.3%
Locals	902	13.5%
Subtotal Urban Areas	**4,118**	**61.7%**
Total Highway Fatalities*	**6,673**	**100.0%**

** Total excludes 85 intersection-related fatalities not identified by functional class.*

Source: Fatality Analysis Reporting System/ National Center for Statistics and Analysis, NHTSA.

Intersection Focus States and Countermeasures

Intersection Focus States are eligible based on their average number of intersection fatalities over a 3-year period. In addition, FHWA considers the urban and rural roadway percentages within these States and the ratio of their actual intersection fatality rate versus the expected intersection fatality rate per VMT based on national urban and rural rates.

FHWA recognizes that, although a number of States have identified intersection safety as an emphasis area in their Strategic Highway Safety Plans (SHSPs), they may not have implementation plans to guide their intersection safety implementation activities on State and local roads. As part of the Focused Approach to Safety, FHWA works with States to develop Intersection Safety Implementation Plans (ISIPs). Using a systemic approach, these ISIPs include the specific activities, countermeasures, strategies, deployment levels, implementation steps, and estimates of funds necessary to achieve the intersection component of a State's SHSP goals. FHWA is also providing assistance to those States through webinars, technical assistance, and training courses.

FHWA is promoting three proven countermeasures associated specifically with intersection safety:

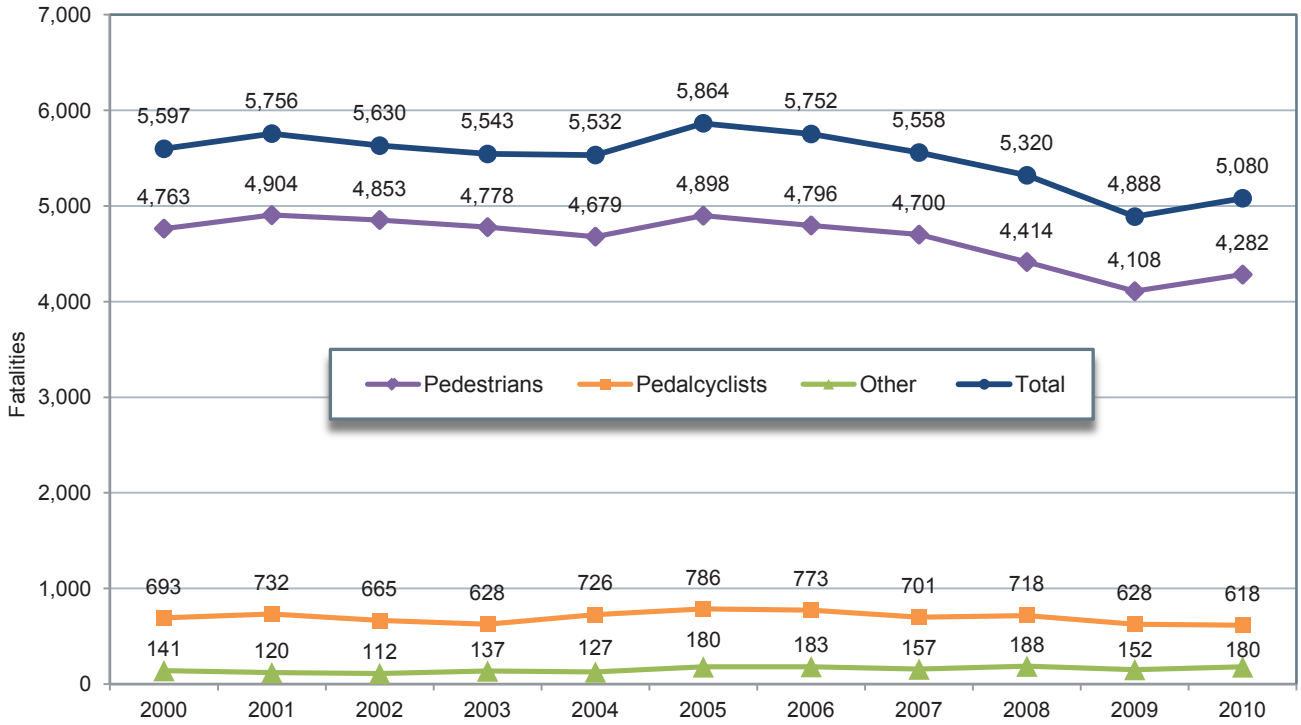
- Roundabouts – Modern type of circular intersection defined by a set of specific operational principles designed to create a low-speed environment, high operational performance, and a reduction of conflict points
- Corridor access management – Set of techniques that can be used to control access to highways, major arterials, and other roadways and that result in improved movement of traffic, reduced crashes, and fewer vehicle conflicts
- Backplates with retroreflective border – Added to traffic signals to improve the visibility of the illuminated face of the signal.

In addition, two of the countermeasures being promoted for pedestrian safety can also improve intersection safety: pedestrian hybrid beacons and road diets. Additional information on the benefits of countermeasures can be found at http://safety.fhwa.dot.gov/provencountermeasures/.

Pedestrians and Other Nonmotorists

Exhibit 4-7 displays nonmotorist traffic fatalities that occurred between 2000 and 2010. For the purposes of this report, the term nonmotorist includes pedestrians, pedalcyclists (such as bicyclists), skateboarders, roller skaters, and others using forms of transportation that are not motorized.

Exhibit 4-7 Pedestrian and Other Nonmotorist Traffic Fatalities, 2000–2010



Source: Fatality Analysis Reporting System/National Center for Statistics and Analysis, NHTSA.

Pedestrian Safety Focus States and Countermeasures

For the pedestrian focus area, FHWA designates focus cities and focus States. Cities are eligible to participate as pedestrian focus cities based on the number of pedestrian fatalities or the pedestrian fatality rate per population over a three year period.

FHWA's Office of Safety is aggressively working to reduce pedestrian fatalities by providing resources to focus States and cities. The Focused Approach effort has helped raise awareness of pedestrian safety problems and draw attention and resources to generate momentum for addressing pedestrian issues. The Focused Approach has provided support in the form of course offerings, conference calls, Web conferences, data analysis, and technical assistance for development of Pedestrian Safety Action Plans, which help State and local officials determine where to begin addressing pedestrian safety issues.

The Focused Approach offers free technical assistance and training courses to each of the focus States and cities and free bi-monthly webinars on a comprehensive, systemic approach to preventing pedestrian crashes. Training is available at a cost to non-focus States and cities through the Pedestrian and Bicycle Information Center and is made available through the National Highway Institute.

FHWA is promoting three proven countermeasures associated specifically with pedestrian safety:

- Median and pedestrian crossing islands in urban and suburban areas – Improve safety benefits to both pedestrians and vehicles by providing an area of refuge at the mid-point of the roadway, enhancing pedestrian crossing visibility, and reducing the speed of vehicles approaching the crossing
- Pedestrian hybrid beacons – Pedestrian-activated warning device located on the roadside or on mast arms over midblock pedestrian crossings.
- Road diets: A classic roadway reconfiguration that involves converting an undivided four-lane roadway into three lanes made up of two through-lanes and a center two-way left turn lane.

The number of nonmotorist fatalities decreased 9.2 percent, from 5,597 in 2000 to 5,080 in 2010. This represents the overall reduction from 2000 to 2010, but the 5,080 nonmotorists killed in 2010 is an increase over the 11-year low of 4,888 reached in 2009.

Since 2000, the number of pedestrians killed by motor vehicle crashes has decreased by 10.1 percent, from 4,763 to 4,282, and the number of pedalcyclists has decreased almost 10.8 percent, from 693 to 618. However, there is some fluctuation in pedalcyclist fatalities, with the highest number of pedalcyclist fatalities (726) between 2000 and 2010 being reported in 2005.

There are several fatal crash scenarios involving pedestrians and bicyclists that are more common than others. In 2010, over three-fourths (79 percent) of all pedestrian fatalities occurred at non-intersection locations. Pedestrian fatalities are also more common in urban areas (73 percent) than rural areas (27 percent), and males made up 69 percent of the total pedestrian fatalities. Bicyclist fatalities demonstrate similar trends. In 2010, bicyclist fatalities usually occurred at non-intersections (67 percent) and in urban areas (72 percent), and mostly involved males (86 percent). FHWA has developed resources to conduct both pedestrian- and bicyclist-focused road safety audits, which can be used to identify nonmotorist safety problems and recommend potential solutions, such as roadway lighting, median refuges, bike lanes, HAWK (or High-Intensity Activated Crosswalk beacon) signals, road diets, and other traffic calming strategies. A number of States and cities have adopted "complete streets" policies, which aim to safely accommodate all road users. Such policies help ensure that safe and convenient walking and bicycling networks are developed.

Fatalities by Roadway Functional Class

Exhibit 4-8 and *Exhibit 4-9* show the number of fatalities and fatality rates by rural and urban functional class between 2000 and 2010. (See Chapter 2 for functional class definitions.)

As shown in *Exhibit 4-8*, the absolute number of fatalities grew slightly between 2000 and 2004 and then declined to 32,885 deaths in 2010. During the period from 2000 to 2010, the number of fatalities on urban

Exhibit 4-8 Fatalities by Functional System, 2000–2010

Functional System	2000	2002	2004	2006	2008	2010	Percent Change 2010/2000
Rural Areas (under 5,000 in population)							
Interstate	3,254	3,298	3,227	2,887	2,422	2,119	-34.9%
Other Principal Arterial	4,917	4,894	5,167	4,554	4,395	3,962	-19.4%
Minor Arterial	4,090	4,467	5,043	4,346	3,507	3,009	-26.4%
Major Collector	5,501	6,014	5,568	5,675	5,084	4,162	-24.3%
Minor Collector	1,808	2,003	1,787	1,650	1,421	1,137	-37.1%
Local	4,414	5,059	4,162	4,294	4,060	3,526	-20.1%
Unknown Rural	854	161	225	240	98	111	-87.0%
Subtotal Rural	**24,838**	**25,896**	**25,179**	**23,646**	**20,987**	**18,026**	**-27.4%**
Urban Areas (5,000 or more in population)							
Interstate	2,419	2,482	2,602	2,663	2,300	2,110	-12.8%
Other Freeway and Expressway	1,364	1,506	1,673	1,690	1,538	1,233	-9.6%
Other Principal Arterial	4,948	5,124	4,847	5,447	4,504	4,247	-14.2%
Minor Arterial	3,211	3,218	3,573	3,807	3,128	2,928	-8.8%
Collector	1,001	1,151	1,385	1,513	1,256	1,061	6.0%
Local	2,912	3,497	3,290	3,622	3,461	2,951	1.3%
Unknown Urban	258	35	211	49	31	16	-93.8%
Subtotal Urban	**16,113**	**17,013**	**17,581**	**18,791**	**16,218**	**14,546**	**-9.7%**
Unknown Rural or Urban	994	96	76	271	218	313	-68.5%
Total Highway Fatalities	**41,945**	**43,005**	**42,836**	**42,708**	**37,423**	**32,885**	**-21.6%**

Source: Fatality Analysis Reporting System/National Center for Statistics and Analysis, NHTSA.

roads decreased from 16,113 to 14,546, a reduction of almost 10 percent. At the same time, the number of fatalities on rural roads decreased from 24,838 to 18,026, a reduction of more than 27 percent. In 2010, fatalities from urban crashes accounted for 44.2 percent of all fatalities, while those resulting from rural crashes accounted for almost 54.8 percent. As shown in *Exhibit 4-8*, about 1 percent of crashes were not classified as either urban or rural. The fatality rate also decreased on both urban and rural roads since 2000, due in part to a combination of safety countermeasures and programs introduced by U.S. DOT and State partners. Although some of the reduction in roadway fatalities may have been attributed to a decrease in VMT between 2007 and 2009, the number of fatalities continued to decrease between 2009 and 2010 even as VMT increased in those 2 years.

Exhibit 4-9 shows the fatality rates for every urban and rural functional system between 2000 and 2010. Urban Interstate highways were the safest functional system, with a fatality rate of 0.44 per 100 million VMT in 2010. Among urban roads, Interstate highways and other freeways and expressways recorded the sharpest declines in fatality rates during this 11-year period with an overall reduction of approximately 28 percent.

Exhibit 4-9 Fatalities by Functional System, 2000–2010 (per 100 Million VMT)

Functional System	2000	2002	2004	2006	2008	2010	Percent Change 2010/2000
Rural Areas (under 5,000 in population)							
Interstate	1.21	1.18	1.21	1.12	1.00	0.86	-28.7%
Other Principal Arterial	1.98	1.90	2.14	1.96	1.98	1.76	-11.2%
Minor Arterial	2.38	2.53	2.99	2.67	2.31	1.99	-16.3%
Major Collector	2.63	2.82	2.77	2.94	2.73	2.36	-10.2%
Minor Collector	3.12	3.26	2.97	2.84	2.58	2.14	-31.5%
Local	3.45	3.63	3.14	3.22	3.08	2.66	-23.0%
Subtotal Rural	**2.29**	**2.30**	**2.35**	**2.28**	**2.12**	**1.83**	-20.0%
Urban Areas (5,000 or more in population)							
Interstate	0.61	0.61	0.57	0.56	0.48	0.44	-27.6%
Other Freeway and Expressway	0.77	0.79	0.80	0.78	0.69	0.56	-27.5%
Other Principal Arterial	1.24	1.25	1.08	1.17	0.97	0.93	-25.1%
Minor Arterial	0.99	0.95	0.99	1.01	0.83	0.78	-21.0%
Collector	0.74	0.81	0.85	0.87	0.72	0.59	-20.6%
Local	1.24	1.46	1.29	1.36	1.28	1.09	-12.4%
Subtotal Urban	**0.97**	**0.98**	**0.93**	**0.95**	**0.82**	**0.73**	-24.4%
Total Highway Fatality Rate	**1.53**	**1.51**	**1.45**	**1.42**	**1.26**	**1.11**	**-27.5%**

Source: Fatality Analysis Reporting System/National Center for Statistics and Analysis, NHTSA.

The overall fatality rate decreased by 20.0 percent on rural roads between 2000 and 2010. Among rural roads, minor collectors and Interstate highways recorded the sharpest declines in fatality rates during this period. The fatality rate for rural minor collectors in 2010 was 31.5 percent lower than in 2000, and the fatality rate for rural Interstates also decreased by 28.7 percent in the same period. Despite the overall decrease in fatality rate on both urban and rural functional systems, rural roads are far more dangerous than their urban counterparts, evidenced by a fatality rate on rural roads that is 2.5 times higher than the fatality rate on urban roads. A number of factors collectively result in this rural road safety challenge, such as greater curvature and obstacles close to the roadway, greater potential for roadway departure, and higher levels of speeding on undivided roadways.

There have been notable decreases in the fatality rates for both rural and urban local roads since 2000, at 23.0 and 12.4 percent, respectively. However, the fatality rate for rural local roads in 2010 was more than three times higher than that for the safest rural functional system (Interstate). Similarly, the fatality rate for urban local roads was more than two times higher the fatality rate for the safest urban functional classification (Interstate). Addressing the challenges associated with non-Interstate roads can be made more difficult by the diversity of ownership; Interstate roads are maintained by the State while other roads may be maintained by the State or a variety of local organizations, including cities and counties.

Locally Owned Road Safety

There are more than 30,000 local agencies that own and operate more than 75 percent of the Nation's roadways. Agency practitioners have varying levels of transportation safety expertise and often perform several duties in addition to transportation safety. The FHWA developed the workshop "Road Safety 365: A Workshop for Local Governments" to help local practitioners routinely identify safety issues along their roadways and provide ideas on how to address them.

Behavioral

Speeding is one of the most prevalent factors contributing to traffic crashes, and represents one area of great collaboration between transportation safety professionals from both the roadway and driver behavior areas of expertise. Speeding is also a contributing factor that affects all of the FHWA focus areas. The economic cost to society of speeding-related crashes is estimated by NHTSA to be $40.4 billion per year.

Nearly one-half of all vehicles involved in fatal crashes in 2010 were on roads with posted speed limits of 55 miles per hour or more, as compared with 19 percent of vehicles involved in injury crashes and 18 percent of vehicles involved in property-damage-only crashes. Although much of the public concern about speed-related crashes focuses on high-speed roadways, speeding is a safety concern on all roads. In 2010, about 21 percent of drivers involved in fatal crashes (10,532) were given tickets for driving too fast for conditions or in excess of posted speed limits—the highest driver factor cited for all fatal crashes. While speeding has often been seen as a prevalent occurrence on major highways, 86 percent of speeding-related fatalities occurred on roads that were not Interstate highways in 2010.

In addition to addressing opportunities for safety improvements associated with roadway design and operations, it is important to consider safety improvements associated with the drivers responsible for navigating the roadway environments.

Among drivers involved in fatal crashes, young males are the most likely to be speeding. The relative proportion of speeding-related crashes to all crashes decreases with increasing driver age. In 2010, 39 percent of male drivers in the 15- to 24-year-old age groups who were involved in fatal crashes were reported to be speeding at the time of the crash.

As shown by cases for which blood alcohol data are available, alcohol involvement is prevalent for drivers involved in speeding-related crashes. In 2010, 41 percent of drivers with a blood alcohol content (BAC) of 0.08 grams per deciliter (g/dL) or higher involved in fatal crashes were speeding, compared with only 15 percent of drivers with a BAC of 0.00 g/dL who were involved in fatal crashes. In 2010, 27 percent of the speeding drivers under age 21 who were involved in fatal crashes also had a BAC of 0.08 g/dL or higher; in contrast, only 13 percent of the nonspeeding drivers under age 21 involved in fatal crashes in 2010 had a BAC of 0.08 g/dL or higher.

Distracted driving is a behavior dangerous to drivers, passengers, and nonoccupants alike. Distraction is a specific type of inattention that occurs when drivers divert their attention from the driving task to focus on some other activity. A distraction-affected crash is any crash in which a driver was identified as distracted at the time of the crash.

In 2011, 10 percent of fatal crashes and 17 percent of injury crashes were reported as distraction-affected crashes. Of those people killed in distraction-affected crashes, 12 percent (385) died in crashes in which at least one of the drivers was using a cell phone at the time of the crash. Use of a cell phone includes talking/listening to a cell phone, dialing/texting a cell phone, and other cell-phone-related activities. Eleven percent of all drivers 15 to 19 years old involved in fatal crashes were reported as distracted at the time of the crashes. This age group has the largest proportion of drivers who were distracted. Twenty-one percent in this group were distracted by the use of cell phones. To put this in context, for all fatal crashes, only 7 percent of the drivers in the fatal crashes were 15 to 19 years old. However, for distraction, 11 percent of the drivers in fatal distraction-affected crashes were 15 to 19 years old. Likewise, drivers in their 20s were overrepresented in distraction-affected crashes relative to their proportion in total drivers—23 percent of all drivers in fatal crashes were in their 20s, but 26 percent of distracted drivers were in their 20s.

Another area of particular concern is motorcycle fatalities. While motorcycles made up 3 percent of all registered vehicles in the United States in 2011 and accounted for only 0.6 percent of all vehicle miles traveled, motorcycle fatalities accounted for 14 percent of all traffic fatalities for the year. Per vehicle mile traveled in 2011, motorcyclists were more than 30 times more likely than passenger car occupants to die in motor vehicle traffic crashes and 5 times more likely to be injured. Per registered vehicle, the fatality rate for motorcyclists in 2011 was 6 times the fatality rate for passenger car occupants. The injury rate for motorcyclists was about the same as the injury rate for passenger car occupants.

In 2011, 40 percent of fatally injured motorcycle riders and 51 percent of fatally injured motorcycle passengers were not wearing helmets at the time of the crash.

More than one-fifth of motorcycle riders (22 percent) involved in fatal crashes in 2011 were driving the vehicles with invalid licenses at the time of the collision. The percentage of motorcycle riders involved in fatal crashes in 2011 who had BAC levels of .08 g/dL or higher—29 percent—was higher than for any other type of motor vehicle driver. NHTSA estimates that helmets saved the lives of 1,617 motorcyclists in 2011. If all motorcyclists had worn helmets, an additional 703 lives could have been saved.

Transit Safety

This section describes the safety of the Nation's public transportation system. Statistics are primarily drawn from the National Transit Database (NTD). The NTD serves as a nationwide repository of transit operating, financial, service, asset, and safety data. It captures information from 47 rail transit systems, more than 650 bus transit service providers, and 1,500 demand response agencies. Combined, these modes of public transportation provided over 10 billion passenger trips and 41 billion passenger miles of service in 2010. The NTD does not collect safety data for commuter rail systems; we report FRA data for them here.

Based on the number of fatalities and injuries reported on an annual basis, public transportation generally experiences lower rates of incident, fatality, and injury than other modes of transportation in the same year. However, serious incidents do occur, and the potential for catastrophic events remains. Several transit agencies in recent years have had major accidents that resulted in fatalities, injuries, and significant property damage. The National Transportation Safety Board (NTSB) has investigated a number of these accidents and has issued reports identifying the probable causes of and factors that contributed to them. Since 2004, the NTSB has reported on nine transit accidents that, collectively, resulted in 15 fatalities, 297 injuries, and over $30 million in property damages. The NTSB identified serious deficiencies in the training and supervision of employees; the maintenance of equipment and infrastructure; and deficiencies in safety management and oversight, such as weaknesses in transit agencies' safety rules and procedures, lack of a safety culture within the transit agency, and lack of adequate oversight by the state and Federal agencies. Of the 42 safety recommendations NTSB has made to FTA since 1991, 26 of them have been addressed and closed. FTA is working diligently to address the remaining safety recommendations.

The Moving Ahead for Progress in the 21st Century (MAP-21) Act, signed into law on July 6, 2012, provides new authorities for FTA to strengthen public transportation safety throughout the United States. The law requires new safety provisions for rail and bus operators and provides grant funds to States to support enhanced oversight. FTA will implement the new law in consultation with the transit community, the State oversight agencies, and the U.S. Department of Transportation Transit Rail Advisory Committee for Safety (TRACS).

Incidents, Fatalities, and Injuries

An incident is recorded by a transit agency for a variety of events occurring on transit property or vehicles, involving transit vehicles, or affecting persons using the transit system. The Q&A box on this page provides exact reporting thresholds.

What sort of events result in a recorded transit incident? Q&A

A transit agency records an incident for any event occurring on transit property, onboard or involving transit vehicles, or to persons using the transit system that results in one of the following:

- One or more confirmed fatalities within 30 days of the incident
- One or more injuries requiring immediate transportation away from the scene for medical attention
- Total property damage to transit property or private property in excess of $25,000
- An evacuation for life safety reasons
- A mainline derailment (i.e., occurring on a revenue service line, regardless of whether the vehicle was in service or out of service)
- A fire.

Additionally, an incident is recorded by a transit agency whenever certain security situations occur on transit property, such as:

- A robbery, burglary, or theft
- A rape
- An arrest or citation, such as for trespassing, vandalism, fare evasion, or assault
- A cyber security incident
- A hijacking
- A nonviolent civil disturbance that results in the disruption of transit service.

Included among these is any event that results in significant property damage, one or more reported injuries, one or more reported fatalities, or some combination thereof. From 2002 to 2007, the definition of significant property damage was total property damage in excess of $7,500 (in current-year dollars, not indexed to inflation); this threshold increased to $25,000 in 2008.

An injury is reported when a person has been immediately transported away from the scene of a transit incident for medical care. Any event producing a reported injury is also reported as an incident.

A transit-related fatality is reported for any death occurring within 30 days of a transit incident that is confirmed to be a result of that incident.

What types of injuries and fatalities are reported?

Q&A

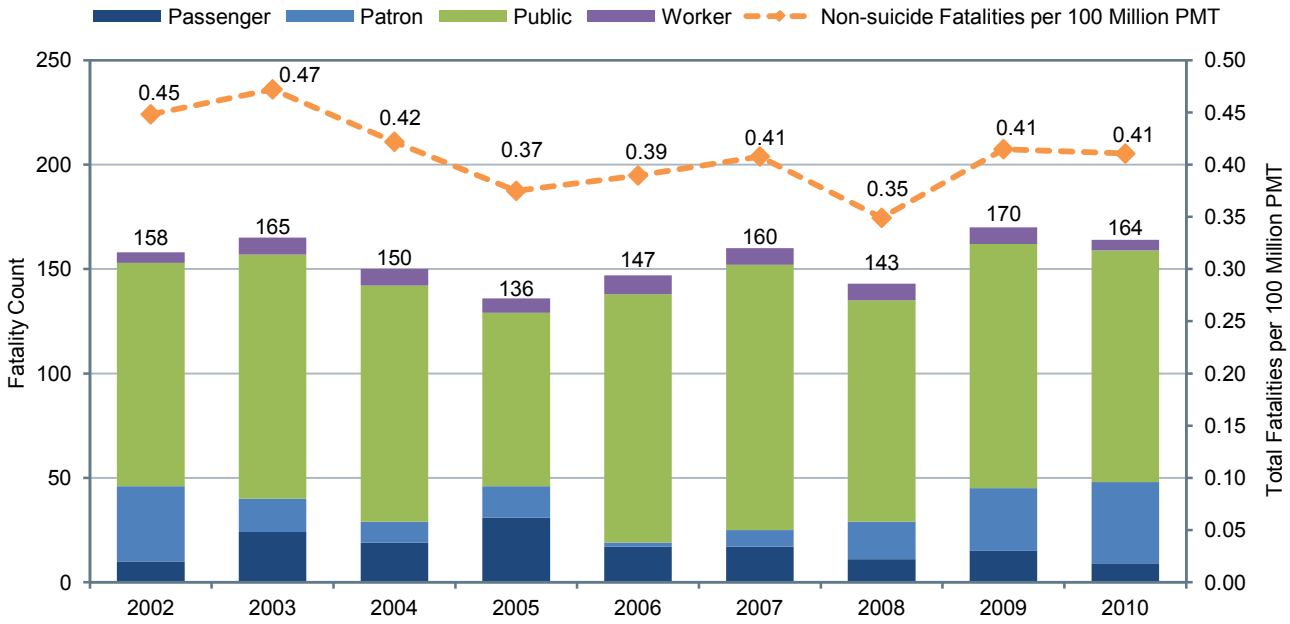
Person types are defined as:

- Passengers: Individuals on-board a transit vehicle or boarding or alighting a transit vehicle
- Patrons: Individuals waiting for or leaving transit at stations, in mezzanines, on stairs, escalators, or elevators, in parking lots and other transit-controlled property
- Public: All others who come into contact with the transit system, including pedestrians, automobile drivers, and trespassers
- Workers: Transit agency employees or contractors engaged in operations or maintenance, not construction of new transit infrastructure
- Suicides: Individuals who come into contact with the transit system intending to harm themselves

Since 2008, nationwide, collisions have resulted in about 140 fatalities per year, mostly occurring when pedestrians, bicyclists, motorists, and individuals waiting in stations, at stops, at rail grade crossings, or at intersections are struck by the transit vehicle.

Exhibit 4-10 provides data on fatalities, excluding suicides, both in total fatalities and per 100 million PMT for heavy rail, light rail, demand response, and motor bus. From 2002 to 2010, the number of fatalities has remained relatively flat while the rate per 100 million passenger miles has declined slightly due to increasing ridership. Unlike other modes, such as highway travel, public transportation has not achieved a consistent decrease in fatalities.

Exhibit 4-10 Annual Transit Fatalities Excluding Suicides, 2002–2010



Note: Exhibit includes data for DR, HR, LR, and MB. Also, fatality totals include both directly operated (DO) and purchased transportation (PT) service types.

Source: National Transit Database—Transit Safety and Security Statistics and Analysis Reporting.

Transit interaction with pedestrians, cyclists, and motorists at rail grade crossings, pedestrian crosswalks, and intersections largely drives overall transit safety performance. The majority of fatalities and injuries in public transportation result from interaction with the public on busy city streets, from suicides, and from trespassing on transit right-of-way and facilities. Pedestrian fatalities accounted for 29 percent of all transit fatalities in 2010.

Exhibit 4-11 shows the transit fatality rate by person type between 2002 and 2010.

Exhibit 4-11 shows that workers typically account for the lowest fatality rate by person type, but that this percentage remains well above its historic level throughout the 1990s, when worker fatalities accounted for 2 percent of all transit fatalities. The NTSB also has issued a series of recommendations to support needed improvements in this area, and FTA has targeted this number with a series of new worker protection initiatives in an effort to ensure greater safety for transit workers.

Exhibit 4-11 Transit Fatality Rates by Person Type, 2002–2010, per 100 Million PMT

Year	Passenger	Patron	Public	Worker	Suicide
2002	0.03	0.10	0.30	0.01	0.04
2003	0.10	0.04	0.33	0.02	0.04
2004	0.06	0.03	0.33	0.02	0.04
2005	0.08	0.04	0.22	0.02	0.02
2006	0.05	0.01	0.31	0.02	0.03
2007	0.04	0.02	0.32	0.02	0.06
2008	0.03	0.04	0.25	0.02	0.06
2009	0.04	0.07	0.28	0.03	0.12
2010	0.02	0.09	0.27	0.01	0.13

Note: Exhibit includes data for all transit modes, excluding commuter rail.

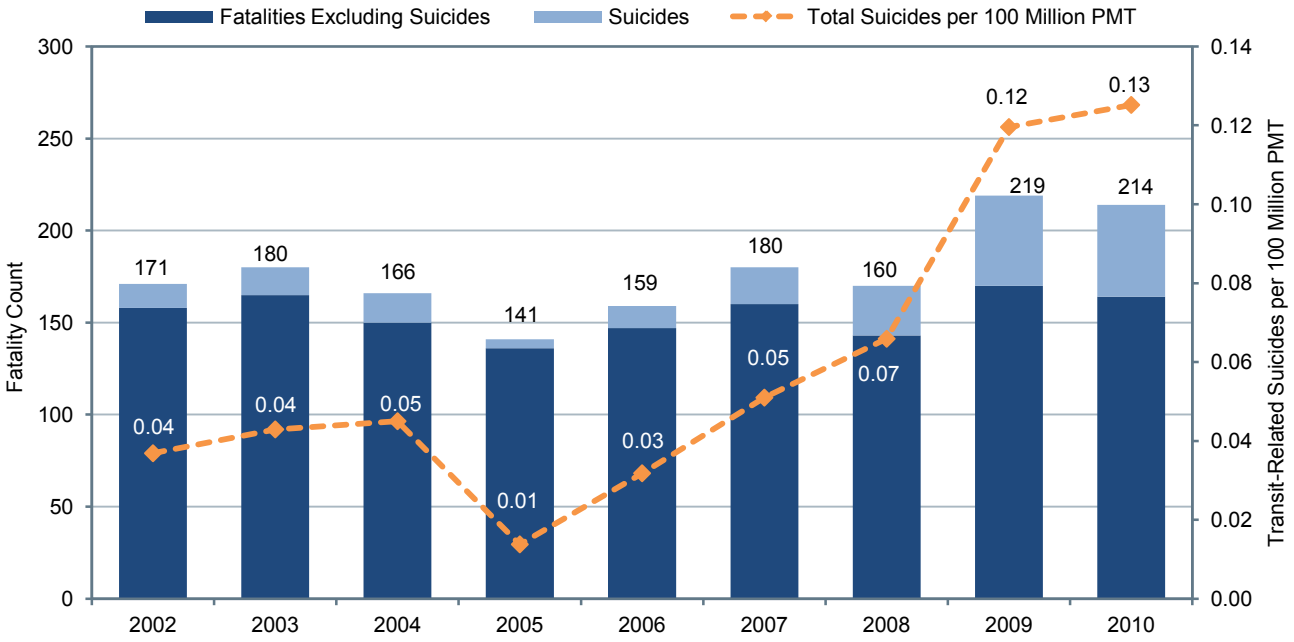
Source: National Transit Database.

Exhibit 4-11 also highlights that, although public fatalities have been decreasing in recent years, suicides have steadily increased. This change could be attributed to improvements arising from clarifications to the procedures for reporting and distinguishing between trespasser fatalities and suicides, or it could indicate a rising trend of suicides in public transportation environments. On average, fatalities involving suicides and persons who are not transit passengers or patrons (usually pedestrians and drivers) account for about 75 percent of all public transportation fatalities. This creates distinct challenges for public transportation agencies and FTA because they involve causalities which are largely outside the control of transit operators.

Many agencies and FTA are partnering with groups such as Operation Lifesaver International, universities, and local mental health agencies to devise programs to reach trespassers and suicidal individuals to attempt to change their behavior before their actions result in fatal incidents. Transit providers are working with highway agencies to address traffic problems associated with light rail and bus operations on public streets. Accident rates are expected to decline as drivers adjust to new light rail facilities and as municipalities correct roadway design features that experience multiple accidents.

Exhibit 4-12 presents fatality data for the transit industry that includes suicides. Since 2005, the number and rate of suicides has increased each year. Many transit agencies also are concerned at the recent increase in patron fatalities, largely in stations, which accounts for 18 percent of fatalities in 2010, up from a low of 4 percent in 2007.

Exhibit 4-12 Annual Transit Fatalities Including Suicides, 2002–2010



Note: Exhibit includes data for DR, HR, LR, and MB. Also, fatality totals include both directly operated (DO) and purchased transportation (PT) service types.

Source: National Transit Database—Transit Safety and Security Statistics and Analysis Reporting.

Exhibit 4-13, which shows transit injury rates by person type, also highlights a sharp increase in patron injury rates in recent years. Although transit incident occurrences and impacts fluctuate from year to year, it appears that transit patrons are experiencing an increased risk of fatality and injury in transit stations, stops, and mezzanines. One potential cause of this increased risk could be greater passenger crowding, particularly on rail transit modes, where this increasing patron injury trend has been reported.

Exhibit 4-13 Transit Injury Rates by Person Type, 2002–2010, per 100 Million PMT

Year	Passenger	Patron	Public	Worker	Suicide
2002	34.23	7.06	7.69	2.99	0.05
2003	29.93	8.85	9.90	3.29	0.03
2004	29.65	10.44	10.20	2.95	0.00
2005	28.22	9.06	8.32	2.59	0.00
2006	31.11	9.20	8.00	3.08	0.07
2007	33.32	7.35	8.74	4.72	0.04
2008*	30.34	16.89	6.86	4.03	0.04
2009	32.35	17.61	7.80	4.08	0.05
2010	35.33	13.60	8.01	3.77	0.09

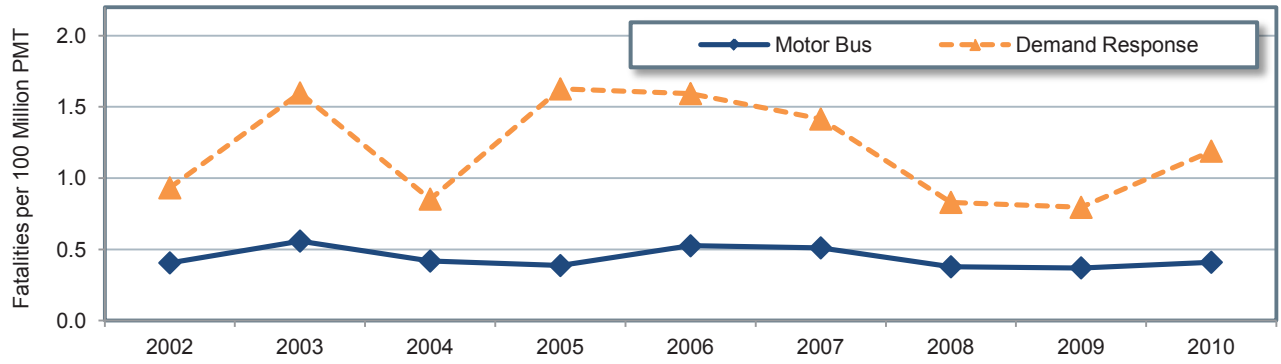
Note: Exhibit includes data for all transit modes, excluding commuter rail.

*Beginning for calendar year 2008, the reporting threshold for a reportable injury changed from two people to one person.

Source: National Transit Database.

Exhibit 4-14 shows fatality rates per 100 million PMT for motor bus and demand response (including suicides). The data show more volatility in the demand response rate, as would be expected because relatively fewer people use demand response. One or two more fatalities in a year can make the rate jump significantly. Considering this, fatality rates have not changed significantly for either mode. Absolute fatalities are not comparable across modes because of the wide range of passenger miles traveled on each mode; they are, therefore, not provided. Note that demand response fatality rates are similar to those of privately operated automobiles, which they resemble in both form and operating characteristics.

Exhibit 4-14 Annual Transit Fatality Rates by Highway Mode, 2002–2010

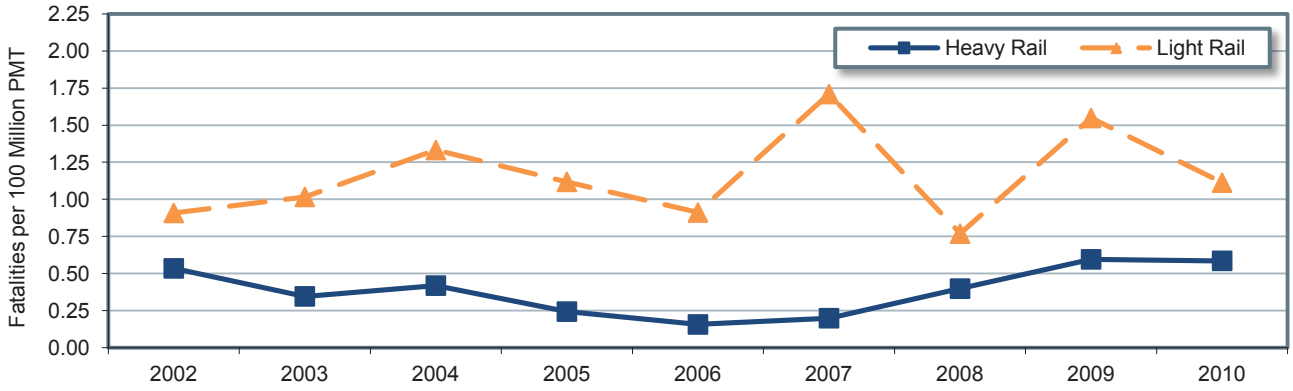


Note: Fatality totals include both DO and PT service types.

Source: National Transit Database.

Exhibit 4-15 shows fatality rates per 100 million PMT for heavy rail and light rail (including suicides). Heavy rail fatality rates were more than twice as high in 2010 as they were in 2006, although lower than they were in 2009. Of the 96 fatalities reported by heavy rail systems in 2010, 41 were classified as suicides. Light rail experiences more accidents than heavy rail because it does not usually operate on dedicated guideway and it generally picks up passengers from stops on the roadside rather than from station platforms.

Exhibit 4-15 Annual Transit Fatality Rates by Rail Mode, 2002–2010



Note: Fatality totals include both DO and PT service types.

Source: National Transit Database.

Exhibit 4-16 provides data on incidents and injuries per 100 million PMT for transportation services on the four largest modes reporting to the NTD from 2004 to 2010. Commuter rail data are presented separately because that data was collected according to different definitions in the FRA's Rail Accident/ Incident Reporting System (RAIRS). The data in *Exhibit 4-17* suggest that the highway modes (motor bus and demand response) saw a decrease in incidents between 2004 and 2010 while they simultaneously saw an increase in injuries. This is unexplained and may be due to a change in reporting practices. Data for the rail modes is volatile, but does not suggest any significant positive or negative trends.

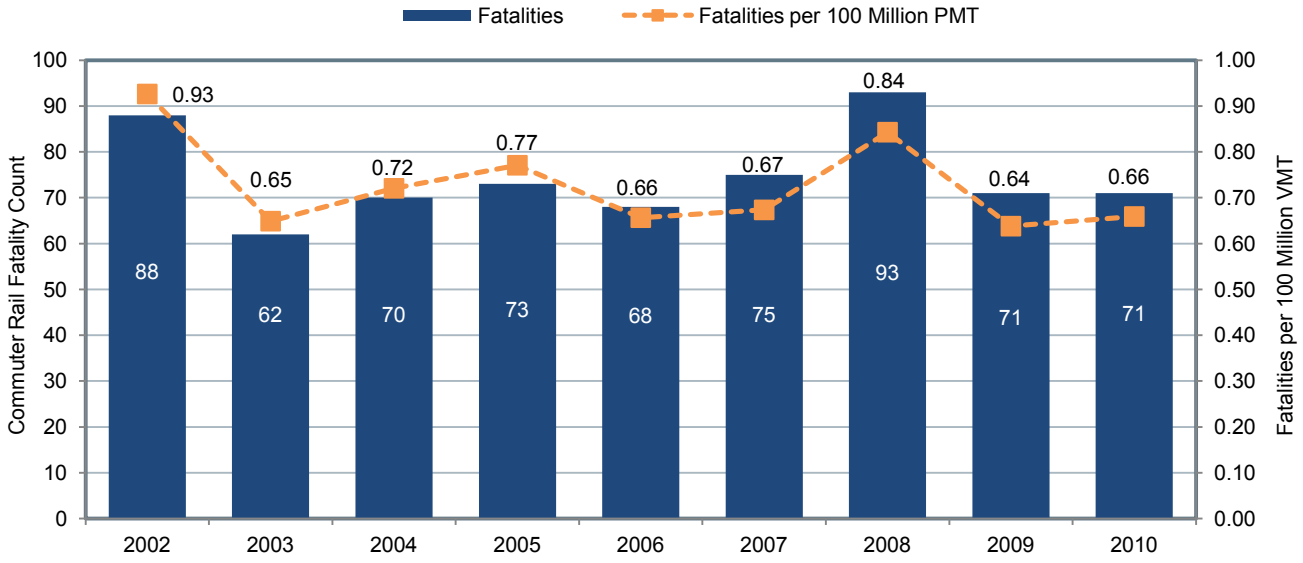
Exhibit 4-16 Transit Incidents and Injuries by Mode, 2004–2010

Analysis Parameter	2004	2005	2006	2007	2008	2009	2010
Incidents per 100 Million PMT							
Motor Bus	65.82	65.16	69.38	66.02	54.14	58.28	55.79
Heavy Rail	43.68	39.80	42.57	43.15	52.83	51.75	53.17
Light Rail	59.57	66.43	60.57	61.18	48.48	44.90	37.55
Demand Response	289.41	325.44	373.82	247.39	204.28	194.81	171.68
Injuries per 100 Million PMT							
Motor Bus	67.52	63.15	62.30	68.57	66.89	72.27	72.49
Heavy Rail	33.15	26.45	32.74	31.08	43.11	44.84	45.84
Light Rail	41.49	36.13	35.16	43.67	48.34	47.99	42.51
Demand Response	146.48	159.87	213.33	227.33	234.50	215.24	196.06

Source: National Transit Database.

Exhibit 4-17 shows both the absolute number and fatality rate per 100 million PMT for commuter rail. This data was obtained from the FRA's RAIRS. The RAIRS database records fatalities that occurred as a result of a commuter rail collision, derailment, or fire. The database also includes a category called "not otherwise classified," which includes fatalities that occurred as a result of a slip, trip, or fall. In 2011, FRA added a separate category for suicides; this data may be reported in future editions of the C&P report (suicides are not included in the data shown here). In 2010, 214 fatalities were recorded in the NTD for demand response, heavy rail, light rail, and motor bus modes, and the fatality rate per 100 million PMT (excluding suicides) was 0.41. For commuter rail, however, the absolute number of fatalities in 2010 was 71 and the fatality rate per 100 million PMT was 0.66.

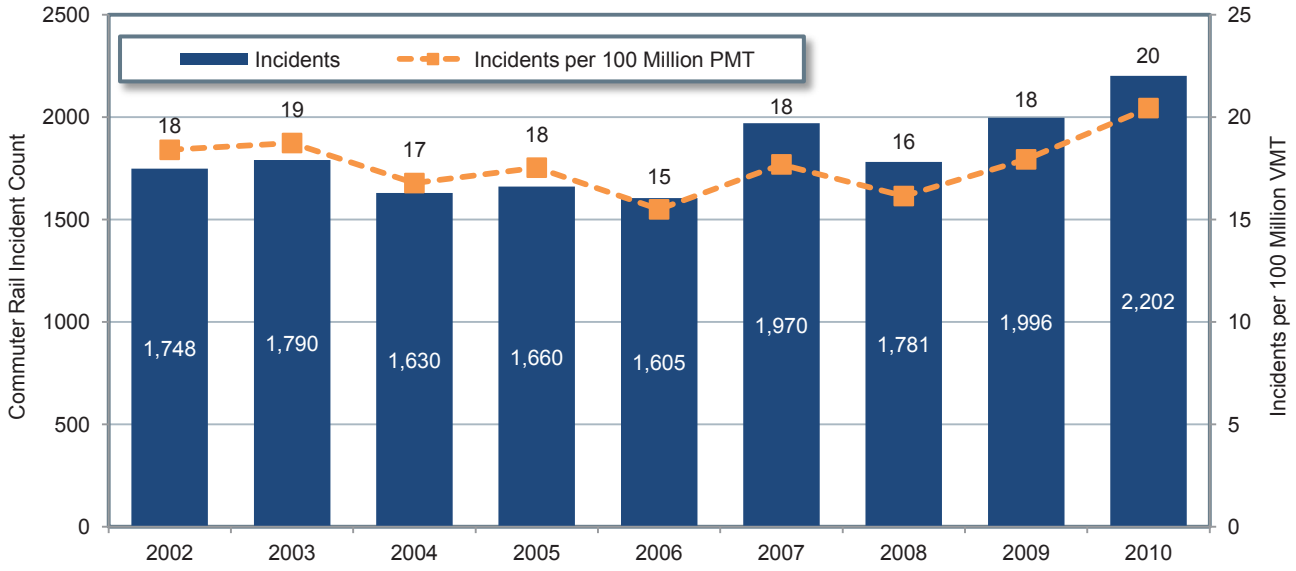
Exhibit 4-17 Commuter Rail Fatalities, 2002–2010



Source: Federal Railroad Administration Rail Accident/Incident Reporting System.

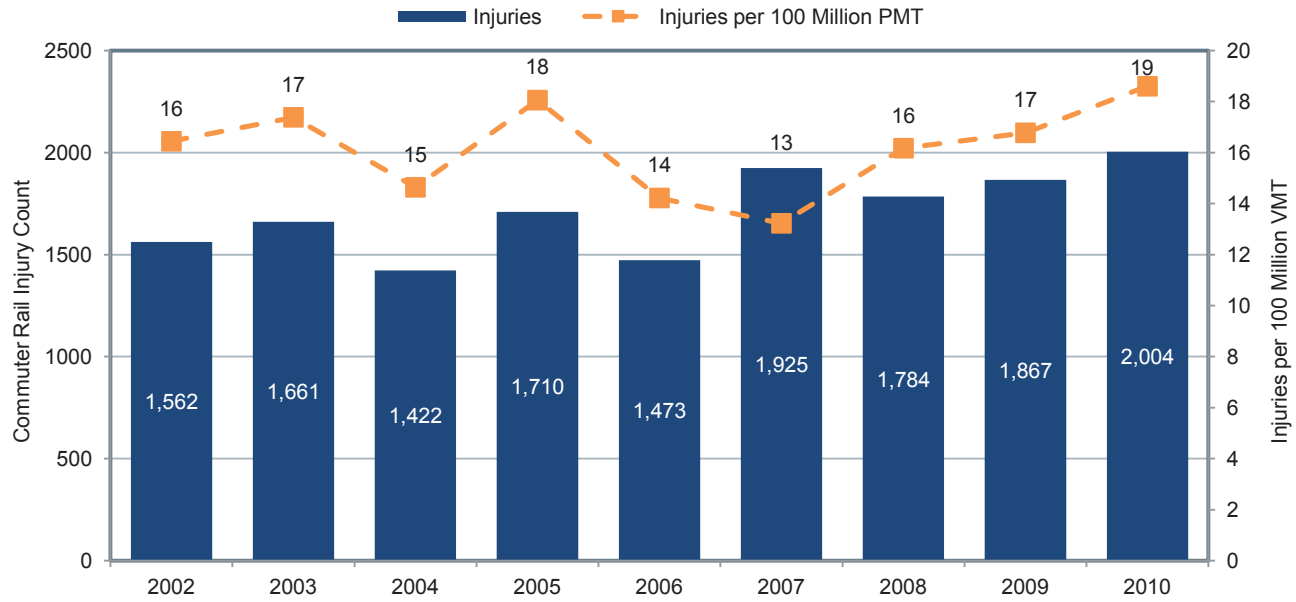
Exhibits 4-18 and *4-19* show the absolute number of commuter rail incidents and injuries per 100 million PMT, respectively. Although commuter rail has a very low number of incidents per PMT, commuter rail incidents are far more likely to result in a fatality than incidents occurring on any other mode. Most likely, this is because the average speed of commuter rail vehicles is considerably higher than the other modes (except vanpools). The number of both incidents and injuries declined from 2007 to 2008. However, between 2008 and 2010 there was a steady increase in the number of both incidents and injuries.

Exhibit 4-18 Commuter Rail Incidents, 2002–2010



Source: Federal Railroad Administration Rail Accident/Incident Reporting System.

Exhibit 4-19 Commuter Rail Injuries, 2002–2010



Source: Federal Railroad Administration Rail Accident/Incident Reporting System.