# Pedestrian and Bicyclist Fatalities in Large Truck Crashes, 2013

U.S. Department of Transportation
Federal Motor Carrier Safety Administration

May 2016

# FOREWORD

This report discusses trends and issues regarding pedestrian and bicyclist fatalities in large truck crashes over the past several years (up to 2013), using Fatality Analysis Reporting System (FARS) data. Pedestrian fatalities as percentage of total fatalities in all motor vehicle crashes rose from 11.4 percent in 2007 to 14.5 percent in 2013. The pedestrian fatality percentage in large truck crashes also increased over this period (6.5 percent in 2007; 8.5 percent in 2013). The percentage of all crash fatalities that were bicyclists rose from 1.7 percent in 2007 to 2.3 percent in 2013, with the bicyclist fatalities percentage in large truck crashes increasing from 1.5 percent in 2007 to 2.0 percent in 2013.

# NOTICE



# QUALITY ASSURANCE STATEMENT

The Federal Motor Carrier Safety Administration (FMCSA) provides high-quality information to serve Government, industry, and the public in a manner that promotes public understanding. Standards and policies are used to ensure and maximize the quality, objectivity, utility, and integrity of its information. FMCSA periodically reviews quality issues and adjusts its programs and processes to ensure continuous quality improvement.

## Technical Report Documentation Page

| 1. Report No.<br>**FMCSA-RRA-14-008** | 2. Government Accession No. | 3. Recipient's Catalog No. |
|---|---|---|
| 4. Title and Subtitle<br>**Pedestrian Fatalities in Large Truck Crashes, 2013** | | 5. Report Date<br>**May 2016** |
| | | 6. Performing Organization Code |
| 7. Author(s)<br>**Britton, Daniel** | | 8. Performing Organization Report No. |
| 9. Performing Organization Name and Address<br>**Econometrica, Inc.**<br>**7475 Wisconsin Avenue, Suite 1000**<br>**Bethesda, MD, 20814** | | 10. Work Unit No. (TRAIS) |
| | | 11. Contract or Grant No. |
| 12. Sponsoring Agency Name and Address<br>**U.S. Department of Transportation**<br>**Federal Motor Carrier Safety Administration**<br>**Office of Analysis, Research, and Technology**<br>**1200 New Jersey Ave. SE**<br>**Washington, DC 20590** | | 13. Type of Report and Period Covered<br>**Final Report, October 2015** |
| | | 14. Sponsoring Agency Code<br>**FMCSA** |
| 15. Supplementary Notes<br>**Contracting Officer's Representative: William Bannister** | | |

16. Abstract

**This report presents data on pedestrian and bicyclist fatalities in large truck crashes over the past several years (up to 2013). Information is provided on the characteristics of fatal crashes recorded in the National Highway Traffic Safety Administration's (NHTSA's) Fatality Analysis Reporting System (FARS). Pedestrians who died in crashes involving large trucks were much more likely to be under the influence of alcohol or drugs than were the large truck drivers in those crashes (although significant portions of both groups were not tested). Bicyclists who died in crashes involving large trucks were much more likely to be coded as having "failed to yield" than were the large truck drivers in those crashes. Other issues discussed in this report include work zones, age, roadway function class (rural versus urban), vehicle types (single-unit trucks versus combination trucks), initial point of impact, time of day, and race/Hispanic origin.**

| 17. Key Words<br>**pedestrian fatalities, bicyclist fatalities, large truck crashes, bus crashes** | 18. Distribution Statement<br>**No restrictions** | | |
|---|---|---|---|
| 19. Security Classif. (of this report)<br>**Unclassified** | 20. Security Classif. (of this page)<br>**Unclassified** | 21. No. of Pages<br>**73** | 22. Price |

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized.

# SI* (MODERN METRIC) CONVERSION FACTORS

| Approximate Conversions to SI Units | | | | |
|---|---|---|---|---|
| **Symbol** | **When You Know** | **Multiply By** | **To Find** | **Symbol** |
| | | **Length** | | |
| in | inches | 25.4 | millimeters | mm |
| ft | feet | 0.305 | meters | m |
| yd | yards | 0.914 | meters | m |
| mi | miles | 1.61 | kilometers | km |
| | | Area | | |
| $in^2$ | square inches | 645.2 | square millimeters | $mm^2$ |
| $ft^2$ | square feet | 0.093 | square meters | $m^2$ |
| $yd^2$ | square yards | 0.836 | square meters | $m^2$ |
| ac | Acres | 0.405 | hectares | ha |
| $mi^2$ | square miles | 2.59 | square kilometers | $km^2$ |
| | | **Volume (volumes greater than 1,000L shall be shown in $m^3$)** | | |
| fl oz | fluid ounces | 29.57 | milliliters | mL |
| gal | gallons | 3.785 | liters | L |
| $ft^3$ | cubic feet | 0.028 | cubic meters | $m^3$ |
| $yd^3$ | cubic yards | 0.765 | cubic meters | $m^3$ |
| | | **Mass** | | |
| oz | ounces | 28.35 | grams | g |
| lb | pounds | 0.454 | kilograms | kg |
| T | short tons (2,000 lb) | 0.907 | megagrams (or “metric ton”) | Mg (or “t”) |
| | | **Temperature (exact degrees)** | | |
| °F | Fahrenheit | 5(F-32)/9 or (F-32)/1.8 | Celsius | °C |
| | | **Illumination** | | |
| fc | foot-candles | 10.76 | lux | lx |
| fl | foot-Lamberts | 3.426 | candela/$m^2$ | $cd/m^2$ |
| | | **Force and Pressure or Stress** | | |
| lbf | poundforce | 4.45 | newtons | N |
| $lbf/in^2$ | poundforce per square inch | 6.89 | kilopascals | kPa |

| Approximate Conversions from SI Units | | | | |
|---|---|---|---|---|
| **Symbol** | **When You Know** | **Multiply By** | **To Find** | **Symbol** |
| | | **Length** | | |
| mm | millimeters | 0.039 | inches | in |
| m | meters | 3.28 | feet | ft |
| m | meters | 1.09 | yards | yd |
| km | kilometers | 0.621 | miles | mi |
| | | **Area** | | |
| $mm^2$ | square millimeters | 0.0016 | square inches | $in^2$ |
| $m^2$ | square meters | 10.764 | square feet | $ft^2$ |
| $m^2$ | square meters | 1.195 | square yards | $yd^2$ |
| Ha | hectares | 2.47 | acres | ac |
| $km^2$ | square kilometers | 0.386 | square miles | $mi^2$ |
| | | **Volume** | | |
| mL | milliliters | 0.034 | fluid ounces | fl oz |
| L | liters | 0.264 | gallons | gal |
| $m^3$ | cubic meters | 35.314 | cubic feet | $ft^3$ |
| $m^3$ | cubic meters | 1.307 | cubic yards | $yd^3$ |
| | | **Mass** | | |
| g | grams | 0.035 | ounces | oz |
| kg | kilograms | 2.202 | pounds | lb |
| Mg (or “t”) | megagrams (or “metric ton”) | 1.103 | short tons (2,000 lb) | T |
| | | **Temperature (exact degrees)** | | |
| °C | Celsius | 1.8c+32 | Fahrenheit | °F |
| | | **Illumination** | | |
| lx | lux | 0.0929 | foot-candles | fc |
| $cd/m^2$ | candela/$m^2$ | 0.2919 | foot-Lamberts | fl |
| | | **Force and Pressure or Stress** | | |
| N | newtons | 0.225 | poundforce | lbf |
| kPa | kilopascals | 0.145 | poundforce per square inch | $lbf/in^2$ |

* SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380. (Revised March 2003, Section 508-accessible version September 2009.)

# TABLE OF CONTENTS



# LIST OF APPENDICES

# LIST OF FIGURES (AND FORMULAS)

# LIST OF TABLES

# LIST OF ACRONYMS, ABBREVIATIONS, AND SYMBOLS

| Acronym | Definition |
|---|---|
| AC | alcohol content |
| BAC | blood alcohol content |
| CMV | commercial motor vehicle |
| EMS | emergency medical service |
| FARS | Fatality Analysis Reporting System |
| FMCSA | Federal Motor Carrier Safety Administration |
| GVWR | gross vehicle weight rating |
| NHTSA | National Highway Traffic Safety Administration |
| PBT | preliminary breath test |
| PCP | phencyclidine |
| USDOT | U.S. Department of Transportation |

[This page intentionally left blank.]

# EXECUTIVE SUMMARY

## PURPOSE

This report describes trends and issues regarding pedestrian and bicyclist fatalities in large truck crashes over the past several years, but focusing on 2013. The issue of pedestrian fatalities is of particular interest to the Federal Motor Carrier Safety Administration (FMCSA) due to the increase in the percentage of all crash fatalities that were pedestrians between 2007 (11.4 percent) and 2013 (14.5 percent). The pedestrian fatality percentage in large truck crashes also increased over this period (6.5 percent in 2007; 8.5 percent in 2013). The percentage of all crash fatalities that were bicyclists rose from 1.7 percent in 2007 to 2.3 percent in 2013, with the bicyclist fatalities percentage in large truck crashes increasing from 1.5 percent in 2007 to 2.0 percent in 2013.

## PROCESS

This study relies almost exclusively on data contained in the Fatality Analysis Reporting System (FARS), maintained by the National Highway Traffic Safety Administration (NHTSA).[1] FARS is a census of fatal crashes involving motor vehicles traveling on public trafficways. FARS data are available for fatal crashes between 1975 and 2013.

## STUDY FINDINGS

In crashes involving a large truck and a pedestrian, the pedestrian frequently loses his or her life. Pedestrians who died in crashes involving large trucks were much more likely to be under the influence of alcohol or drugs than the large truck drivers in those crashes, although significant portions of both groups were not tested. Pedestrians killed in all crashes, including crashes not involving large trucks, were much more likely to test positive for drugs or alcohol than the drivers of vehicles in those crashes. Other issues discussed include work zones, age, roadway function class (rural versus urban), vehicle type (single-unit trucks versus combination trucks), the initial point of impact, time of day, and race/Hispanic origin.

### Pedestrian Fatalities

Among the findings discovered through the analysis of FARS data in this report are the following:

- For pedestrian fatalities in crashes involving large trucks, a crash circumstance was recorded for 69 percent of the pedestrians (i.e., the crash circumstance was attributed to the pedestrian) versus 34 percent of the large truck drivers.

[1] http://www.nhtsa.gov/FARS

- Of the 338 pedestrians who died in large truck crashes in 2013, 37 percent tested positive for alcohol or drugs or were coded as being under the influence of alcohol, drugs, or other medication, versus 4 percent of the 339 large truck drivers in those crashes.
- The percentage of pedestrian fatalities who have tested positive for alcohol has remained somewhat constant (approximately 40 percent of those who were tested) over the past 10 years, while the percentage of those who tested positive for drugs has risen from 25 percent in 2004 to 33 percent in 2013.
- Pedestrian fatalities in large truck crashes where the pedestrian was coded as being "at work" occurred at almost five times the rate of pedestrian fatalities in general (10 percent versus 2 percent).
- The number of pedestrian fatalities on urban local streets has increased over the past 10 years, especially from 2011 to 2013. The number of pedestrian fatalities who were 51–70 years old has increased at an even more rapid rate. These trends apply to pedestrian fatalities in large truck crashes and to pedestrian fatalities in general.
- Large trucks that strike and kill pedestrians in single-vehicle crashes have an initial point of impact in an area other than the front of the vehicle more often than passenger vehicles that strike and kill pedestrians in single-vehicle crashes.

**Bicyclist Fatalities**

- Fourteen percent of the 78 bicyclists who died in crashes with large trucks in 2013 tested positive for having any alcohol in their system, while none of the large truck drivers in these crashes tested positive for alcohol.
- Eighteen percent of the bicyclists who died in crashes with large trucks in 2013 tested positive for alcohol or drugs or were coded as being under the influence of alcohol, drugs, or other medication; 2 percent of the large truck drivers in those same crashes were so coded.
- At least one crash circumstance was coded for 76 percent of the bicyclists who died in crashes involving large trucks in 2013 (i.e., the crash circumstance was attributed to the bicyclist), versus 27 percent of the large truck drivers in those crashes.
- In 2013, 31 percent of the bicyclist fatalities in large truck crashes were coded as having failed to yield.
- In 2013, 18 percent of the bicyclist fatalities in large truck crashes and 32 percent of the bicyclist fatalities in all crashes were found to have taken no improper action.
- From 2004 to 2013, in large truck crashes with bicyclist fatalities, 98 percent of the time the large truck in the crash was the vehicle that actually struck and killed the bicyclist. During that same time period, in large truck crashes with pedestrian fatalities, 89 percent of the time the large truck was the vehicle that struck and killed the pedestrian.
- For 38 percent of the large trucks that struck and killed bicyclists in single-vehicle crashes in 2013, the initial point of impact was on the front of the vehicle; this is much lower than the 87 percent of other vehicles (passenger vehicles, buses, motorcycles, etc.)

that struck and killed bicyclists in single-vehicle crashes where the initial point of impact was on the front of the vehicle.

- From 2011 to 2013, 68 percent of all bicyclist fatalities occurred in urban areas, but 74 percent of bicyclist fatalities involving large trucks occurred in urban areas.
- Four percent of bicyclist fatalities in large truck crashes from 2011 to 2013 occurred on interstate highways, significantly less than the 35 percent of pedestrian fatalities in large truck crashes that occurred on interstate highways during this period.

[This page intentionally left blank.]

# 1. INTRODUCTION

There were 338 pedestrian fatalities in large truck crashes and 71 pedestrian fatalities in bus crashes in 2013.[2] An additional 78 bicyclist[3] fatalities occurred in large truck crashes and 13 bicyclist fatalities in bus crashes. The total number of pedestrian and bicyclist fatalities in large truck crashes—416—was the highest it has been since 2005.

As shown in Figure 1, fatalities in all crashes declined by 25 percent from 2005 to 2013. Pedestrian fatalities also declined from 2005 to 2009, by 16 percent; however, those gains were mostly erased from 2009 to 2013, after a 15 percent increase. As a result, pedestrians' share of total fatalities has grown steadily since 2007, as shown in Figure 2.

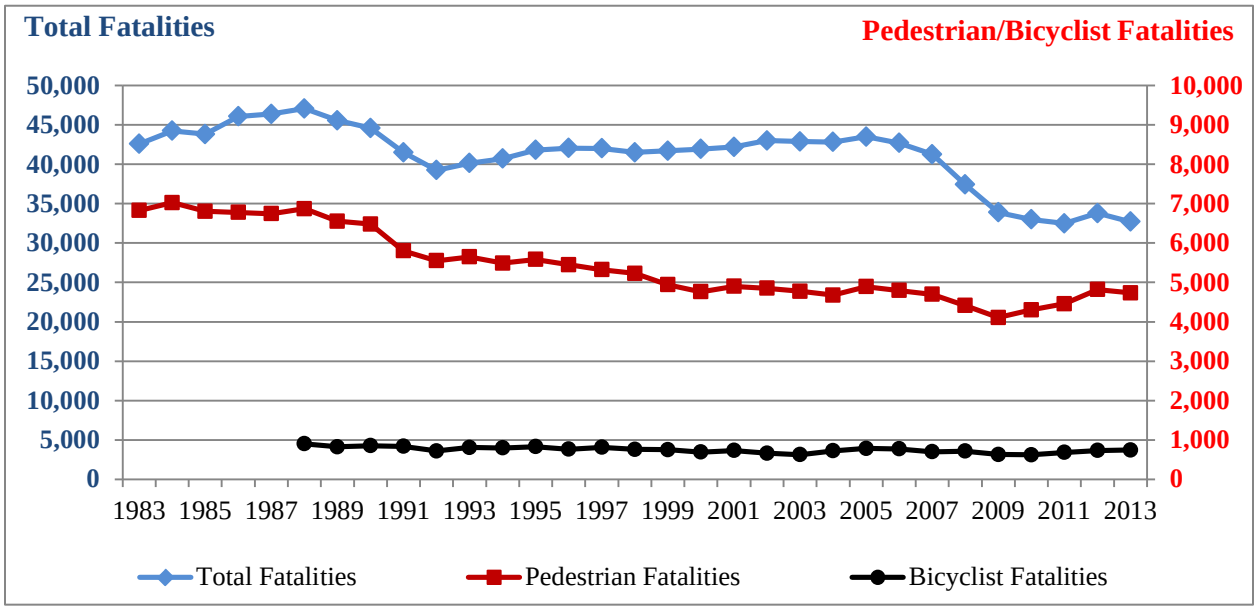


**Figure 1. Line graph. Fatality trends in all crashes, 1983–2013.**

Source: National Highway Traffic Safety Administration (NHTSA), Fatality Analysis Reporting System (FARS)

[2] One of these pedestrian fatalities was in a crash involving both a large truck and a bus; consequently, the total number of pedestrian fatalities in large truck and bus crashes was 408.

[3] Because there were no fatalities categorized as "other cyclists" in large truck or bus crashes in 2013, the number of "pedalcyclist" fatalities in large truck and bus crashes is equal to the number of "bicyclist" fatalities, and the term "bicyclist" is used in this report.

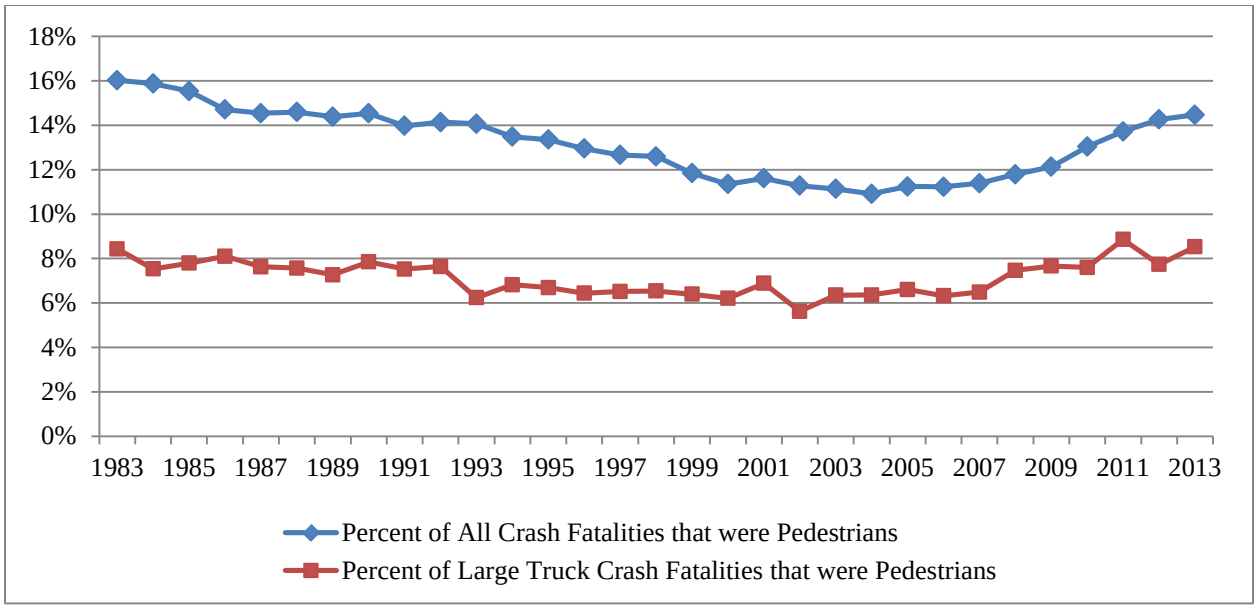


**Figure 2. Line graph. Pedestrians' share of total crash fatalities and large truck crash fatalities, 1983–2013.**
Source: NHTSA, FARS.

In 2013, large trucks and buses represented 8 percent of the vehicles that struck and killed pedestrians and 12 percent of the vehicles that struck and killed bicyclists.[4] Figure 3 is based on the information from which these numbers were derived.

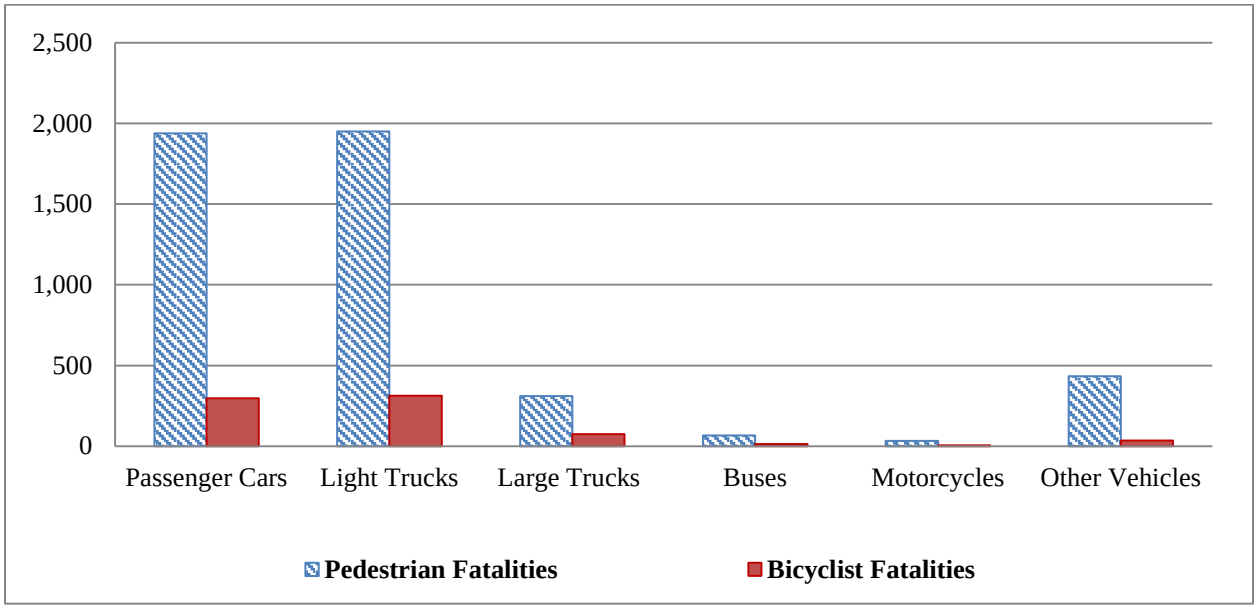


**Figure 3. Bar graph. Pedestrian and bicyclist fatalities by the vehicle type that struck them, 2013.**
Source: NHTSA, FARS.

[4] Note that striking and killing a pedestrian or bicyclist is different from merely being involved in a crash with a pedestrian or bicyclist fatality.

There was a significant downward trend in large truck crash fatalities from 2005 to 2009, followed by a smaller increase from 2009 to 2013 (shown in Figure 4). The annual number of pedestrian and bicyclist fatalities in large truck crashes remained somewhat stable over this period but showed a rising trend from 2009 to 2013, and total large truck crash fatalities declined enough to make pedestrians' share of those fatalities in each year from 2008 to 2013 higher than it had been since 1992 (as shown in Figure 2).

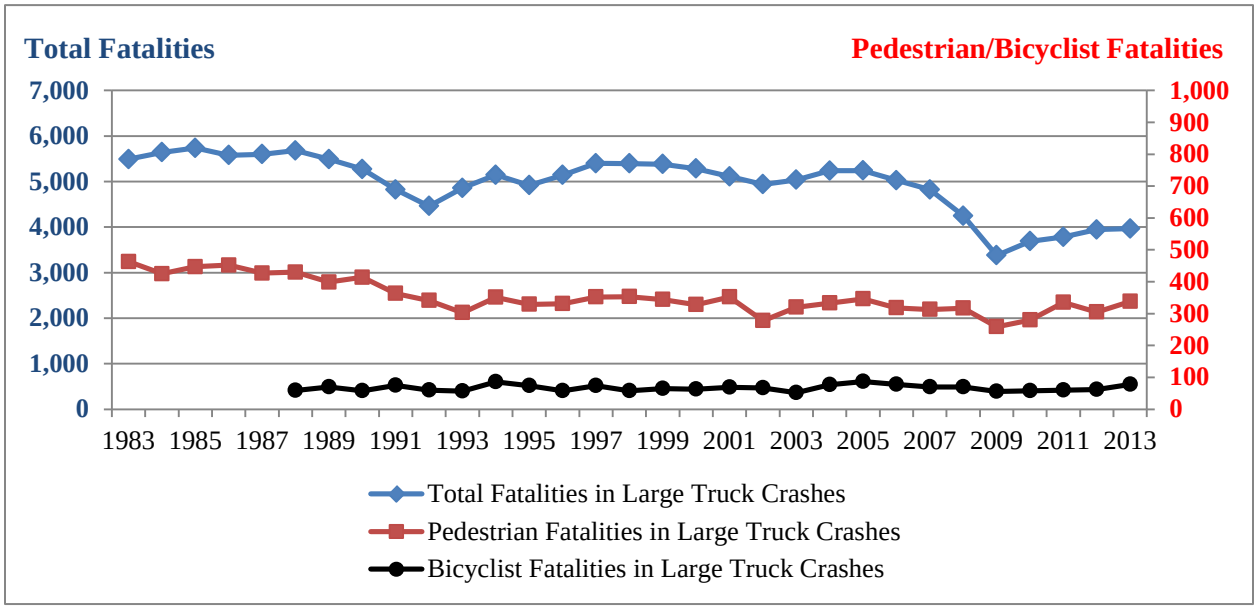


**Figure 4. Line graph. Fatality trends in large truck crashes, 1983–2013.**

Source: NHTSA, FARS.

Since 2004, there has been a steady upward trend in the percentage of fatal crashes that involved at least one pedestrian fatality; a decline in the percentage of fatal crashes involving at least one large truck until 2009, followed by a rise; and a very slight upward trend in the percentage of fatal crashes involving at least one large truck and at least one pedestrian fatality (shown in Figure 5).

The percentage of fatal crashes with at least one pedestrian fatality increased from 2006 to 2013 (from 12 to 15 percent), while the percentage of fatal crashes that involved at least one large truck remained more stable—between 11 and 12 percent (except for a larger drop to 10 percent in 2009). Theoretically, multiplying these two percentages would provide a rough estimate of the proportion of fatal crashes expected to involve a pedestrian fatality and a large truck, if large truck involvement and pedestrian fatalities were evenly distributed among all fatal crashes, with no positive or negative correlation. However, the actual share of fatal crashes involving both large trucks and pedestrian fatalities is about 39 percent smaller than what this method would suggest. This indicates that large trucks and pedestrians tend not to be involved in the same crashes—which is consistent with what one might expect, as pedestrians usually do not walk along the roads typically traveled by large trucks.

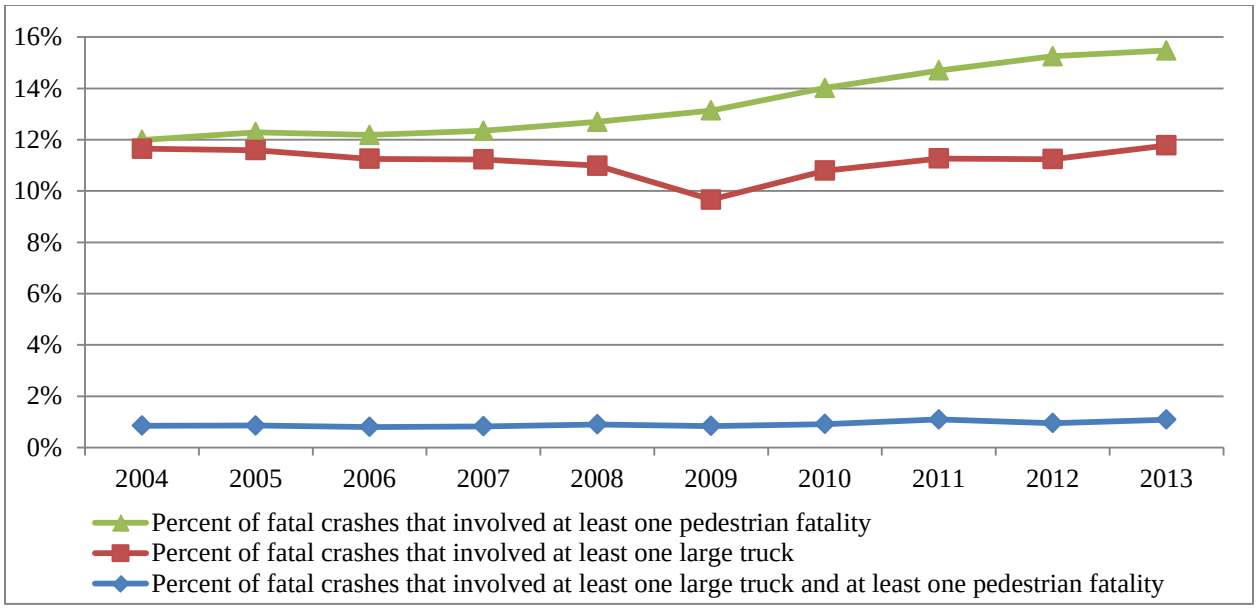


**Figure 5. Line graph. Percent of fatal crashes that involved large trucks and/or pedestrians, 2004–13.**
Source: NHTSA, FARS.

Figure 6, Figure 7, and Figure 8 show that large truck crash fatalities tend to happen in States with more rural populations (although the correlation is not very strong, $R^2 = 0.11$), while pedestrian and bicyclist fatalities tend to happen in States with urban populations ($R^2 = 0.58$ for pedestrian fatalities and $R^2 = 0.49$ for bicyclist fatalities).

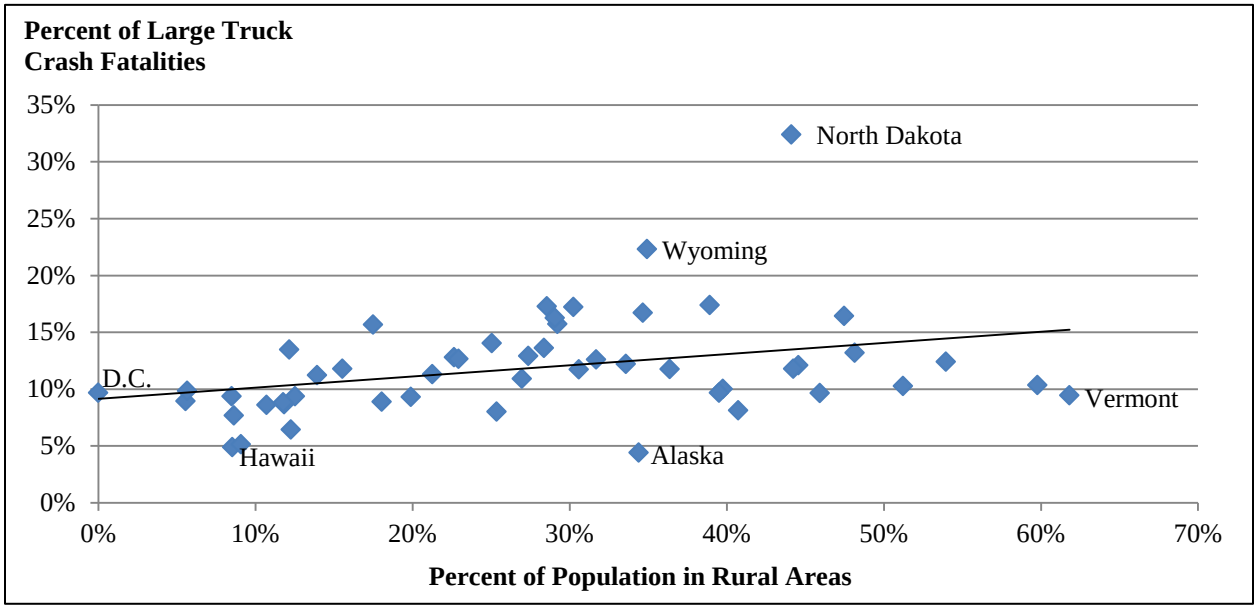


**Figure 6. Scatterplot graph. Percent of crash fatalities that involved large trucks (2011–13) and percent of population in rural areas (2010 census) by State.**
Sources: NHTSA, FARS; 2010 Census Resident Population Data.

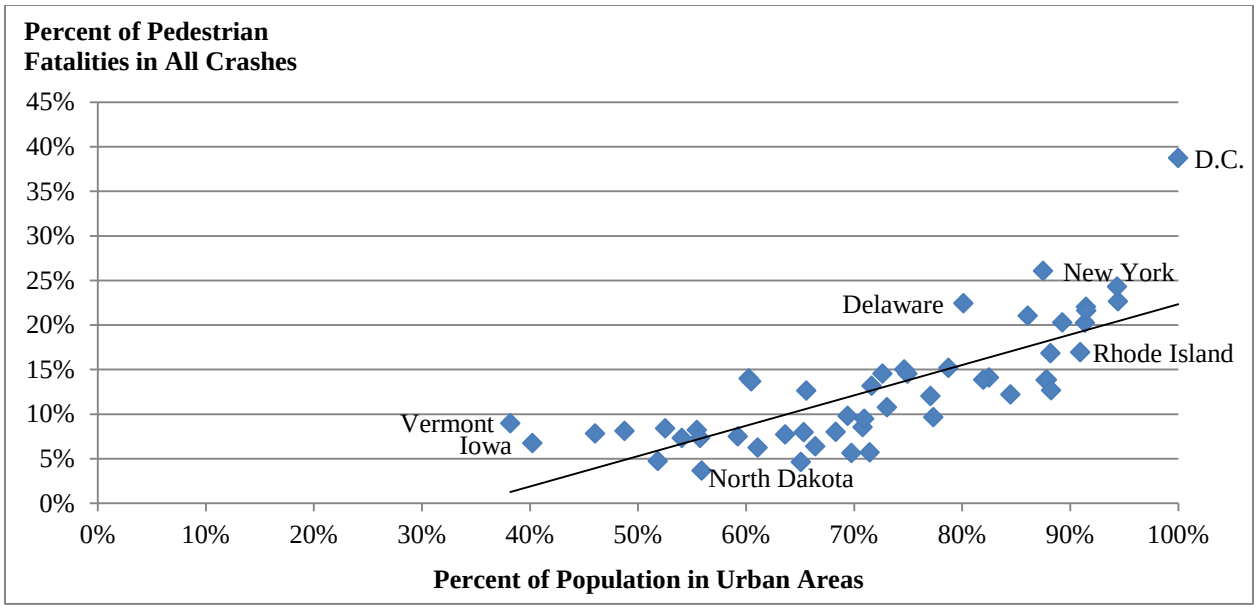


**Figure 7. Scatterplot graph. Percent of crash fatalities that were pedestrians (2011–13) and percent of population in urban areas (2010 census) by State.**

Sources: NHTSA, FARS; 2010 Census Resident Population Data.

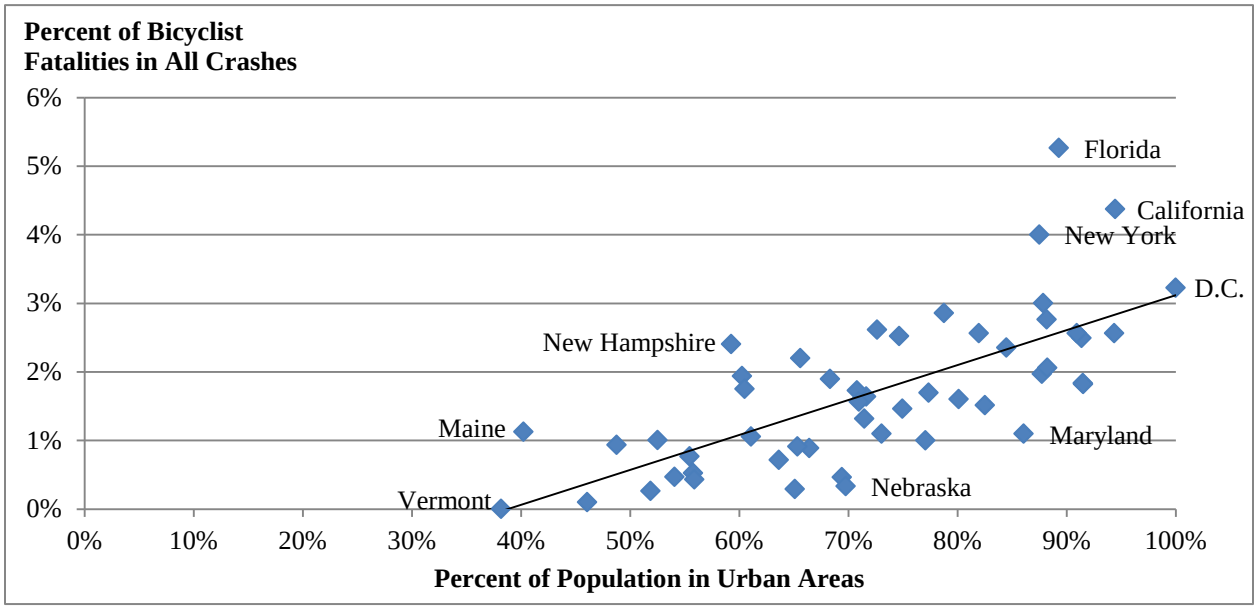


**Figure 8. Scatterplot graph. Percent of crash fatalities that were bicyclists (2011–13) and percent of population in urban areas (2010 census) by State.**

Sources: NHTSA, FARS; 2010 Census Resident Population Data.

[This page intentionally left blank.]

# 2. CRITICAL EVENTS AND CRASH CIRCUMSTANCES

FARS contains a data element—Critical Pre-crash Event—which is "the attribute that best describes the critical event which made this crash imminent (i.e., something occurred which made the collision possible)." Table 1 , Table 2, and Table 3 show the critical pre-crash events for vehicles in crashes with pedestrian or bicyclist fatalities and for vehicles in all fatal crashes (respectively), for calendar years 2011–13. The critical pre-crash event options (almost 60) are divided into 7 categories:

- "This vehicle loss of control due to …"
- "This vehicle traveling…"
- "Other motor vehicle in lane."
- "Other motor vehicle encroaching into lane."
- 'Pedestrian or pedalcyclist or other non-motorist."
- "Object or animal."
- "Other."

The options can also be reorganized into the categories shown in Table 1 and Table 2.

**Table 1. Critical pre-crash events for vehicles in crashes with pedestrian fatalities, 2011–13.**

| Critical Pre-crash Event | Large Trucks | | All Vehicles | |
|---|---|---|---|---|
| | Number | Percent | Number | Percent |
| Vehicle problems | 3 | 0.3% | 83 | 0.5% |
| This vehicle did something out-of-the-ordinary | 80 | 8.0% | 1,036 | 6.6% |
| Other vehicle/object did something out-of-the-ordinary | 92 | 9.2% | 1,032 | 6.6% |
| Pedestrian-related | 769 | 77.3% | 13,031 | 83.5% |
| Unknown | 51 | 5.1% | 432 | 2.8% |
| **Total** | **995** | **100.0%** | **15,614** | **100.0%** |

Source: NHTSA, FARS.

**Table 2. Critical pre-crash events for vehicles in crashes with bicyclist fatalities, 2011–13.**

| Critical Pre-crash Event | Large Trucks | | All Vehicles | |
|---|---|---|---|---|
| | Number | Percent | Number | Percent |
| Vehicle problems | 0 | 0.0% | 5 | 0.2% |
| This vehicle did something out-of-the-ordinary | 4 | 2.0% | 149 | 6.6% |
| Other vehicle/object did something out-of-the-ordinary | 0 | 0.0% | 45 | 2.0% |
| Bicyclist-related | 190 | 95.0% | 2,032 | 90.3% |
| Unknown | 6 | 3.0% | 19 | 0.8% |
| **Total** | **200** | **100.0%** | **2,250** | **100.0%** |

Source: NHTSA, FARS.

**Table 3. Critical pre-crash events for vehicles in all fatal crashes, 2011–13.**

| Critical Pre-crash Event | Large Trucks | | All Vehicles | |
|---|---|---|---|---|
| | Number | Percent | Number | Percent |
| Vehicle problems | 232 | 2.0% | 5,383 | 4.0% |
| This vehicle did something out-of-the-ordinary | 2,441 | 21.5% | 60,761 | 45.0% |
| Other vehicle/object did something out-of-the-ordinary | 7,251 | 63.8% | 48765 | 36.1% |
| Pedestrian-related | 988 | 8.7% | 15,571 | 11.5% |
| Unknown | 452 | 4.0% | 4,467 | 3.3% |
| **Total** | **11,364** | **100.0%** | **134,618** | **100.0%** |

Source: NHTSA, FARS.

For nearly 84 percent of the vehicles in crashes with pedestrian fatalities from 2011–13, the critical pre-crash event was pedestrian-related; only 7 percent of the vehicles were coded as doing something "out-of-the-ordinary" (such as traveling too fast for conditions or traveling off the side of the road). About 8 percent of the large trucks in crashes with pedestrian fatalities were coded as doing something out-of-the-ordinary, but this is less than the nearly 22 percent of all large trucks and 45 percent of all vehicles in fatal crashes coded as having done something out-of-the-ordinary.

For 90 percent of the vehicles in crashes with bicyclist fatalities from 2011–13, the critical pre-crash event was bicyclist-related; 7 percent of the vehicles were coded as doing something out-of-the-ordinary. Two percent of the large trucks in crashes with bicyclist fatalities were coded as doing something out-of-the-ordinary.

FARS divides most aspects of a crash (such as environmental conditions, motorist actions, and other qualities) into several distinct variables, making it difficult to examine comprehensively all the circumstances around crashes of a particular type. For example, most drivers and pedestrians are coded with drug and alcohol test results, and it is easy to list those results on a person level, but it is slightly more difficult to determine the total number of crashes that involved at least one driver who tested positive for drugs or alcohol. With some effort, crashes of a particular type (in this case, large truck crashes with pedestrian fatalities) can be isolated, and the FARS data for them can be reorganized to facilitate a more comprehensive analysis of all the circumstances surrounding the crashes. In this report, these circumstances have been named "crash circumstances." It should be emphasized that the term "crash circumstances" is not found in FARS but represents an analysis of a few hundred options within several dozen FARS data elements. Table 4 lists the most common crash circumstances for the 338 pedestrian fatalities in large truck crashes in 2013.

This analysis also allows for the grouping of all the crash circumstances (not just those listed in Table 4) that indicate how driver or non-motorist behaviors might have contributed to the crash. Almost 200 circumstances were included in this analysis, although some were never coded for any of the crashes with pedestrian fatalities. This requires some judgment and should not be regarded as authoritative. However, it suggests that pedestrian behavior leads to more pedestrian fatalities in large truck crashes than does large truck driver behavior, as shown in Table 5.

**Table 4. Top 20 crash circumstances for the 338 pedestrian fatalities in large truck crashes in 2013.**

| Crash Circumstance | Type | Number | Percent |
|---|---|---|---|
| The area of the crash was dark and not lighted | Environment | 145 | 42.9% |
| It was raining | Environment | 23 | 6.8% |
| The crash occurred in a work zone | Environment | 21 | 6.2% |
| The pedestrian tested positive for at least one drug | Pedestrian | 76 | 22.5% |
| The pedestrian had a blood alcohol content of .08 or above | Pedestrian | 68 | 20.1% |
| The pedestrian was in the roadway working or playing | Pedestrian | 65 | 19.2% |
| The pedestrian was in the roadway improperly | Pedestrian | 65 | 19.2% |
| The pedestrian failed to yield | Pedestrian | 50 | 14.8% |
| The pedestrian darted or dashed | Pedestrian | 49 | 14.5% |
| The pedestrian was under the influence of alcohol, drugs, or medication | Pedestrian | 36 | 10.7% |
| The large truck driver was distracted or inattentive | Large Truck Driver | 49 | 14.5% |
| The large truck was skidding, swerving, or sliding | Large Truck Driver | 33 | 9.8% |
| The critical event for the large truck was its own movement | Large Truck Driver | 31 | 9.2% |
| The large truck driver's vision was obscured | Large Truck Driver | 25 | 7.4% |
| The first harmful event in the crash was not a collision with the pedestrian | Other | 53 | 15.7% |
| The pedestrian was coded as being at work | Other | 31 | 9.2% |
| The pedestrian was working on a disabled vehicle | Other | 30 | 8.9% |
| An action of another vehicle (e.g., passenger vehicle) was the critical precrash event | Other | 26 | 7.7% |
| Another vehicle (e.g., passenger vehicle) driver was distracted or inattentive | Other | 22 | 5.9% |
| There were more than three vehicles in the crash | Other | 21 | 6.2% |

Note: More than one circumstance may be coded for each pedestrian fatality.

Source: NHTSA, FARS.

**Table 5. Crash circumstances for large truck drivers and pedestrians in large truck crashes with pedestrian fatalities in 2013.**

| Crash Circumstance | No Crash Circumstance Coded for the Pedestrian | At Least One Crash Circumstance Coded for the Pedestrian | Total |
|---|---|---|---|
| No crash circumstance coded for the large truck driver | 42 (12.4%) | 180 (53.3%) | 223 (66.0%) |
| At least one crash circumstance coded for the large truck driver | 62 (18.3%) | 54 (16.0%) | 115 (34.0%) |
| **Total** | **104 (30.8%)** | **234 (69.2%)** | **338 (100.0%)** |

Source: NHTSA, FARS.

For 69 percent of the 338 pedestrian fatalities in crashes involving large trucks in 2013,[5] at least 1 crash circumstance was recorded in FARS for the pedestrian. On the other hand, for 34 percent of these pedestrian fatalities, a large truck driver was coded with at least one factor that could have contributed to the crash.

In addition, 55 percent of these fatalities had environmental crash circumstances, such as being in a dark and unlighted area (145; 43 percent). Some of these crashes also involved other vehicles, such as passenger vehicles and light trucks; 8 percent of the pedestrian fatalities in large truck crashes involved drivers of these other vehicle types, at least one of which was coded with at least one crash circumstance. Seventeen of the 338 pedestrian fatalities (5 percent) were in crashes without a single coded crash circumstance of any kind (large truck, pedestrian, environmental, or other vehicle-related).

For crashes with bicyclist fatalities involving large trucks, the disparity is even stronger: at least one possible crash circumstance was coded for 76 percent of the bicyclists and 27 percent of the large truck drivers, as shown in Table 6.

**Table 6. Crash circumstances for large truck drivers and bicyclists in large truck crashes with bicyclist fatalities in 2013.**

| Crash Circumstance | No Crash Circumstance Coded for the Bicyclist | At Least One Crash Circumstance Coded for the Bicyclist | Total |
|---|---|---|---|
| No crash circumstance coded for the large truck driver | 9 (11.5%) | 48 (61.5%) | 57 (73.1%) |
| At least one crash circumstance coded for the large truck driver | 10 (12.8%) | 11 (14.1%) | 21 (26.9%) |
| **Total** | **19 (24.4%)** | **59 (75.6%)** | **78 (100.0%)** |

Source: NHTSA, FARS.

Other points gathered from this analysis include the following:

- In 2013, 84 of the 338 pedestrians (25 percent) who died in crashes with large trucks and 984 of the 4,735 pedestrians (21 percent) who died in all crashes were found to have taken no improper action.
- In 2013, 124 of the 338 pedestrians (37 percent) who died in crashes with large trucks tested positive for alcohol or drugs or were coded as being under the influence of alcohol, drugs, or other medication. Conversely, 14 of the 339 large truck drivers in those crashes (4 percent) were so coded.
- In 2013, the first harmful event was something other than a collision with a pedestrian for 16 percent of pedestrian fatalities involving a large truck and for 6 percent of all pedestrian fatalities. About 6 percent of pedestrian fatalities in large truck crashes were in

[5] In 2013, there were 14 driverless large trucks in crashes with pedestrian fatalities, 9 large truck crashes with more than 1 pedestrian fatality, and 9 crashes with pedestrian fatalities that involved more than 1 large truck. As a result, there were a total of 326 crashes involving at least 1 large truck and at least 1 pedestrian fatality; in these crashes there were 353 large trucks, 339 large truck drivers, and 338 pedestrian fatalities.

crashes with three or more vehicles, versus 2 percent of pedestrian fatalities in general. These facts suggest that crashes involving pedestrian fatalities and large trucks include events other than a vehicle-pedestrian collision more often than crashes with pedestrian fatalities in general.

- For the 71 pedestrian fatalities in bus crashes in 2013, at least 1 crash circumstance was recorded for (i.e., attributed to) 49 pedestrians (69 percent) and 20 bus drivers (28 percent).
- For the 13 bicyclist fatalities in bus crashes in 2013, at least 1 crash circumstance was recorded for (i.e., attributed to) 12 bicyclists (92 percent) and 2 bus drivers (15 percent).

Table 7, Table 8, Table 9, Table 10, and Table 11 list the top crash circumstances for several crash types.

**Table 7. Top 10 crash circumstances for the 71 pedestrian fatalities in bus crashes in 2013.**

| Crash Circumstance | Pedestrian Fatalities in Bus Crashes | Percent |
|---|---|---|
| The pedestrian tested positive for at least one drug | 14 | 19.7% |
| The pedestrian darted or dashed | 12 | 16.9% |
| The pedestrian failed to yield | 12 | 16.9% |
| The pedestrian had a blood alcohol content of .08 or above | 12 | 16.9% |
| The pedestrian was in the roadway working or playing | 9 | 12.7% |
| The pedestrian was under the influence of alcohol, drugs, or other medication. | 9 | 12.7% |
| The area of the crash was dark and not lighted | 9 | 12.7% |
| The pedestrian was in the roadway improperly | 8 | 11.3% |
| The bus failed to yield | 8 | 11.3% |
| The bus was skidding, swerving, or sliding | 7 | 9.9% |

Note: More than one circumstance may be coded for each pedestrian fatality.

Source: NHTSA, FARS.

**Table 8. Top 10 crash circumstances for the 4,327 pedestrian fatalities in crashes without large trucks or buses in 2013.**

| Crash Circumstance | Pedestrian Fatalities in Crashes Without a Large Truck or Bus | Percent |
|---|---|---|
| The area of the crash was dark and not lighted | 1,485 | 34.3% |
| The pedestrian had a blood alcohol content of .08 or above | 1,079 | 24.9% |
| The pedestrian failed to yield | 975 | 22.5% |
| The pedestrian tested positive for at least one drug | 813 | 18.8% |
| The pedestrian was in the roadway improperly | 622 | 14.4% |
| The pedestrian was under the influence of alcohol, drugs, or other medication | 593 | 13.7% |
| A motor vehicle driver was distracted or inattentive | 591 | 13.7% |
| The pedestrian was in the roadway working or playing | 587 | 13.6% |
| The pedestrian darted or dashed | 557 | 12.9% |
| A motor vehicle driver was impaired (fatigue, alcohol, illness, etc.) | 441 | 10.2% |

Note: More than one circumstance may be coded for each pedestrian fatality.

Source: NHTSA, FARS.

**Table 9. Top 10 crash circumstances for the 78 bicyclist fatalities in large truck crashes in 2013.**

| Crash Circumstance | Bicyclist Fatalities in Large Truck Crashes | Percent |
|---|---|---|
| The bicyclist failed to yield | 24 | 30.8% |
| The bicyclist tested positive for at least one drug | 13 | 16.7% |
| The bicyclist was younger than 15 years old | 10 | 12.8% |
| The area of the crash was dark and not lighted | 9 | 11.5% |
| The bicyclist was under the influence of alcohol, drugs, or other medication | 7 | 9.0% |
| The bicyclist darted or dashed | 7 | 9.0% |
| The bicyclist had a blood alcohol content of .08 or above | 7 | 9.0% |
| The large truck failed to yield | 6 | 7.7% |
| The bicyclist made an improper turn | 5 | 6.4% |
| It was raining | 5 | 6.4% |

Note: More than one circumstance may be coded for each bicyclist fatality.

Source: NHTSA, FARS.

**Table 10. Top 5 crash circumstances for the 13 bicyclist fatalities in bus crashes in 2013.**

| Crash Circumstance | Bicyclist Fatalities in Bus Crashes | Percent |
|---|---|---|
| The bicyclist failed to yield | 5 | 38.5% |
| The bicyclist tested positive for at least one drug | 4 | 30.8% |
| The bicyclist made an improper turn | 3 | 23.1% |
| The bicyclist had a blood alcohol content of .08 or above | 3 | 23.1% |
| The area of the crash was dark and not lighted | 2 | 15.4% |

Note: More than one circumstance may be coded for each bicyclist fatality.

Source: NHTSA, FARS.

**Table 11. Top 10 crash circumstances for the 650 bicyclist fatalities in crashes without large trucks or buses in 2013.**

| Crash Circumstance | Bicyclist Fatalities in Crashes Without a Large Truck or Bus | Percent |
|---|---|---|
| The bicyclist failed to yield | 184 | 28.3% |
| The area of the crash was dark and not lighted | 144 | 22.2% |
| The bicyclist tested positive for at least one drug | 118 | 18.2% |
| A motor vehicle driver was distracted or inattentive | 98 | 15.1% |
| The bicyclist had a blood alcohol content of .08 or above | 81 | 12.5% |
| A motor vehicle driver was impaired (fatigue, alcohol, illness, etc.) | 80 | 12.3% |
| The bicyclist was younger than 15 years old | 50 | 7.7% |
| The bicyclist was under the influence of alcohol, drugs, or other medication | 47 | 7.2% |
| The critical event for a vehicle was its own movement | 47 | 7.2% |
| A motor vehicle failed to yield | 46 | 7.1% |

Note: More than one circumstance may be coded for each pedestrian fatality.

Source: NHTSA, FARS.

[This page intentionally left blank.]

# 3. DRUGS AND ALCOHOL

From 2004 to 2013, 29 percent of pedestrians who died in all fatal crashes tested positive for alcohol, compared with 1 percent of the large truck drivers in crashes with pedestrian fatalities and 7 percent of passenger-vehicle drivers in crashes with pedestrian fatalities (as shown in Table 12). Over the same period, 19 percent of bicyclists who died in all fatal crashes tested positive for alcohol, compared with 1 percent of the large truck drivers in crashes with bicyclist fatalities and 8 percent of passenger-vehicle drivers in crashes with pedestrian fatalities (see Table 13). For all fatal crashes, 1 percent of large truck drivers tested positive for alcohol, as compared with 19 percent of passenger-vehicle drivers (as shown in Table 14). Passenger-vehicle drivers in crashes with pedestrian fatalities were significantly less likely to test positive for alcohol than passenger-vehicle drivers in fatal crashes in general; for large truck drivers, alcohol test results were about the same for both crash types. This suggests that pedestrian and bicyclist intoxication may be a determining factor for pedestrian and bicyclist fatalities far more often than driver intoxication.

However, many people involved in fatal crashes are not tested for alcohol, or the test results are inconclusive; and the rates at which people are not tested differ significantly among large truck drivers, pedestrians, and passenger-vehicle drivers. From 2004 to 2013, 44 percent of the pedestrian fatalities *who were tested for alcohol and had known results* tested positive, compared with 4 percent of the large truck drivers in crashes with pedestrian fatalities and 24 percent of the passenger-vehicle drivers in crashes with pedestrian fatalities. Over the same period, 30 percent of the bicyclist fatalities *who were tested for alcohol and had known results* tested positive, compared with 3 percent of the large truck drivers in crashes with bicyclist fatalities and 25 percent of the passenger vehicle drivers in crashes with bicyclist fatalities.

**Table 12. Alcohol test results for individuals in crashes with pedestrian fatalities, 2004–13.**

| Alcohol Test Result | Pedestrian Fatalities | | Large Truck Drivers in Crashes with Pedestrian Fatalities | | Passenger-Vehicle Drivers in Crashes with Pedestrian Fatalities | |
|---|---|---|---|---|---|---|
| | Number | Percent | Number | Percent | Number | Percent |
| No alcohol | 17,315 | 37.7% | 854 | 27.8% | 8,768 | 21.5% |
| .01–.07 blood alcohol content (BAC) | 1,649 | 3.6% | 12 | 0.4% | 804 | 2.0% |
| .08 BAC and greater | 11,796 | 25.7% | 19 | 0.6% | 1,999 | 4.9% |
| Test refused/not reported | 590 | 1.3% | 65 | 2.1% | 900 | 2.2% |
| None given[6] | 10,312 | 22.5% | 1,732 | 56.4% | 23,821 | 58.3% |
| Alcohol content (AC) test performed, results unknown | 1,787 | 3.9% | 100 | 3.3% | 1,110 | 2.7% |
| Preliminary breath test (PBT) positive reading with no actual value | 46 | 0.1% | 0 | 0.0% | 11 | 0.0% |
| Unknown if tested | 2,401 | 5.2% | 289 | 9.4% | 3,427 | 8.4% |
| **Total** | **45,896** | **100.0%** | **3,071** | **100.0%** | **40,840** | **100.0%** |

Source: NHTSA, FARS.

[6] For various reasons, many drivers and pedestrians involved in fatal crashes are not tested for alcohol. This information (including how these untested rates differ for drivers and pedestrians), which is presented in Table 12, should be taken into account when interpreting this table.

**Table 13. Alcohol test results for individuals in crashes with bicyclist fatalities, 2004–13.**

| Alcohol Test Result | Bicyclist Fatalities | | Large Truck Drivers in Crashes with Bicyclist Fatalities | | Passenger-Vehicle Drivers in Crashes with Bicyclist Fatalities | |
|---|---|---|---|---|---|---|
| | Number | Percent | Number | Percent | Number | Percent |
| No alcohol | 3,127 | 44.1% | 230 | 33.0% | 1464 | 24.1% |
| .01–.07 BAC | 260 | 3.7% | 3 | 0.4% | 108 | 1.8% |
| .08 BAC and greater | 1,061 | 15.0% | 3 | 0.4% | 392 | 6.4% |
| Test refused/not reported | 111 | 1.6% | 13 | 1.9% | 172 | 2.8% |
| None given | 1,906 | 26.9% | 349 | 50.1% | 3,306 | 54.4% |
| AC test performed, results unknown | 205 | 2.9% | 23 | 3.3% | 162 | 2.7% |
| PBT positive reading with no actual value | 4 | 0.1% | 0 | 0.0% | 2 | 0.0% |
| Unknown if tested | 416 | 5.9% | 75 | 10.8% | 473 | 7.8% |
| **Total** | **7,090** | **100.0%** | **696** | **100.0%** | **6,079** | **100.0%** |

Source: NHTSA, FARS.

In 2013, 72 of the 338 pedestrians (21 percent) who died in crashes with large trucks tested positive for alcohol, versus 4 of the 339 large truck drivers (1 percent) involved in these crashes. Eleven of the 78 bicyclists (14 percent) who died in crashes with large trucks in 2013 tested positive for having any alcohol in their system, while none of the large truck drivers in these crashes tested positive for alcohol.

**Table 14. Alcohol test results for drivers in all fatal crashes, 2004–13.**

| Alcohol Test Result | Large Truck Drivers in All Fatal Crashes | | Passenger-Vehicle Drivers in All Fatal Crashes | |
|---|---|---|---|---|
| | Number | Percent | Number | Percent |
| No alcohol | 14,719 | 35.9% | 118,830 | 29.6% |
| .01–.07 BAC | 236 | 0.6% | 11,329 | 2.8% |
| .08 BAC and greater | 341 | 0.8% | 65,288 | 16.3% |
| Test refused/not reported | 360 | 0.9% | 4,105 | 1.0% |
| None given | 21,932 | 53.5% | 168,071 | 41.9% |
| AC test performed, results unknown | 1,388 | 3.4% | 14,814 | 3.7% |
| PBT positive reading with no actual value | 5 | 0.0% | 197 | 0.0% |
| Unknown if tested | 1,990 | 4.9% | 18,947 | 4.7% |
| **Total** | **40,971** | **100.0%** | **401,581** | **100.0%** |

Source: NHTSA, FARS.

As shown in Figure 9, the percentage of pedestrian fatalities who were tested for alcohol (with known results) and tested positive hovered between 42 and 46 percent from 2004 to 2013. Thus, the increase in pedestrian fatalities since 2009 probably cannot be attributed to a change in alcohol consumption by pedestrians. Alcohol test results for bicyclist fatalities did not exhibit a consistent trend over this period, either.

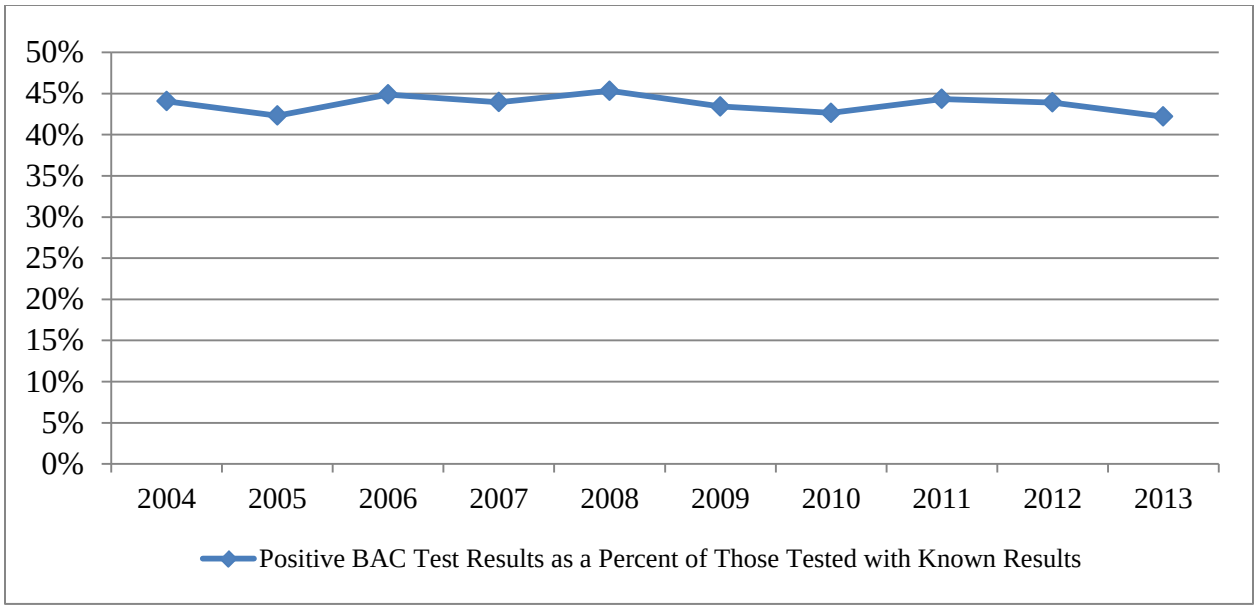


**Figure 9. Line graph. Alcohol test results for pedestrian fatalities as a percent of those tested with known results, 2004–13.**

Source: NHTSA, FARS.

The number of pedestrian fatalities who tested positive for at least one drug grew from 570 in 2004 to 903 in 2013, an increase of 59 percent; however, the number of pedestrians who were tested for drugs also grew over that period (the percent of pedestrians who were tested for alcohol remained steadier over the same period). To better identify a trend, the number of pedestrians who were actually tested should also be examined. The number of pedestrian fatalities with at least one positive drug test result as a percentage of those tested increased from 25 percent in 2004 to 33 percent in 2013 (a still sizable increase of 30 percent), as shown in Figure 10. The data presented in Figure 9 and Figure 10 show that while the percentage of pedestrians who died in crashes and tested positive for alcohol remained steady, the percentage of those testing positive for drugs increased.

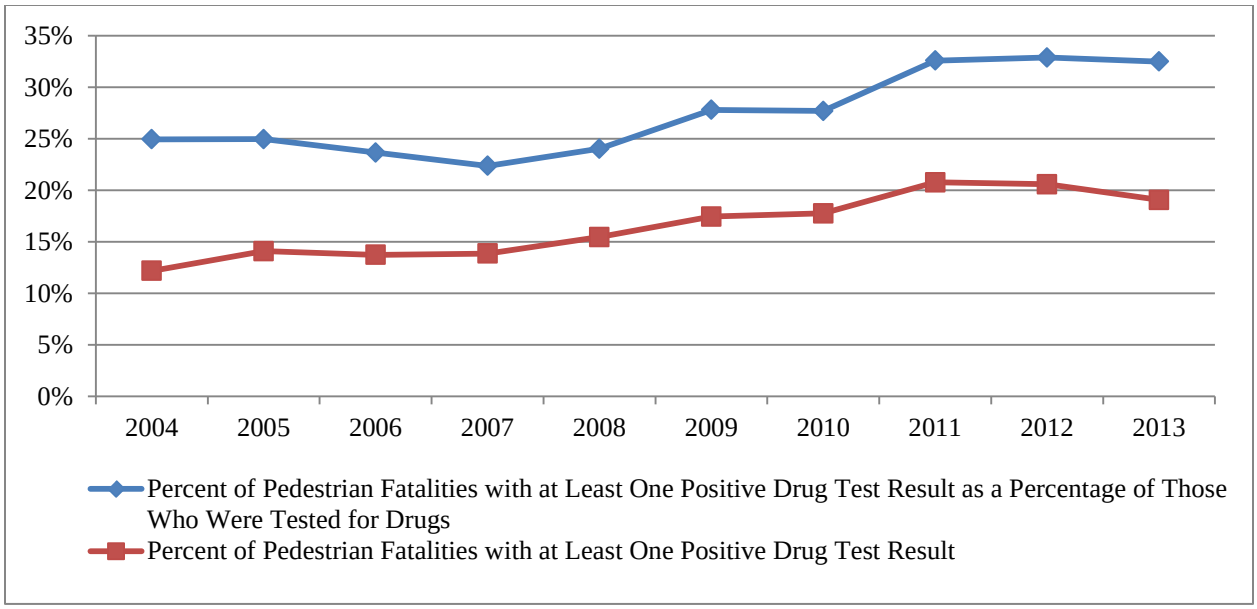


**Figure 10. Line graph. Pedestrian fatalities with at least one positive drug test result, as a percentage of those who were tested for drugs, 2004–13.**

Source: NHTSA, FARS.

Three percent of large truck drivers in crashes with pedestrian fatalities tested positive for at least one drug from 2004 to 2013, while nearly 17 percent of the pedestrian fatalities in those crashes tested positive for at least one drug (as shown in Table 15). Table 15 also shows that drug test results for pedestrians who died in large truck crashes were not significantly different compared with drug test results for pedestrians who died in all crashes.

Table 16 shows that 3 percent of the large truck drivers in crashes with bicyclist fatalities from 2004 to 2013 tested positive for at least one drug, while 15 percent of the bicyclist fatalities in those crashes tested positive for at least one drug. Table 16 also shows that drug test results for bicyclists who died in large truck crashes were not significantly different compared with drug test results for bicyclists who died in all crashes.

**Table 15. Drug test results for pedestrian fatalities, large truck drivers in crashes with pedestrian fatalities, and all drivers in fatal crashes, 2004–13.**

| Drug Test Results | Pedestrian Fatalities | | Pedestrian Fatalities in Crashes Involving Large Trucks | | Large Truck Drivers in Crashes with Pedestrian Fatalities | | All Drivers in Fatal Crashes | |
|---|---|---|---|---|---|---|---|---|
| | Number | Percent | Number | Percent | Number | Percent | Number | Percent |
| Not tested for drugs | 15,218 | 33.2% | 1,018 | 32.4% | 2,022 | 65.8% | 274,797 | 54.3% |
| No drugs reported/negative | 18,241 | 39.7% | 1,233 | 39.2% | 457 | 14.9% | 118,222 | 23.4% |
| Not reported | 476 | 1.0% | 34 | 1.1% | 61 | 2.0% | 5,017 | 1.0% |
| Tested for drugs, results unknown | 1,762 | 3.8% | 136 | 4.3% | 129 | 4.2% | 22,392 | 4.4% |
| Unknown if tested | 2,643 | 5.8% | 188 | 6.0% | 317 | 10.3% | 30,568 | 6.0% |
| At least one positive result: | 7,556 | 16.5% | 535 | 17.0% | 85 | 2.8% | 54,914 | 10.9% |
| • Narcotic | 1,653 | 3.6% | 134 | 4.3% | 11 | 0.4% | 13,457 | 2.7% |
| • Depressant | 2,111 | 4.6% | 143 | 4.5% | 13 | 0.4% | 14,715 | 2.9% |
| • Stimulant | 4,055 | 8.8% | 275 | 8.7% | 30 | 1.0% | 19,301 | 3.8% |
| • Hallucinogen | 59 | 0.1% | 4 | 0.1% | 0 | 0.0% | 331 | 0.1% |
| • Cannabinoid | 2,221 | 4.8% | 135 | 4.3% | 22 | 0.7% | 22,708 | 4.5% |
| • Phencyclidine (PCP) | 72 | 0.2% | 4 | 0.1% | 0 | 0.0% | 314 | 0.1% |
| • Anabolic Steroid | 3 | 0.0% | 1 | 0.0% | 0 | 0.0% | 22 | 0.0% |
| • Inhalant | 5 | 0.0% | 1 | 0.0% | 0 | 0.0% | 112 | 0.0% |
| • Other drugs | 2,165 | 4.7% | 153 | 4.9% | 26 | 0.8% | 15,877 | 3.1% |
| Type unknown/positive | 387 | 0.8% | 34 | 1.1% | 13 | 0.4% | 2,782 | 0.5% |
| **Total** | **45,896** | **100.0%** | **3,144** | **100.0%** | **3,071** | **100.0%** | **519,526** | **100.0%** |

Source: NHTSA, FARS.

**Table 16. Drug test results for bicyclist fatalities, large truck drivers in crashes with bicyclist fatalities, and all drivers in fatal crashes, 2004–13.**

| Drug Test Results | Bicyclist Fatalities | | Bicyclist Fatalities in Crashes Involving Large Trucks | | Large Truck Drivers in Crashes with Bicyclist Fatalities | | All Drivers in Fatal Crashes | |
|---|---|---|---|---|---|---|---|---|
| | Number | Percent | Number | Percent | Number | Percent | Number | Percent |
| Not tested for drugs | 2,692 | 38.0% | 212 | 30.5% | 437 | 62.8% | 274,797 | 54.3% |
| No drugs reported/negative | 2,693 | 38.0% | 308 | 44.3% | 113 | 16.2% | 118,222 | 23.4% |
| Not reported | 79 | 1.1% | 3 | 0.4% | 9 | 1.3% | 5,017 | 1.0% |
| Tested for drugs, results unknown | 226 | 3.2% | 22 | 3.2% | 34 | 4.9% | 22,392 | 4.4% |
| Unknown if tested | 380 | 5.4% | 47 | 6.8% | 82 | 11.8% | 30,568 | 6.0% |
| At least one positive result: | 1,020 | 14.4% | 104 | 14.9% | 21 | 3.0% | 54,914 | 10.9% |
| • Narcotic | 153 | 2.2% | 18 | 2.6% | 7 | 1.0% | 13,457 | 2.7% |
| • Depressant | 207 | 2.9% | 19 | 2.7% | 2 | 0.3% | 14,715 | 2.9% |
| • Stimulant | 594 | 8.4% | 57 | 8.2% | 6 | 0.9% | 19,301 | 3.8% |
| • Hallucinogen | 6 | 0.1% | 0 | 0.0% | 0 | 0.0% | 331 | 0.1% |
| • Cannabinoid | 355 | 5.0% | 29 | 4.2% | 5 | 0.7% | 22,708 | 4.5% |
| • Phencyclidine (PCP) | 5 | 0.1% | 0 | 0.0% | 0 | 0.0% | 314 | 0.1% |
| • Anabolic Steroid | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% | 22 | 0.0% |
| • Inhalant | 1 | 0.0% | 1 | 0.1% | 0 | 0.0% | 112 | 0.0% |
| • Other drugs | 251 | 3.5% | 36 | 5.2% | 8 | 1.1% | 15,877 | 3.1% |
| Type unknown/positive | 62 | 0.9% | 5 | 0.7% | 1 | 0.1% | 2,782 | 0.5% |
| **Total** | **7,090** | **100.0%** | **696** | **100.0%** | **696** | **100.0%** | **519,526** | **100.0%** |

Source: NHTSA, FARS.

# 4. WORK ZONES AND WORK-RELATED STATUS

Many fatal crashes occur in construction, maintenance, or utility "work zones." Fatalities may also be coded as occurring while the person was "at work." Although these issues are similar, pedestrians who are not working can be killed in work zones (e.g., a person jogging next to a construction area), and pedestrians who are working can be killed in areas that are not work zones (e.g., a police officer who pulled someone over and was struck while out of the police vehicle).

As shown in Table 17, fatal large truck crashes occur in work zones at about twice the rate of fatal crashes in general: 4.5 percent of fatal large truck crashes from 2003 to 2012 were in work zones versus 2.0 percent of all fatal crashes. This is due in part to the fact that a higher percentage of large truck vehicle miles traveled is on interstate highways—where a disproportionate amount of work zone space is likely to be located.[7] Crashes with pedestrian fatalities are only slightly more likely to occur in work zones than are fatal crashes in general (2.3 percent versus 2.0 percent). Fatal crashes involving large trucks and pedestrian fatalities in work zones (6.7 percent) occur at an even greater rate—almost three times the rate of all crashes with pedestrian fatalities (2.3 percent). This indicates that when pedestrians, large trucks, and work zones are present simultaneously, there is greater risk for a pedestrian fatality than when these conditions are not grouped together.

**Table 17. Fatal crashes involving pedestrian fatalities or large trucks in work zones, 2004–13.**

| | Large Truck Crashes with Pedestrian Fatalities | | All Crashes with Pedestrian Fatalities | | All Fatal Large Truck Crashes | | All Fatal Crashes | |
|---|---|---|---|---|---|---|---|---|
| **Work Zone Type** | **Number** | **Percent** | **Number** | **Percent** | **Number** | **Percent** | **Number** | **Percent** |
| Not a work zone | 2,863 | 93.2% | 44,143 | 97.7% | 36,276 | 95.5% | 333,104 | 98.0% |
| Construction | 134 | 4.4% | 692 | 1.5% | 1,278 | 3.4% | 5,141 | 1.5% |
| Maintenance | 43 | 1.4% | 128 | 0.3% | 210 | 0.6% | 697 | 0.2% |
| Utility | 6 | 0.2% | 34 | 0.1% | 22 | 0.1% | 124 | 0.0% |
| Unknown work zone type | 24 | 0.8% | 175 | 0.4% | 190 | 0.5% | 920 | 0.3% |
| **Total Work Zones** | **207** | **6.7%** | **1,029** | **2.3%** | **1,700** | **4.5%** | **6,882** | **2.0%** |
| Not reported | 1 | 0.0% | 10 | 0.0% | 7 | 0.0% | 53 | 0.0% |
| **Total** | **3,071** | **100.0%** | **45,182** | **100.0%** | **37,983** | **100.0%** | **340,039** | **100.0%** |

Source: NHTSA, FARS.

Table 18 shows that pedestrian fatalities in large truck crashes for which the pedestrian is coded as being "at work" occurred at almost five times the rate of pedestrian fatalities in general; 2 percent of all pedestrian fatalities from 2004 to 2013 were "at work," while 10 percent of those

[7] In 2013, 12 percent of all fatal crashes were on interstate highways, and 36 percent of all fatal crashes in work zones were on interstate highways. Although fatal crash rates provide an imperfect sample of where work zones are located, this indicates that work zone space is more common on interstate highways than on other roadway function classes.

killed in large truck crashes were "at work." Since this is higher than the percentage of large truck crashes with pedestrian fatalities that were in work zones, it indicates that many of the pedestrians who died in large truck crashes had been working (possibly as police officers, mail carriers, etc.), but they were not working in an area designated as a work zone.

**Table 18. "Work-related" status for fatalities in large truck and pedestrian-related crashes, 2004–13.**

| Work-related Status | Large Truck Drivers in Crashes with Pedestrian Fatalities | | Pedestrian Fatalities in Large Truck Crashes | | All Drivers in Crashes with Pedestrian Fatalities | | All Pedestrian Fatalities | | Large Truck Driver Fatalities | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Number | Percent | Number | Percent | Number | Percent | Number | Percent | Number | Percent |
| No (not at work) | 0 | 0.0% | 2,450 | 77.9% | 127 | 0.3% | 40,059 | 87.3% | 510 | 8.5% |
| Yes (at work) | 14 | 0.5% | 316 | 10.1% | 15 | 0.0% | 950 | 2.1% | 5,091 | 85.2% |
| Not a fatality | 3,057 | 99.5% | 0 | 0.0% | 49,223 | 99.7% | 0 | 0.0% | 0 | 0.0% |
| Unknown | 0 | 0.0% | 378 | 12.0% | 14 | 0.0% | 4,887 | 10.6% | 374 | 6.3% |
| **Total** | **3,071** | **100.0%** | **3,144** | **100.0%** | **49,379** | **100.0%** | **45,896** | **100.0%** | **5,975** | **100.0%** |

Source: NHTSA, FARS.

In 2013, 45 pedestrians who died in large truck crashes were coded as being either "at work," "in a work zone," or both. The breakdown for this coding (shown in Figure 11) is as follows:

- Seven were coded as being both "at work" and in a "work zone."
- Fourteen were coded as being in a "work zone" but not "at work."
- Twenty-four were coded as being "at work" but not in a "work zone."

The total number of pedestrians who died in crashes with large trucks and who were coded as being "at work" was 31; the total who were coded as being in a "work zone" was 21.

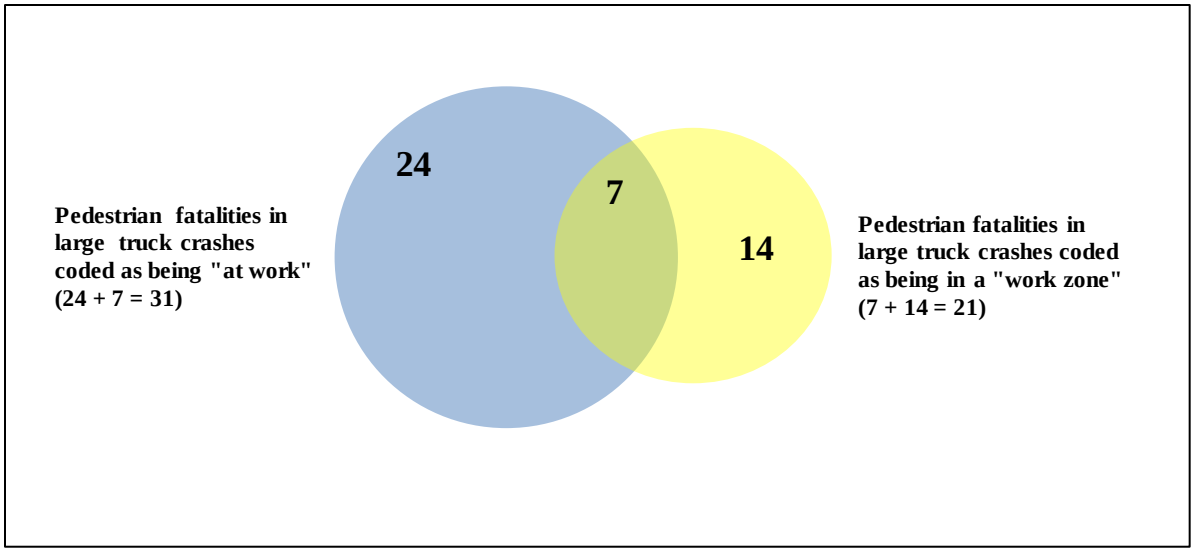


**Figure 11. Venn diagram. Pedestrian fatalities in large truck crashes by "work-related" and "work zone" statuses, 2013.**

Five pedestrians who died in large truck crashes in 2013 were coded as being construction, maintenance, or utility workers; four of them were coded as being "at work" in work zones; the other one was coded as being "at work" but not in a work zone. One pedestrian who died in a large truck crash was coded as being a police officer, but not "at work" and not in a work zone. Three pedestrian fatalities in large truck crashes were coded as being "Emergency Medical Service (EMS) personnel." Two of them were "at work," but none of them were in work zones.

In 2013, there were no bicyclist fatalities in work zones or who were coded as being "at work" in crashes involving large trucks.

[This page intentionally left blank.]

# 5. ROADWAY FUNCTION CLASS, AGE, AND ROUTES

Dividing pedestrian fatalities by roadway function class and age and examining how the number of pedestrian fatalities in the roadway function class and age categories fluctuates over time can provide some insight. As shown in Figure 12 and Figure 13, pedestrian fatalities on urban local streets increased by 32 percent, from 639 in 2004 to 845 in 2013, with most of that growth occurring from 2011 to 2013. Pedestrian fatalities on urban local streets in large truck crashes grew at a similar rate of 28 percent, from 32 in 2004 to 41 in 2013. Breaking down pedestrian fatalities by age shows that the number of pedestrian fatalities ages 51–70 in all crashes grew by 34 percent, from 1,056 in 2004 to 1,418 in 2013. The number of pedestrian fatalities ages 51– 70 in large truck crashes grew at an even higher rate of 57 percent, from 60 in 2004 to 94 in 2013. Together, these two groups (pedestrian fatalities on urban local streets and pedestrians ages 51–70-year old pedestrian fatalities) represented 2,017 pedestrian fatalities in 2013,[8] which was 43 percent of the total number of pedestrian fatalities.

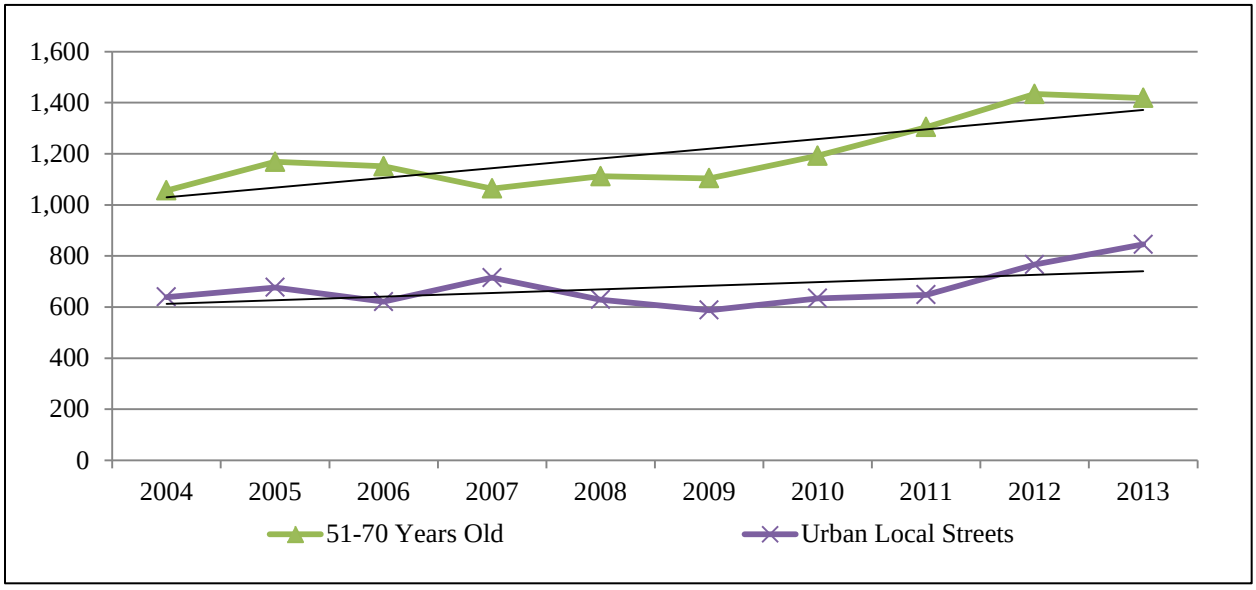


**Figure 12. Line graph. Pedestrian fatalities in all crashes for selected age/roadway function class groups, 2004–13.**

Source: NHTSA, FARS.

[8] Two hundred forty-six pedestrian fatalities belonged to both groups in 2013.

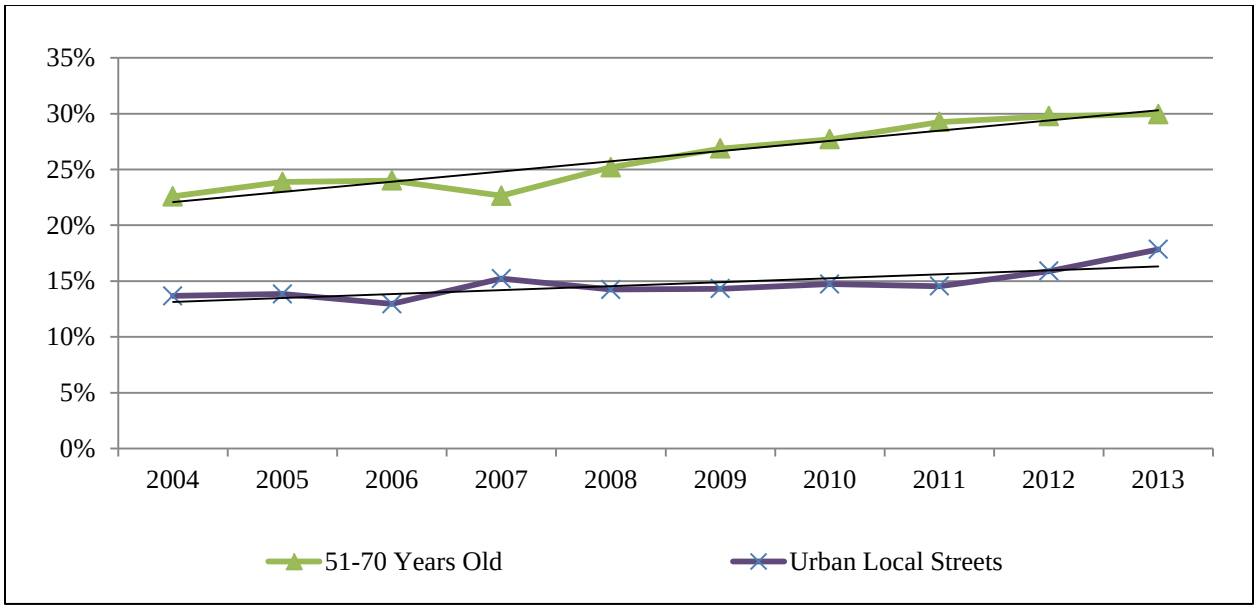


**Figure 13. Line graph. Percent of pedestrian fatalities in selected age/roadway function class groups, 2004–13.**

Source: NHTSA, FARS.

Figure 14 shows that although interstates were the fourth most common road type for all pedestrian fatalities, 23 percent of pedestrian fatalities on interstates involved at least one large truck. Ten percent of all pedestrian fatalities occurred on interstates from 2011 to 2013, but 34 percent of pedestrian fatalities in large truck crashes occurred on interstates over this period.

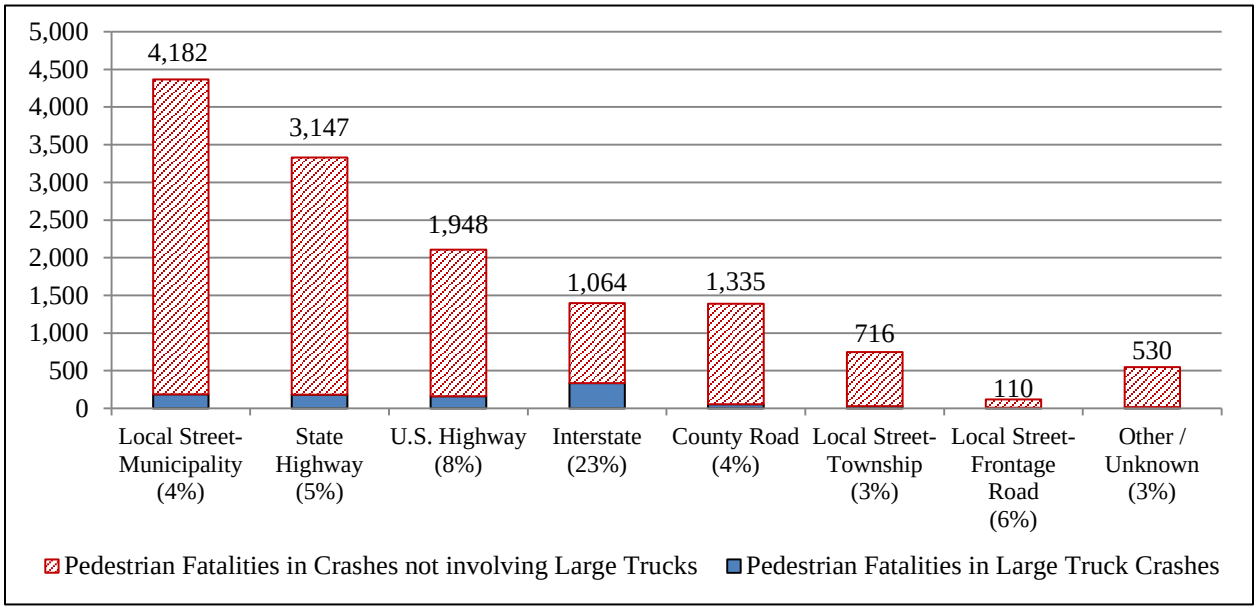


**Figure 14. Bar graph. Pedestrian fatalities by route and large truck involvement, with large truck percentage shares, 2011–13.**

Source: NHTSA, FARS.

As shown in Table 19, pedestrian fatalities in large truck crashes from 2011 to 2013 skewed slightly toward the 21-to-60 age ranges in comparison with all pedestrian fatalities (70 percent of pedestrian fatalities in large truck crashes were in this age range versus 64 percent of pedestrian fatalities in all crashes). This is probably because people who are younger than 21 or older than 60 walk along interstate highways (where large trucks tend to travel) less often than people who are 21–60 years old. It is also interesting that pedestrian fatalities ages 31–40 in crashes are less common than in the adjacent 21–30 and 41–50 age ranges. Table 20 shows that bicyclist fatalities are also lower in the 31–40 age range than the adjacent age ranges, and they peak in the 51–60 age range, in all crashes and in crashes involving large trucks.

**Table 19. Pedestrian fatalities by age and large truck involvement, 2011–13.**

| Age of Pedestrian Fatality | Pedestrian Fatalities in All Crashes, 2011–13 | | Pedestrian Fatalities in Large Truck Crashes, 2011–13 | |
|---|---|---|---|---|
| | Number | Percent | Number | Percent |
| 0–10 | 489 | 3.5% | 20 | 2.0% |
| 11–20 | 1,096 | 7.8% | 75 | 7.7% |
| 21–30 | 2,205 | 15.7% | 194 | 19.8% |
| 31–40 | 1,753 | 12.5% | 137 | 14.0% |
| 41–50 | 2,359 | 16.8% | 169 | 17.3% |
| 51–60 | 2,580 | 18.4% | 184 | 18.8% |
| 61–70 | 1,576 | 11.2% | 91 | 9.3% |
| 71–80 | 1,100 | 7.9% | 54 | 5.5% |
| 81 and up | 777 | 5.5% | 48 | 4.9% |
| Not reported or unknown | 75 | 0.5% | 6 | 0.6% |
| **Total** | **14,010** | **100.0%** | **978** | **100.0%** |

Source: NHTSA, FARS.

**Table 20. Bicyclist fatalities by age and large truck involvement, 2011–13.**

| Age of Bicyclist Fatality | Bicyclist Fatalities in All Crashes, 2011–13 | | Bicyclist Fatalities in Large Truck Crashes, 2011–13 | |
|---|---|---|---|---|
| | Number | Percent | Number | Percent |
| 0–10 | 80 | 3.7% | 5 | 2.5% |
| 11–20 | 290 | 13.5% | 31 | 15.5% |
| 21–30 | 266 | 12.4% | 35 | 17.5% |
| 31–40 | 211 | 9.8% | 26 | 13.0% |
| 41–50 | 402 | 18.7% | 26 | 13.0% |
| 51–60 | 503 | 23.4% | 49 | 24.5% |
| 61–70 | 237 | 11.0% | 15 | 7.5% |
| 71–80 | 108 | 5.0% | 9 | 4.5% |
| 81 and up | 41 | 1.9% | 3 | 1.5% |
| Not reported or unknown | 13 | 0.6% | 1 | 0.5% |
| **Total** | **2,151** | **100.0%** | **200** | **100.0%** |

Source: NHTSA, FARS.

As shown in Table 21, pedestrian fatalities in large truck crashes between 2011 and 2013 occurred on interstate highways at more than three times the rate of pedestrian fatalities in all crashes (35 percent of pedestrian fatalities in large truck crashes were on rural or urban interstates versus 10 percent of all pedestrian fatalities). Pedestrian fatalities in large truck crashes in rural areas also occurred at a higher rate than pedestrian fatalities in general (40 percent of pedestrian fatalities in large truck crashes were in rural areas versus 26 percent of all pedestrian fatalities). Given that 11 percent of pedestrian fatalities in large truck crashes occurred on urban local streets during this period (compared to 16 percent of all pedestrian fatalities), pedestrian fatalities in large truck crashes are slightly less likely than pedestrian fatalities in general to be affected by the recent increases in pedestrian fatalities on urban local streets.

**Table 21. Pedestrian fatalities by roadway function class and large truck involvement, 2011–13.**

| Roadway Function Class | Pedestrian Fatalities in All Crashes, 2011–13 | | Pedestrian Fatalities in Large Truck Crashes, 2011–13 | |
|---|---|---|---|---|
| | Number | Percent | Number | Percent |
| Rural-Principal Arterial-Interstate | 465 | 3.3% | 165 | 16.9% |
| Rural-Principal Arterial-Other | 1,002 | 7.2% | 102 | 10.4% |
| Rural-Minor Arterial | 638 | 4.6% | 41 | 4.2% |
| Rural-Major Collector | 617 | 4.4% | 36 | 3.7% |
| Rural-Minor Collector | 124 | 0.9% | 4 | 0.4% |
| Rural-Local Road or Street | 835 | 6.0% | 41 | 4.2% |
| Rural-Unknown Rural | 26 | 0.2% | 2 | 0.2% |
| Urban-Principal Arterial-Interstate | 990 | 7.1% | 174 | 17.8% |
| Urban-Principal Arterial-Other Freeways or Expressways | 603 | 4.3% | 44 | 4.5% |
| Urban-Other Principal Arterial | 3,637 | 26.0% | 158 | 16.2% |
| Urban-Minor Arterial | 2,105 | 15.0% | 79 | 8.1% |
| Urban-Collector | 658 | 4.7% | 23 | 2.4% |
| Urban-Local Road or Street | 2,259 | 16.1% | 108 | 11.0% |
| Urban-Unknown Urban | 17 | 0.1% | 1 | 0.1% |
| Unknown | 34 | 0.2% | 0 | 0.0% |
| **Total** | **14,010** | **100.0%** | **978** | **100.0%** |

Source: NHTSA, FARS.

As shown in Table 21 and Table 22, from 2011 to 2013, 68 percent of bicyclist fatalities and 73 percent of pedestrian fatalities in all crashes occurred in urban areas. When considering only those crashes involving large trucks, the percent of bicyclist fatalities in urban areas increases to 74 percent, and the percent of pedestrian fatalities in urban areas decreases to 60 percent. Four percent of bicyclist fatalities in large truck crashes from 2011 to 2013 occurred on interstate highways, significantly less than the 35 percent of pedestrian fatalities in large truck crashes on interstate highways over this period.

**Table 22. Bicyclist fatalities by roadway function class and large truck involvement, 2011–13.**

| Roadway Function Class | Bicyclist Fatalities in All Crashes, 2011–13 | | Bicyclist Fatalities in Large Truck Crashes, 2011–13 | |
|---|---|---|---|---|
| | Number | Percent | Number | Percent |
| Rural-Principal Arterial-Interstate | 9 | 0.4% | 1 | 0.5% |
| Rural-Principal Arterial-Other | 139 | 6.5% | 14 | 7.0% |
| Rural-Minor Arterial | 117 | 5.4% | 18 | 9.0% |
| Rural-Major Collector | 155 | 7.2% | 9 | 4.5% |
| Rural-Minor Collector | 34 | 1.6% | 0 | 0.0% |
| Rural-Local Road or Street | 215 | 10.0% | 11 | 5.5% |
| Rural-Unknown Rural | 3 | 0.1% | 0 | 0.0% |
| Urban-Principal Arterial-Interstate | 22 | 1.0% | 7 | 3.5% |
| Urban-Principal Arterial-Other Freeways or Expressways | 54 | 2.5% | 5 | 2.5% |
| Urban-Other Principal Arterial | 521 | 24.2% | 58 | 29.0% |
| Urban-Minor Arterial | 362 | 16.8% | 29 | 14.5% |
| Urban-Collector | 131 | 6.1% | 15 | 7.5% |
| Urban-Local Road or Street | 382 | 17.8% | 33 | 16.5% |
| Urban-Unknown Urban | 1 | 0.0% | 0 | 0.0% |
| Unknown | 6 | 0.3% | 0 | 0.0% |
| **Total** | **2,151** | **100.0%** | **200** | **100.0%** |

Source: NHTSA, FARS.

FARS does not have a method for coding pedestrians who were using a cell phone while walking. This is somewhat understandable since frequent, extended cell phone use is a fairly recent phenomenon. Although attempts were made in the analysis for this report to approximate cell phone usage by examining younger pedestrian fatalities in urban areas (with the assumption that these pedestrians were more likely to have been using a cell phone), these pedestrian fatalities did not exhibit significant increases over the past 10 years, leading to inconclusive results for testing the hypothesis that cell phone usage is related to the growth in pedestrian fatalities.

[This page intentionally left blank.]

# 6. VEHICLES IN CRASHES WITH PEDESTRIAN FATALITIES BY VEHICLE TYPE

The data suggest that smaller single-unit trucks (with gross vehicle weight ratings from 10,000 to 19,500 pounds) are becoming more common, as evidenced by the increase in smaller single-unit trucks in fatal crashes from 162 in 2004 to 218 in 2010 and 291 in 2013. From 2004 to 2010, between 14 and 19 10,000–19,500-pound single-unit trucks struck and killed[9] pedestrians each year; this increased to 40 in 2011 and then decreased to a still-high 31 in 2013. Table 23, below, shows the counts for the various types of vehicles that struck and killed pedestrians in calendar years 2004–13.

[9] Note again the distinction between striking and killing a pedestrian and merely being involved in a crash with a pedestrian fatality.

**Table 23. Vehicles that struck and killed pedestrians by vehicle type, 2004–13.**

| Body Type | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|---|---|---|---|---|
| Passenger car | 2,036 | 2,064 | 1,997 | 1,941 | 1,800 | 1,693 | 1,757 | 1,859 | 2,089 | 1,939 |
| Light truck | 1,876 | 1,937 | 1,932 | 1,933 | 1,804 | 1,749 | 1,823 | 1,824 | 1,956 | 1,950 |
| Other/unknown | 367 | 446 | 448 | 423 | 393 | 332 | 379 | 375 | 384 | 433 |
| ***Total Passenger Vehicles and Other/Unknown Vehicles*** | **4,279** | **4,447** | **4,377** | **4,297** | **3,997** | **3,774** | **3,959** | **4,058** | **4,429** | **4,322** |
| School bus | 24 | 24 | 19 | 15 | 20 | 15 | 18 | 11 | 15 | 15 |
| Cross-country/intercity bus | 4 | 12 | 5 | 6 | 5 | 11 | 6 | 11 | 10 | 12 |
| Transit bus (city bus) | 41 | 34 | 50 | 36 | 36 | 31 | 39 | 30 | 35 | 33 |
| Van-based bus | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 8 | 5 |
| Other bus type | 1 | 5 | 5 | 2 | 3 | 0 | 0 | 4 | 3 | 2 |
| Unknown bus type | 6 | 5 | 4 | 0 | 3 | 2 | 3 | 3 | 0 | 0 |
| ***Total Buses*** | ***76*** | ***80*** | ***83*** | ***59*** | ***67*** | ***59*** | ***66*** | ***66*** | ***71*** | ***67*** |
| Step van | 2 | 0 | 0 | 1 | 1 | 1 | 3 | 2 | 1 | 1 |
| Single-unit truck (10,000–19,500 lb) | 16 | 17 | 15 | 18 | 14 | 19 | 14 | 40 | 34 | 31 |
| Single-unit truck (19,500–26,000 lb) | 21 | 28 | 20 | 20 | 19 | 14 | 13 | 15 | 30 | 15 |
| Single-unit truck (>26,000 lb) | 61 | 72 | 64 | 58 | 66 | 39 | 53 | 42 | 56 | 63 |
| Single-unit truck (gross vehicle weight rating [GVWR] unknown) | 2 | 0 | 1 | 0 | 1 | 3 | 0 | 0 | 2 | 2 |
| Truck/tractor (cab only, or trailing units) | 183 | 190 | 182 | 183 | 171 | 144 | 157 | 188 | 151 | 184 |
| Medium/heavy pickup (> 10,000 lb) | 1 | 3 | 3 | 4 | 9 | 11 | 11 | 17 | 12 | 14 |
| Other/unknown large truck | 5 | 3 | 4 | 3 | 2 | 2 | 0 | 0 | 3 | 2 |
| ***Total Large Trucks*** | ***291*** | ***313*** | ***289*** | ***287*** | ***283*** | ***233*** | ***251*** | ***304*** | ***289*** | ***312*** |
| Motorcycle | 27 | 33 | 29 | 38 | 43 | 25 | 26 | 29 | 29 | 34 |
| **Total** | **4,673** | **4,873** | **4,778** | **4,681** | **4,390** | **4,091** | **4,302** | **4,457** | **4,818** | **4,735** |

Source: NHTSA, FARS.

Table 24 compares the number of vehicles in crashes with pedestrian fatalities with the number of vehicles that actually struck and killed pedestrians, by vehicle type, for the same 10-year period. As shown in Table 24, from 2004 to 2013, large trucks accounted for 6.3 percent of the vehicles involved in crashes with pedestrian fatalities and 6.2 percent of the vehicles that struck and killed pedestrians. This shows that large trucks were the vehicle that actually struck and killed the pedestrian less often (per vehicle involved in a crash with a pedestrian fatality), than most of the other main vehicle types; of the five main vehicle types, the 88.6 percent of large trucks that were in crashes with pedestrian fatalities and actually struck and killed pedestrians (the last column of Table 24) is lowest, though only by a small margin.

**Table 24. Vehicles in crashes with pedestrian fatalities by vehicle type, 2004–13.**

| Vehicle Type | Vehicles in Crashes with Pedestrian Fatalities | | Vehicles that Struck and Killed Pedestrians | | Percentage of Vehicles in Crashes with Pedestrian Fatalities that Actually Struck and Killed Pedestrians |
|---|---|---|---|---|---|
| | Number | Percent | Number | Percent | |
| Passenger car | 21,618 | 42.5% | 19,175 | 41.9% | 88.7% |
| Light truck | 20,404 | 40.1% | 18,784 | 41.0% | 92.1% |
| Large truck | 3,219 | 6.3% | 2,852 | 6.2% | 88.6% |
| Bus | 735 | 1.4% | 694 | 1.5% | 94.4% |
| Motorcycle | 349 | 0.7% | 313 | 0.7% | 89.7% |
| Other motor vehicle type | 4,498 | 8.9% | 3,980 | 8.6% | 88.5% |
| **Total** | **50,823** | **100.0%** | **45,762** | **100.0%** | **90.1%** |

Source: NHTSA, FARS.

Table 25 shows that 98 percent of the large trucks in crashes with bicyclist fatalities from 2004 to 2013 were the vehicle that actually struck and killed the bicyclist, while only 89 percent of the large trucks in crashes with pedestrian fatalities from 2004 to 2013 were the vehicle that actually struck and killed the pedestrian. This is partially due to the fact that crashes with pedestrian fatalities typically involve more vehicles: an average of 1.12 vehicles were involved in each crash with at least one pedestrian fatality from 2004 to 2013 (and 1.32 vehicles were involved in crashes with at least one pedestrian fatality and one large truck), while an average of only 1.05 vehicles were involved in each crash with at least one bicyclist fatality from 2004 to 2013 (and 1.04 vehicles were involved in crashes with at least one bicyclist fatality and one large truck). The location of the vehicle that struck the bicyclist is also relevant to this issue (see Section 7), since many bicyclists were not actually struck by the front of the vehicle that struck and killed them.

**Table 25. Vehicles in crashes with bicyclist fatalities by vehicle type, 2004–13.**

| Vehicle Type | Vehicles in Crashes with Bicyclist Fatalities | | Vehicles that Struck and Killed Bicyclists | | Percentage of Vehicles in Crashes with Bicyclist Fatalities that Actually Struck and Killed Bicyclists |
|---|---|---|---|---|---|
| | Number | Percent | Number | Percent | |
| Passenger car | 2,875 | 38.9% | 2,717 | 38.3% | 94.5% |
| Light truck | 3,206 | 43.4% | 3,108 | 43.9% | 96.9% |
| Large truck | 696 | 9.4% | 682 | 9.6% | 98.0% |
| Bus | 119 | 1.6% | 116 | 1.6% | 97.5% |
| Motorcycle | 53 | 0.7% | 53 | 0.7% | 100.0% |
| Other motor vehicle type | 439 | 5.9% | 411 | 5.8% | 93.6% |
| **Total** | **7,388** | **100.0%** | **7,087** | **100.0%** | **95.9%** |

Source: NHTSA, FARS.

Table 26 and Table 27 present data on large trucks' involvement in striking and killing pedestrians (the "A" columns in Table 26), all fatal crashes (the "B" columns in Table 26), and crashes with pedestrian fatalities (the "C" columns in Table 26) by vehicle type, for 2004–13. Because smaller single-unit trucks and medium/heavy pickup trucks have seen their shares of large trucks in fatal crashes grow in recent years, these two truck types are of particular interest, and the differences between these ratios are noteworthy.

Although medium/heavy pickup trucks accounted for only 2.8 percent of the large trucks in crashes with pedestrian fatalities (Table 26, column "C") from 2004 to 2013, they accounted for 3.0 percent of the large trucks that struck and killed pedestrians (Table 26, column "A"). This indicates that medium/heavy pickup trucks are actually striking and killing pedestrians more than other large truck types, per vehicle involved in a crash with a pedestrian fatality.

It might appear that smaller single-unit trucks are striking more pedestrians than one would expect, because they have a high "A/B" ratio of vehicles striking and killing pedestrians to vehicles involved in fatal crashes. However, single-unit trucks (especially smaller ones) often travel in areas with pedestrians (they are involved in a greater share of crashes with pedestrian fatalities than fatal crashes in general, as shown by a high "C/B" ratio), and they actually are not significantly more likely to be the vehicles that struck and killed pedestrians in crashes with pedestrian fatalities (they have an "A/C" ratio consistent with that of all large trucks).

**Table 26. Pedestrian fatality data by large truck vehicle type, 2004–13.**

| Large Truck Vehicle Type | A: Large Trucks that Struck and Killed Pedestrians | | B: Large Trucks in Fatal Crashes | | C: Large Trucks in Crashes with Pedestrian Fatalities | |
|---|---|---|---|---|---|---|
| | Number | Percent | Number | Percent | Number | Percent |
| Step van | 12 | 0.4% | 182 | 0.4% | 13 | 0.4% |
| Single-unit truck (GVWR 10,000–19,500 lb) | 218 | 7.6% | 2,199 | 5.3% | 247 | 7.7% |
| Single-unit truck (GVWR 19,500–26,000 lb) | 195 | 6.8% | 2,287 | 5.5% | 229 | 7.1% |
| Single-unit truck (GVWR > 26,000 lb) | 574 | 20.1% | 7,228 | 17.5% | 639 | 19.8% |
| Single-unit straight truck (GVWR unknown) | 11 | 0.4% | 91 | 0.2% | 12 | 0.4% |
| Truck/tractor (cab only, or trailing units) | 1,733 | 60.8% | 28,241 | 68.2% | 1,966 | 61.1% |
| Medium/heavy pickup | 85 | 3.0% | 976 | 2.4% | 89 | 2.8% |
| Other/unknown large truck | 24 | 0.8% | 206 | 0.5% | 25 | 0.8% |
| **Total large trucks** | **2,852** | **100.0%** | **41,410** | **100.0%** | **3,220** | **100.0%** |

Source: NHTSA, FARS.

**Table 27. Ratios of various columns from Table 26.**

| Body Type | A/B | A/C (related to the likelihood of striking the pedestrian if involved in a crash with a pedestrian fatality) | C/B (related to the likelihood of being in areas with pedestrians) |
|---|---|---|---|
| Step van | 6.6% | 92.3% | 7.1% |
| Single-unit truck (GVWR 10,000–19,500 lbs.) | 9.9% | 88.3% | 11.2% |
| Single-unit truck (GVWR 19,500–26,000 lbs.) | 8.5% | 85.2% | 10.0% |
| Single-unit truck (GVWR >26,000 lbs.) | 7.9% | 89.8% | 8.8% |
| Single-unit straight truck (GVWR unknown) | 12.1% | 91.7% | 13.2% |
| Truck/tractor (cab only, or trailing units) | 6.1% | 88.1% | 7.0% |
| Medium/heavy pickup | 8.7% | 95.5% | 9.1% |
| Other/unknown large truck | 11.7% | 96.0% | 12.1% |
| **Total large trucks** | **6.9%** | **88.6%** | **7.8%** |

Source: NHTSA, FARS.

[This page intentionally left blank.]

# 7. OTHER TOPICS

## 7.1 INITIAL POINT OF IMPACT

As shown in Table 28, the numbers suggest that large truck and bus drivers struck pedestrians with the front of their vehicles less often than passenger-vehicle drivers did when involved in single-vehicle crashes with pedestrian fatalities. It is also noteworthy that a high percentage of the large trucks referenced in Table 28 struck pedestrians with the rear of their vehicles in 2013, compared to passenger vehicles: 69 and 70 percent of pedestrians struck and killed by buses and large trucks (respectively) in single-vehicle crashes were struck by the front of the vehicle, versus 86 percent for passenger vehicles and other vehicles.

**Table 28. Initial point of impact for vehicles that struck and killed pedestrians in single-vehicle crashes, 2013.**

| | Passenger Vehicles and Other Vehicles | | Buses | | Large Trucks | | Total | |
|---|---|---|---|---|---|---|---|---|
| **Initial Point of Impact** | **Number** | **Percent** | **Number** | **Percent** | **Number** | **Percent** | **Number** | **Percent** |
| Non-collision | 2 | 0.1% | 0 | 0.0% | 0 | 0.0% | 2 | 0.0% |
| 1 clock value | 223 | 5.8% | 2 | 3.1% | 25 | 9.1% | 250 | 6.0% |
| 2 clock value | 45 | 1.2% | 0 | 0.0% | 7 | 2.6% | 52 | 1.2% |
| 3 clock value | 10 | 0.3% | 3 | 4.7% | 4 | 1.5% | 17 | 0.4% |
| 4 clock value | 4 | 0.1% | 3 | 4.7% | 2 | 0.7% | 9 | 0.2% |
| 5 clock value | 6 | 0.2% | 3 | 4.7% | 5 | 1.8% | 14 | 0.3% |
| 6 clock value | 49 | 1.3% | 0 | 0.0% | 15 | 5.5% | 64 | 1.5% |
| 7 clock value | 4 | 0.1% | 1 | 1.6% | 1 | 0.4% | 6 | 0.1% |
| 8 clock value | 3 | 0.1% | 1 | 1.6% | 3 | 1.1% | 7 | 0.2% |
| 9 clock value | 12 | 0.3% | 1 | 1.6% | 3 | 1.1% | 16 | 0.4% |
| 10 clock value | 19 | 0.5% | 1 | 1.6% | 0 | 0.0% | 20 | 0.5% |
| 11 clock value | 118 | 3.1% | 2 | 3.1% | 12 | 4.4% | 132 | 3.1% |
| 12 clock value | 2,968 | 76.9% | 40 | 62.5% | 156 | 56.9% | 3,164 | 75.4% |
| Top | 8 | 0.1% | 0 | 0.0% | 0 | 0.0% | 3 | 0.1% |
| Undercarriage | 103 | 2.7% | 5 | 7.8% | 16 | 5.8% | 124 | 3.0% |
| Other objects set-in-motion | 1 | 0.0% | 0 | 0.0% | 1 | 0.4% | 2 | 0.0% |
| Left | 3 | 0.1% | 0 | 0.0% | 1 | 0.4% | 4 | 0.1% |
| Left-front side | 11 | 0.3% | 0 | 0.0% | 2 | 0.7% | 13 | 0.3% |
| Left-back side | 1 | 0.0% | 0 | 0.0% | 2 | 0.7% | 3 | 0.1% |
| Right | 12 | 0.3% | 0 | 0.0% | 1 | 0.4% | 13 | 0.3% |
| Right-front side | 21 | 0.5% | 0 | 0.0% | 2 | 0.7% | 23 | 0.5% |
| Right-back side | 0 | 0.0% | 0 | 0.0% | 2 | 0.7% | 2 | 0.0% |
| Not reported | 84 | 2.2% | 1 | 1.6% | 8 | 2.9% | 93 | 2.2% |
| Unknown | 156 | 4.0% | 1 | 1.6% | 6 | 2.2% | 163 | 3.9% |
| *Front (11, 12, 1 clock values)* | *3,309* | *85.8%* | *44* | *68.8%* | *193* | *70.44%* | *3,546* | *84.51%* |
| **Total** | **3,858** | **100.0%** | **64** | **100.0%** | **274** | **100.0%** | **4,196** | **100.0%** |

Source: NHTSA, FARS.

Table 29 shows that 38 percent of the large trucks that struck and killed bicyclists in single-vehicle crashes in 2013 had an initial point of impact on the front of their vehicle; this is much lower than the 87 percent of other vehicles (passenger vehicles, buses, motorcycles, etc.) that struck and killed bicyclists in single-vehicle crashes with the initial point of impact on the front of the vehicle.

**Table 29. Initial point of impact for vehicles that struck and killed bicyclists in single-vehicle crashes, 2013.**

| Initial Point of Impact | Passenger Vehicles and Other Vehicles | | Buses | | Large Trucks | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Number | Percent | Number | Percent | Number | Percent | Number | Percent |
| Non-collision | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% | **0** | **0.0%** |
| 1 clock value | 44 | 7.1% | 2 | 15.4% | 6 | 7.9% | **52** | **7.3%** |
| 2 clock value | 10 | 1.6% | 0 | 0.0% | 5 | 6.6% | **15** | **2.1%** |
| 3 clock value | 9 | 1.4% | 1 | 7.7% | 5 | 6.6% | **15** | **2.1%** |
| 4 clock value | 4 | 0.6% | 0 | 0.0% | 6 | 7.9% | **10** | **1.4%** |
| 5 clock value | 2 | 0.3% | 1 | 7.7% | 11 | 14.5% | **14** | **2.0%** |
| 6 clock value | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% | **0** | **0.0%** |
| 7 clock value | 0 | 0.0% | 0 | 0.0% | 1 | 1.3% | **1** | **0.1%** |
| 8 clock value | 1 | 0.2% | 0 | 0.0% | 2 | 2.6% | **3** | **0.4%** |
| 9 clock value | 2 | 0.3% | 0 | 0.0% | 3 | 3.9% | **5** | **0.7%** |
| 10 clock value | 3 | 0.5% | 0 | 0.0% | 1 | 1.3% | **4** | **0.6%** |
| 11 clock value | 10 | 1.6% | 0 | 0.0% | 0 | 0.0% | **10** | **1.4%** |
| 12 clock value | 492 | 79.0% | 6 | 46.2% | 23 | 30.3% | **521** | **73.2%** |
| Top | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% | **0** | **0.0%** |
| Undercarriage | 7 | 1.1% | 1 | 7.7% | 6 | 7.9% | **14** | **2.0%** |
| Other objects set-in-motion | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% | **0** | **0.0%** |
| Left | 3 | 0.5% | 0 | 0.0% | 0 | 0.0% | **3** | **0.4%** |
| Left-front side | 3 | 0.5% | 0 | 0.0% | 0 | 0.0% | **3** | **0.4%** |
| Left-back side | 1 | 0.2% | 0 | 0.0% | 0 | 0.0% | **1** | **0.1%** |
| Right | 1 | 0.2% | 2 | 15.4% | 1 | 1.3% | **4** | **0.6%** |
| Right-front side | 8 | 1.3% | 0 | 0.0% | 0 | 0.0% | **8** | **1.1%** |
| Right-back side | 0 | 0.0% | 0 | 0.0% | 3 | 3.9% | **3** | **0.4%** |
| Not reported | 7 | 1.1% | 0 | 0.0% | 2 | 2.6% | **9** | **1.3%** |
| Unknown | 16 | 2.6% | 0 | 0.0% | 1 | 1.3% | **17** | **2.4%** |
| *Front (11, 12, 1 clock values)* | *546* | *87.6%* | *8* | *61.5%* | *29* | *38.2%* | ***583*** | ***81.9%*** |
| **Total** | **623** | **100.0%** | **13** | **100.0%** | **76** | **100.0%** | **712** | **100.0%** |

Source: NHTSA, FARS.

## 7.2 TIME OF DAY OF THE CRASH

From 2004 to 2013, 46 percent of pedestrian fatalities in all crashes occurred between 6 p.m. and midnight, compared with 30 percent of all crash fatalities (as shown in Table 30). Similarly, in the case of large trucks, 24 percent of pedestrian fatalities in large truck crashes occurred between 6 p.m. and midnight, while only 17 percent of large truck fatalities resulted from crashes

that occurred during this period. Note that the ratios of 46/30 and 24/17 both show that pedestrian crashes are overrepresented during this time period for both truck-related fatal crashes and all fatal crashes. Because large truck crash fatalities peak around midday, and pedestrian fatalities peak during the late evening, pedestrian fatalities in large truck crashes are fairly evenly distributed throughout the day, with the exception of the early morning hours. There were no significant trends regarding the time of day of crashes with pedestrian fatalities from 2004 to 2013.

**Table 30. Fatalities by time of day of the crash, 2004–13.**

| Time of Day of the Crash | Pedestrian Fatalities in All Crashes | | Pedestrian Fatalities in Large Truck Crashes | | All Fatalities in Large Truck Crashes | | All Fatalities in All Crashes | |
|---|---|---|---|---|---|---|---|---|
| | Number | Percent | Number | Percent | Number | Percent | Number | Percent |
| 12–3 a.m. | 5,732 | 12.5% | 441 | 14.0% | 3,338 | 7.7% | 47,787 | 12.8% |
| 3–6 a.m. | 4,248 | 9.3% | 445 | 14.2% | 3,977 | 9.2% | 30,914 | 8.3% |
| 6–9 a.m. | 4,112 | 9.0% | 387 | 12.3% | 6,426 | 14.8% | 35,871 | 9.6% |
| 9 a.m.–12 p.m. | 2,556 | 5.6% | 402 | 12.8% | 7,189 | 16.6% | 35,973 | 9.6% |
| 12–3 p.m. | 2,837 | 6.2% | 413 | 13.1% | 8,167 | 18.9% | 48,789 | 13.1% |
| 3–6 p.m. | 4,865 | 10.6% | 305 | 9.7% | 6,809 | 15.7% | 60,129 | 16.1% |
| 6–9 p.m. | 11,424 | 24.9% | 351 | 11.2% | 4,022 | 9.3% | 58,706 | 15.7% |
| 9 p.m.–12 a.m. | 9,875 | 21.5% | 397 | 12.6% | 3,351 | 7.7% | 52,544 | 14.1% |
| Unknown | 247 | 0.5% | 3 | 0.1% | 45 | 0.1% | 2,885 | 0.8% |
| **Total** | **45,896** | **100.0%** | **3,144** | **100.0%** | **43,324** | **100.0%** | **373,598** | **100.0%** |

Source: NHTSA, FARS.

Table 31 can be compared with Table 30. The same pattern of bicyclist fatalities in crashes involving large trucks peaking between the hours when bicyclist fatalities in all crashes peak (between 3 p.m. and 9 p.m.) and the hours when fatalities in large truck crashes peak (between 9 a.m. and 3 p.m.) is observed: bicyclist fatalities in large truck crashes peak between 12 noon and 6 p.m. However, unlike pedestrian fatalities in large truck crashes between midnight and 6 a.m., bicyclist fatalities in large truck crashes are actually at their lowest during this period, with lower percentages than both bicyclist fatalities and large truck fatalities.

**Table 31. Bicyclist and large truck fatalities by time of day of the crash, 2004–13.**

| Time of Day of the Crash | Bicyclist Fatalities in All Crashes | | Bicyclist Fatalities in Large Truck Crashes | | All Fatalities in Large Truck Crashes | |
|---|---|---|---|---|---|---|
| | Number | Percent | Number | Percent | Number | Percent |
| 12–3 a.m. | 446 | 6.3% | 23 | 3.3% | 3,338 | 7.7% |
| 3–6 a.m. | 353 | 5.0% | 31 | 4.5% | 3,977 | 9.2% |
| 6–9 a.m. | 753 | 10.6% | 111 | 15.9% | 6,426 | 14.8% |
| 9 a.m.–12 p.m. | 753 | 10.6% | 126 | 18.1% | 7,189 | 16.6% |
| 12 p.m.–3 p.m. | 885 | 12.5% | 163 | 23.4% | 8,167 | 18.9% |
| 3–6 p.m. | 1,219 | 17.2% | 140 | 20.1% | 6,809 | 15.7% |
| 6–9 p.m. | 1,566 | 22.1% | 61 | 8.8% | 4,022 | 9.3% |
| 9 p.m.–12 a.m. | 1,094 | 15.4% | 40 | 5.7% | 3,351 | 7.7% |
| Unknown | 21 | 0.3% | 1 | 0.1% | 45 | 0.1% |
| **Total** | **7,090** | **100.0%** | **696** | **100.0%** | **43,324** | **100.0%** |

Source: NHTSA, FARS.

## 7.3 RACE AND HISPANIC ORIGIN

Table 32 provides information on pedestrian, bicyclist, and driver and passenger fatalities by race, and Table 33 breaks this information down by Hispanic and non-Hispanic origin. As shown in Table 32, in 2013, minorities accounted for 17.3 percent of driver and passenger fatalities (with known races) but 30.2 percent of pedestrian fatalities and 20.0 percent of bicyclist fatalities (with known races). Table 33 shows that a higher percentage of pedestrian and bicyclist fatalities were Hispanic, compared to their share of driver and passenger fatalities in 2013.

**Table 32. Fatalities by person type and race, 2013.**

| Race | Drivers and Passengers | | Pedestrians | | Bicyclists | |
|---|---|---|---|---|---|---|
| | Number | Percent | Number | Percent | Number | Percent |
| White | 19,410 | 71.9% | 2,726 | 57.6% | 485 | 65.5% |
| Black | 2,889 | 10.7% | 791 | 16.7% | 82 | 11.1% |
| American Indian | 388 | 1.4% | 101 | 2.1% | 9 | 1.2% |
| Chinese | 47 | 0.2% | 54 | 1.1% | 4 | 0.5% |
| Japanese | 11 | 0.0% | 6 | 0.1% | 2 | 0.3% |
| Hawaiian | 28 | 0.1% | 2 | 0.0% | 1 | 0.1% |
| Filipino | 56 | 0.2% | 19 | 0.4% | 2 | 0.3% |
| Asian Indian | 45 | 0.2% | 18 | 0.4% | 1 | 0.1% |
| Other Indian | 43 | 0.2% | 18 | 0.4% | 5 | 0.7% |
| Korean | 31 | 0.1% | 14 | 0.3% | 0 | 0.0% |
| Samoan | 8 | 0.0% | 0 | 0.0% | 0 | 0.0% |
| Vietnamese | 28 | 0.1% | 5 | 0.1% | 0 | 0.0% |
| Guamanian | 7 | 0.0% | 0 | 0.0% | 0 | 0.0% |
| Other Asian or Pacific Islander | 93 | 0.3% | 19 | 0.4% | 2 | 0.3% |
| Asian or Pacific Islander | 82 | 0.3% | 14 | 0.3% | 2 | 0.3% |
| Multiple Races | 50 | 0.2% | 18 | 0.4% | 2 | 0.3% |
| All other races | 262 | 1.0% | 100 | 2.1% | 9 | 1.2% |
| Unknown | 3,504 | 13.0% | 830 | 17.5% | 135 | 18.2% |
| Non-white, non-black total | 1,179 | 4.4% | 388 | 8.2% | 39 | 5.3% |
| Minorities' share of fatalities with known races | N/A | 17.3 % | N/A | 30.2% | N/A | 20.0% |
| **Total** | **26,982** | **100.0%** | **4,735** | **100.0%** | **741** | **100.0%** |

Source: NHTSA, FARS.

**Table 33. Fatalities by person type and Hispanic origin, 2013.**

| Hispanic Origin | Drivers and Passengers | | Pedestrians | | Bicyclists | |
|---|---|---|---|---|---|---|
| | Number | Percent | Number | Percent | Number | Percent |
| Mexican | 1,178 | 4.4% | 274 | 5.8% | 46 | 6.2% |
| Puerto Rican | 197 | 0.7% | 47 | 1.0% | 6 | 0.8% |
| Cuban | 91 | 0.3% | 25 | 0.5% | 5 | 0.7% |
| Central or South American | 227 | 0.8% | 83 | 1.8% | 12 | 1.6% |
| European Spanish | 18 | 0.1% | 6 | 0.1% | 0 | 0.0% |
| Hispanic, Origin not specified or other | 1,166 | 4.3% | 279 | 5.9% | 28 | 3.8% |
| ***Total Hispanic*** | ***2,877*** | ***10.7%*** | ***714*** | ***15.1%*** | ***97*** | ***13.1%*** |
| Non-Hispanic | 18,841 | 69.8% | 2,941 | 62.1% | 484 | 65.3% |
| Unknown | 5,264 | 19.5% | 1,080 | 22.8% | 160 | 21.6% |
| **Total** | **26,982** | **100.0%** | **4,735** | **100.0%** | **741** | **100.0%** |

Source: NHTSA, FARS.

[This page intentionally left blank.]

# 8. CONCLUSIONS

Pedestrian and bicyclist fatalities in large truck crashes are a small subset of pedestrian and bicyclist fatalities in all crashes. However, many of the trends related to pedestrian fatalities in general are relevant to pedestrian fatalities in large truck crashes (for example, intoxication), while some issues become apparent only when the focus is on pedestrian fatalities in large truck crashes (for example, pedestrians coded as being "at work"). Among the findings discovered through the analysis of FARS data in this report are the following:

**Pedestrian Fatalities**

- For pedestrian fatalities in crashes involving large trucks, a crash circumstance was recorded for 69 percent of the pedestrians (i.e., the crash circumstance was attributed to the pedestrian) versus 34 percent of the large truck drivers.
- Of the 338 pedestrians who died in large truck crashes in 2013, 37 percent tested positive for alcohol or drugs or were coded as being under the influence of alcohol, drugs, or other medication, versus 4 percent of the 339 large truck drivers in those crashes.
- The percentage of pedestrian fatalities who have tested positive for alcohol has remained somewhat constant (approximately 40 percent of those who were tested) over the past 10 years, while the percentage of those who tested positive for drugs has risen from 25 percent in 2004 to 33 percent in 2013.
- Pedestrian fatalities in large truck crashes where the pedestrian was coded as being "at work" occurred at almost five times the rate of pedestrian fatalities in general (10 percent versus 2 percent).
- The number of pedestrian fatalities on urban local streets has increased over the past 10 years, especially from 2011 to 2013. The number of pedestrian fatalities who were 51–70 years old has increased at an even more rapid rate. These trends apply to pedestrian fatalities in large truck crashes and to pedestrian fatalities in general.
- Large trucks that strike and kill pedestrians in single-vehicle crashes have an initial point of impact in an area other than the front of the vehicle more often than passenger vehicles that strike and kill pedestrians in single-vehicle crashes.

**Bicyclist Fatalities**

- Fourteen percent of the 78 bicyclists who died in crashes with large trucks in 2013 tested positive for having any alcohol in their system, while none of the large truck drivers in these crashes tested positive for alcohol.
- Eighteen percent of the bicyclists who died in crashes with large trucks in 2013 tested positive for alcohol or drugs or were coded as being under the influence of alcohol, drugs, or other medication; 2 percent of the large truck drivers in those same crashes were so coded.

- At least one crash circumstance was coded for 76 percent of the bicyclists who died in crashes involving large trucks in 2013 (i.e., the crash circumstance was attributed to the bicyclist), versus 27 percent of the large truck drivers in those crashes.
- In 2013, 31 percent of the bicyclist fatalities in large truck crashes were coded as having failed to yield.
- In 2013, 18 percent of the bicyclist fatalities in large truck crashes and 32 percent of the bicyclist fatalities in all crashes were found to have taken no improper action.
- From 2004 to 2013, in large truck crashes with bicyclist fatalities, 98 percent of the time the large truck in the crash was the vehicle that actually struck and killed the bicyclist. During that same time period, in large truck crashes with pedestrian fatalities, 89 percent of the time the large truck was the vehicle that struck and killed the pedestrian.
- For 38 percent of the large trucks that struck and killed bicyclists in single-vehicle crashes in 2013, the initial point of impact was on the front of the vehicle; this is much lower than the 87 percent of other vehicles (passenger vehicles, buses, motorcycles, etc.) that struck and killed bicyclists in single-vehicle crashes where the initial point of impact was on the front of the vehicle.
- From 2011 to 2013, 68 percent of all bicyclist fatalities occurred in urban areas, but 74 percent of bicyclist fatalities involving large trucks occurred in urban areas.
- Four percent of bicyclist fatalities in large truck crashes from 2011 to 2013 occurred on interstate highways, significantly less than the 35 percent of pedestrian fatalities in large truck crashes that occurred on interstate highways during this period.

# APPENDIX A: CATEGORIZATION OF CRITICAL PRECRASH EVENTS FOR TABLE 1, TABLE 2, AND TABLE 3

These options for Critical Precrash Event (P_CRASH2) in FARS data were categorized as "Vehicle Problems" for Table 1 and Table 3:

- 01 THIS VEHICLE LOSS OF CONTROL DUE TO: Blow Out/Flat Tire.
- 02 THIS VEHICLE LOSS OF CONTROL DUE TO: Stalled Engine.
- 03 THIS VEHICLE LOSS OF CONTROL DUE TO: Disabling Vehicle Failure (e.g., Wheel Fell Off).
- 04 THIS VEHICLE LOSS OF CONTROL DUE TO: Non-Disabling Vehicle Problem (e.g., Hood Flew Up).
- 05 THIS VEHICLE LOSS OF CONTROL DUE TO: Poor Road Conditions (Puddle, Pothole, Ice, etc.).
- 08 THIS VEHICLE LOSS OF CONTROL DUE TO: Other Cause of Control Loss.
- 09 THIS VEHICLE LOSS OF CONTROL DUE TO: Unknown Cause of Control Loss.

These options for Critical Precrash Event (P_CRASH2) were categorized as "This Vehicle Did Something Out-of-the-Ordinary" for Table 1 and Table 3:

- 06 THIS VEHICLE LOSS OF CONTROL DUE TO: Traveling Too Fast For Conditions.
- 10 THIS VEHICLE TRAVELING Over the Lane Line on Left Side of Travel Lane.
- 11 THIS VEHICLE TRAVELING Over the Lane Line on Right Side of Travel Lane.
- 12 THIS VEHICLE TRAVELING Off the Edge of the Road on the Left Side.
- 13 THIS VEHICLE TRAVELING Off the Edge of the Road on the Right Side.
- 14 THIS VEHICLE TRAVELING End Departure.
- 15 THIS VEHICLE TRAVELING Turning Left at junction.
- 16 THIS VEHICLE TRAVELING Turning Right at junction.
- 17 THIS VEHICLE TRAVELING Crossing Over (Passing Through) Intersection.
- 18 THIS VEHICLE TRAVELING This Vehicle Decelerating.
- 19 THIS VEHICLE TRAVELING Unknown Travel Direction.

These options for Critical Precrash Event (P_CRASH2) were categorized as “Other Vehicle/Object Did Something Out-of-the-Ordinary” for Table 1 and Table 3:

- 50 OTHER MOTOR VEHICLE IN LANE Other Vehicle Stopped.
- 51 OTHER MOTOR VEHICLE IN LANE Traveling In Same Direction with Lower or Steady Speed.
- 52 OTHER MOTOR VEHICLE IN LANE Traveling In Same Direction while Decelerating.
- 53 OTHER MOTOR VEHICLE IN LANE Traveling In Same Direction with Higher Speed.
- 54 OTHER MOTOR VEHICLE IN LANE Traveling In Opposite Direction.
- 55 OTHER MOTOR VEHICLE IN LANE In Crossover.
- 56 OTHER MOTOR VEHICLE IN LANE Backing.
- 59 OTHER MOTOR VEHICLE IN LANE Unknown Travel Direction of the Other Motor Vehicle in Lane.
- 60 OTHER MOTOR VEHICLE ENCROACHING INTO LANE From Adjacent Lane (Same Direction) Over Left Lane Line.
- 61 OTHER MOTOR VEHICLE ENCROACHING INTO LANE From Adjacent Lane (Same Direction) Over Right Lane Line.
- 62 OTHER MOTOR VEHICLE ENCROACHING INTO LANE From Opposite Direction Over Left Lane Line.
- 63 OTHER MOTOR VEHICLE ENCROACHING INTO LANE From Opposite Direction Over Right Lane Line.
- 64 OTHER MOTOR VEHICLE ENCROACHING INTO LANE From Parking Lane, Median, Shoulder, Roadside.
- 65 OTHER MOTOR VEHICLE ENCROACHING INTO LANE From Crossing Street, Turning Into Same Direction.
- 66 OTHER MOTOR VEHICLE ENCROACHING INTO LANE From Crossing Street, Across Path.
- 67 OTHER MOTOR VEHICLE ENCROACHING INTO LANE From Crossing Street, Turning Into Opposite Direction.
- 68 OTHER MOTOR VEHICLE ENCROACHING INTO LANE From Crossing Street, Intended Path Not Known.
- 70 OTHER MOTOR VEHICLE ENCROACHING INTO LANE From Driveway, Turning Into Same Direction.
- 71 OTHER MOTOR VEHICLE ENCROACHING INTO LANE From Driveway, Across Path.

- 72 OTHER MOTOR VEHICLE ENCROACHING INTO LANE From Driveway, Turning Into Opposite Direction.
- 73 OTHER MOTOR VEHICLE ENCROACHING INTO LANE From Driveway, Intended Path Not Known.
- 74 OTHER MOTOR VEHICLE ENCROACHING INTO LANE From Entrance to Limited Access Highway.
- 78 OTHER MOTOR VEHICLE ENCROACHING INTO LANE Encroachment by Other Vehicle - Details Unknown.
- 87 OBJECT OR ANIMAL Animal in Road.
- 88 OBJECT OR ANIMAL Animal Approaching Road.
- 89 OBJECT OR ANIMAL Animal - Unknown Location.
- 90 OBJECT OR ANIMAL Object in Road.
- 91 OBJECT OR ANIMAL Object Approaching Road.
- 92 OBJECT OR ANIMAL Object Unknown Location.

These options for Critical Precrash Event (P_CRASH2) were categorized as “Pedestrian-Related” for Table 1 and Table 3:

- 80 PEDESTRIAN OR PEDALCYCLIST OR OTHER NON-MOTORIST Pedestrian in Road.
- 81 PEDESTRIAN OR PEDALCYCLIST OR OTHER NON-MOTORIST Pedestrian Approaching Road.
- 82 PEDESTRIAN OR PEDALCYCLIST OR OTHER NON-MOTORIST Pedestrian Unknown Location.
- 83 PEDESTRIAN OR PEDALCYCLIST OR OTHER NON-MOTORIST Pedalcyclist or Other Non-Motorist in Road.
- 84 PEDESTRIAN OR PEDALCYCLIST OR OTHER NON-MOTORIST Pedalcyclist or Other Non-Motorist Approaching Road.
- 85 PEDESTRIAN OR PEDALCYCLIST OR OTHER NON-MOTORIST Pedalcyclist or Other Non-Motorist Unknown Location.

These options for Critical Precrash Event (P_CRASH2) were categorized as “Unknown” for Table 1 and Table 3:

- 98 OTHER Other Critical Precrash Event
- 99 OTHER Unknown

[This page intentionally left blank.]

# APPENDIX B: CATEGORIZATION OF CRASH CIRCUMSTANCES FOR TABLES 4–11

## PEDESTRIAN AND BICYCLIST CRASH CIRCUMSTANCES

For pedestrians and bicyclists, the variables in FARS that were used to locate person-level and environment-related circumstances were:

| SAS Name | Full Data Element Name |
|---|---|
| NMIMPAIR | Condition (Impairment) at Time of Crash- Non-Motorist |
| MTM_CRSH | Non-Motorist Action/Circumstances at Time of Crash |
| MPR_ACT | Non-Motorist Action/Circumstances Prior to Crash |
| WEATHER | Atmospheric Conditions |
| P_SF1 | Related Factors- Person Level |
| P_SF2 | Related Factors- Person Level |
| P_SF3 | Related Factors- Person Level |
| ALC_RES | Alcohol Test Result |
| LGT_COND | Light Condition |
| WRK_ZONE | Work Zone |
| DRUGRES1 | Drug Test Result |
| DRUGRES2 | Drug Test Result |
| DRUGRES3 | Drug Test Result |
| WORK_INJ | Fatal Injury at Work |
| AGE | Age |
| VE_FORMS | Number of Motor Vehicles in Transport (MVIT) |
| HARM_EV | First Harmful Event |

Pedestrian-level and bicyclist-level circumstances were further divided into those that involved qualities that were at least somewhat likely to have contributed to the cause of the crash, and those that merely explained aspects of the environment or situation at the time of the crash. If a pedestrian or bicyclist was coded with any of the following qualities, then s/he was credited in this analysis as having at least one crash circumstance:

- If NMIMPAIR = “01 Ill, Blackout”
- If NMIMPAIR = “02 Asleep or Fatigued”
- If NMIMPAIR = “06 Deaf”
- If NMIMPAIR = “07 Blind”
- If NMIMPAIR = “08 Emotional (Depressed, Angry, Disturbed, etc.)”
- If NMIMPAIR = “09 Under the Influence of Alcohol, Drugs or Medication”
- If NMIMPAIR = “10 Physical Impairment – No Details”
- If NMIMPAIR = “96 Other Physical Impairment”

- If MTM_CRASH = “01 Dart/Dash”
- If MTM_CRASH = “02 Failure to Yield Right-Of-Way”
- If MTM_CRASH = “03 Failure to Obey Traffic Signs, Signals or Officer”
- If MTM_CRASH = “04 In Roadway Improperly (Standing, Lying, Working, Playing)”
- If MTM_CRASH = “06 Inattentive (Talking, Eating, etc.)”
- If MTM_CRASH = “07 Improper Turn/Merge”
- If MTM_CRASH = “08 Improper Passing”
- If MTM_CRASH = “09 Wrong-Way Riding or Walking”
- If MTM_CRASH = “10 Driving on Wrong Side of Road”
- If MTM_CRASH = “12 Improper Crossing of Roadway or Intersection (Jaywalking)”
- If MTM_CRASH = “13 Failing to Have Lights on When Required”
- If MTM_CRASH = “14 Operating Without Required Equipment”
- If MTM_CRASH = “15 Improper or Erratic Lane Changing”
- If MTM_CRASH = “16 Failure to Keep in Proper Lane or Running Off Road”
- If MTM_CRASH = “17 Making Improper Entry to or Exit from Trafficway”
- If MTM_CRASH = “18 Operating the Vehicle in Other Erratic, Reckless, Careless or Negligent Manner”
- If MTM_CRASH = “20 Passing with Insufficient Distance or Inadequate Visibility or Failing to Yield to Overtaking Vehicle”
- If P_SF1 or P_SF2 or P_SF3 = “37 Traveling on Prohibited Trafficway”
- If P_SF1 or P_SF2 or P_SF3 = “91 Portable Electronic Devices”
- If P_SF1 or P_SF2 or P_SF3 = “42 Failure to Signal Intentions”
- If P_SF1 or P_SF2 or P_SF3 = “51 Operator Inexperience”
- If P_SF1 or P_SF2 or P_SF3 = “57 Improper Tire Pressure”
- If ALC_RES was higher than .01
- If DRUGRES1 or DRUGRES2 or DRUGRES3 was a positive drug test result

**DRIVER CRASH CIRCUMSTANCES**

For large truck, bus, and other vehicle drivers, the variables in FARS that were utilized to locate crash circumstances were:

- SAS name Full Data Element Name
- SPEEDREL Speed Related
- ALC_RES Alcohol Test Result
- DRUGRES1 Drug Test Result
- DRUGRES2 Drug Test Result
- DRUGRES3 Drug Test Result
- DR_SF1 Related Factors- Driver Level
- DR_SF2 Related Factors- Driver Level
- DR_SF3 Related Factors- Driver Level
- DR_SF4 Related Factors- Driver Level
- P_CRASH2 Critical Event - Precrash
- MFACTOR Crash circumstances, Motor Vehicle
- VEH_SC1 Related Factors – Vehicle Level
- VEH_SC2 Related Factors – Vehicle Level

Driver-level circumstances were further divided into those that involved qualities that were at least somewhat likely to have contributed to the cause of the crash, and those that merely explained aspects of the environment or situation at the time of the crash. If a motor vehicle driver was coded with any of the following qualities, then s/he was credited in this analysis as having at least one crash circumstance:

- If SPEEDREL = “2 Yes, Racing”
- If SPEEDREL = “3 Yes, Exceeded Speed Limit”
- If SPEEDREL = “4 Yes, Too Fast for Conditions”
- If SPEEDREL = “5 Yes, Specifics Unknown”
- If ALC_RES was higher than .01
- If DRUGRES1 or DRUGRES2 or DRUGRES3 was a positive drug test result
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “4 Reaction to or Failure to Take Drugs/Medication”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “6 Careless Driving”

- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “8 Road Rage/Aggressive Driving”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “18 Traveling on Prohibited Trafficways”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “20 Leaving Vehicle Unattended with Engine Running; Leaving Vehicle Unattended in Roadway”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “21 Overloading or Improper Loading of Vehicle with Passenger or Cargo”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “22 Towing or Pushing Vehicle Improperly”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “23 Failing to Dim Lights or to Have Lights on When Required”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “26 Following Improperly”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “27 Improper or Erratic Lane Changing”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “28 Failure to Keep in Proper Lane”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “29 Illegal Driving on Road Shoulder, in Ditch, or Sidewalk, or on Median”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “30 Making Improper Entry to or Exit from Trafficway”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “31 Starting or Backing Improperly”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “32 Opening Vehicle Closure into Moving Traffic or Vehicle is in Motion”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “33 Passing Where Prohibited by Posted Signs, Pavement Markings, Hill or Curve, or School Bus Displaying Warning Not to Pass”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “34 Passing on Wrong Side”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “35 Passing with Insufficient Distance or Inadequate Visibility or Failing to Yield to Overtaking Vehicle”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “36 Operating the Vehicle in an Erratic, Reckless, Careless or Negligent Manner or Operating at Erratic or Suddenly Changing Speeds”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “37 Police Pursuing this Driver or Police Officer in Pursuit”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “38 Failure to Yield Right of Way”

- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “39 Failure to Obey Actual Traffic Signs, Traffic Control Devices or Traffic Officers, Failure to Observe Safety Zone Traffic Laws”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “40 Passing Through or Around Barrier”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “41 Failure to Observe Warnings or Instructions on Vehicle Displaying Them”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “42 Failure to Signal Intentions”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “47 Making Right Turn from Left-Turn Lane or Making Left Turn from Right-Turn Lane”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “48 Making Improper Turn”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “50 Driving Wrong Way on One-Way Trafficway”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “51 Driving on Wrong Side of Road (Intentionally or Unintentionally)”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “52 Operator Inexperience”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “54 Stopping in Roadway”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “58 Over Correcting”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “92 Other Non-Moving Traffic Violation”
- If MDRDSTRD = “1 Looked But Did Not See”
- If MDRDSTRD = “3 By Other Occupant(s)”
- If MDRDSTRD = “4 By a Moving Object in Vehicle”
- If MDRDSTRD = “5 While Talking or Listening to Cellular Phone”
- If MDRDSTRD = “6 While Manipulating Cellular Phone”
- If MDRDSTRD = “7 While Adjusting Audio or Climate Controls”
- If MDRDSTRD = “9 While Using Other Component/Controls Integral to Vehicle”
- If MDRDSTRD = “10 While Using or Reaching For Device/Object Brought Into Vehicle”
- If MDRDSTRD = “12 Distracted by Outside Person, Object or Event”
- If MDRDSTRD = “13 Eating or Drinking”
- If MDRDSTRD = “14 Smoking Related”
- If MDRDSTRD = “15 Other Cellular Phone Related”

- If MDRDSTRD = “16 No Driver Present/Unknown if Driver Present”
- If MDRDSTRD = “17 Distraction/Inattention”
- If MDRDSTRD = “18 Distraction/Careless”
- If MDRDSTRD = “19 Careless/Inattentive”
- If MDRDSTRD = “92 Distraction (Distracted), Details Unknown”
- If MDRDSTRD = “93 Inattention (Inattentive), Details Unknown”
- If MDRDSTRD = “97 Lost In Thought/Day Dreaming”
- If MDRDSTRD = “98 Other Distraction”
- If DRIMPAIR = “1 Ill, Blackout”
- If DRIMPAIR = “2 Asleep or Fatigued”
- If DRIMPAIR = “7 Blind”
- If DRIMPAIR = “8 Emotional (Depressed, Angry, Disturbed, etc.)”
- If DRIMPAIR = “9 Under the Influence of Alcohol, Drugs or Medication”
- If DRIMPAIR = “10 Physical Impairment – No Details”
- If DRIMPAIR = “96 Other Physical Impairment”
- If P_CRASH2 = “06 THIS VEHICLE LOSS OF CONTROL DUE TO: Traveling Too Fast For Conditions”
- If P_CRASH2 = “10 THIS VEHICLE TRAVELING Over the Lane Line on Left Side of Travel Lane”
- If P_CRASH2 = “11 THIS VEHICLE TRAVELING Over the Lane Line on Right Side of Travel Lane”
- If P_CRASH2 = “12 THIS VEHICLE TRAVELING Off the Edge of the Road on the Left Side”
- If P_CRASH2 = “13 THIS VEHICLE TRAVELING Off the Edge of the Road on the Right Side”
- If P_CRASH2 = “14 THIS VEHICLE TRAVELING End Departure”
- If P_CRASH2 = “15 THIS VEHICLE TRAVELING Turning Left at junction”
- If P_CRASH2 = “16 THIS VEHICLE TRAVELING Turning Right at junction”
- If P_CRASH2 = “17 THIS VEHICLE TRAVELING Crossing Over (Passing Through) Intersection”
- If P_CRASH2 = “18 THIS VEHICLE TRAVELING This Vehicle Decelerating”
- If P_CRASH2 = “19 THIS VEHICLE TRAVELING Unknown Travel Direction”

## ENVIRONMENTAL CRASH CIRCUMSTANCES

The variables in FARS that were utilized to locate additional environment-related crash circumstances were:

- SAS name Full Data Element Name
- WEATHER Atmospheric Conditions
- WEATHER1 Atmospheric Conditions
- WEATHER2 Atmospheric Conditions
- LGT_COND Light Condition
- MVISOBSC Driver's Vision Obscured by
- P_CRASH2 Critical Event - Precrash
- DR_SF1 Related Factors- Driver Level
- DR_SF2 Related Factors- Driver Level
- DR_SF3 Related Factors- Driver Level
- DR_SF4 Related Factors- Driver Level

If a crash or vehicle in a crash was coded with any of the following qualities, then the crash was credited in this analysis as having at least one environmental crash circumstance:

- If WEATHER or WEATHER1 or WEATHER2 = "2 Rain"
- If WEATHER or WEATHER1 or WEATHER2 = "3 Sleet, Hail (Freezing Rain or Drizzle)"
- If WEATHER or WEATHER1 or WEATHER2 = "4 Snow"
- If WEATHER or WEATHER1 or WEATHER2 = "5 Fog, Smog, Smoke"
- If WEATHER or WEATHER1 or WEATHER2 = "6 Severe Crosswinds"
- If WEATHER or WEATHER1 or WEATHER2 = "7 Blowing Sand, Soil, Dirt"
- If WEATHER or WEATHER1 or WEATHER2 = "11 Blowing Snow"
- If WEATHER or WEATHER1 or WEATHER2 = "12 Freezing Rain or Drizzle"
- If P_SF1 or P_SF2 or P_SF3 = "60 VISION OBSCURED BY Rain, Snow, Fog, Smoke, Sand, Dust"
- If P_SF1 or P_SF2 or P_SF3 = "61 VISION OBSCURED BY Reflected Glare, Bright Sunlight, Headlights"
- If P_SF1 or P_SF2 or P_SF3 = "62 VISION OBSCURED BY Curve, Hill, or Other Design Features (Including Traffic Signs, Embankment)"

- If P_SF1 or P_SF2 or P_SF3 = “63 VISION OBSCURED BY Building, Billboard, Other Structures”
- If P_SF1 or P_SF2 or P_SF3 = “64 VISION OBSCURED BY Trees, Crops, Vegetation”
- If P_SF1 or P_SF2 or P_SF3 = “65 VISION OBSCURED BY Motor Vehicle (Including Load)”
- If P_SF1 or P_SF2 or P_SF3 = “66 VISION OBSCURED BY Parked Vehicle”
- If P_SF1 or P_SF2 or P_SF3 = “67 VISION OBSCURED BY Splash or Spray or Passing Vehicle”
- If P_SF1 or P_SF2 or P_SF3 = “68 VISION OBSCURED BY Inadequate Lighting System”
- If P_SF1 or P_SF2 or P_SF3 = “69 VISION OBSCURED BY Obstructing Angles on Vehicle”
- If P_SF1 or P_SF2 or P_SF3 = “70 VISION OBSCURED BY Mirrors”
- If P_SF1 or P_SF2 or P_SF3 = “72 VISION OBSCURED BY Other Visual Obstruction”
- If P_SF1 or P_SF2 or P_SF3 = “83 SKIDDING, SWERVING, OR SLIDING DUE TO Ice, Snow, Slush, Water, Sand, Dirt, Oil, Wet Leaves on Road”
- If LGT_COND = “2 Dark – Not Lighted”
- If MVISOBSC = “1 Rain, Snow, Fog, Smoke, Sand, Dust”
- If MVISOBSC = “2 Reflected Glare, Bright Sunlight, Headlights”
- If MVISOBSC = “3 Curve, Hill, or Other Roadway Design Features”
- If MVISOBSC = “4 Building, Billboard, or Other Structure”
- If MVISOBSC = “5 Trees, Crops, Vegetation”
- If MVISOBSC = “6 In-Transport Motor Vehicle (Including Load)”
- If MVISOBSC = “7 Not-in-Transport Motor Vehicle (Parked, Working)”
- If MVISOBSC = “8 Splash or Spray of Passing Vehicle”
- If MVISOBSC = “9 Inadequate Defrost or Defog System”
- If MVISOBSC = “10 Inadequate Vehicle Lighting System”
- If MVISOBSC = “11 Obstructing Interior to the Vehicle”
- If MVISOBSC = “12 External Mirrors”
- If MVISOBSC = “13 Broken or Improperly Cleaned Windshield”
- If MVISOBSC = “14 Obstructing Angles on Vehicle”
- If MVISOBSC = “97 Vision Obscured – No Details”

- If MVISOBSC = “98 Other Visual Obstruction”
- If P_CRASH2 = “05 THIS VEHICLE LOSS OF CONTROL DUE TO: Poor Road Conditions (Puddle, Pothole, Ice, etc.)”
- If P_CRASH2 = “08 THIS VEHICLE LOSS OF CONTROL DUE TO: Other Cause of Control Loss”
- If P_CRASH2 = “09 THIS VEHICLE LOSS OF CONTROL DUE TO: Unknown Cause of Control Loss”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “77 SKIDDING, SWERVING, OR SLIDING DUE TO Severe Crosswind”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “78 SKIDDING, SWERVING, OR SLIDING DUE TO Wind from Passing Truck”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “79 SKIDDING, SWERVING, OR SLIDING DUE TO Slippery or Loose Surface”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “80 SKIDDING, SWERVING, OR SLIDING DUE TO Tire Blow-Out or Flat”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “81 SKIDDING, SWERVING, OR SLIDING DUE TO Debris or Objects in Road”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “82 SKIDDING, SWERVING, OR SLIDING DUE TO Ruts, Holes, Bumps in Road”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “83 SKIDDING, SWERVING, OR SLIDING DUE TO Live Animals in Road”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “84 SKIDDING, SWERVING, OR SLIDING DUE TO Vehicle in Road”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “85 SKIDDING, SWERVING, OR SLIDING DUE TO Phantom Vehicle”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “86 SKIDDING, SWERVING, OR SLIDING DUE TO Pedestrian, Pedalcyclist, or Other Non-Motorist in Road”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “87 SKIDDING, SWERVING, OR SLIDING DUE TO Ice, Water, Snow, Slush, Sand, Dirt, Oil, Wet Leaves on Road”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “88 SKIDDING, SWERVING, OR SLIDING DUE TO Trailer Fishtailing or Swaying”

**VEHICLE CRASH CIRCUMSTANCES**

The variables in FARS that were utilized to locate vehicle-related circumstances were:

- SAS name Full Data Element Name
- P_CRASH2 Critical Event - Precrash
- MFACTOR Crash circumstances, Motor Vehicle
- DR_SF1 Related Factors - Driver Level
- DR_SF2 Related Factors - Driver Level
- DR_SF3 Related Factors - Driver Level
- DR_SF4 Related Factors - Driver Level

If a vehicle in a crash was coded with any of the following qualities, then it was credited in this analysis as having at least one vehicle crash circumstance (note that these circumstances are distinct from those credited to the vehicle's driver):

- If P_CRASH2 = "01 THIS VEHICLE LOSS OF CONTROL DUE TO: Blow Out/Flat Tire"
- If P_CRASH2 = "02 THIS VEHICLE LOSS OF CONTROL DUE TO: Stalled Engine"
- If P_CRASH2 = "03 THIS VEHICLE LOSS OF CONTROL DUE TO: Disabling Vehicle Failure (e.g., Wheel Fell Off)"
- If P_CRASH2 = "04 THIS VEHICLE LOSS OF CONTROL DUE TO: Non-Disabling Vehicle Problem (e.g., Hood Flew Up)"
- If MFACTOR = "01 Tires"
- If MFACTOR = "02 Brake System"
- If MFACTOR = "03 Steering"
- If MFACTOR = "04 Suspension"
- If MFACTOR = "05 Power Train"
- If MFACTOR = "06 Exhaust System"
- If MFACTOR = "07 Head Lights"
- If MFACTOR = "08 Signal Lights"
- If MFACTOR = "09 Other Lights"
- If MFACTOR = "10 Wipers"
- If MFACTOR = "11 Wheels"
- If MFACTOR = "12 Mirrors"

- If MFACTOR = “13 Windows/Windshield”
- If MFACTOR = “14 Body, Doors”
- If MFACTOR = “15 Truck Coupling / Trailer Hitch / Safety Chains”
- If MFACTOR = “16 Safety Systems”
- If MFACTOR = “17 Vehicle Contributing Factors – No Details”
- If MFACTOR = “97 Other”
- If DR_SF1 or DR_SF2 or DR_SF3 or DR_SF4 = “57 Locked Wheel”