U.S. Department
of Transportation

**National Highway
Traffic Safety
Administration**

NHTSA
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Not-in-Traffic Surveillance (NiTS) System

NiTS 2007:
Noncrash Fatality Database
User's Manual

DISCLAIMER

TECHNICAL REPORT DOCUMENTATION PAGE

1. Report No. DOT HS 811 065	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle NiTS 2007: Noncrash Fatality Database User's Manual		5. Report Date December 2008
		6. Performing Organization Code NHTSA/NVS-421
7. Author(s) Austin, Rory		8. Performing Organization Report No.
9. Performing Organization Name and Address National Highway Traffic Safety Administration 1200 New Jersey Avenue SE. Washington, DC 20590		10. Work Unit No. (TRAIS)
		11. Contract or Grant No.
12. Sponsoring Agency Name and Address National Highway Traffic Safety Administration 1200 New Jersey Avenue SE. Washington, DC 20590		13. Type of Report and Period Covered 2007
		14. Sponsoring Agency Code
15. Supplementary Notes		

16. Abstract

The Not-in-Traffic Surveillance (NiTS) system is a virtual data collection system designed to provide counts and details regarding fatalities and injuries that occur in nontraffic crashes and in noncrash incidents. The NiTS 2007 system provided information about an estimated 1,159 fatalities and 98,000 injuries that occurred in nontraffic crashes on private roads, on driveways and in parking facilities. The NiTS 2007 system also provided information about an annual average of 588 fatalities and 743,000 injuries in noncrash incidents that occurred inside of or otherwise involved a passenger vehicle.

This document describes the creation of the noncrash fatality database using a special death certificate file containing information on all accidental deaths that occurred in 2003 and 2004. The file was provided by the Centers for Disease Control's National Vital Statistics System. More than half of the noncrash fatalities occurred when a vehicle fell on a person who was usually working under it or from unintentional carbon monoxide poisoning. Other frequent categories included falls from vehicles, vehicle fires, struck by an object while in a vehicle or by a part of vehicle such as a door, and hyperthermia and hypothermia inside the vehicle. This document also describes the noncrash fatality database, which is available as a Microsoft Excel file.

17. Key Words Not in Traffic Surveillance, NiTS, noncrash, carbon monoxide, hyperthermia	18. Distribution Statement This report is free of charge from the NHTSA Web site at www.nhtsa.dot.gov		
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 16	22. Price

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

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1. Not-in-Traffic Surveillance and Noncrash Fatalities

Motor-vehicle-related fatalities and injuries can occur in a variety of situations. The three major categories of motor-vehicle-related fatalities and injuries are traffic crashes, nontraffic crashes and noncrash incidents. Since 1975 the National Highway Traffic Safety Administration has collected extensive information on fatalities that occur in traffic crashes through the Fatality Analysis Reporting System (FARS). Additionally, NHTSA's National Automotive Sampling System (NASS) has provided national estimates of the number and nature of traffic crash injuries since 1979. Data regarding fatalities and injuries that occur in nontraffic crashes, which can occur on private roads, driveways, and parking lots, and in noncrash incidents, such as fatalities involving children left in hot vehicles or injuries that occur while repairing a vehicle, have not routinely been collected by NHTSA. Congress required NHTSA to collect and maintain information about fatalities and injuries in nontraffic and noncrash incidents in Public Law Number 109-59, the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). Section 10305 of SAFETEA-LU states:

> (a) IN GENERAL. — In conjunction with the study required in section 10304 [Vehicle Backover Avoidance Technology Study], the National Highway Traffic Safety Administration shall establish a method to collect and maintain data on the number and types of injuries and deaths involving motor vehicles with a gross vehicle weight rating of not more than 10,000 pounds in non-traffic incidents.
> (b) DATA COLLECTION AND PUBLICATION. — The Secretary of Transportation shall publish the data collected under subsection (a) no less frequently than biennially.

Congress also required the Secretary of Transportation to establish and maintain a database of motor-vehicle-related fatalities and injuries that occur in nontraffic and noncrash incidents in Public Law Number 110-189, the Cameron Gulbransen Kids Transportation Safety Act of 2007 (K.T. Safety Act). Section 2(f) of the K.T. Safety Act states:

> (1) IN GENERAL. — Not later than 12 months after the date of the enactment of this Act, the Secretary shall establish and maintain a database of injuries and deaths in nontraffic, noncrash events involving motor vehicles.
> (2) CONTENTS. — The database established pursuant to paragraph
>   (1) shall include information regarding—
>   (A) the number, types, and causes of injuries and deaths resulting from the events described in paragraph (1);
>   (B) the make, model, and model year of motor vehicles involved in such events, when practicable; and
>   (C) other variables that the Secretary determines will enhance the value of the database.
> (3) AVAILABILITY. — The Secretary shall make the information contained in the database established pursuant to paragraph (1) available to the public through the Internet and other means.

In addition, Section 2(e) of the K.T. Safety Act defines a motor vehicle to exclude motorcycles, trailers, and any vehicle with gross vehicle weight rating (GWVR) of more than 10,000 pounds. For the purpose of the Act, motor vehicle is therefore synonymous with passenger vehicles, which include passenger cars, pickup trucks, utility vehicles, and vans.

NHTSA designed and implemented the Not-in-Traffic Surveillance (NiTS) System to fulfill the requirements of SAFETEA-LU Section 10305 and the K.T. Safety Act Section 2(f). NHTSA considered several methods for collecting information about nontraffic crashes and noncrash incidents including police reports, trauma registries and hospital records, insurance company data, and newspaper stories. The available sources were reviewed and evaluated by the degree to which they could provide accurate national counts as well as useful information. The assessment indicated that the most appropriate source of data depended upon whether the event was a nontraffic crash or noncrash incident and whether it was a fatality or nonfatal injury. Therefore, the NiTS system was developed as a virtual system comprised of four major components. One component is a database of fatalities and injuries in nontraffic crashes based predominantly on police reports. A second component is a database of noncrash fatalities based upon death certificate information, and the third component is a database of noncrash injuries based upon a nationally representative sample of emergency department records. The fourth component is a collection of detailed investigations of particular types of crash and noncrash events such as backovers where a driver reverses into a pedestrian or pedalcyclist, power window strangulation, children left in hot vehicles (hyperthermia) and trunk entrapment, which are conducted by NHTSA's Special Crash Investigations (SCI) program.

This document focuses on the noncrash fatality component. The noncrash fatality database was based upon mortality data, which in turn were derived from death certificates. This manual begins with an overview of the U.S. national death certificate system. The manual then provides an overview of how the database was created and describes its content. The database was created using special mortality data files obtained from the Centers for Disease Control's National Vital Statistics System (NVSS) for 2003 and 2004. The NVSS data use agreement signed by NHTSA prohibits the release of any part of the two mortality files based upon privacy concerns. Therefore, NHTSA created an aggregate database that provides the number and type of noncrash motor-vehicle-related fatalities. The database also contains information about the age of the victim.

NHTSA determined that it was not practicable to collect information about the make, model, or model year of the vehicles involved. As described above, NHTSA considered several methods for collecting information about noncrash fatalities. After examining the available information, NHTSA determined that death certificates were the best method for collecting information about noncrash fatalities for a variety of reasons. The first reason is that NHTSA could use the existing data collection and file creation infrastructure of the NVSS to provide national counts. The second reason is that the death certificate information in the NVSS is likely to offer the most complete coverage of these events without the danger of "double-counting." However, a trade-off is that the narrative section of the mortality data does not usually contain information about the vehicle beyond a general vehicle body type such as car or truck. This fact is also true of many of the other sources except police reports, and the task of creating a new data collection for collecting police reports for noncrash fatalities was not feasible.

2. NATIONAL DEATH CERTIFICATE SYSTEM

Mortality data derived from death certificates is a primary source of information for identifying and monitoring major public health problems throughout the world. In the United States, death certificate data is among the most widely used sources of health information at the national, State, and local levels. This data has several important strengths:

- Coverage is universal because State laws require death certificates for disposition of bodies and because the certificates are often needed for legal purposes;
- Considerable uniformity in content and format is achieved among the States through Federal-State cooperation in the design of the death certificate; and
- Standardization in reporting, coding, processing, and data presentation are promoted through cooperation between the States, professional societies, the National Center for Health Statistics (NCHS) and the World Health Organization (WHO).

The U.S. Standard Certificate of Death, which is used with some minor revisions by all States, is revised approximately once every 10 years with collaboration by the States, NCHS, other Federal agencies, and subject-matter experts. The death certificate is used for all deaths regardless of the decedent's age. Final mortality information is processed principally in State vital statistics offices. Information from the death certificate is coded from copies of the original certificate using uniform specifications developed by NCHS. Tabulations of the final mortality data, which include approximately 2 million deaths each year, are published by the NCHS when all the data is received from the States.

The WHO plays a major role in collecting, classifying and tabulating mortality statistics for the United States and other countries. The United States is a signatory to an international agreement coordinated by WHO that promotes standardization of mortality statistics through the International Classification of Diseases (ICD). The ICD defines each of more than 5,000 categories to which medical conditions and circumstances of death may be assigned.

The ICD also provides recommendations for the broad categories used for tabulating and ranking mortality data, as well as standard definitions for such concepts as maternal mortality, underlying cause of death and fetal death. The WHO also provides rules for selecting one underlying cause of death from among the many medical conditions that physicians may indicate contributed to the death. The WHO prescribes in the ICD how cause-of-death information should be collected and indicates how the death certificate should be completed. A rule that is very helpful for injury researchers is that, when death is attributed to injury or poisoning, the underlying cause code is defined to be the external cause code that identifies the injury or poisoning event.

The ICD has been revised approximately once each decade since the beginning of the 20th century. The last revision, ICD-10, was implemented in the United States in 1999. Interim changes in the classification system have been made infrequently between major revisions. Cause-of-death data are traditionally presented in terms of one underlying cause for each death. However, underlying cause data can be augmented with additional information on the other conditions that the medical certifier reported as contributing to the death.

Most of the death certificates with an external cause contain a short narrative description of accident cause that substantially enhances their value for use by NHTSA. All States are now sending NCHS the death certificate data including these narratives in computer files that can be used for analysis. Data from these files is used to build the noncrash fatality database. The files used in this report do not contain personal identifiers and cannot be linked to other files (news clips, police reports, etc.) that contain personal identifiers.

3. The International Classification of Diseases Coding

The United States began using the latest version of the ICD coding system, ICD-10, to code death certificates in 1999. This coding system contains codes for over 5,000 different causes of death and, in particular, has a special set of codes for external causes (injuries and poisonings). The data set used to create the noncrash fatality database contains the 164,002 death reports for the year 2003 and the 167,183 death reports for 2004 that were classified with an external cause of death.

When a death is the result of an external cause, versus for example a chronic illness, a code called an external cause of injury code is used in addition to the illness codes. This code defines both the mechanism of the event and the manner of the death. The mechanism of the event is what caused the injury, for example, a motor vehicle crash, a firearm, a drug or a fall. Manner relates to the intent behind the death. The five categories of manner are unintentional, suicide, homicide, legal intervention or act of war, and unknown intent.

While the ICD codes themselves provide valuable information, there is a widely used categorization of these codes that provides important support for the building of the noncrash fatality database. This categorization is the External Cause of Injury Matrix developed by researchers around the world to simplify use and interpretation of ICD coded mortality data (see www.cdc.gov/nchs/about/otheract/ice/matrix10.htm). This algorithm takes the original ICD-10 external code and produces a simplified set of codes that represents the major hazard patterns. The matrix titles, which represent the major hazard patterns, are consistent with the WHO definitions that form the basis for ICD coding. The following are the major hazard groups produced by this categorization:

- Cut/Pierce
- Drowning/Submersion
- Fall
- Fire/Hot Object Or Substance
- Firearm
- Machinery
- All Transport
- Natural/Environmental
- Overexertion
- Poisoning
- Struck By/Against
- Suffocation

- Other Specified
- Unspecified

4. Creation of the Noncrash Fatality Database

This section describes the steps taken to extract the relevant noncrash fatalities from the larger NVSS datasets of all deaths with an external cause. In the first step, the ICD codes described in the previous section were used to eliminate three types of deaths. One type of excluded death is a transport accident. According to WHO, a transport accident is "any accident involving a device designed primarily for, or being used at the time primarily for, conveying persons or goods from one place to another." The category of transport deaths includes the subcategories of motor vehicle traffic, motor vehicle nontraffic, other land transport, and other transport (including water, air, and unspecified). The motor vehicle traffic fatalities are not included in the noncrash fatality database because they are already included in FARS. The motor vehicle nontraffic fatalities are not included in this database because they are the focus of the NiTS nontraffic crash database. According to the ICD-10's Chapter XX, "External Causes of Morbidity and Mortality," situations excluded from the category of transport accidents include "accidents involving vehicles but unrelated to the hazards associated with the means of transportation" such as a "finger crushed when shutting car door" (www.who.int/classifications/apps/icd/icd10online). These situations are the focus of the noncrash component of the NiTS system.

The second set of deaths that were excluded in the first step was intentional deaths. NiTS follows the convention used by the American National Standards Institute's (ANSI's) D16.1 *Manual on Classification of Motor Vehicle Traffic Accidents*, which requires a motor vehicle accident to be unintentional. Therefore, cases where the manner of death was suicide, homicide, legal intervention or act of war were excluded.

Finally, NHTSA also used the ANSI convention of excluding motor vehicle accident fatalities where a firearm was the cause of the injury. In firearm cases, the firearm is treated as the primary cause of death with no vehicle involvement. These exclusions left a dataset with unintentional deaths and deaths of unknown intent from external causes that were neither transport nor firearm-related. This step left 61,116 potential cases in 2003 and 63,978 in 2004.

These unintentional nontransport deaths provide the passenger vehicle noncrash deaths that are the basis of the NiTS 2007 Noncrash Fatality Database. The database focused on passenger vehicles as prescribed by the requirements of SAFETEA-LU and the K.T. Safety Act. The second step involved searching the unintentional nontransport deaths to identify cases that may have involved a passenger vehicle. Passenger vehicles are broadly defined as passenger cars, utility vehicles, pickup trucks, and vans. To identify cases that may have involved a passenger vehicle, a character string search of the narrative sections of the over 125,000 records in the unintentional nontransport category was conducted based upon the following keywords: CAR, AUTO, AUTOMOBILE, TRUCK, PICK-UP, PICKUP, SUV, VEHICLE, VAN, TAXI, JEEP, CONVERTIBLE and SEDAN. An additional search of these cases was conducted using the 15 most common vehicle makes to identify other cases where these names (e.g., FORD or HONDA) were used instead of the generic body type. The narrative sections include the medical

information in narrative form, the place of injury, and the description of how the injury occurred. This search resulted in over 3,000 potential cases over the two years.

Some limitations of the data may have affected the results in this step. Approximately 17 percent of the records do not have a narrative description of the injury so the analysis of these records was based on the codes and the narrative from the medical part of the death certificate. Some cases may have been missed because keywords were omitted or misspelled on the death certificate, and inappropriate cases might have been included (e.g., all-terrain vehicles) at the initial stages of analysis if a specified key word (such as vehicle) was used for an out of scope case. Also, while heavy trucks and buses were excluded from the analysis, some narratives only report truck or even vehicle. The decision rule for creating the database was to include fatalities that involved a "truck" or "vehicle" with no further details. This decision may have included some vehicles that were not passenger vehicles. A final issue was that some of the nontransport fatalities may be classified as a motor vehicle accident by ANSI (and as a motor vehicle crash by NHTSA) and perhaps should have been considered transport accidents, such as when a tree falls on a vehicle in transport or when a person jumps from a moving vehicle. However, the decision was made to ensure consistency by using the ICD coding rather than attempting to recode cases. In the end, many different search strategies and classifications were attempted in the process of creating this database. Because the different approaches produced only slightly different results, NHTSA believes that the issues mentioned above did not have a major effect on the results.

The third step in the process involved reading the over 3,000 narratives of potential noncrash fatalities, assigning the relevant cases to categories based upon the type of noncrash passenger vehicle fatality, and extracting any additional information from the narratives. In particular, the review asked three questions to determine whether the case was a relevant passenger vehicle noncrash fatality:
- Was a motor vehicle involved in the incident?
- Was the vehicle a passenger vehicle?
- Was the vehicle a factor in the incident?

The first question was needed to eliminate some of the false positives. For example, it was discovered that "CAR" sometimes meant passenger car but was also used as shorthand for cardiac. The second question eliminated cases that were out of scope because the vehicle was not a passenger vehicle, such as a recreational vehicle, a boom truck, or a garbage truck. Finally, the third question required a degree of judgment. Cases where the vehicle was a factor, and thus a noncrash fatality eligible for NiTS, had to involve one of the four following scenarios: the injury occurred inside the vehicle, the injury occurred while a person was exiting or falling from a vehicle, the injury involved a person outside the vehicle who came in contact with the vehicle, or the injury involved a person outside of the vehicle who came in contact with an emission from the vehicle (such as fire, smoke, exhaust, gasoline, battery acid, or radiator fluid).

This third step identified 1,175 passenger vehicle noncrash fatalities in 2003 and 2004. Table 1 below lists the major types of noncrash fatalities identified and contained in the NiTS 2007 Noncrash Fatality Database and the annual average for each type.

Table 1 Annual Average of Noncrash Fatalities by Type

Incident Type	Annual Average (2003 and 2004)
Drowning	3
Fall	88
Struck by Object	44
Struck by Falling Vehicle	168
Vehicle Fire	57
Hypothermia (Excessive Cold)	14
Hyperthermia (Excessive Heat)	37
Radiator Fluid Burns	2
Closed in Trunk	3
Vehicle Window Asphyxia	5
Carbon Monoxide Poisoning From Vehicle Exhaust	147
Poisoning in Vehicle From Other Source	9
Electrocution	4
Exploding Tire	7
Miscellaneous Vehicle Incidents	2
Total	**588**

Source: National Vital Statistics System special mortality file, 2003-2004

5. Structure of the Noncrash Fatality Database

This section describes the structure and the variables included in the noncrash fatality database. Because the data use agreement between CDC and NHTSA prohibited release of any information about individual deaths, the noncrash fatality database contains aggregate information designed to provide information about the number, types, and causes of passenger vehicle noncrash fatalities. The database is provided as a Microsoft Excel workbook. The variables included in the database indicate the type of incident, the external cause of death, the age of the victim, and the location of the incident (relative to the passenger vehicle). The workbook contains four worksheets, one for each variable. The first worksheet provides the annual average fatalities by the type of incident. The second worksheet provides the annual average fatalities by the type of incident and the external cause of death. The third worksheet provides the annual average fatalities by the type of incident and the (categorized) age of the victim. The fourth worksheet provides the annual average fatalities by the type of incident and the location of the incident.

5.1 Type of Incident

As described in the previous section, the type of incident was assigned based upon a review of the narrative information from the death certificate. Almost all of the incidents fit into one of fourteen categories. The remaining cases, which average two deaths per year, were placed in a miscellaneous category. For some types of incidents, a similar situation could also have occurred in a transport accident. These situations include drowning deaths, falls from vehicles, vehicles struck by an object such as a tree, vehicle fires, and carbon monoxide poisoning. However, as described in the previous section, passenger vehicle deaths classified as transport accidents by the ICD coding are by definition motor vehicle accidents. Motor vehicle accidents are either traffic crashes, which are captured in FARS, or are nontraffic crashes, which are

captured in the nontraffic crash database portion of NiTS. The remaining deaths involving passenger vehicles, which were not coded as transport accidents, are included in the noncrash fatality database. The following provides more detail regarding each of the incident types.

Drowning: For the drowning to fit the definition of a passenger vehicle noncrash fatality, the victim had to drown in the vehicle. Therefore, the definition of a passenger vehicle noncrash fatality excludes victim who drowned after they exited the vehicle. Also, NiTS followed the ANSI D.16 convention of excluding deaths that were the result of a cataclysm. Therefore, all of the drowning deaths related to flooding were excluded.

Falls: Noncrash fatalities involving falls occurred in a variety of situations. In some cases the person fell outside of a vehicle and struck a vehicle's exterior such as the bumper. In other cases the person fell from the exterior of the vehicle, usually to the ground, such as from the tailgate of a vehicle or from the hood of the vehicle. Another type of fall occurred while a person was attempting to enter or exit a vehicle, which are also known as boarding and alighting injuries, or otherwise fell out of a vehicle. A less common type of fall occurred when a person fell inside a passenger vehicle. This situation commonly involved wheelchairs inside vans. The definition of a passenger vehicle noncrash fatality excludes victims who fell near or around a vehicle without contacting the vehicle.

Struck by Object: Deaths involving a person struck by an object occurred in two main situations. In one situation, a person was inside a vehicle that was struck by something outside of the vehicle such as a tree, a rock, cargo from another vehicle, or even a part of another vehicle such as a tire. In the other situation, a person outside of a vehicle was struck by either a part of the vehicle such as the door or was struck by cargo that fell from a passenger vehicle such as the back of a pickup truck. A few victims also struck vehicles while boarding or alighting.

Struck by Falling Vehicle: These incidents involved a victim who was pinned or trapped under a vehicle. In many situations the victim was working on the vehicle, and the vehicle fell from a jack, hoist, ramp, or other support.

Vehicle Fire: Many of these incidents involved victims found dead inside burning or burned vehicles. A vehicle fire involving a victim outside of the vehicle often involved a victim who was working on a vehicle and accidently ignited gasoline.

Hyperthermia and Hypothermia: Following the definition of a passenger vehicle noncrash fatality, the victim had to be inside the vehicle. The definition excludes victims who left their vehicle and were then exposed to the elements. While many of these cases involved unattended children, the adult cases often involved individuals who were sleeping in a vehicle or who were intoxicated. Hyperthermia cases involving victims in trunks were classified in the incident type "closed in vehicle trunk."

Closed in Vehicle Trunk: These incidents involved either hyperthermia or asphyxia with the victims being found inside the vehicle trunks.

Radiator Fluid Burns: These incidents either involved repairing vehicles or removing hot radiator caps.

Vehicle Window Asphyxia: All of the cases involved the neck, and about half of the cases indicated power windows.

Carbon Monoxide Poisoning From Vehicle Exhaust: This kind of incident involved a person inside a vehicle that was inside an enclosed space, usually a garage. However, a few cases involved victims inside vehicles that had faulty or blocked exhaust systems where vehicle exhaust entered the vehicles while they were being operated. Victims who were outside of the vehicles were often either working on running vehicles in closed garages or left vehicles running in attached garages that sent vehicle exhaust into the residences. In many cases, it was not possible to determine whether the victims were inside the passenger vehicles because the cases only stated "inhalation of vehicle exhaust" or "inhalation of vehicle exhaust in closed garage" where the victims could either have been inside or outside of the vehicles.

Poisoning in Vehicle From Other Source: Most of these incidents involved victims using charcoal grills or a propane heaters inside passenger vehicles.

Electrocution: These incidents involved victims either inside or outside vehicles that came in contact with power lines and victims outside of vehicles who were working on the vehicles, usually while welding.

Exploding Tire: These incidents either indicated tire explosions or victims struck by tire rims.

Miscellaneous Vehicle Incidents: These were unique incidents that were not covered by one of the other incident categories such as choking on a toy inside a vehicle.

5.2 EXTERNAL CAUSE OF DEATH

The external cause of death, as discussed above, was determined using the External Cause of Injury Matrix. This variable is based upon the ICD-10 codes in the NVSS special mortality file. The categories in the noncrash fatality database include the following:

- Drowning/Submersion
- Fall
- Fire/Hot Object or Substance
- Machinery
- Natural/Environmental
- Poisoning
- Struck by/Against
- Suffocation
- Other Specified
- Unspecified

5.3 AGE OF VICTIM

The age of the victim was provided as part of the NVSS special mortality file. The age of the victim was categorized into the following age groups:
- 3 years old or younger
- 4 to 7 years old
- 8 to 14 years old
- 15 to 24 years old
- 25 to 44 years old
- 45 to 64 years old
- 65 to 74 years old
- 75 to 84 years old
- 85 years old and older

5.4 LOCATION OF INCIDENT

The location of the incident relative to the passenger vehicle was determined based upon the narrative. The location was categorized into five locations: inside the vehicle, outside the vehicle, while entering or exiting through a vehicle (side) door, other entering or exiting of the vehicle, and unknown location. All incidents where the victims were inside passenger vehicles were included. As described above, incidents involving victims outside of a vehicle were included when the victim either had contact with the vehicle or made contact with an emission from the vehicle such as fire, exhaust, gasoline, or radiator fluid. Incidents that occurred while entering or exiting through a vehicle (side) door included boarding and alighting injuries when a person was attempting to either enter or exit a vehicle or when a person jumped or fell out of a vehicle through a side door. Other falls from a vehicle included falls from unenclosed areas such as the bed of a pickup truck and falls from the tailgate or back of vehicle (rear doors).

DOT HS 811 065
December 2008

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