



U.S. Department of Transportation
National Highway Traffic
Safety Administration

***National Automotive Sampling System
Crashworthiness Data System
1993 -1995***

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Executive Summary

During the period 1993 through 1995, an estimated 11.4 million vehicles each year were involved in police-reported traffic crashes. Approximately 93 percent of these were automobiles, pickup trucks, vans, and sport/utility vehicles, collectively referred to as *passenger vehicles*. Pickup trucks, vans, and utility vehicles are collectively referred to as *light trucks*. Most of these vehicles were not seriously damaged: only 26 percent of them were towed from the crash scene due to damage sustained in the crash. Approximately 47,000 passenger vehicles were involved in fatal crashes each year.

This report focuses attention on occupants of those passenger vehicles that were towed from the crash scene. NHTSA's National Automotive Sampling System (NASS)/Crashworthiness Data System (CDS) collects detailed information on towed passenger vehicle crashes, employing trained, professional crash investigation teams. The in-depth data collection, scientific protocols, and professionalism of those involved make the NASS/CDS database a valuable resource to many in the traffic safety community.

NASS data are used by government, industry, and the private sector to conduct research, identify injury patterns and mechanisms, provide a basis for regulatory decisionmaking, and provide a means of evaluating the association between occupant injury and various crash-related characteristics.

Some highlights of the report include:

- ! Passenger cars comprise the largest segment (about 73 percent) of the passenger vehicles found in the NASS/CDS, and hence, in police-reported towaway crashes. In the report, cars are treated separately from the remaining vehicles, which have been grouped together as light trucks.
- ! Occupancy patterns for towed crash-involved cars and light trucks were very similar: about two-thirds (about 66 percent) of the time, the only occupant of a towed crash-involved car or light truck was the driver. A front-seat passenger was present in the car about 21.0 percent of the time, with passengers in the second and further seats about 13.5 percent of the time. For occupants of light trucks, front-seat passengers were present 18.0 percent of the time, with passengers in the second and further seats about 16.4 percent of the time.
- ! One of the health-care consequences of motor vehicle crashes is the burden on emergency and health services. About 230,000 occupants of passenger vehicles were hospitalized each year as a result of police-reported traffic crashes. Another 1,200,000 occupants were transported to a medical facility and released, and 296,000 occupants were treated at the scene of the crash.
- ! Contact with the steering assembly accounted for about 10 percent of the minor injuries (AIS 1-2) but about 15 percent of the serious-maximum (AIS 3+) injuries. A similar pattern was observed for contact with the interior side surface, comprising 8 percent of the minor injuries and 18 percent of serious and greater injuries.

Executive Summary

- ! Approximately 172,000 injuries to occupants resulted from contacting an air bag. Around 97 percent were minor injuries, and about 3 percent were serious injuries.
- ! About 5 percent of the towed cars in crashes rolled over, compared with 14 percent of the towed light trucks.
- ! Eight percent of car occupants in rollover crashes were ejected; the remaining crash types exhibited ejection rates in the range of 0.2 to 1.3 percent.
- ! The restraint use rate for all occupants of passenger vehicles was about 76 percent.
- ! The alcohol involvement rate for drivers of passenger cars in traffic crashes is highest for the age group 25-34 years. In comparison, for drivers of light trucks, the alcohol involvement rate is highest for drivers 35-44 years old.
- ! The alcohol involvement rate for all drivers of light trucks in traffic crashes is almost twice that for drivers of passenger cars.

1. Introduction

Background

The National Automotive Sampling System (NASS)—formerly, the National Accident Sampling System—is the mechanism through which the National Highway Traffic Safety Administration (NHTSA) collects nationally representative data on motor vehicle traffic crashes to aid in the development, implementation, and evaluation of motor vehicle and highway safety countermeasures. The NASS was originally designed and implemented in 1979 to support highway and motor vehicle safety programs. The NASS program was reevaluated in the mid-1980s. The evaluation team concluded that the program should be redesigned to focus on enhanced in-depth analyses of passenger vehicle crash protection performance. This reevaluation resulted in changes that were implemented by NHTSA's National Center for Statistics and Analysis (NCSA) in January 1988.

To enhance its applicability in addressing crashworthiness issues, the NASS was divided into two parts: (1) the General Estimates System (GES), which collects data on an annual sample of approximately 55,000 police-reported traffic crashes; and (2) the Crashworthiness Data System (CDS), which collects additional detailed information on an annual sample of approximately 5,000 police-reported traffic crashes involving passenger vehicles towed from the crash scene due to damage resulting from the crash. In this report, the term *passenger vehicles* is used to refer to all cars, pickup trucks, vans, and sport/utility vehicles with a gross vehicle weight rating (GVWR) of 10,000 pounds or less. The term *light trucks* is used to refer to pickup trucks, vans, and sport/utility vehicles.

Unlike the CDS, the GES does not investigate crashes. Its only source of information is the police crash report. It does provide the data needed for assessments of the state of and trends in motor vehicle and traffic safety. An annual report is published each year that describes the data availability from the NASS/GES and the Fatality Analysis Reporting System (FARS). The FARS is a census of all fatal crashes that occur in the United States and Puerto Rico.

Objective

The objective of this report is to illustrate the availability, resolution, and applicability of crash, vehicle, occupant, and casualty attributes for the characterization of vehicle crash protection performance on U.S. roads during the years 1993 through 1995, based on the NASS/CDS records for those years.

Vehicles Under Consideration

This report addresses towed passenger cars, pickup trucks, vans, and sport/utility vehicles under 10,000 pounds GVWR. Sport/utility vehicles include jeeps, truck-based station wagons, utility vehicles, and other van- or truck-based motor vehicles under 10,000 pounds GVWR that are not cars, pickups, or vans. Motorcycles, bicycles, horse-drawn carriages, etc., are not included.

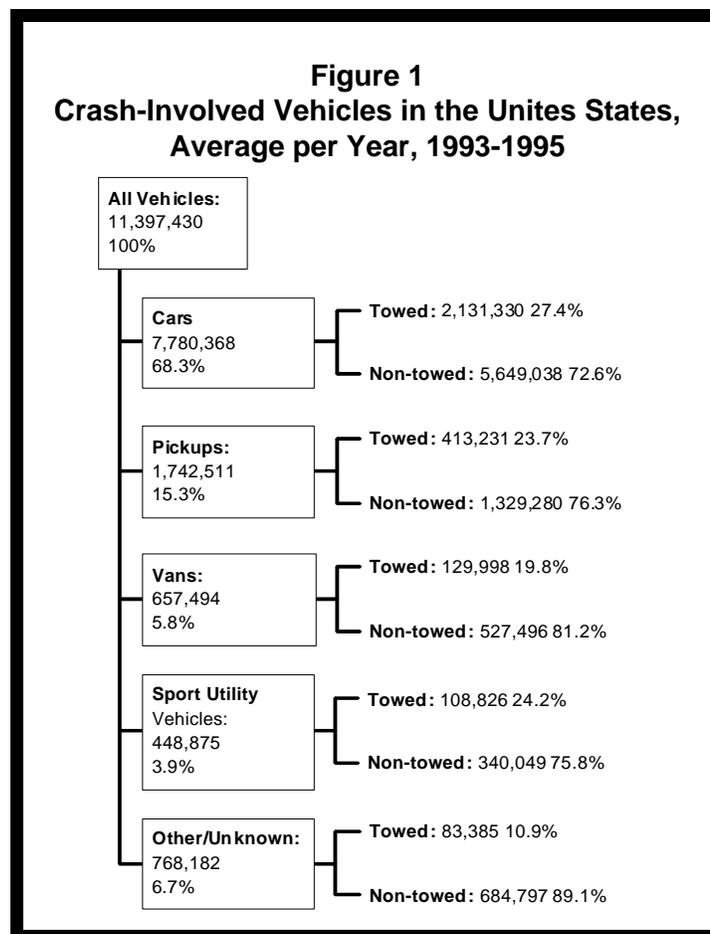
CDS Estimates

Unless otherwise noted, all the CDS statistics presented in this report are estimates—not exact counts—generated from a sample of crashes that occurred in the 3-year period from 1993 through 1995. Descriptions of the CDS sample design and the procedure used to obtain the data shown in the tables are contained in Appendix B. Since the CDS is a probability sample, the sampling error of every CDS statistic can be estimated. Approximate sampling errors for the weighted average counts over the 1993-1995 period are provided in Appendix G.

2. Perspective

A perspective on crash-involved vehicles is illustrated in Figure 1, which shows annual incidence averaged over the years 1993-1995.

The number of all vehicle body types involved in police-reported crashes each year in the United States is about 11,400,000; about 93.0 percent of these are passenger cars, pickups, vans, and sport/utility vehicles. In this report, pickups, vans, and sport/utility vehicles are collectively referred to as "light trucks." Each of these body types is subdivided into towed and non-towed vehicles.



Note: For those vehicles where tow status is unknown it is assumed that the vehicles were not towed. While all vehicles are addressed by NASS/GES, only towed passenger vehicles are addressed by NASS/CDS.

Source: NASS/CDS and NASS/GES, 1993-1995.

Perspective

The towed vehicles shown in Figure 1 are investigated in the NASS/CDS, because of interest in the crashworthiness of vehicles involved in the more severe crashes. These are the subject of the following analyses and illustrations, with emphasis on cars. During the period 1993-1995, the average number of registered passenger vehicles per year, as reported by R.L. Polk & Co., was 181,624,854, of which 122,097,953 (67.2 percent) were passenger cars and 59,526,901 (32.8 percent) were light trucks.

3. Vehicle Crash Data

Car Size

About 2,351,000 cars are towed away from the scene of traffic crashes every year. Table 1 shows the distribution of these cars by weight class. Passenger cars made up about 77 percent of all NASS/CDS towed vehicles; the remaining 23 percent were light trucks (see Table 5).

Weight Class	Total Sample	Annual Average	
		Percent	Count
Small (<2,500 lbs)	5,032	35.1	824,647
Mid-Size (2,500-3,000 lbs)	4,388	32.4	761,361
Large (>3,000 lbs)	4,734	31.0	728,035
Unknown Size	281	1.6	37,292
Total	14,435	100.0	2,351,335

Examples of Weight Class:

- Small—Ford Tempo, Mercury Tracer, Saturn, Nissan Sentra, Honda Civic
- Mid-size—Plymouth Sundance, Ford Probe, Honda Prelude, Toyota Celica
- Large—Ford Taurus, Dodge Dynasty, BMW 3 series, Pontiac Grand Prix

Car Crash Modes and Areas of Damage

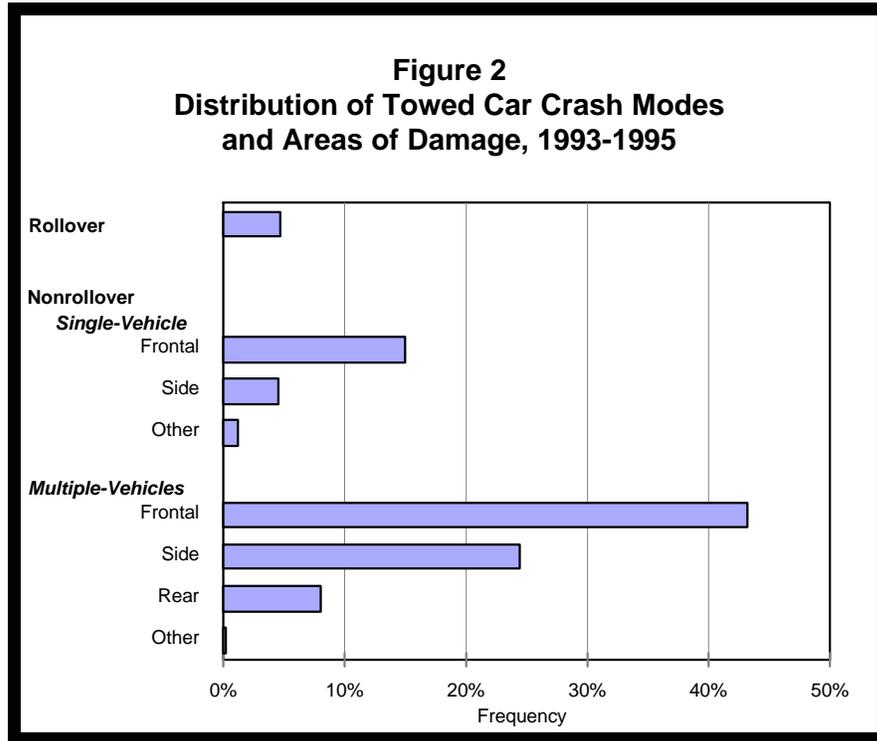
Table 2 and Figure 2 show the distribution of towed cars among the primary crash modes and areas of damage. Frontal damage in nonrollover car crashes is the most frequent crash type, accounting for about 58 percent of all towed car crashes. Side damage and all other nonrollover crash types account for 29 percent and 9 percent, respectively. Rollover car crashes account for the remaining 4 percent.

These crash frequencies do not reflect the distribution of harmful outcomes to the car occupants. Certain crash types are associated with higher proportions of injury. For example, although rollover occurs in about 4 percent of towed car crashes, it is responsible for about 12 percent of the harm-weighted injuries to car occupants in towed crashes. On the other hand, car crashes with rear damage account for about 9 percent of the cases but are responsible for about 5 percent of the harm-weighted injuries to occupants (see Table 25).

Vehicle Crash Data

Table 2			
Distribution of Towed Car Crash Modes and Areas of Damage, 1993-1995			
Crash Mode and Area of Damage	Total Sample	Annual Average	
		Percent	Count
Rollover			
1-3 Quarter Turns	631	2.8	66,217
4+ Quarter Turns	435	1.6	37,594
End Over End	46	0.1	2,975
<i>Total Rollover</i>	<i>1112</i>	<i>4.5</i>	<i>106,786</i>
Nonrollover			
Single-Vehicle			
Frontal Damage	2,078	14.8	349,124
Side Damage	574	4.3	101,910
Rear, Top, or Under Damage	81	1.0	20,716
Total Single-Vehicle	2,733	20.1	471,750
Multiple-Vehicle			
Frontal Damage	6,106	43.1	1,014,544
Side Damage	3,503	24.3	571,762
Rear Damage	963	7.9	184,648
Top or Under Damage	17	0.1	1,845
Total Multiple-Vehicle	10,589	75.4	1,772,799
<i>Total Nonrollover</i>	<i>13,322</i>	<i>95.5</i>	<i>2,244,549</i>
Total Towed Car Crashes	14,435	100.0	2,351,335

Note: Damage Area "Unknown" has been imputed into the known damage areas.



Note: The "Other" category for single-vehicle crashes includes rear, top, and under damage. For multiple-vehicle crashes, "Other" includes top and under damage.

Source: NASS/CDS, 1993-1995.

Vehicle Crash Data

Car Crash Severity

Crash severity (delta-v in miles per hour) for cars varies generally in the range from 1 to 50 mph. Table 3 shows the distribution of towed cars by severity and area of damage. No crash severity, in terms of delta-v, can be defined for rollover crashes. Figure 3 illustrates the primary aspects of this distribution.

Crash frequency rises sharply to a peak located between 11 and 20 mph, as shown in Figure 3. This frequency drops sharply following the peak; cumulative frequency beyond 40 mph is about 0.2 percent. The same general pattern holds for all areas of damage in nonrollover crashes: front, side, and rear.

Great caution is recommended in the use and interpretation of crash severity data, for two reasons: (a) the large number of unknowns; and (b) the sharp reduction in the number of available cases as crash severity increases. For "Unknown" area of damage in Table 3, crash severity was calculated using the missing vehicle reconstruction algorithm (see Appendix E, "CRASHPC and OLDMISSPC Summary"). Area of damage "other" includes top and undercarriage, which are outside the scope of the reconstruction algorithm.

Table 3
Distribution of Towed Cars by Crash Severity (delta-v) and Area of Damage:
Average per Year, 1993-1995

Area of Damage	Crash Frequency by Crash Severity*						Total
	1-10 mph	11-20 mph	21-30 mph	31-40 mph	>40 mph	Unknown	
Front	187,068 33.8%	318,708 57.5%	42,095 7.6%	4,964 0.9%	1,175 0.2%	397,404 41.8%	951,414 40.5%
Side	116,670 48.2%	111,404 46.0%	12,830 5.3%	1,206 0.5%	118 0.1%	238,763 49.6%	480,990 20.5%
Rear	16,702 18.0%	61,653 66.3%	12,858 13.8%	1,383 1.5%	352 0.4%	45,184 32.7%	138,132 5.9%
Other	NA --	NA --	NA --	NA --	NA --	63,398 100.0%	63,398 2.7%
Unknown	1,428 38.3%	2,182 58.5%	117 3.1%	0 0.0%	0 0.0%	713,673 99.5%	717,401 30.5%
Total	321,867 36.0%	493,947 55.3%	67,899 7.6%	7,553 0.8%	1,645 0.2%	1,458,422 62.0%	2,351,335 100.0%

*For each area of damage and known crash severity, the first data row shows the number of vehicles, and the second row shows the percentage of the total number of vehicles for which crash severities were known. For the "Unknown" column, the second data row shows the percentage of the total for each area of damage. For the "Total" column, the second data row shows the percentage of the grand total. NA = not available.

Vehicle Crash Data

Seating Position of Car Occupants

Every year, approximately 3.6 million people are involved in crashes as occupants of towed cars. Table 4 shows the distribution of occupant seating positions for towed cars from 1993 through 1995.

The distribution pattern—about 65 percent drivers, 21 percent right front passengers, and 12 percent all other—is roughly the same as for all cars regardless of crash involvement.

Car Occupants	Total Sample	Annual Average	
		Percent	Count
Drivers	14,392	65.4	2,340,829
Right Front Passengers	5,179	21.1	754,599
Second Seat Passengers	3,349	12.1	433,661
Other Passengers	348	1.4	50,596
Total	23,268	100.0	3,579,685

Functional Class and Size of Light Trucks

About 700,000 light trucks (pickup trucks, vans, and sport/utility vehicles) under 10,000 pounds gross vehicle weight rating are towed away from the scene of traffic crashes every year. Table 5 shows the distribution of these vehicles by functional class and size. The annual average for these vehicles is 23 percent of all NASS/CDS towed vehicles. The remaining 77 percent are cars.

Table 5			
Distribution of Towed Light Trucks by Vehicle Class and Size, 1993-1995			
Vehicle Category and Size	Total Sample	Annual Average	
		Percent	Count
Compact Pickup	1,272	28.9	202,515
Standard Pickup	1,228	24.7	172,783
Unknown Size Pickup	45	0.8	5,524
Minivan	635	12.3	86,355
Standard Van	408	9.1	63,601
Unknown Size Van	46	0.6	4,231
Compact Utility Vehicle	902	19.4	136,211
Standard Utility Vehicle	243	3.9	27,599
Unknown Size Utility Vehicle	11	0.2	1568
Total	4,790	100.0	700,387

Vehicle Crash Data

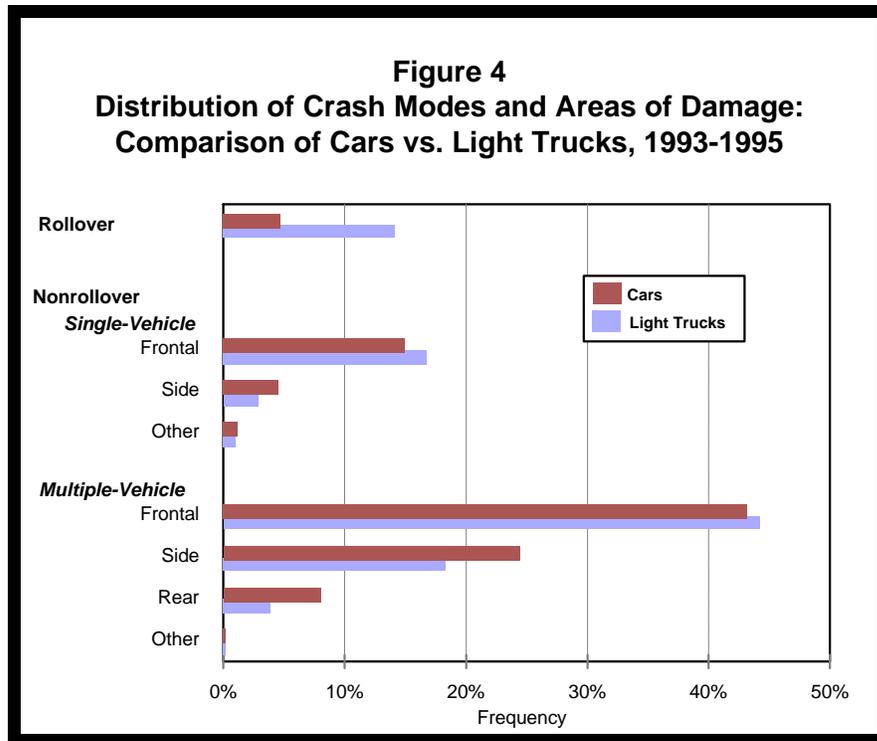
Light Truck Crash Modes and Areas of Damage

Crash mode and area of damage distributions for towed light trucks involved in crashes are generally similar to those for towed cars, except for rollover crashes. The proportion of rollovers for light trucks is 3 times that for passenger cars. Table 6 shows the distribution of towed light trucks among the primary crash modes and areas of damage.

Crash Mode and Area of Damage	Total Sample	Annual Average	
		Percent	Count
Rollover			
1-3 Quarter Turns	537	8.5	59,695
4+ Quarter Turns	418	5.4	37,808
End Over End	23	0.1	782
<i>Total Rollover</i>	<i>978</i>	<i>14.0</i>	<i>98,285</i>
Nonrollover			
Single-Vehicle			
Frontal Damage	639	16.7	116,716
Side Damage	116	2.6	18,307
Rear, Top, or Under Damage	22	0.9	6,039
Total Single-Vehicle	777	20.1	141,062
Multiple-Vehicle			
Frontal Damage	2,203	44.0	308,035
Side Damage	641	18.1	126,917
Rear Damage	188	3.7	26,045
Top or Under Damage	3	0.0	43
Total Multiple-Vehicle	3,035	65.8	461,040
<i>Total Nonrollover</i>	<i>3,812</i>	<i>86.0</i>	<i>602,102</i>
Total Crashes	4,790	100.0	700,387

Figure 4 shows the distribution of crash modes and areas of damage for towed light trucks, compared with the distribution for towed cars for the years 1993 through 1995.

Most of the observations for car crash frequencies and injury as a function of crash mode and area of damage are also valid for these vehicles. Rollover is the major exception: rollover crashes for light trucks are both more frequent than car rollover crashes (14 percent and 5 percent, respectively) and result in a greater proportion of harmful outcomes to the vehicle occupants (39 percent and 14 percent, respectively). The proportion of harm-weighted injuries (39 percent) associated with rollover crashes is the average for three vehicle classes—pickups, vans, and sport/utility vehicles (see Table 26). For these three classes the proportion of harmful outcomes varies significantly: approximately 39 percent for pickups, 28 percent for vans, and 49 percent for sport/utility vehicles.



Note: The "Other" category for single-vehicle crashes includes rear, top, and under damage. For multiple-vehicle crashes, "Other" includes top and under damage.

Vehicle Crash Data

Light Truck Crash Severity

Table 7 shows the distribution of towed light truck crashes by crash severity (delta-v in miles per hour) and area of damage. Most of the observations made for towed car crash frequencies and injuries to occupants as a function of crash severity are also valid for these vehicles; the same general patterns are observed. For example, for frontal impact, the injury proportions (not shown) in the five crash severity intervals used in Table 7 are 6 percent, 33 percent, 32 percent, 18 percent, and 10 percent for frontal impacts, and the corresponding crash proportions are 31 percent, 59 percent, 9 percent, 2 percent, and about 0 percent.

A large majority of the injuries to occupants in towed light truck crashes occur at crash severities under 40 mph. For example, in frontal impacts 90 percent of the injuries occur at severities under 40 mph. The cumulative injury proportion under 40 mph is 100 percent for both side and rear impacts.

The comment made in connection with car crash severities is even more important for these vehicles: great caution is recommended in the use and interpretation of crash severity data, for two reasons: (a) the large number of unknowns; and (b) the sharp reduction of the number of available cases as crash severity increases. For "Unknown" area of damage in Table 7, crash severity was calculated using the missing vehicle reconstruction algorithm.

Table 7 Distribution of Towed Light Trucks by Crash Severity (delta-v) and Area of Damage: Average per Year, 1993-1995							
Area of Damage	Crash Frequency by Crash Severity*						Total
	1-10 mph	11-20 mph	21-30 mph	31-40 mph	>40 mph	Unknown	
Front	42,419 30.7%	81,303 58.8%	11,734 8.5%	2,461 1.8%	453 0.3%	127,295 47.9%	265,664 37.9%
Side	29,886 62.1%	16,056 33.4%	2,124 4.4%	64 0.1%	0 0.0%	58,350 54.8%	106,480 15.2%
Rear	3,858 44.1%	4,749 54.2%	106 1.2%	44 0.5%	0 0.0%	8,033 47.9%	16,790 2.4%
Other	NA --	NA --	NA --	NA --	NA --	34,178 100.0%	34,178 4.9%
Unknown	0 0.0%	155 94.2%	10 5.9%	0 %	0 0.0%	277,110 99.9%	277,275 39.6%
Total	76,162 39.0%	102,263 52.3%	13,973 7.2%	2,569 1.3%	453 0.2%	504,967 72.1%	700,387 100.0%

*For each area of damage and known crash severity, the first data row shows the number of vehicles, and the second row shows the percentage of the total number of vehicles for which crash severities were known. For the "Unknown" column, the second data row shows the percentage of the total for each area of damage. For the "Total" column, the second data row shows the percentage of the grand total. NA = not available.

Seating Position of Light Truck Occupants

Approximately 1,064,000 people are involved in crashes as occupants of towed light trucks every year. Table 8 shows the distribution of occupant seating positions for these vehicles from 1993 through 1995.

The distribution pattern—about 66 percent drivers, 18 percent right front passengers, and 16 percent all other—is roughly the same as for all light trucks regardless of crash involvement. It is also similar to the corresponding distribution for towed car crashes (Table 4).

Table 8			
Occupant Seating Positions in Towed Light Trucks, 1993-1995			
Vehicle Occupants	Total Sample	Annual Average	
		Percent	Count
Drivers	4,774	65.6	697,432
Right Front Passengers	1,608	18.0	191,661
Second Seat Passengers	720	7.0	74,980
Other Passengers	630	9.4	99,644
Total	7,732	100.0	1,063,717

4. Occupant Injury Data

Crash-Involved Occupants by Injury Severity

Approximately 3,580,000 occupants are involved in towed car crashes every year. About 51 percent of them are uninjured, and 49 percent are injured at various severity levels. Similarly, about 1,064,000 occupants are involved in towed light truck crashes per year, with about 57 percent uninjured and 43 percent injured.

Given that each injured occupant usually has more than one injury, the severity of the occupant's most harmful injury is used to characterize the seriousness of the injuries resulting from the crash. The Abbreviated Injury Scale (AIS) is used to compare injury severities, as follows:

AIS	Severity of Injury
-----	--------------------

- 0 Not injured
- 1 Minor
- 2 Moderate
- 3 Serious
- 4 Severe
- 5 Critical
- 6 Maximum
- 7 Injured, Severity Unknown

The AIS scale reflects primarily the threat to life: approximately 99 percent for AIS=6; about 58 percent for AIS=5; about 33 percent for AIS=4; declining rapidly to 0 percent for AIS=1. However, the scale is also used to reflect the gravity of consequences for survivors.

The distribution of injury severities for injured crash-involved occupants is shown in Table 9 for cars and in Table 10 for light trucks. The two distributions are compared in Figure 5, where it is evident that there are no major differences at any given level of injury severity.

Occupants coded as "unknown if injured" have been excluded from the detail in Tables 9 through 14, but have been included in the "Total" rows to reflect the total number of occupants involved in towed passenger vehicle crashes.

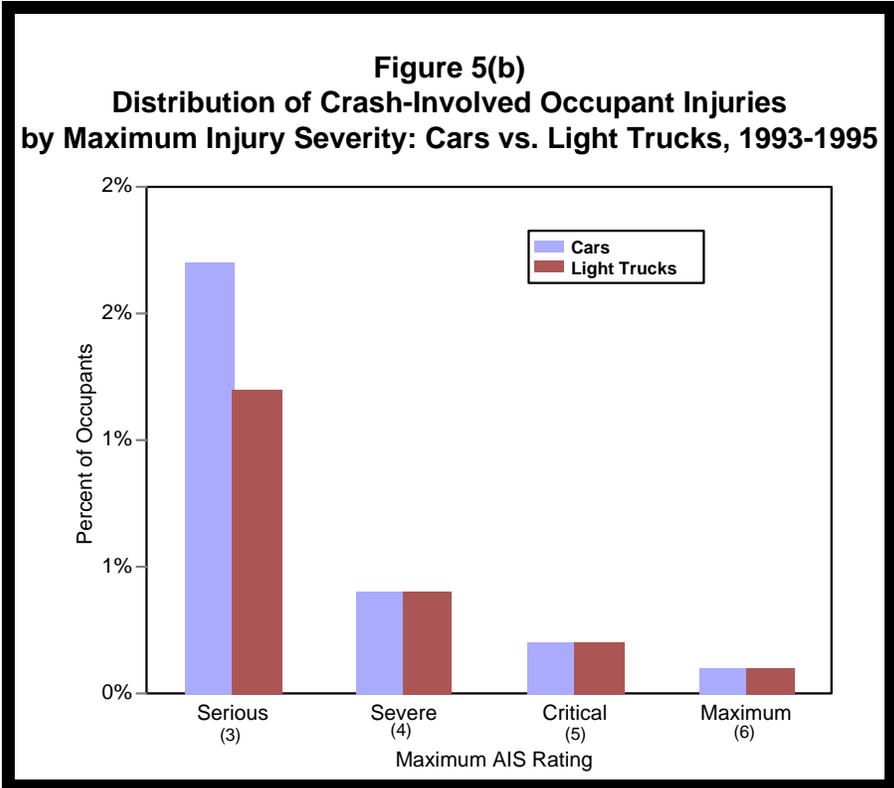
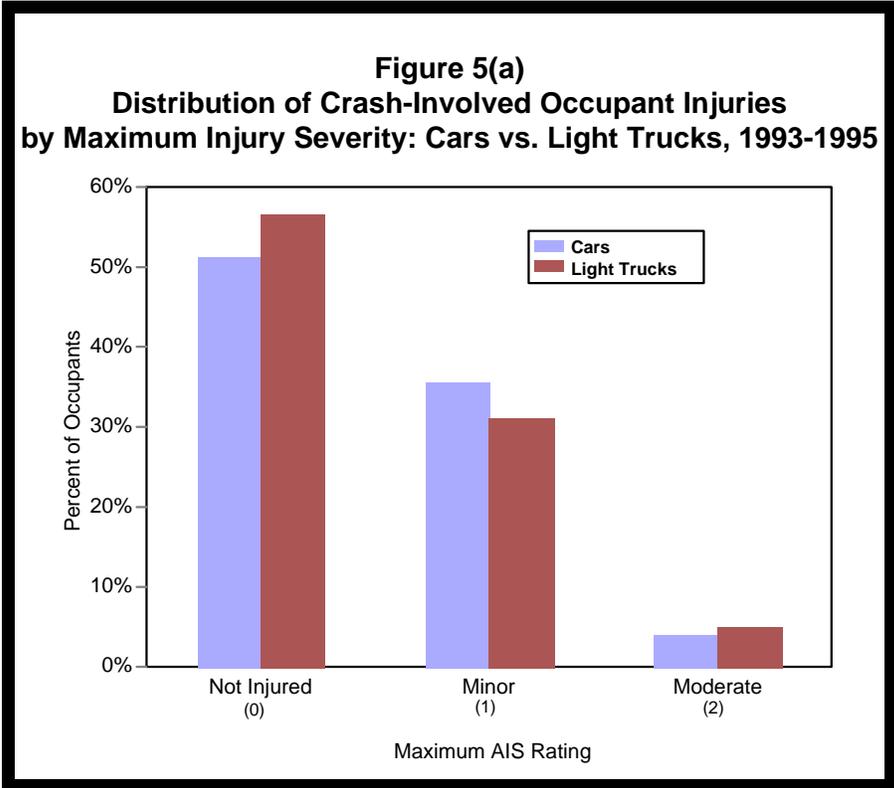
Occupant Injury Data

Table 9
Distribution of Crash-Involved
Car Occupants by Maximum Injury Severity:
Average per Year, 1993-1995

Maximum AIS Rating	Count	Percent
Not Injured (0)	1,833,404	51.2
Minor (1)	1,269,168	35.5
Moderate (2)	142,915	4.0
Serious (3)	62,230	1.7
Severe (4)	13,393	0.4
Critical (5)	8,479	0.2
Maximum (6)	2,712	0.1
<i>Total, Known Severity</i>	<i>3,332,301</i>	<i>93.1</i>
Injured, Severity Unknown (7)	208,012	5.8
Total	3,579,685	100.0

Table 10
Distribution of Crash-Involved
Light Truck Occupants by Maximum Injury Severity:
Average per Year, 1993-1995

Maximum AIS Rating	Count	Percent
Not Injured (0)	600,859	56.5
Minor (1)	330,668	31.1
Moderate (2)	53,268	5.0
Serious (3)	13,092	1.2
Severe (4)	4,343	0.4
Critical (5)	2,546	0.2
Maximum (6)	981	0.1
<i>Total, Known Severity</i>	<i>1,005,757</i>	<i>94.5</i>
Injured, Severity Unknown (7)	50,410	4.7
Total	1,063,717	100.0



Occupant Injury Data

Use of Restraints

The annual distribution of injuries to crash-involved car occupants by maximum injury severity and restraint use is shown in Table 11. A similar joint distribution is shown in Table 12 for crash-involved light truck occupants.

Table 11
Distribution of Crash-Involved Car Occupants by Restraint Use
and Maximum Injury Severity: Average per Year, 1993-1995

Restraint Use	Frequency of Injury by Maximum AIS Rating*								Injured, Severity Unknown (7)	Total
	Not Injured (0)	Minor (1)	Moderate (2)	Serious (3)	Severe (4)	Critical (5)	Maximum (6)			
None	252,540 16.6%	338,188 28.1%	63,494 47.0%	27,990 48.4%	5,689 45.1%	4,665 58.2%	1,451 63.9%	27,704 25.7%	729,092 23.8%	
Automatic Belt	316,811 20.8%	209,333 17.4%	23,908 17.7%	12,120 21.0%	1,917	1,160 14.5%	319 14.1%	16,874 15.4%	582,929 19.0%	
Manual Belt	894,254 58.8%	648,004 53.8%	47,670 35.3%	17,644 30.5%	4,886 38.7%	2,167 27.0%	486 21.4%	64,776 59.0%	1,687,069 55.0%	
Belt With Child Seat	57,997 3.1%	8,141 0.7%	166 0.1%	27 0.1%	122 1.0%	26 0.3%	14 0.6%	518 0.5%	67,012 2.2%	
<i>Total, Restrained</i>	<i>1,269,062</i> <i>83.4%</i>	<i>865,478</i> <i>71.9%</i>	<i>71,744</i> <i>53.1%</i>	<i>29,792</i> <i>51.6%</i>	<i>6,925</i> <i>54.9%</i>	<i>3,354</i> <i>41.8%</i>	<i>819</i> <i>36.1%</i>	<i>82,169</i> <i>74.8%</i>	<i>2,337,010</i> <i>76.2%</i>	
Total Known	1,521,602 83.0%	1,203,667 94.8%	135,238 94.6%	57,782 92.9%	12,614 94.2%	8,018 94.6%	2,270 83.7%	109,873 52.8%	3,066,102 85.7%	
Unknown	311,802 17.0%	65,501 5.2%	7,677 5.4%	4,448 7.1%	779 5.8%	460 5.4%	442 16.3%	98,139 47.2%	513,583 14.4%	
Total	1,833,404 51.2%	1,269,168 35.5%	142,915 4.0%	62,230 1.7%	13,393 0.4%	8,479 0.2%	2,712 0.1%	208,012 5.8%	3,579,685 100.0%	

*For each known belt use category, the first data row shows the number of injuries and the second row shows the percentage of the "Total Known." For the "Total Known" and "Unknown" belt use categories, the first row shows the number of injuries and the second row shows the percentage of the column total. For the column totals, the first row shows the number of injuries and the second row shows the percentage of the total number of injuries. The row totals include the number of "unknown if injured".

Occupant Injury Data

Overall, restraint use is approximately 76 percent for passenger car occupants and 69 percent for occupants of light trucks. These belt use rates are in agreement with the belt use rates obtained by individual state surveys reported to NHTSA each year. Not all states report belt usage rates each year. Therefore, to calculate the national safety belt use rate from the individual state use rates, each state's most recent rate is weighted by the state's proportion of the total U.S. population. Average state belt use rates were reported as 66 percent in 1993, 67 percent in 1994, and 68 percent in 1995.

Table 12
Distribution of Crash-Involved Light Truck Occupants by Restraint Use
and Maximum Injury Severity: Average per Year, 1993-1995

Restraint Use	Frequency of Injury by Maximum AIS Rating*								Total
	Not Injured (0)	Minor (1)	Moderate (2)	Serious (3)	Severe (4)	Critical (5)	Maximum (6)	Injured, Severity Unknown (7)	
None	114,522 22.9%	114,705 36.2%	22,855 44.7%	8,073 65.7%	3,358 84.0%	2,117 85.9%	360 63.3%	12,319 40.7%	283,217 30.7%
Automatic Belt	2,480 0.5%	1,148 0.4%	104 0.2%	10 0.1%	0 --	0 --	0 --	0 --	3,742 0.4%
Manual Belt	373,292 74.7%	199,590 63.1%	28,118 55.0%	4,166 33.9%	642 16.0%	346 14.1%	209 36.7%	17,820 58.9%	624,577 67.7%
Belt With Child Seat	9,786 2.0%	1,107 0.4%	69 0.1%	32 0.3%	0 --	0 --	0 --	112 0.4%	11,106 1.2%
<i>Total, Restrained</i>	<i>385,558</i> <i>77.1%</i>	<i>201,846</i> <i>63.4%</i>	<i>28,290</i> <i>55.3%</i>	<i>4,208</i> <i>34.3%</i>	<i>642</i> <i>16.1%</i>	<i>346</i> <i>14.0%</i>	<i>209</i> <i>36.7%</i>	<i>17,931</i> <i>59.3%</i>	<i>639,425</i> <i>69.3%</i>
Total Known	500,080 83.2%	316,551 95.7%	51,145 96.0%	12,281 93.8%	4,000 92.1%	2,464 96.8%	569 58.0%	30,250 60.0%	922,642 86.7%
Unknown	100,778 16.8%	14,117 4.3%	2,123 4.0%	811 6.2%	343 7.9%	82 3.2%	412 42.0%	20,161 40.0%	141,075 13.3%
Total	600,859 56.5%	330,668 31.1%	53,268 5.0%	13,092 1.2%	4,343 0.4%	2,546 0.2%	981 0.1%	50,411 4.7%	1,063,717 100.0%

*For each known belt use category, the first data row shows the number of injuries and the second row shows the percentage of the "Total Known." For the "Total Known" and "Unknown" belt use categories, the first row shows the number of injuries and the second row shows the percentage of the column total. For the column totals, the first row shows the number of injuries and the second row shows the percentage of the total number of injuries. The row totals include the number of unknown injuries.

Injury Severity and Outcome

As discussed above (see Table 9), not all crash deaths are associated with untreatable injuries (AIS=6). Rather, the probability of death increases sharply with injury severity, and many fatalities occur as a result of one or more injuries that are generally considered survivable. Crash injury outcomes—fatality, hospitalization, needed emergency medical care, first aid treatment, and no treatment needed—are generally a function of the severity of an occupant's most severe injury, plus other factors, such as the number, severity, and type of additional injuries; the person's age and overall health; extrication time; etc.

The primary determinant of an outcome is the maximum injury severity. Table 13 shows the distribution of injuries to crash-involved car occupants according to the AIS values of maximum injury severity and the pertinent outcomes of maximum injury severities. This table also includes the number of days an occupant was hospitalized for injuries sustained in the crash as a result of the crash. An occupant may be hospitalized for observation or due to a pre-existing medical condition, as directed by the attending physician, without having received any injuries in the crash. Fatal injuries with AIS=1 are the result of incomplete medical information by which to code the data. A similar distribution is shown in Table 14 for crash-involved light truck occupants.

Occupant Injury Data

Table 13
Distribution of Crash-Involved Car Occupants by Treatment
and Maximum Injury Severity: Average per Year, 1993-1995

Treatment	Frequency of Injury by Maximum AIS Rating*								Injured, Severity Unknown (7)	Total
	Not Injured (0)	Minor (1)	Moderate (2)	Serious (3)	Severe (4)	Critical (5)	Maximum (6)			
None	1,753,110 85.1%	268,663 13.0%	937 0.0%	0 --	0 --	0 --	0 --	28,453 1.4%	2,060,109 57.6%	
Treated at Scene	16,348 7.1%	182,031 79.2%	7,855 3.4%	486 0.2%	0 --	0 --	0 --	22,489 9.8%	229,757 6.4%	
Transported and Released	57,779 6.0%	755,708 79.0%	75,012 7.8%	11,636 1.2%	97 0.0%	16 0.0%	0 --	54,844 5.7%	956,090 26.7%	
Hospitalized 1-2 Days	2,879 3.1%	39,285 42.0%	28,609 30.6%	15,774 16.8%	1,589 1.7%	470 0.5%	0 --	5,022 5.4%	93,628 2.6%	
3-7 Days	320 0.6%	9,993 17.8%	23,586 42.0%	18,445 32.8%	2,771 4.9%	671 1.2%	0 --	376 0.7%	56,163 1.6%	
8-14 Days	43 0.2%	274 1.6%	3,644 21.0%	10,199 58.9%	1,813 10.5%	991 5.7%	0 --	360 2.1%	17,325 0.5%	
15-30 Days	0 --	615 9.9%	917 14.7%	2,501 40.2%	910 14.6%	1,246 20.0%	0 --	34 0.5%	6,224 0.2%	
>30 Days	0 --	33 1.0%	271 7.7%	1,264 35.9%	1,522 43.2%	378 10.8%	27 0.8%	23 0.6%	3,518 0.1%	
Fatal	0 --	1,239 6.4%	1,846 9.5%	1,892 9.8%	4,690 24.2%	4,693 24.2%	2,685 13.8%	2,189 11.4%	19,234 0.5%	
Unknown	2,926 2.1%	11,325 8.2%	238 0.2%	34 0.0%	0 --	12 0	0 --	94,223 68.5%	137,636 3.8%	
Total	1,833,404 51.2%	1,269,168 35.5%	142,915 4.0%	62,230 1.7%	13,393 0.4%	8,479 0.2%	2,712 0.1%	208,012 5.8%	3,579,685 100.0%	

*For each treatment category, the first data row shows the number of injuries and the second row shows the percentage of the row total.

Table 14
Distribution of Crash-Involved Light Truck Occupants by Treatment
and Maximum Injury Severity: Average per Year, 1993-1995

Treatment	Frequency of Injury by Maximum AIS Rating*								Injured, Severity Unknown (7)	Total
	Not Injured (0)	Minor (1)	Moderate (2)	Serious (3)	Severe (4)	Critical (5)	Maximum (6)			
None	575,362 86.8%	74,232 11.2%	159 0.0%	0 --	0 --	0 --	0 --	12,204 1.8%	662,555 62.3%	
Treated at Scene	14,647 22.0%	44,565 67.1%	3,061 4.6%	166 0.3%	0 --	0 --	0 --	3,920 5.9%	66,433 6.2%	
Transported and Released	8,696 3.6%	197,499 81.2%	26,913 11.1%	1,341 0.6%	0 --	0 --	0 --	8,757 3.6%	243,231 22.9%	
Hospitalized 1-2 Days	201 0.7%	11,149 39.3%	10,969 38.7%	3,317 11.7%	526 1.9%	214 0.8%	0 --	1,924 6.8%	28,348 2.7%	
3-7 Days	42 0.3%	1,917 11.6%	8,919 54.1%	4,149 25.2%	1,324 8.0%	78 0.5%	0 --	58 0.4%	16,487 1.5%	
8-14 Days	0 --	121 2.9%	1,233 29.3%	2,142 50.9%	551 13.1%	154 3.7%	0 --	4 0.1%	4,205 0.4%	
15-30 Days	0 --	34 1.0%	1,571 45.8%	1,347 39.3%	313 9.1%	128 3.7%	0 --	35 1.0%	3,428 0.3%	
>30 Days	0 --	56 6.0%	160 17.1%	226 24.1%	237 25.2%	175 18.6%	0 --	85 9.1%	939 0.1%	
Fatal	0 --	446 7.0%	247 3.9%	386 6.0%	1,392 21.7%	1,797 28.0%	981 15.3%	1,154 18.0%	6,404 0.6%	
Unknown	1,911 6.0%	650 2.1%	36 0.1%	18 0.1%	0 0.0%	0 0.0%	0 0.0%	22,268 70.3%	31,687 3.0%	
Total	600,859 56.5%	330,668 31.1%	53,268 5.0%	13,092 1.2%	4,343 0.4%	2,546 0.2%	981 0.1%	50,410 4.7%	1,063,717 100.0%	

*For each treatment category, the first data row shows the number of injuries and the second row shows the percentage of the row total.

Effect of Alcohol Use on Injury Risk

The presence of alcohol in a motor vehicle driver increases (a) the likelihood of being involved in a crash, and (b) the severity of the crash. In this report, alcohol reporting is based on the police officer's assessment at the time of the crash.

Table 15 shows that, for drivers of passenger cars, those whose age is between 25 and 34 have the highest alcohol use rate, followed by the 21 through 24 age range and then the 35- through 44-year-old drivers. Table 16 shows that, for drivers of light trucks, those whose age is between 35 and 44 have the highest alcohol use rate, followed by drivers 25 through 34 years old and then by those 45 through 64 years old. Drivers of light trucks have almost twice the alcohol use rate of passenger car drivers. These percentages are based on the "Total Known."

Table 17 shows that, for drivers of passenger cars, as the severity of the injury increases so does the presence of alcohol. Drivers in towed passenger cars with alcohol present had MAIS 3-6 injury rates 4 times those for drivers with no alcohol present. Approximately 30 percent of the MAIS 6 injuries are the result of alcohol involvement, followed by 26 percent of the MAIS 4 injuries and 22 percent of the MAIS 5 injuries. Table 18 describes the same pattern for drivers of towed light trucks. Drivers in towed light trucks with alcohol present had MAIS 3-6 injury rates at least twice those for drivers with no alcohol present.

Occupant Injury Data

Table 15
Distribution of Crash-Involved Car Drivers
by Age Group and Alcohol Use: Average per Year, 1993-1995

Police-Reported Alcohol Use	Age Group (Years)							Total
	15-20	21-24	25-34	35-44	45-64	>65	Unknown	
No Alcohol Present	421,354 21.0%	284,272 14.2%	440,281 22.0%	345,570 17.3%	307,384 15.3%	192,995 9.6%	11,058 0.6%	2,002,915 85.6%
Alcohol Present	16,083 10.0%	28,019 17.4%	62,648 39.0%	26,999 16.8%	19,894 12.4%	5,454 3.4%	1,694 1.1%	160,793 6.9%
Not Reported	32,057 23.1%	19,539 14.1%	27,551 19.8%	19,540 14.1%	16,058 11.6%	8,784 6.3%	15,458 11.1%	138,986 5.9%
Not Coded	5,496 14.5%	8,816 23.2%	7,880 20.7%	3,057 8.0%	1,941 5.1%	578 1.5%	10,213 26.9%	37,981 1.6%
Total	474,991 20.3%	340,646 14.6%	538,360 23.0%	395,166 16.9%	345,278 14.8%	207,812 8.9%	38,423 1.6%	2,340,675 100.0%

*For each police-reported alcohol category, the first data row shows the number of drivers and the second row shows the percentage of the row total.

Table 16
Distribution of Crash-Involved Light Truck Drivers
by Age Group and Alcohol Use: Average per Year, 1993-1995

Police-Reported Alcohol Use	Age Group (Years)							Total
	15-20	21-24	25-34	35-44	45-64	>65	Unknown	
No Alcohol Present	92,461 16.5%	58,303 10.4%	143,877 25.7%	130,541 23.3%	104,691 18.7%	28,421 5.1%	1,563 0.3%	559,857 80.2%
Alcohol Present	9,672 10.4%	10,029 10.8%	23,306 25.1%	24,233 26.1%	22,744 24.5%	1,914 2.1%	860 0.9%	92,757 13.3%
Not Reported	2,893 9.6%	2,048 6.8%	13,493 44.7%	4,307 14.3%	5,246 17.4%	1,190 3.9%	1,018 3.4%	30,195 4.3%
Not Coded	1,898 12.1%	1,341 8.5%	2,975 19.0%	1,141 7.3%	1,034 6.6%	622 4.0%	6,680 42.6%	15,690 2.2%
Total	106,924 15.3%	71,720 10.3%	183,651 26.3%	160,222 22.9%	133,715 19.1%	32,147 4.6%	10,120 1.4%	698,500 100.0%

*For each police-reported alcohol category, the first data row shows the number of drivers and the second row shows the percentage of the row total.

Table 17
Distribution of Crash-Involved Car Drivers by Alcohol Use
and Maximum Injury Severity: Average per Year, 1993-1995

Police-Reported Alcohol Use	Frequency of Injury by Maximum AIS Rating*								Total
	Not Injured (0)	Minor (1)	Moderate (2)	Serious (3)	Severe (4)	Critical (5)	Maximum (6)	Injured, Severity Unknown (7)	
No Alcohol Present	1,009,373 50.4%	747,479 37.3%	82,095 4.1%	31,010 1.5%	4,962 0.2%	3,043 0.2%	667 0.0%	118,348 5.9%	2,002,915 85.6%
Alcohol Present	61,565 38.3%	60,038 37.3%	12,940 8.0%	8,866 5.5%	2,337 1.5%	1,198 0.7%	534 0.3%	11,595 7.2%	160,793 6.9%
Not Reported	50,752 36.5%	58,276 41.9%	7,785 5.6%	1,946 1.4%	628 0.5%	558 0.4%	413 0.3%	7,351 5.3%	138,986 5.9%
Not Coded	14,208 37.4%	10,152 26.7%	1,236 3.3%	1,645 4.3%	971 2.6%	731 1.9%	149 0.4%	1,780 4.7%	37,981 1.6%
Total	1,135,898 48.5%	875,945 37.4%	104,057 4.4%	43,467 1.9%	8,898 0.4%	5,530 0.2%	1,762 0.1%	139,074 5.9%	2,340,675 100.0%

*For each police-reported alcohol use category, the first data row shows the number of drivers involved and the second row shows the percentage of the row total.

Table 18
Distribution of Crash-Involved Light Truck Drivers by Alcohol Use
and Maximum Injury Severity: Average per Year, 1993-1995

Police-Reported Alcohol Use	Frequency of Injury by Maximum AIS Rating*								Total
	Not Injured (0)	Minor (1)	Moderate (2)	Serious (3)	Severe (4)	Critical (5)	Maximum (6)	Injured, Severity Unknown (7)	
No Alcohol Present	301,223 53.8%	198,401 35.4%	21,095 3.8%	6,745 1.2%	1,907 0.3%	802 0.1%	237 0.0%	29,128 5.2%	559,857 80.2%
Alcohol Present	53,548 57.7%	27,021 29.1%	4,356 4.7%	1,887 2.0%	752 0.8%	506 0.5%	73 0.1%	3,747 4.0%	92,757 13.3%
Not Reported	14,908 49.4%	5,939 19.7%	7,243 24.0%	247 0.8%	81 0.3%	79 0.3%	78 0.3%	1,555 5.2%	30,195 4.3%
Not Coded	2,961 18.9%	2,895 18.4%	546 3.5%	606 3.9%	174 1.1%	290 1.8%	416 2.7%	1,865 11.9%	15,690 2.2%
Total	372,640 53.4%	234,256 33.5%	33,240 4.8%	9,485 1.4%	2,914 0.4%	1,677 0.2%	804 0.1%	36,295 5.2%	698,500 100.0%

*For each police-reported alcohol use category, the first data row shows the number of drivers involved and the second row shows the percentage of the row total.

Occupant Injury Data

Body Regions Injured in Traffic Crashes

There are about 2,351,000 cars towed away from traffic crashes every year. The incidence of crash-involved occupants in these cars is about 3,580,000 per year. Of these, about 1,746,000 car occupants per year are injured, incurring about 4,280,000 injuries of various severities, in various body regions, and by various injury contacts. Table 19 shows the distribution of all injuries incurred by injured occupants of crash-involved cars (as opposed to each occupant's most severe injury, reported in Tables 9-18) as a function of injury severity and injured body region. Table 20 shows the same distribution for injured occupants of light trucks.

The numbers for "injured, severity unknown" (AIS=7) are lower in these tables than in tables using maximum AIS (MAIS), because of the level of information available for coding the injuries. An AIS of 7 is assigned to an injury when there is not sufficient information about the injury available. An MAIS of 7 is assigned to an occupant when it is known that the occupant was injured, but no information about the injury is available. Therefore, an occupant with an MAIS of 7 may not have any associated injuries coded.

Body Region	Frequency of Injury by AIS Rating*							Total
	1	2	3	4	5	6	7	
Head (Brain)	33,730 27.0% 0.9%	57,157 45.8% 19.3%	16,584 13.3% 14.2%	10,096 8.1% 39.4%	6,602 5.3% 50.2%	708 0.6% 23.9%	0 -- --	124,877
Head (Skull)	0 -- --	2,901 26.7% 1.0%	5,536 51.0% 4.7%	1,906 17.6% 7.4%	0 -- --	506 4.7% 17.1%	0 -- --	10,850
Head (Other)	0 -- --	383 3.6% 0.1%	21 0.2% 0.0%	46 0.4% 0.2%	50 0.5% 0.4%	0 -- --	10,227 95.3% 48.3%	10,728
Face	73,189 77.5% 1.9%	18,092 19.1% 6.1%	3,205 3.4% 2.7%	0 -- --	0 -- --	0 -- --	0 -- --	94,487
Neck	335,298 99.8% 8.8%	206 0.1% 0.1%	162 0.0% 0.1%	70 0.0% 0.3%	42 0.0% 0.3%	22 0.0% 0.7%	79 0.0% 0.4%	335,879
Chest	25,818 25.3% 0.7%	23,406 22.9% 7.9%	31,165 30.5% 26.7%	10,167 10.0% 39.7%	3,750 3.7% 28.5%	1,128 1.1% 38.1%	6,694 6.6% 31.6%	102,129
Shoulder and Back	159,783 73.8% 4.2%	51,673 23.9% 17.5%	4,930 2.3% 4.2%	0 -- --	0 -- --	0 -- --	0 -- --	216,387

*For each body region, the first data row shows the number of injuries, the second row shows the percentage of the row total, and the third row shows the percentage of the column total.

Table 19 (Continued)								
Distribution of All Injuries to Crash-Involved Car Occupants by Body Region and Severity: Average per Year, 1993-1995								
Body Region	Frequency of Injury by AIS Rating*							Total
	1	2	3	4	5	6	7	
Abdomen	704 2.0% 0.0%	21,821 60.5% 7.4%	4,721 13.1% 4.0%	2,714 7.5% 10.6%	1,929 5.3% 14.7%	0 -- --	4,175 11.6% 19.7%	36,065
Spine	0 -- --	0 -- --	523 27.5% 0.4%	444 23.4% 1.7%	763 40.2% 5.8%	169 8.9% 5.7%	0 -- --	1,900
Upper Extremities	49,134 46.1% 1.3%	36,858 34.6% 12.5%	20,542 19.3% 17.6%	0 -- --	0 -- --	0 -- --	0 -- --	106,534
Pelvis	0 -- --	15,510 69.9% 5.2%	6,635 29.9% 5.7%	40 0.2% 0.2%	8 0.0% 0.1%	0 -- --	0 -- --	22,192
Lower Extremities	41,907 32.9% 1.1%	63,001 49.5% 21.3%	22,337 17.5% 19.1%	78 0.1% 0.3%	0 -- --	0 -- --	0 -- --	127,322
Skin	3,085,157 99.8% 81.1%	4,464 0.1% 1.5%	269 0.0% 0.2%	0 -- --	7 0.0% 0.1%	427 0.0% 14.4%	0 -- --	3,090,325
All Other	11 4.2% 0.0%	0 -- --	219 83.4% 0.2%	33 12.5% 0.1%	0 -- --	0 -- --	0 -- --	262
Total	3,804,731	295,473	116,851	25,594	13,151	2,961	21,176	4,279,937

*For each body region, the first data row shows the number of injuries, the second row shows the percentage of the row total, and the third row shows the percentage of the column total.

Occupant Injury Data

Table 20 Distribution of All Injuries to Crash-Involved Light Truck Occupants by Body Region and Severity: Average per Year, 1993-1995								
Body Region	Frequency of Injury by AIS Rating*							Total
	1	2	3	4	5	6	7	
Head (Brain)	15,980	24,355	5,575	3,653	2,303	173	0	52,038
	30.7%	46.8%	10.7%	7.0%	4.4%	0.3%	--	
	1.5%	23.1%	18.0%	40.7%	61.7%	14.7%	--	
Head (Skull)	0	2,592	2,110	925	0	293	0	5,921
	--	43.8%	35.6%	15.6%	--	5.0%	--	
	--	2.5%	6.8%	10.3%	--	24.8%	--	
Head (Other)	0	2	0	39	0	0	2,951	2,992
	--	0.1%	--	1.3%	--	--	98.6%	
	--	0.0%	--	0.4%	--	--	55.8%	
Face	18,247	7,612	1,419	0	0	0	0	27,278
	66.9%	27.9%	5.2%	--	--	--	--	
	1.7%	7.2%	4.6%	--	--	--	--	
Neck	72,729	45	13	0	0	4	0	72,791
	99.9%	0.1%	0.0%	--	--	0.0%	--	
	6.6%	0.0%	0.0%	--	--	0.3%	--	
Chest	4,197	7,224	5,879	2,882	766	361	1,252	22,562
	18.6%	32.0%	26.1%	12.8%	3.4%	1.6%	5.5%	
	0.4%	6.9%	19.0%	32.1%	20.5%	30.6%	23.7%	
Shoulder and Back	45,225	16,952	1,656	0	0	0	0	63,833
	70.8%	26.6%	2.6%	--	--	--	--	
	4.1%	16.1%	5.3%	--	--	--	--	

*For each body region, the first data row shows the number of injuries, the second row shows the percentage of the row total, and the third row shows the percentage of the column total.

Table 20 (Continued)
Distribution of All Injuries to Crash-Involved Light Truck Occupants
by Body Region and Severity: Average per Year, 1993-1995

Body Region	Frequency of Injury by AIS Rating*							Total
	1	2	3	4	5	6	7	
Abdomen	312 2.8% 0.0%	7,162 63.2% 6.8%	1,208 10.7% 3.9%	1,127 9.9% 12.6%	408 3.6% 10.9%	33 0.3% 2.8%	1,090 9.6% 20.6%	11,340
Spine	0 -- --	0 -- --	159 26.5% 0.5%	308 51.5% 3.4%	114 19.1% 3.1%	17 2.9% 1.4%	0 -- --	598
Upper Extremities	13,667 42.6% 1.2%	14,330 44.7% 13.6%	4,087 12.7% 13.2%	0 -- --	0 -- --	0 -- --	0 -- --	32,085
Pelvis	0 -- --	4,011 56.0% 3.8%	3,058 42.7% 9.9%	0 -- --	89 1.2% 2.4%	0 -- --	0 -- --	7,159
Lower Extremities	9,735 28.5% 0.9%	18,714 54.7% 17.7%	5,708 16.7% 18.4%	25 0.1% 0.3%	0 -- --	0 -- --	0 -- --	34,182
Skin	921,450 99.7% 83.7%	2,441 0.3% 2.3%	97 0.0% 0.3%	0 -- --	28 0.0% 0.8%	300 0.0% 25.4%	0 -- --	924,317
All Other	0 -- --	0 -- --	32 46.4% 0.1%	15 21.4% 0.2%	22 32.2% 0.6%	0 -- --	0 -- --	69
Total	101,542	105,440	31,002	8,974	3,731	1,182	5,293	1,257,164

*For each body region, the first data row shows the number of injuries, the second row shows the percentage of the row total, and the third row shows the percentage of the column total.

Restraint Use and Body Regions Injured

Figure 9 shows the distribution of crash-involved car occupants by injured body region and belt usage. An occupant may receive more than one injury to a given body region; however, this figure represents one injury per body region per occupant. An occupant may also receive injuries across more than one body region. Therefore, the number for each body region will add up to more than the number of injured occupants. For example, an occupant may have a contusion to the left side of the brain and a laceration to the right side of the brain. The figure counts only one of the injuries to the brain. If the occupant in the example sustained a contusion to the left side of the brain and a skull fracture, then both injuries would be included in the figure, and one injury would be counted in the brain body region while the other injury would be counted in the skull body region. To determine the percent of belted occupants who sustained a brain injury, divide the number of occupants with a brain injury by the total number of occupants using a restraint system. The same methodology applies to the unbelted occupants. The percentages will not add to 100 percent, because the total number of occupants includes those who were not injured. Figure 10 shows a similar distribution of crash-involved occupants of light trucks by belt usage.

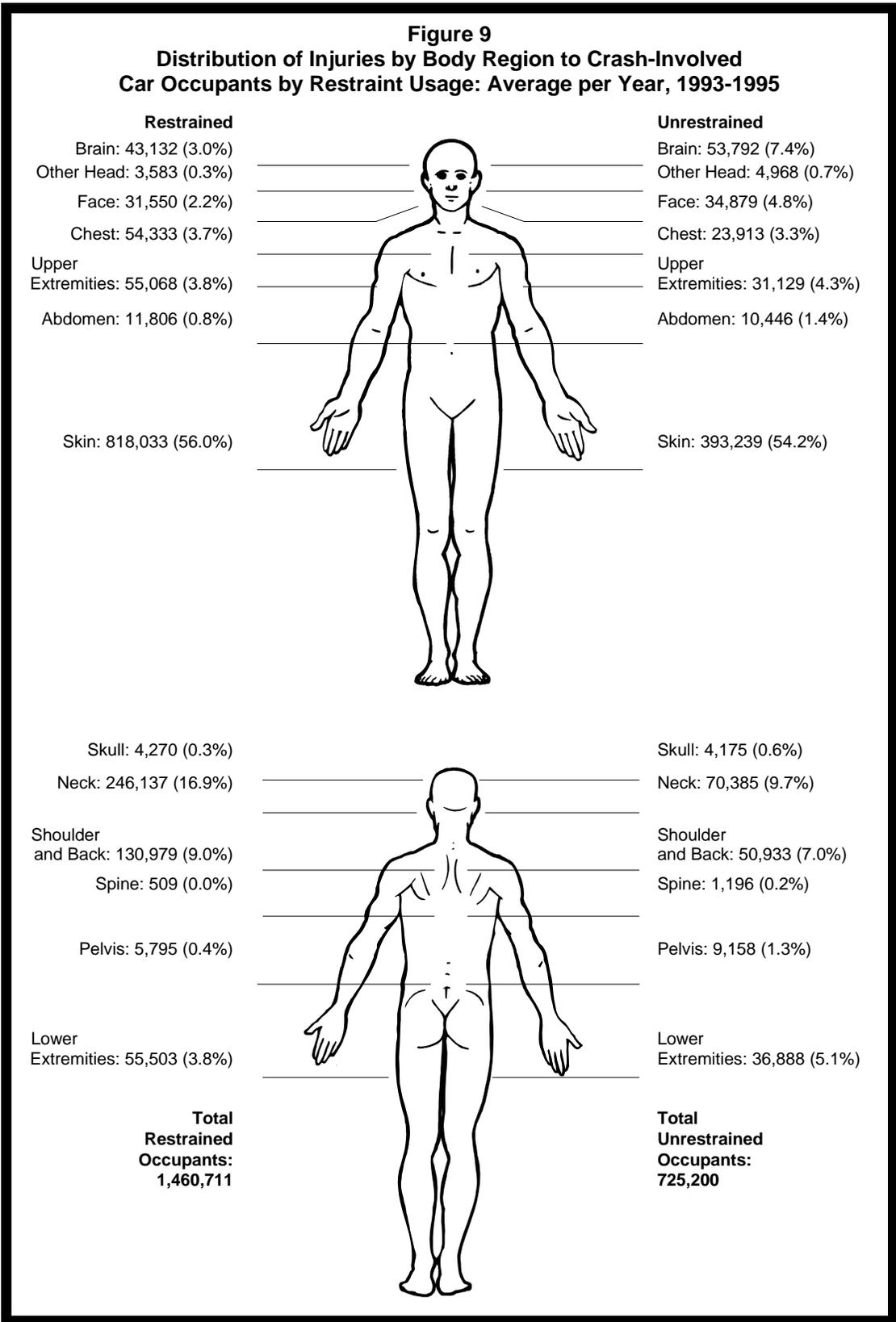
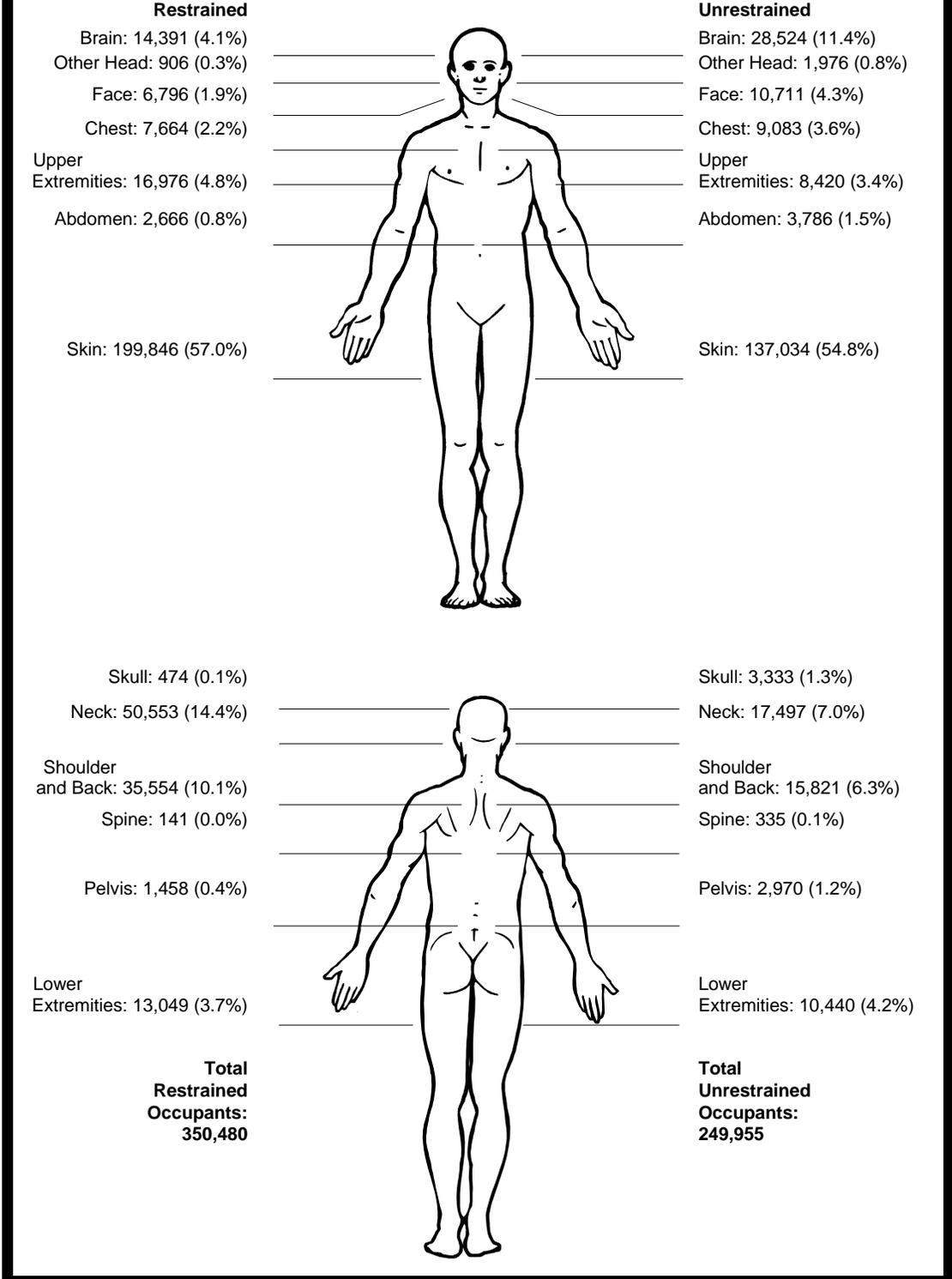


Figure 10
Distribution of Injuries by Body Region to Crash-Involved
Light Truck Occupants by Restraint Usage: Average per Year, 1993-1995



Occupant Injury Data

Injury Contacts

In addition to data on injured body regions, crash protection practitioners need data concerning the various sources of injury (injury contacts). A summary of injury contacts for injuries to crash-involved occupants is presented in Table 21 for cars and in Table 22 for light trucks. Table 21 shows the distribution of all crash-involved car occupant injuries as a function of injury severity and injury contact. Table 22 shows the same distribution for light truck occupants.

Table 21 Distribution of All Injuries to Crash-Involved Car Occupants by Injury Contact and Severity: Average per Year, 1993-1995								
Injury Contact	Frequency of Injury by AIS Rating*							Total
	1	2	3	4	5	6	7	
Steering Assembly	405,487 86.1% 10.7%	37,083 7.9% 12.6%	17,713 3.8% 15.2%	3,162 0.7% 12.4%	1,911 0.4% 14.5%	421 0.1% 14.2%	5,016 1.1% 23.7%	470,793
Instrument Panel	592,272 90.3% 15.6%	43,588 6.6% 14.8%	16,720 2.6% 14.3%	1,303 0.2% 5.1%	553 0.1% 4.2%	405 0.1% 13.7%	764 0.1% 3.6%	655,605
Windshield	346,890 91.8% 9.1%	21,536 5.7% 7.3%	4,750 1.3% 4.1%	1,516 0.4% 5.9%	492 0.1% 3.7%	106 0.0% 3.6%	2,425 0.6% 11.5%	377,716
Interior Side Surface	287,178 80.2% 7.5%	39,627 11.1% 13.4%	21,871 6.1% 18.7%	6,251 1.7% 24.4%	2,678 0.7% 20.4%	280 0.1% 9.5%	396 0.1% 1.9%	358,281
Pillars	75,031 76.7% 2.0%	12,394 12.7% 4.2%	6,409 6.6% 5.5%	2,214 2.3% 8.6%	1,170 1.2% 8.9%	122 0.1% 4.1%	499 0.5% 2.4%	97,838
Restraint (Belt) System	450,005 94.9% 11.8%	14,388 3.0% 4.9%	7,362 1.6% 6.3%	839 0.2% 3.3%	382 0.1% 2.9%	12 0.0% 0.4%	1,000 0.2% 4.7%	473,988
Child Seat	7,195 98.1% 0.2%	92 1.3% 0.0%	18 0.2% 0.0%	0 -- --	0 -- --	14 0.2% 0.5%	14 0.2% 0.1%	7,334
Air Bag	167,344 97.3% 4.4%	2,425 1.4% 0.8%	1,056 0.6% 0.9%	375 0.2% 1.5%	431 0.3% 3.3%	42 0.0% 1.4%	346 0.2% 1.6%	172,020
Head Restraints	31,816 83.9% 0.8%	5,212 13.7% 1.8%	496 1.3% 0.4%	297 0.8% 1.2%	25 0.1% 0.2%	0 -- --	95 0.3% 0.4%	37,942
Seat Back	169,720 89.3% 4.5%	12,376 6.5% 4.2%	6,634 3.5% 5.7%	398 0.2% 1.6%	332 0.2% 2.5%	17 0.0% 0.6%	595 0.3% 2.8%	190,073
Roof	77,033 76.6% 2.0%	13,051 13.0% 4.4%	5,603 5.6% 4.8%	2,408 2.4% 9.4%	1,655 1.6% 12.6%	224 0.2% 7.6%	630 0.6% 3.0%	100,603

*For each injury contact, the first data row shows the number of injuries, the second row shows the percentage of the row total, and the third row shows the percentage of the column total.

Table 21 (Continued)
Distribution of All Injuries to Crash-Involved Car Occupants
by Injury Contact and Severity: Average per Year, 1993-1995

Injury Contact	Frequency of Injury by AIS Rating*							Total
	1	2	3	4	5	6	7	
Floor	72,281 70.8% 1.9%	26,947 26.4% 9.1%	2,864 2.8% 2.5%	0 -- --	0 -- --	0 -- --	0 -- --	102,092
Non-Contact Injuries	469,875 99.1% 12.3%	3,083 0.6% 1.0%	516 0.1% 0.4%	69 0.0% 0.3%	33 0.0% 0.2%	0 -- --	793 0.2% 3.7%	474,370
Fire in Vehicle	720 48.5% 0.0%	59 4.0% 0.0%	221 14.9% 0.2%	51 3.4% 0.2%	7 0.5% 0.1%	427 28.8% 14.4%	0 -- --	1,486
Ground	32,174 75.9% 0.8%	5,489 12.9% 1.9%	2,563 6.0% 2.2%	1,116 2.6% 4.4%	334 0.8% 2.5%	156 0.4% 5.3%	565 1.3% 2.7%	42,397
Exterior (Occupant's Vehicle)	2,968 46.9% 0.1%	1,555 24.6% 0.5%	757 12.0% 0.6%	413 6.5% 1.6%	249 3.9% 1.9%	192 3.0% 6.5%	194 3.1% 0.9%	6,327
Exterior (Other Vehicle or Exterior Object)	7,560 44.5% 0.2%	3,512 20.7% 1.2%	3,162 18.6% 2.7%	1,571 9.2% 6.1%	949 5.6% 7.2%	145 0.9% 4.9%	88 0.5% 0.4%	16,987
Side and Rear Glazing	69,280 87.6% 1.8%	8,149 10.3% 2.8%	1,047 1.3% 0.9%	245 0.3% 1.0%	111 0.1% 0.8%	28 0.0% 1.0%	207 0.3% 1.0%	79,066
All Others	164,071 92.5% 4.3%	8,705 4.9% 2.9%	3,054 1.7% 2.6%	575 0.3% 2.2%	156 0.1% 1.2%	34 0.0% 1.1%	843 0.5% 4.0%	177,438
Unknown	375,831 85.9% 9.9%	36,202 8.3% 12.3%	14,037 3.2% 12.0%	2,790 0.6% 10.9%	1,683 0.4% 12.8%	335 0.1% 11.3%	6,705 1.5% 31.7%	437,582
Total	3,804,731	295,473	116,851	25,594	13,151	2,961	21,176	4,279,937

*For each injury contact, the first data row shows the number of injuries, the second row shows the percentage of the row total, and the third row shows the percentage of the column total.

Occupant Injury Data

Table 22 Distribution of All Injuries to Crash-Involved Light Truck Occupants by Injury Contact and Severity: Average per Year, 1993-1995								
Injury Contact	Frequency of Injury by AIS Rating*							Total
	1	2	3	4	5	6	7	
Steering Assembly	97,753 85.9% 8.9%	10,405 9.1% 9.9%	3,505 3.1% 11.3%	783 0.7% 8.7%	328 0.3% 8.8%	105 0.1% 8.9%	883 0.8% 16.7%	113,762
Instrument Panel	165,185 87.6% 15.0%	17,336 9.2% 16.4%	5,786 3.1% 18.7%	122 0.1% 1.4%	141 0.1% 3.8%	19 0.0% 1.6%	83 0.0% 1.6%	188,671
Windshield	84,331 91.1% 7.7%	5,981 6.5% 5.7%	836 0.9% 2.7%	304 0.3% 3.4%	197 0.2% 5.3%	20 0.0% 1.7%	859 0.9% 16.2%	92,527
Interior Side Surface	79,561 82.6% 7.2%	11,005 11.4% 10.4%	4,361 4.5% 14.1%	1,016 1.1% 11.3%	204 0.2% 5.5%	0 -- --	132 0.1% 2.5%	96,280
Pillars	25,244 75.0% 2.3%	5,482 16.3% 5.2%	1,616 4.8% 5.2%	513 1.5% 5.7%	324 1.0% 8.7%	49 0.1% 4.2%	433 1.3% 8.2%	33,660
Restraint (Belt) System	99,875 94.7% 9.1%	4,022 3.8% 3.8%	1,087 1.0% 3.5%	204 0.2% 2.3%	0 -- --	0 -- --	221 0.2% 4.2%	105,410
Child Seat	2,126 98.0% 0.2%	10 0.5% 0.0%	27 1.3% 0.1%	0 -- --	0 -- --	0 -- --	5 0.2% 0.1%	2,168
Air Bag	11,211 89.0% 1.0%	1,362 10.8% 1.3%	22 0.2% 0.1%	0 -- --	0 -- --	0 -- --	0 -- --	12,594
Head Restraints	3,371 96.7% 0.3%	71 2.0% 0.1%	23 0.7% 0.1%	0 -- --	0 -- --	0 -- --	21 0.6% 0.4%	3,486
Seat Back	37,120 88.9% 3.4%	4,070 9.7% 3.9%	352 0.8% 1.1%	159 0.4% 1.8%	53 0.1% 1.4%	0 -- --	19 0.0% 0.4%	41,773
Roof	50,661 82.2% 4.6%	7,915 12.8% 7.5%	1,646 2.7% 5.3%	493 0.8% 5.5%	278 0.5% 7.4%	172 0.3% 14.5%	503 0.8% 9.5%	61,668

*For each injury contact, the first data row shows the number of injuries, the second row shows the percentage of the row total, and the third row shows the percentage of the column total.

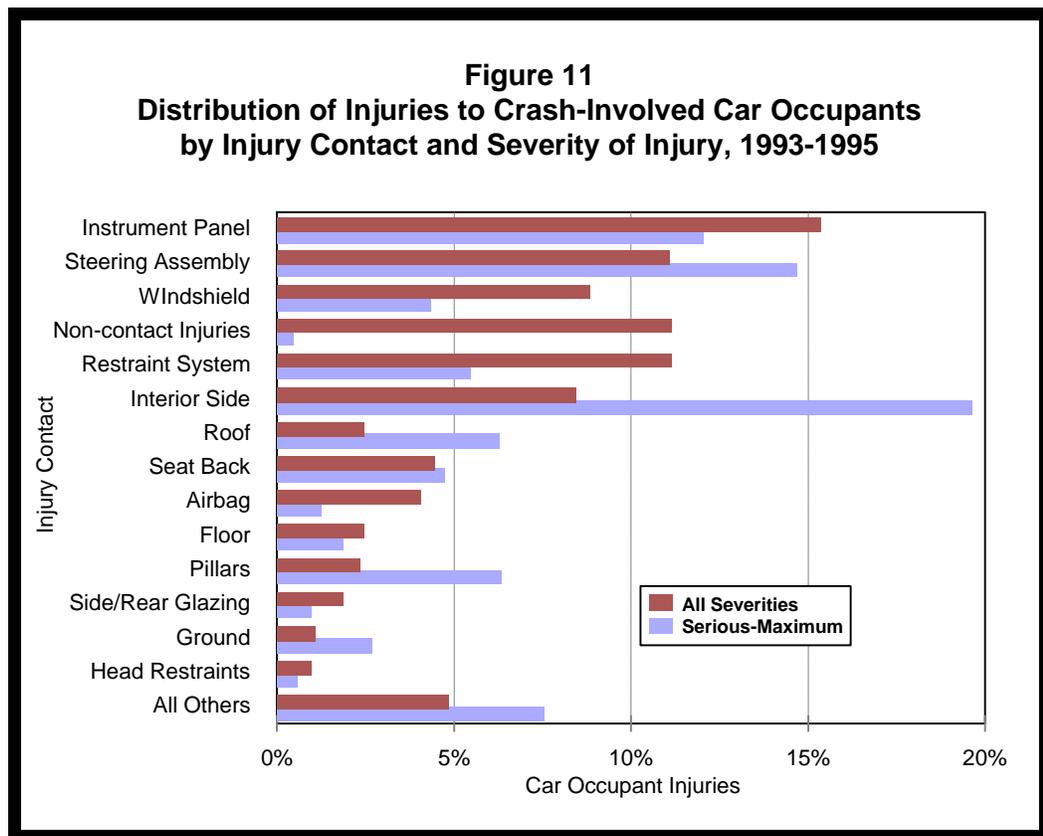
Table 22 (Continued)								
Distribution of All Injuries to Crash-Involved Light Truck Occupants by Injury Contact and Severity: Average per Year, 1993-1995								
Injury Contact	Frequency of Injury by AIS Rating*							Total
	1	2	3	4	5	6	7	
Floor	13,742 68.8% 1.2%	5,801 29.0% 5.5%	435 2.2% 1.4%	0 -- --	0 -- --	0 -- --	0 -- --	19,979
Non-Contact Injuries	135,020 99.5% 12.3%	514 0.4% 0.5%	118 0.1% 0.4%	15 0.0% 0.2%	44 0.0% 1.2%	26 0.0% 2.2%	14 0.0% 0.3%	135,752
Fire in Vehicle	196 34.7% 0.0%	15 2.6% 0.0%	27 4.8% 0.1%	0 -- --	27 4.7% 0.7%	300 53.1% 25.4%	0 -- --	565
Ground	48,324 75.8% 4.4%	8,747 13.7% 8.3%	3,394 5.3% 10.9%	1,886 3.0% 21.0%	991 1.6% 26.6%	76 0.1% 6.4%	303 0.5% 5.7%	63,721
Exterior (Occupant's Vehicle)	3,672 40.8% 0.3%	2,486 27.6% 2.4%	1,590 17.7% 5.1%	909 10.1% 10.1%	306 3.4% 8.2%	22 0.2% 1.9%	16 0.2% 0.3%	9,001
Exterior (Other Vehicle or Exterior Object)	17,085 77.0% 1.6%	3,221 14.5% 3.1%	981 4.4% 3.2%	550 2.5% 6.1%	218 1.0% 5.9%	112 0.5% 9.5%	25 0.1% 0.5%	22,191
Side and Rear Glazing	26,812 91.8% 2.4%	1,594 5.5% 1.5%	641 2.2% 2.1%	44 0.2% 0.5%	4 0.0% 0.1%	0 -- --	102 0.3% 1.9%	29,197
All Others	62,721 94.7% 5.7%	2,566 3.9% 2.4%	635 1.0% 2.0%	205 0.3% 2.3%	34 0.1% 0.9%	0 -- --	59 0.1% 1.1%	66,219
Unknown	137,534 86.8% 12.5%	12,837 8.1% 12.2%	3,919 2.5% 12.6%	1,771 1.1% 19.7%	584 0.4% 15.6%	281 0.2% 23.8%	1,615 1.0% 30.5%	158,540
Total	1,101,542	105,440	31,002	8,974	3,731	1,182	5,293	1,257,164

*For each injury contact, the first data row shows the number of injuries, the second row shows the percentage of the row total, and the third row shows the percentage of the column total.

Occupant Injury Data

It is evident from Tables 21 and 22 that the most frequent injury contacts for injuries of all severities (AIS 1-7) are not necessarily the same as those that are most frequently involved in serious to maximum injuries (AIS 3-6). This is illustrated in Figure 11, where two distributions are shown: one for all severities and one for serious to maximum severities, each adding up to 100 percent.

As can be seen in this figure, the instrument panel, windshield, and restraint system as injury contacts have high frequencies in general but relatively low frequencies for serious to maximum injuries. The converse is observed for the steering assembly, interior side, roof, pillars, and ground.



Occupant Ejection and Entrapment

Table 23 shows the rates of occupant ejections from and entrapment in crash-involved towed cars. Two degrees of ejection are distinguished: complete and partial. The results in Table 23 are shown by primary crash modes and areas of damage. Similar data for light trucks are shown in Table 24. Ejection rates by degree of ejection are also shown in Figure 12. Ejection occurs most frequently in rollover crashes, followed by side impacts.

Crash Mode and Area of Damage	Complete Ejection	Partial Ejection	Entrapment	Total
Rollover	8,357 5.2%	4,806 3.0%	1,395 0.9%	161,822 4.5%
Nonrollover				
Single-Vehicle				
Front	1,124 0.2%	3,941 0.7%	3,891 0.7%	533,892 14.9%
Side	2,105 1.3%	1,103 0.7%	930 0.6%	158,026 4.4%
Rear, Top, or Under	21 0.2%	18 0.2%	5 0.0%	25,391 0.7%
Multiple-Vehicle				
Front	418 0.0%	1,202 0.1%	2,761 0.2%	1,505,070 42.0%
Side	2,306 0.3%	2,410 0.3%	2,932 0.3%	878,177 24.5%
Rear	108 0.0%	366 0.1%	33 0.0%	314,816 8.8%
Top or Under	0 --	0 --	14 0.6%	2,491 0.1%
Total	14,439 0.4%	13,846 0.4%	11,952 0.3%	3,579,685 100.0%

*For each crash mode, the first data row shows the number of occupants ejected or entrapped and the second row shows the percentage of the row total.

Note: Damage Area "Unknown" has been imputed into the known damage areas.

Occupant Injury Data

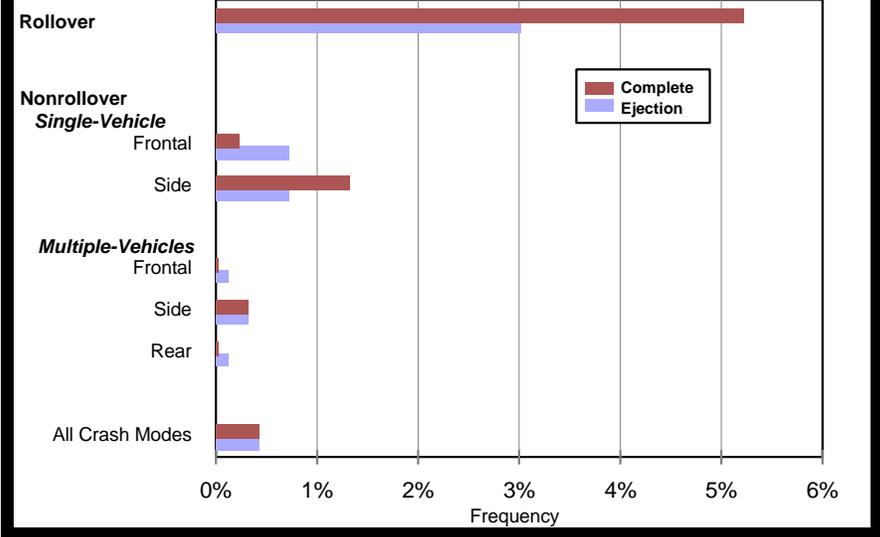
Table 24
Occupant Ejection and Entrapment in Crash-Involved Towed Light Trucks
by Degree of Ejection, Crash Mode, and Area of Damage:
Average of Nationally Weighted Counts per Year, 1993-1995

Crash Mode and Area of Damage	Complete Ejection	Partial Ejection	Entrapment	Total
Rollover	13,819 9.2%	2,486 1.7%	1,479 1.0%	149,546 14.1%
Nonrollover				
Single-Vehicle				
Front	563 0.3%	555 0.3%	606 0.4%	165,495 15.6%
Side	435 1.7%	467 1.8%	150 0.6%	26,224 2.5%
Rear, Top, or Under	3 0%	0 --	0 --	20,447 2.0%
Multiple-Vehicle				
Front	596 0.1%	448 0.1%	696 0.1%	491,007 46.2%
Side	996 0.6%	164 0.1%	271 0.2%	172,879 16.3%
Rear	82 0.2%	471 1.2%	233 0.6%	38,076 3.6%
Top or Under	0 --	0 --	10 14.5%	43 0.0%
Total	16,495 1.6%	4,590 0.4%	3,445 0.3%	1,063,717 100.0%

*For each crash mode, the first data row shows the number of occupants ejected or entrapped and the second row shows the percentage of the row total.

Note: Damage Area "Unknown" has been imputed into the known damage areas.

Figure 12
Towed Car Occupant Ejection Rates
by Crash Mode and Degree of Ejection, 1993-1995



Occupant Injury Data

The ejection rates shown in Tables 23 and 24 are generally small, except in car rollovers. However, due to the very harmful outcomes of occupant ejections, the rate of injuries associated with occupant ejections is significantly higher, as shown in Tables 25 and 26, which show injury-weighted (using Harm—see Appendix E) ejection and entrapment data for crash-involved towed vehicles, and Figure 13, which shows ejection-induced injury rates for towed vehicles. Crashes that involve ejection are generally more severe crashes; therefore, injuries to ejected occupants may be due to higher crash forces as well as the ejection itself.

Table 25
Injury-Weighted Occupant Ejection and Entrapment Rates
for Crash-Involved Towed Cars
by Degree of Ejection, Crash Mode, and Area of Damage:
Average of Nationally Weighted Counts per Year, 1993-1995

Crash Mode and Area of Damage	Complete Ejection	Partial Ejection	Entrapment	Total
Rollover	1,531,133 27.8%	671,680 12.2%	293,223 5.3%	5,516,762 14.2%
Nonrollover				
Single-Vehicle				
Front	222,454 3.8%	467,101 8.0%	533,625 9.2%	5,810,600 15.0%
Side	346,712 14.2%	172,150 7.1%	237,727 9.8%	2,435,085 6.3%
Rear, Top, or Under	100 0.1%	5,909 3.4%	109 0.1%	186,513 0.5%
Multiple-Vehicle				
Front	188,112 1.6%	256,410 2.2%	841,635 7.2%	11,756,619 30.3%
Side	351,630 3.0%	631,691 5.4%	792,494 6.8%	11,680,407 30.1%
Rear	14,355 1.0%	24,362 1.8%	23,446 1.7%	1,384,610 3.6%
Top or Under	0 --	0 --	10,376 48.5%	21,391 0.1%
Total	2,654,495 6.8%	2,229,303 5.7%	2,732,634 7.0%	38,791,987 100.0%

*For each crash mode, the first data row shows the number of occupants ejected or entrapped and the second row shows the percentage of the row total.

Table 26
Injury-Weighted Occupant Ejection and Entrapment Rates
for Crash-Involved Towed Light Trucks
by Degree of Ejection, Crash Mode, and Area of Damage:
Average of Nationally Weighted Counts per Year, 1993-1995

Crash Mode and Area of Damage	Complete Ejection	Partial Ejection	Entrapment	Total
Rollover	2,178,170 49.8%	493,318 11.3%	343,590 7.9%	4,372,254 38.9%
Nonrollover				
Single-Vehicle				
Front	177,979 13.9%	31,281 2.4%	119,518 9.3%	1,283,619 11.4%
Side	52,715 11.8%	36,131 7.5%	32,867 6.9%	479,467 4.3%
Rear, Top, or Under	109 0.1%	0 --	0 --	89,255 0.8%
Multiple-Vehicle				
Front	42,970 1.4%	182,735 6.1%	165,915 5.5%	3,008,343 26.8%
Side	238,399 13.6%	44,868 2.6%	54,699 3.1%	1,755,937 15.6%
Rear	312 0.1%	1,765 0.8%	921 0.4%	231,765 2.1%
Top or Under	0 --	0 --	8,483 66.5%	12,747 0.1%
Total	2,690,654 24.0%	790,100 7.0%	725,991 6.5%	11,233,389 100.0%

*For each crash mode, the first data row shows the number of occupants ejected or entrapped and the second row shows the percentage of the row total.

Appendix A. Glossary

AIS (Abbreviated Injury Scale)

An integer scale developed by the Association for the Advancement of Automotive Medicine to rate the severity of individual injuries. The AIS includes: 1=minor, 2=moderate, 3=serious, 4=severe, 5=critical, and 6=maximum (virtually untreatable). The scale does not explicitly denote a fatal injury. An AIS rating of 7 (injured, severity unknown) is used when sufficient information about an injury is not available.

Body Type

Refers to the individual classifications of motor vehicles by their design structure based on definitions developed by the Society of Automotive Engineers.

Crash

An event that produces injury and/or damage, involves a motor vehicle in transport, and occurs on a trafficway or while the vehicle is still in motion after running off the trafficway. In this report, crash and motor vehicle crash are synonymous. To qualify for the CDS, all crashes must be reported by the police to the state and involve a towed CDS applicable vehicle.

Crash Severity (delta-v is used as a measure of crash severity)

CRASHPC and OLDMISSPC are computer models that provide a measure of crash severity in terms of delta-v (see Appendix E). In vehicle-to-vehicle crashes, the models assume that the two vehicles approach each other at an impact velocity, reach a common velocity, and then separate. Delta-v is equal to the impact velocity minus the separation velocity. Other factors being equal, the greater the delta-v during a collision, the greater the potential for occupant injury.

Crashworthiness Data System Applicable Motor Vehicle

Refers to those motor vehicles classified as automobiles, automobile derivatives and short utility vehicles, van-based light trucks, and light conventional trucks where the qualifying trucks must have a gross vehicle weight rating (GVWR) of less than or equal to 10,000 pounds.

Ejection

Refers to persons being completely or partially thrown from the vehicle as a result of an impact or rollover. Partial ejection refers to a situation where part of the occupant's body remains *in* the vehicle. This does not apply to occupants who are not initially in the seating compartment of the vehicle (e.g., persons riding in pickup beds, boots of convertibles, or open tailgates), since any ejection for them is coded as complete ejection.

Glossary

Entrapment

Refers to persons being partially or completely *in* the vehicle and mechanically restrained by a damaged vehicle component. Jammed doors and immobilizing injuries, by themselves, do not constitute entrapment. Occupants pinned by cargo shift are not considered to be entrapped. Occupants who are completely or partially ejected and subsequently become pinned by their own vehicle and any surface other than their own vehicle are not considered entrapped. An occupant whose seat belt buckle release mechanism is jammed as a result of a crash is not considered entrapped.

Fatally Injured Occupant

A death caused by injuries sustained by an occupant within 30 days of a CDS applicable motor vehicle crash.

Fatal Motor Vehicle Traffic Crash

A crash in which at least one occupant of a CDS applicable motor vehicle dies within 30 days of the crash as a result of injuries sustained in the crash.

Fixed Object

An object attached to the terrain (trees, abutments) or stationary objects intentionally placed for a particular purpose (e.g., poles, barriers).

Gross Vehicle Weight Rating (GVWR)

The maximum capacity of a vehicle, including the weight of the base vehicle, all added equipment, driver and passengers, and all cargo loaded into or onto the vehicle. Actual weight may be less than or greater than GVWR.

Injured Occupant

Occupant of a CDS applicable motor vehicle sustaining any type of injury as a result of a crash, including injuries from non-impact forces.

Light Trucks

Includes utility vehicles, pickups, vans, and truck-based station wagons, with a GVWR less than 10,000 pounds.

Maximum AIS

Represents the highest AIS level sustained by an injured occupant of a CDS applicable motor vehicle.

Motor Vehicle in Transport

A CDS applicable motor vehicle on a roadway or in motion within a trafficway.

Non-Fixed Objects

Objects that are movable or moving but are not motor vehicles, pedestrians, pedalcyclists, animals, or trains.

Occupant

Any person who is in a CDS applicable motor vehicle in transport.

Passenger Car

Any motor vehicle that is an automobile, auto-based pickup, large limousine, or three-wheel automobile or automobile derivative.

Passenger Vehicles

Includes passenger cars, pickup trucks, vans, and sport/utility vehicles with a GVWR less than 10,000 pounds. Equivalent to CDS applicable vehicles.

Police-Reported Crash

A crash investigated or reported by a police officer, documented with a completed form which is signed by the investigating officer, and reported to the state. Driver reports submitted only to motor vehicle officials are excluded.

Primary Sampling Unit (PSU)

A city, county, or group of contiguous counties with an aggregate population of at least 50,000 which defines a geographic area for crash investigation. PSU selection is the first stage in the probability sampling of crashes for the CDS.

Restraint Usage

Manually operated restraint systems include shoulder belts, lap belts, lap and should belt combinations, or child safety seats. Automatic restraint systems include passive belts.

Roadway

That part of a trafficway used for motor vehicle travel or, where travel by various classes of motor vehicles is segregated, that part of a trafficway used by a particular class. The roadway excludes shoulders, designated parking lanes, and median areas.

Serious-Maximum Injury

Injury severity of AIS 3-6, including, for example, compound fractures and internal organ injuries. Unless otherwise noted, summary statistics in this report include all fatally injured persons as seriously injured, but exclude those with unknown injury severity level (see AIS).

Towaway Crash

A crash which is noted on the police report as involving at least one CDS applicable vehicle that was towed from the crash scene as a result of damage from the crash. For those crashes involving injury or fatality, the injured or killed person must be an occupant of the towed CDS applicable vehicle to qualify for the CDS.

Towed Vehicle

A CDS applicable motor vehicle that was involved in a crash and removed from the crash scene due to damage resulting from the crash by means other than its own power.

Glossary

Trafficway

Any right-of-way open to the public as a matter of right or custom for moving persons or property from one place to another, including the entire width between property lines or other boundaries.

Vehicle Type

Refers to a series of CDS applicable motor vehicle body types that have been grouped together because of design similarities. The principal vehicle types used in this report are passenger cars, pickup trucks, vans, and sport/utility vehicles.

Appendix B. NASS/CDS Sample Design

The crashes investigated in NASS/CDS are a probability sample of all police-reported crashes in the United States. Each such crash that occurs within a CDS team's area has a chance of being included in the sample. This design makes it possible to compute not only national estimates but also probable errors associated with those estimates. Many other features of the design have a significant impact on CDS data analysis, the most important of which are highlighted in this appendix.

The selection of sample crashes for CDS is accomplished in stages. The first stage is the selection of geographic areas called primary sample units (PSUs). Each PSU is composed of a large city, a county, or a group of contiguous counties. The United States was divided into 1,195 PSUs. The PSUs were then grouped into 12 categories described by geographic region and degree of urbanization. Two PSUs were selected from each category with probability proportional to its 1983 population. These 24 PSUs are the first stage in the selection of CDS sample crashes.

If every crash in each of the 24 PSUs were investigated, a national estimate could be obtained by weighting each crash in the PSU by the inverse of the probability of selection of the PSU. For example, if a sample PSU had 1 chance in 40 of being selected, then each crash from the PSU would be weighted by a factor of 40. This is called the first-stage expansion factor.

It is not practical to investigate every crash in each sample PSU, so additional stages of sampling are performed. The police agencies in a PSU are categorized by the number and type of police crash reports they process. Sample police agencies are then selected randomly from each category. The fraction of the agencies selected increases as the number and severity of crashes reported by the agency increases. This is called the second-stage expansion factor.

The final stage of sampling is the selection of crashes from all crashes reported in the sample police agencies. A simple random selection of all reported towaway crashes would result in a large percentage of sample crashes with property damage and few injuries, since these constitute such a large fraction of all crashes. This type of sample would not be effective in providing the detailed and accurate information needed for the mitigation of crash consequences. Rather, a substantial sample of serious injury crashes is needed for NASS/CDS.

The procedure used to obtain the desired sample by type and severity of crashes is an unequal probability selection. This required listing police crash reports in categories defined by most severe police-reported injury to an occupant of a towed CDS applicable motor vehicle, disposition of the injured, and model year of the towed CDS applicable motor vehicle. A weighting factor was assigned to crashes in each category to increase or decrease the probability of selection. A random selection was made from the total crashes listed in all categories. In addition to the probabilities of selection varying by type of crash, other factors affected the selection probabilities at this stage, such as the number of crashes listed, the date and time of the crash, and the police agencies from which the crash was listed. The result was that each sampled crash from a PSU has a unique selection probability.