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

NHTSA
www.nhtsa.gov

DOT HS 810 944 **May 2008**

Trends in Non-Fatal Traffic Injuries: 1996 – 2005

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Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipients's Catalog No.
DOT HS 810 944		

4. Title and Subtitle	5. Report Date
Trends in Non-Fatal Traffic Injuries: 1996 – 2005	May 2008
	6. Performing Organization Code NVS-421

7. Author(s)	8. Performing Organization Report No.
Marc Starnes	

9. Performing Organization Name and Address	10. Work Unit No. (TRAIS)n code
National Center for Statistics and Analysis National Highway Traffic Safety Administration U.S. Department of Transportation 1200 New Jersey Avenue SE. Washington, DC 20590	11. Contract of Grant No.

12. Sponsoring Agency Name and Address	13. Type of Report and Period Covered
National Center for Statistics and Analysis National Highway Traffic Safety Administration U.S. Department of Transportation 1200 New Jersey Avenue SE. Washington, DC 20590	NHTSA Technical Report
	14. Sponsoring Agency Code

15.Supplementary Notes

Cejun Liu, Alex Strashny, Marilouise Burgess, Tim Pickrell, and Anders Longthorne contributed in the preparation and review of this report.

16. Abstract

An analysis of three major databases of the National Highway Traffic Safety Administration (NHTSA) shows that from 1996 through 2005, the annual number of "incapacitating" injuries due to motor vehicle crashes decreased by 25 to 28 percent. Incapacitating is a category of injury severity that represents the most severe non-fatal injuries. An incapacitating injury is a non-fatal injury that prevents the injured person from walking, driving, or normally continuing the activities the person was capable of performing before the injury occurred.

This report utilizes three databases from NHTSA's National Center for Statistics and Analysis (NCSA). The databases are used separately to analyze trends in non-fatal motor vehicle injuries. Data was individually examined from the Fatality Analysis Reporting System (FARS) from 1996 through 2005, the National Automotive Sampling System General Estimates System (GES) from 1996 through 2005, and 25 States in the State Data System (SDS) from 1996 through 2004.

A significant reduction was seen in the overall non-fatal injury counts in each of the FARS, GES, and SDS databases. The GES and SDS annual injury counts dropped by 23 percent and 9 percent respectively, while an 11-percent drop in non-fatal injuries was seen in the FARS database of fatal crashes. The largest percentage decline in the FARS database (25%), GES database (28%), and SDS database (25%) occurred among the most severe injuries, referred to as incapacitating injuries. The rate of non-fatal injuries per crash also declined in each of the three databases. These reductions in non-fatal injuries seen in FARS, GES, and SDS have taken place despite a 20-percent increase in vehicle miles traveled. Concurrent with these declines in non-fatal injuries, the number of FARS fatalities rose by 3 percent.

The decline in injuries noted in this report is correlated to the many improvements in vehicle safety and driver and passenger behavior that have taken place in the last decade. These improvements include, but are not limited to: an increased use of seat belts and child safety seats, reductions in drunk driving, as well as an expansion throughout the vehicle fleet of air bags and electronic stability control.

17. Key Words	18. Distribution Statement
Injuries, non-fatal injuries, injury severity, injury rate, impact point, trends, FARS, NASS-GES, State Data Systems, SDS	Document is available to the public through the National Technical Information Service, Springfield, VA 22161

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No of Pages	22. Price
Unclassified	Unclassified		

Form DOT F1700.7 (8-72)

Reproduction of completed page authorized

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I. Executive Summary

An analysis of three major databases maintained by the National Highway Traffic Safety Administration (NHTSA) shows that from 1996 through 2005, a significant decline in non-fatal motor vehicle injuries occurred. The significant decline that had been observed in one database has been validated through an analysis which included two additional NHTSA databases. These three databases show that the average number of people suffering incapacitating injuries each year due to motor vehicle crashes has decreased by 25 to 28 percent. An incapacitating injury is a category of injury severity that represents the most severe non-fatal injuries, as coded by law enforcement officers on police crash reports.

This report utilizes three separate databases to analyze the trend in non-fatal motor vehicle injuries. Data were individually analyzed from the Fatality Analysis Reporting System (FARS) from 1996 through 2005, the National Automotive Sampling System General Estimates System (GES) from 1996 through 2005, and 25 States in the State Data System (SDS) for available years from 1996 through 2004.

Over the years, the traffic on America's roads has increased significantly and much work has been done to make motor vehicle travel in America as safe as possible. NHTSA has put forth a tremendous effort to push for recent improvements in vehicle safety as well as safer behavior displayed by drivers and passengers. These improvements include, but are not limited to, an increased use of seat belts and child safety seats, reductions in drunk driving, as well as an expansion throughout the vehicle fleet of air bags and electronic stability control.

Since the mid-1990s, a decline in injuries has been noted through estimates published using the GES database. The goal of the report was to determine if the decline in injuries that has been seen in the GES database is further validated and in agreement with a decline in injury counts in other NHTSA databases.

Results of this analysis show that the databases are in agreement and validate the decline in incapacitating injuries. The annual number of FARS incapacitating injuries dropped by 25 percent, while GES and SDS incapacitating injury counts dropped by 28 and 25 percent, respectively, during the years examined. In the course of doing this analysis, a significant reduction was also seen in the overall non-fatal injury counts in each of the FARS, GES, and SDS databases. The GES and SDS annual injury counts dropped by 23 percent and 9 percent respectively, while an 11 percent drop in non-fatal injuries was seen in the FARS database of fatal crashes. These reductions in injuries seen in FARS, GES, and SDS have taken place despite a 20-percent increase in vehicle miles traveled (VMT).

The total number of FARS fatalities rose by 3 percent, from 42,065 in 1996 to 43,443 in 2005. Among passenger vehicle occupants, the fatality count dropped 3 percent, from 32,437 to 31,415. While these fatality counts have been relatively stagnant, the number of incapacitating injuries in FARS, GES, and SDS each fell by 25 to 28 percent during this time. This trend suggests that the improvements in safety equipment and occupant behavior over this time period were highly effective in reducing serious injuries.

Police time constraints may have contributed to the reduction in the recorded counts of injuries of the least severity. However, this potential data collection limitation should not have

contributed to the large decline in incapacitating injuries, as a police officer consistently completes a police crash report for a crash where someone was severely injured.

As expected, the shift in injury severity distribution among survivors of FARS fatal crashes was different from survivors of GES and SDS non-fatal injury crashes. Among non-fatal GES and SDS injury crashes, the significant decline in annual injury counts occurred among all injury severity levels (incapacitating, non-incapacitating, and possible injuries). Comparatively, in FARS fatal crashes, the annual count of incapacitating injuries dropped 25 percent, while the non-incapacitating injuries declined only 3 percent and the possible injuries rose 3 percent. The years of 2003 and 2005 were the first time that incapacitating injuries were not the most common non-fatal injury severity among fatal crashes. The count of less severe non-incapacitating injuries was higher than the count of incapacitating injuries during these two years.

The rate of injuries per crash was also examined in the FARS, GES, and SDS databases. The number of crashes where a person was injured declined in GES and SDS, and at the same time the number of injuries from these crashes showed a more significant decline. These two concurrent trends led to a decline in the rate of injuries per crash in both GES and SDS. The rate of injuries per crash dropped five percent in GES and three percent in SDS. In FARS, there was a 15-percent drop in the rate of non-fatal injuries per crash. These findings show that the reduction in injury counts was due to both a drop in the number of injury-related crashes, as well as a drop in the rate of injuries per crash.

Other countries in addition to the United States experienced a decline in motor vehicle injuries. Australia, Great Britain, and France are three examples of the many countries that showed a decline in motor vehicle injuries over the last decade.

II. Introduction

Since the mid-1990s, the traffic on America's roads has increased significantly, as the number of vehicle miles traveled (VMT) rose 20 percent from 1996 to 2005 (FHWA 2006). During this time period, restraint use rose from 61 percent to 82 percent (NOPUS 2005), and the percent of traffic fatalities that were alcohol-related dropped from 42 percent to 39 percent. Many improvements in the vehicle fleet occurred, including a large increase in the number of vehicles equipped with air bags.

To help learn how to best improve the safety of America's roads, NHTSA's National Center for Statistics and Analysis (NCSA) produces and analyzes many different vehicle crash databases. Data on fatal crashes are collected through the FARS database. The number of traffic fatalities climbed 3.3 percent from 42,065 in 1996 to 43,443 in 2005; the number of motorcycle fatalities more than doubled from 2,161 in 1996 to 4,553 in 2005; and there was a 3.2-percent decrease during that time in passenger vehicle fatalities from 32,437 in 1996 to 31,415 in 2005. The overall fatality rate fell 14.2 percent, from 1.69 to 1.45 fatalities per 100 million VMT.

The GES database provides information on State-reported fatal crashes, injury crashes, and property-damage-only (PDO) crashes. GES estimates that the number of non-fatal traffic injuries decreased 22.5 percent over ten years, from 3,332,000 in 1996 to 2,581,000 in 2005. When combined with the increase in VMT during this time, the injury rate dropped from 134 to 86 injured people per 100 million VMT, a reduction of 35.6 percent.

The goal of this report is to test the hypothesis that non-fatal traffic injuries have declined significantly since the mid-1990s. The three databases examined in this report are FARS, GES, and the State Data System (SDS). In order to use the FARS database of fatal crashes to gather information about trends in traffic injury counts, the FARS database was grouped to show counts of A) fatally injured occupants, and B) occupants with non-fatal injuries.

Each of these three databases, FARS, GES, and SDS, has different information that is helpful in analyzing injury trends in traffic crashes in the United States. This report examines data collected since 1996 in FARS, GES, and SDS to attempt to better understand the recent trends in non-fatal traffic injuries, and to determine whether or not there has been a significant decline in traffic injuries over the last decade.

III. Background

Data from the FARS, GES, and State Data System databases were separately examined for this report. These three databases are unique, and have many similarities and differences. Below are brief summaries of what is present in these three databases.

Fatality Analysis Reporting System

Fatality information derived from FARS includes motor vehicle traffic crashes that result in the death of an occupant of a vehicle or a nonmotorist within 30 days of the crash. FARS contains data on all fatal traffic crashes within the 50 States, the District of Columbia, and Puerto Rico. NHTSA has a contract with an agency in each State to provide information on fatal crashes. FARS analysts are State employees who extract the information and put it in a standard format. Data on fatal motor vehicle traffic crashes are gathered from the State's own source documents, and are coded on standard FARS forms. The analysts obtain the documents needed to complete the FARS forms, which generally include some or all of the following: Police Accident Reports (PARs), State vehicle registration files, State driver licensing files, State Highway Department data, Vital Statistics, Death certificates, Coroner/Medical examiner reports, Hospital medical records, and emergency medical service reports

FARS information for this report focuses on two groups of people who were involved in FARS crashes: 1) Vehicle occupants who received non-fatal injuries in fatal crashes, and 2) vehicle occupants who were fatally injured in these fatal crashes.

General Estimates System

The crash data in the GES database come from a nationally representative sample of State-reported motor vehicle traffic crashes. The information is used to estimate how many motor vehicle crashes of different kinds take place, and what happens when they occur. For a crash to be eligible for the GES sample: the crash must be reported on a State accident form (police accident report or PAR); the PAR must be signed by a police officer and sent to the State for inclusion in the State's annual statistics; the crash must involve at least one motor vehicle traveling on a traffic way; and the result must be property damage, injury, or death. These PARs are chosen from 60 areas across the United States that reflect geography and population. GES data collectors make weekly visits to approximately 413 police jurisdictions in the 60 areas across the United States, where they randomly sample about 56,000 PARs each year. The data collectors obtain copies of the PARs and send them to a central contractor for coding.

State Data System

Each State in the SDS maintains a database that contains comprehensive information about people, vehicles, and conditions recorded in PARs. Information will vary from State to State because many States have different data collection and reporting standards. NHTSA obtains crash data files derived from data recorded on State PARs. NHTSA refers to the collection of these computerized State crash data files as the State Data System. The crash data files from the States are requested annually from the appropriate State agencies. In most instances, the coordinating State agency is the State police, the State highway safety department, or the State Department of Transportation. See the Appendix for links to SDS information.

IV. Methodology

This report made use of data from the FARS, GES, and SDS databases for all available years since 1996. In FARS and GES, data were available for crashes occurring from 1996 through 2005. SDS data for the years 1996 through 2004 were examined, since the collection and aggregation of the State data from the many different States is completed on a different timeframe compared to the FARS and GES data.

The FARS database is a census of fatal traffic crashes within the 50 States, the District of Columbia, and Puerto Rico. The GES database is a nationally representative probability sample selected from State-reported crashes. SDS is a collection of databases that contain a census of crashes from police crash reports from each State in the State Data System.

For a crash to be included in this report, a person needed to be injured in the crash. People involved in multi-person crashes where an injury occurred, but were not injured in those crashes, are not included in the person-level counts in this report. No crashes where there was "property damage only" were included.

Injury counts in this report from FARS and GES frequently include injuries of the following severities: incapacitating, non-incapacitating, and possible. Injuries were often categorized in decreasing order of levels of injury severity, as taken from the frequently used "KABCO" scale for injury severity: (K) fatal injury, (A) incapacitating injury, (B) non-incapacitating injury, (C) possible injury, and (O) no injury. As noted, injury counts for some tables in this report include injuries where the severity of the injury was unknown, while other tables only include injuries of known severity. For data consistency, no SDS tables include injuries of unknown severity.

For crashes that were categorized by impact point, the following categories were created: frontal impact (11, 12, and 1 o'clock), left side impact (8, 9, and 10 o'clock), right side impact (2, 3, and 4 o'clock), and rear impact (5, 6, and 7 o'clock). These categories were based on the principal impact point of the crash. Non-collisions and impacts on the top of the vehicle or the undercarriage of the vehicle were not included in the tables that examined impact point.

In order to use the FARS database of fatal crashes to gather information about trends in traffic injury counts, FARS was stratified to show counts of fatally injured vehicle occupants, and occupants with non-fatal injuries. Trends were then separately examined for the time-period of 1996 through 2005 for the number of fatalities in FARS and the number of non-fatally injured people in FARS.

A total of 25 SDS States that had data for some or all of the years 1996 through 2004 were included in this analysis. Five of these States had data for all of the years from 1996 through 2004 (Florida, Maryland, Montana, New Mexico, and Ohio). The remaining 20 States had data available for a subset of the years from 1996 through 2004. A fixed-effects statistical model for longitudinal data analysis was used to aggregate the applicable State data from 24 of these 25 States into one model. State data from Ohio was not included in this model due to coding issues that are discussed in the Limitations section of this report.

The fixed-effects model calculated percent changes in the injury counts, adjusting for the inclusion of a varying number of States over time. The SDS data used in this report cannot be used to extrapolate the change in injury counts for the entire Nation. However, the use of a large number of States from a diverse geographic location allows this model to estimate the overall percentage change in injuries.

The fixed-effects model decomposes injuries by State and by year, and constructs the overall estimates as a sum of State and year effects. This model is a standard technique when dealing with missing longitudinal data. Fixed effects estimation is a method of estimating parameters from a panel data set. The fixed effects estimator is obtained by ordinary least squares on the deviations from the means of each unit or time period. This approach is relevant when one expects that the averages of the dependent variable will be different for each cross-section unit, or each time period, but the variance of the errors will not. More information on fixed-effects modeling can be located in a 31st Annual SAS Users Group International (SUGI) paper on Fixed Effects Regression Methods in SAS (Allison, 2006).

V. Results

Fatalities in Motor Vehicle Crashes

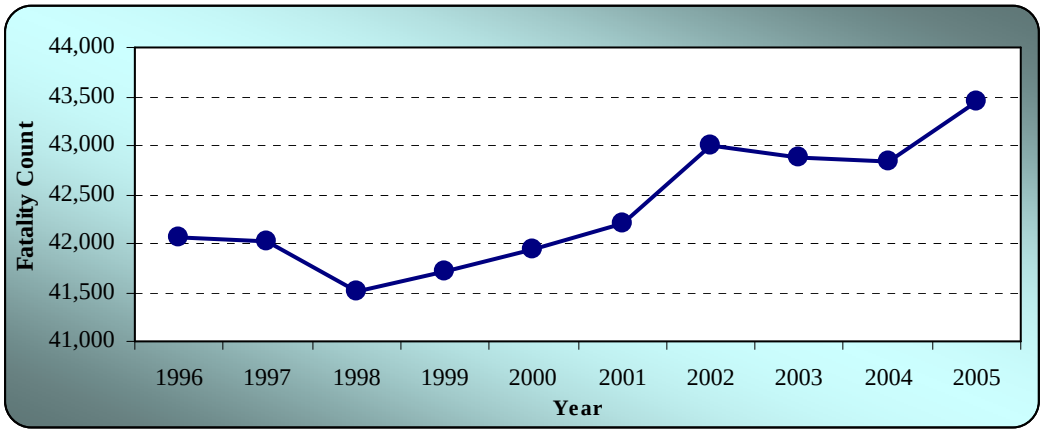
In 2005, the number of traffic fatalities in the United States totaled 43,443. This is a 3.3-percent increase compared to the 1996 fatality count of 42,065. The number of vehicle miles traveled (VMT) increased 20 percent during that time, from 2,486 to 2,990 billion miles traveled. When dividing the fatality counts by the VMT, a fatality rate per 100 million VMT can be calculated. The fatality rate declined 14 percent from 1.69 in 1996 to 1.45 in 2005. These trends can be seen below in Table 1 and Figures 1, 2, and 3.

The fatality counts in Table 1 represent all fatalities from motor vehicle crashes, including vehicle occupants, motorcycle riders, pedestrians, and pedalcyclists.

Table 1
Fatalities, VMT, and Fatality Rate per 100 Million VMT, by Year

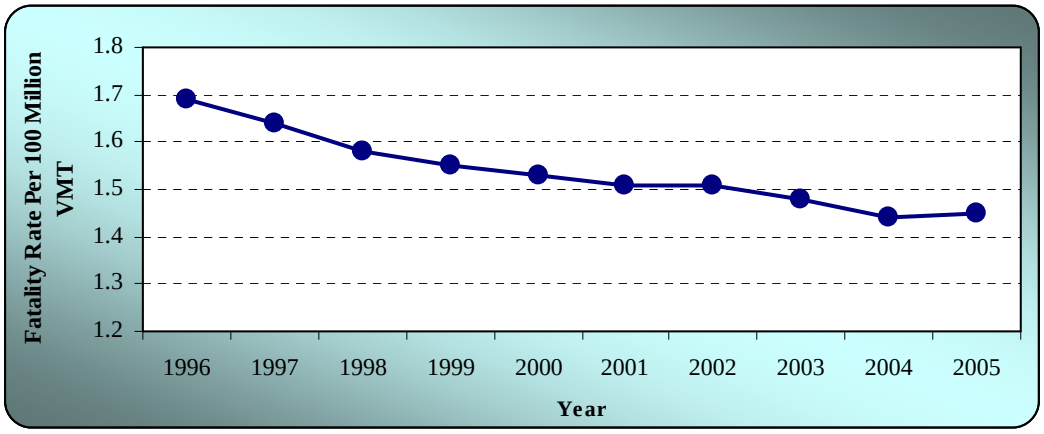
Year	Fatality Count	Percent Change in Fatality Count (Baseline = 1996)	VMT (billions)	Fatality Rate per 100 Million VMT	Percent Change in Fatality Rate (Baseline = 1996)
1996	42,065	Baseline	2,486	1.69	Baseline
1997	42,013	-0.1	2,562	1.64	-3.0
1998	41,501	-1.3	2,632	1.58	-6.5
1999	41,717	-0.8	2,691	1.55	-8.3
2000	41,945	-0.3	2,747	1.53	-9.5
2001	42,196	0.3	2,797	1.51	-10.7
2002	43,005	2.2	2,856	1.51	-10.7
2003	42,884	1.9	2,890	1.48	-12.4
2004	42,836	1.8	2,965	1.44	-14.8
2005	43,443	3.3	2,990	1.45	-14.2
Source: NCSA, NHTSA, FARS 1996-2005 and FHWA, VMT data					

Figure 1
Fatalities, by Year



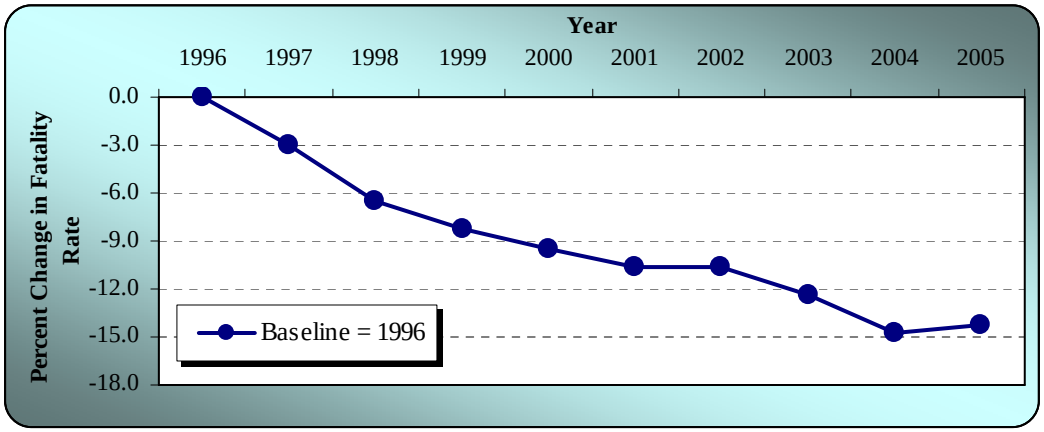
Source: NCSA, NHTSA, FARS 1996-2005

Figure 2
Fatality Rate per 100 Million VMT, by Year



Source: NCSA, NHTSA, FARS 1996-2005 and FHWA, VMT data

Figure 3
Percent Change in Fatality Rate per 100 Million VMT, By Year, Baseline=1996



Source: NCSA, NHTSA, FARS 1996-2005 and FHWA, VMT data

Passenger Vehicle Occupant Fatalities

In 2005, the number of passenger vehicle occupant fatalities in the United States totaled 31,415. This was a 3.2-percent decrease compared to the 1996 fatality count of 32,437. The fatality counts in Table 2 represent fatalities among occupants of passenger vehicles. These counts do not include fatalities to motorcycle riders, large-truck occupants, bus occupants, pedestrians, or pedalcyclists. Passenger vehicles are comprised of passenger cars, sport utility vehicles, pickups, and vans.

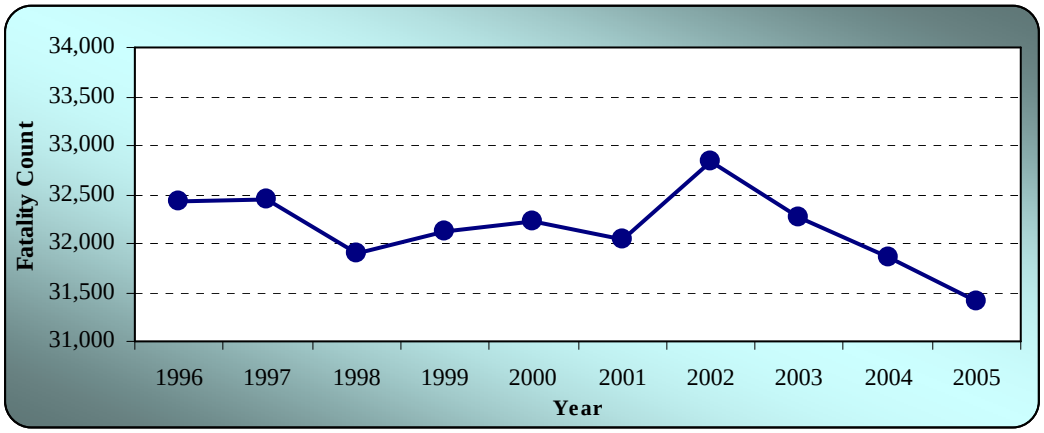
While the number of vehicle miles traveled (VMT) by passenger vehicles increased 20 percent from 2,286 to 2,750 billion miles traveled, the fatality rate per 100 million VMT declined 19.5 percent from 1.42 in 1996 to 1.14 in 2005. These trends can be seen below in Table 2 and Figures 4, 5, and 6. The 19.5-percent decline in the passenger vehicle occupant fatality rate, as shown in Table 2, is larger than the 14.2-percent decline seen in the overall fatality rate in Table 1.

The trend in motorcycle fatalities represents a large portion of the difference between the 3.3-percent increase seen in overall fatality counts in Table 1 and the 3.2-percent decrease seen in passenger vehicle occupant fatality counts in Table 2. The number of motorcycle fatalities has more than doubled from 2,161 in 1996 to 4,553 in 2005.

Table 2
Passenger Vehicle Occupant Fatalities, VMT,
And Fatality Rate per 100 Million VMT, by Year

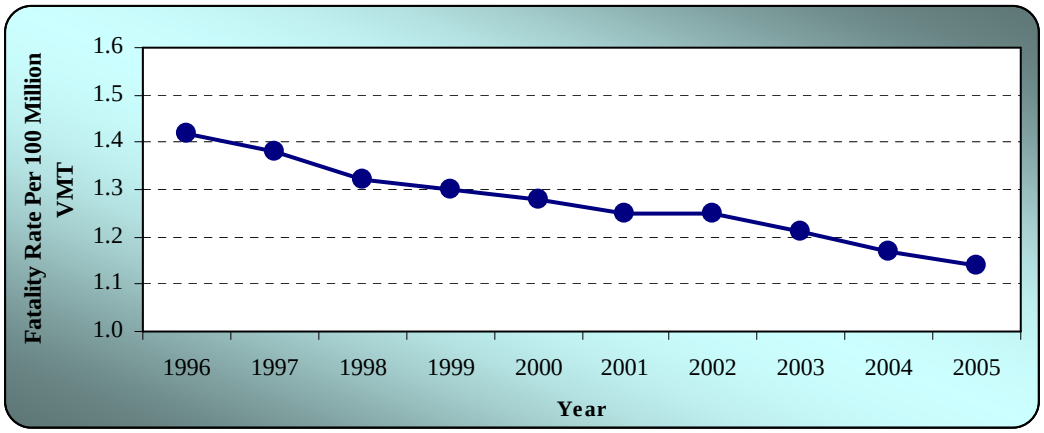
Year	Passenger Vehicle Occupants Fatality Count	Percent Change in Fatality Count (Baseline = 1996)	Passenger Vehicle VMT (billions)	Passenger Vehicle Fatality Rate per 100 Million VMT	Percent Change in Fatality Rate (Baseline = 1996)
1996	32,437	Baseline	2,286	1.42	Baseline
1997	32,448	0.0	2,353	1.38	-2.9
1998	31,899	-1.7	2,418	1.32	-7.1
1999	32,127	-1.0	2,470	1.30	-8.4
2000	32,225	-0.7	2,523	1.28	-10.1
2001	32,043	-1.2	2,572	1.25	-12.2
2002	32,843	1.3	2,625	1.25	-11.9
2003	32,271	-0.5	2,656	1.21	-14.4
2004	31,866	-1.8	2,727	1.17	-17.7
2005	31,415	-3.2	2,750	1.14	-19.5
Source: NCSA, NHTSA, FARS 1996-2005 and FHWA, VMT data					

Figure 4
Passenger Vehicle Occupant Fatalities, by Year



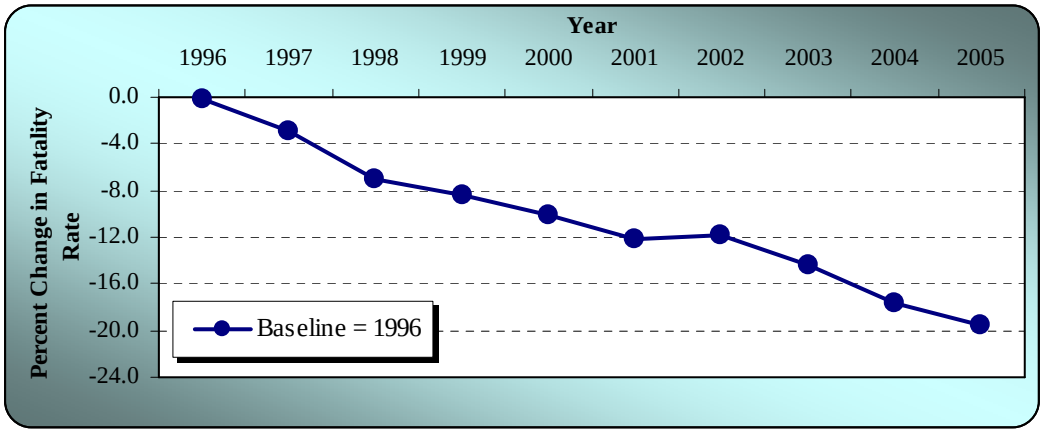
Source: NCSA, NHTSA, FARS 1996-2005, FARS 1996-2005

Figure 5
Passenger Vehicle Occupant Fatality Rate per 100 Million VMT, by Year



Source: NCSA, NHTSA, FARS 1996-2005 and FHWA, VMT data

Figure 6
Percent Change in Passenger Vehicle Occupant Fatality Rate per 100 Million VMT, By Year, Baseline=1996



Source: NCSA, NHTSA, FARS 1996-2005 and FHWA, VMT data

Surviving Occupants Injured in Fatal Crashes

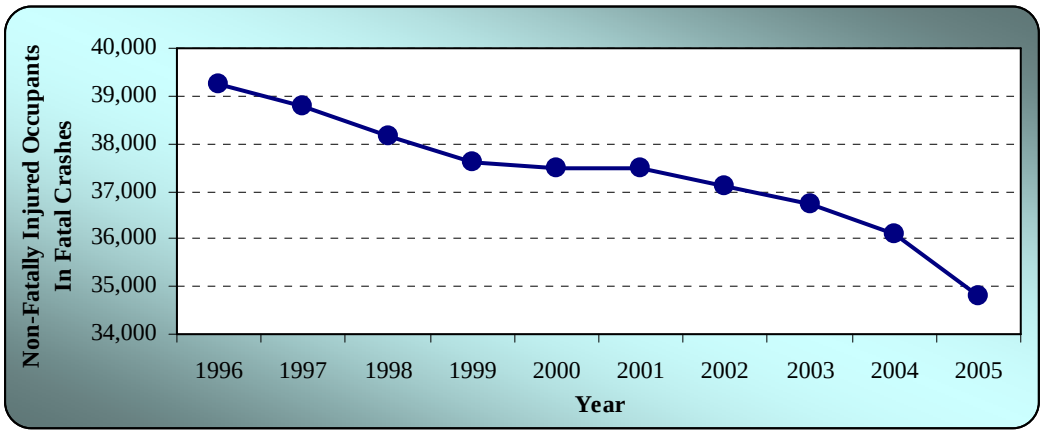
Figure 1 showed that the number of fatalities increased 3.3 percent from 1996 to 2005. However, the number of non-fatal injuries in fatal crashes went down during this time period. In 2005, 34,784 people were non-fatally injured in a fatal crash, compared to 39,243 people in 1996 (see Table 3 and Figure 7). This reduction in non-fatal injuries among occupants in fatal crashes amounts to an 11.4-percent decline from 1996 to 2005 (see Table 3). This drop occurred despite the fact that the number of fatal crashes increased 4.5 percent from 37,494 in 1996 to 39,189 in 2005, as shown in Table 3 and Figure 8. These trends suggest that the likelihood of surviving a fatal crash increased during that time period.

Note: For ease of comparison, the annual fatality counts from Table 1 on page 10 were copied and placed in the far right column of Table 3 below, and the corresponding Figure 1 was recopied and named Figure 9.

Table 3
Non-Fatally Injured Occupants in Fatal Crashes, Fatal Crash Count, and Fatalities, by Year

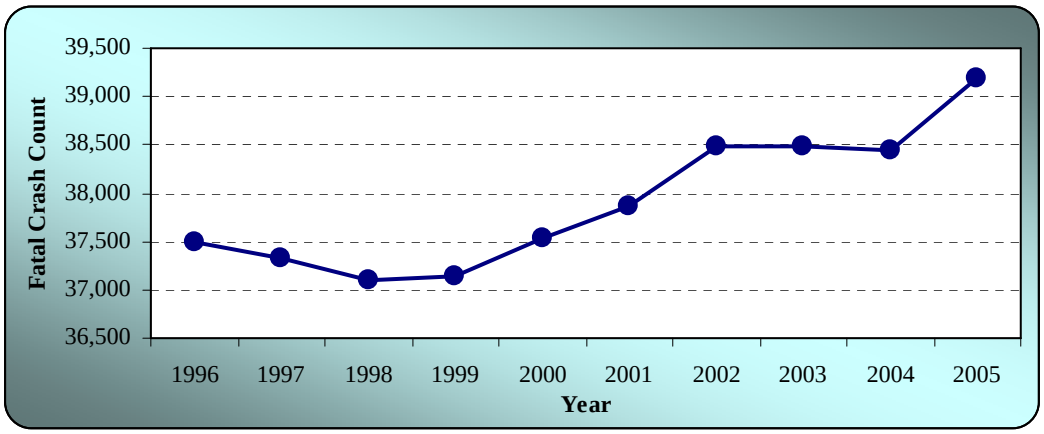
Year	Number Non-Fatally Injured in Fatal Crashes	Percent Change in Non-Fatal Injury Count (Baseline=1996)	Fatal crash count	Percent Change in Fatal Crash Count (Baseline=1996)	Number Fatally Injured in Fatal Crashes
1996	39,243	Baseline	37,494	Baseline	42,065
1997	38,764	-1.2	37,324	-0.5	42,013
1998	38,138	-2.8	37,107	-1.0	41,501
1999	37,607	-4.2	37,140	-0.9	41,717
2000	37,496	-4.5	37,526	0.1	41,945
2001	37,489	-4.5	37,862	1.0	42,196
2002	37,103	-5.5	38,491	2.7	43,005
2003	36,712	-6.4	38,477	2.6	42,884
2004	36,090	-8.0	38,444	2.5	42,836
2005	34,784	-11.4	39,189	4.5	43,443
Source: NCSA, NHTSA, FARS 1996-2005					

Figure 7
Non-Fatally Injured Occupants in Fatal Crashes, by Year



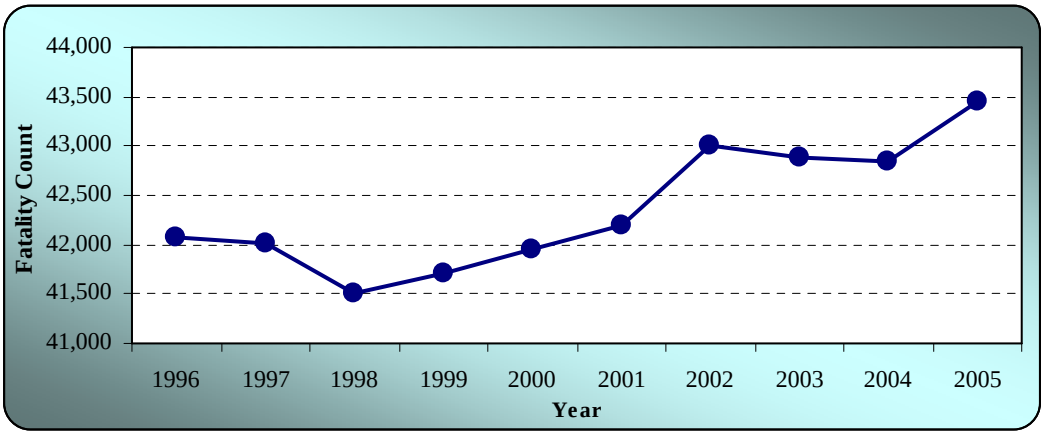
Source: NCSA, NHTSA, FARS 1996-2005

Figure 8
Fatal Crashes, by Year



Source: NCSA, NHTSA, FARS 1996-2005

Figure 9
Fatalities, by Year



Source: NCSA, NHTSA, FARS 1996-2005

More evidence that points to an improvement in vehicles can be seen by looking at non-injured occupants in passenger vehicles in fatal crashes. From 1996 through 2005, the number of passenger vehicles that had exactly two occupants and at least one fatality declined by 7.9 percent. However, despite this 7.9-percent decrease in the vehicle count, the number of non-injured occupants in these vehicles increased by 4.1 percent; thus the proportion of non-injured occupants in these crashes increased by 13.0 percent.

An increase in restraint use is likely to be a major reason for the rise in the portion of non-injured occupants in fatal crashes. From 1996 to 2005, the percent of surviving passenger vehicle occupants who were restrained in fatal crashes climbed from 56 percent to 70 percent.

Non-Fatal Injuries in GES Crashes

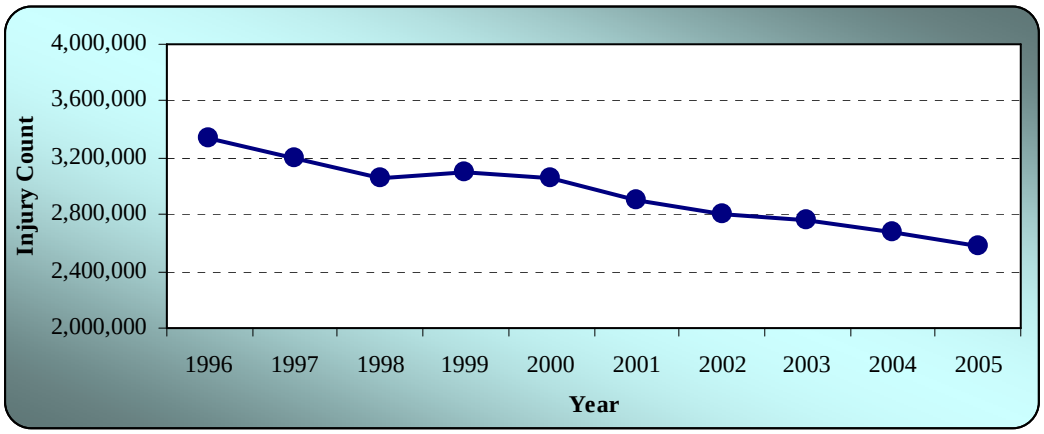
Table 3 shows that there was an 11.4-percent decline in the number of non-fatal injuries in fatal crashes since 1996. By comparison, Table 4, below, provides information on non-fatal crashes from the GES database. The number of injuries in these non-fatal crashes declined 22.5 percent, from 3,332,000 in 1996 to 2,581,000 in 2005 (see Figure 10). The injury rate per 100 million VMT shown in Table 4 is calculated using the same VMT exposure data as listed in Table 1. This injury rate was reduced by 35.6 percent, from 134 in 1996 to 86 in 2005 (see Figures 11 and 12).

The National Occupant Protection Use Survey (NOPUS) shows that estimated restraint use climbed from 61 percent in 1996 to 82 percent in 2005 (NOPUS 2005). This increase in restraint use, as well as improvements in vehicle safety, is likely to be a major contributor to the decline in injuries seen in Table 4 below.

Table 4
Non-Fatally Injured and Injury Rate per 100 Million VMT, by Year

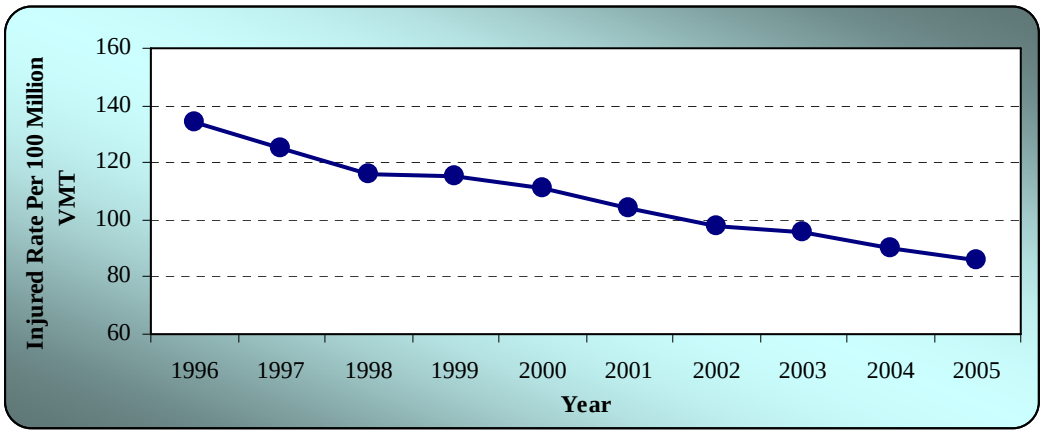
Year	Injured Count	Percent Change in Number Injured (Baseline = 1996)	VMT (billions)	Injury rate per 100 Million VMT	Percent Change in Injury Rate (Baseline = 1996)
1996	3,332,000	Baseline	2,486	134	Baseline
1997	3,201,000	-3.9	2,562	125	-6.8
1998	3,061,000	-8.1	2,632	116	-13.2
1999	3,097,000	-7.1	2,691	115	-14.1
2000	3,055,000	-8.3	2,747	111	-17.0
2001	2,901,000	-12.9	2,797	104	-22.6
2002	2,800,000	-16.0	2,856	98	-26.9
2003	2,764,000	-17.0	2,890	96	-28.6
2004	2,670,000	-19.9	2,965	90	-32.8
2005	2,581,000	-22.5	2,990	86	-35.6
Source: NCSA, NHTSA, GES 1996-2005 and FHWA, VMT data					

Figure 10
Non-Fatally Injured, by Year



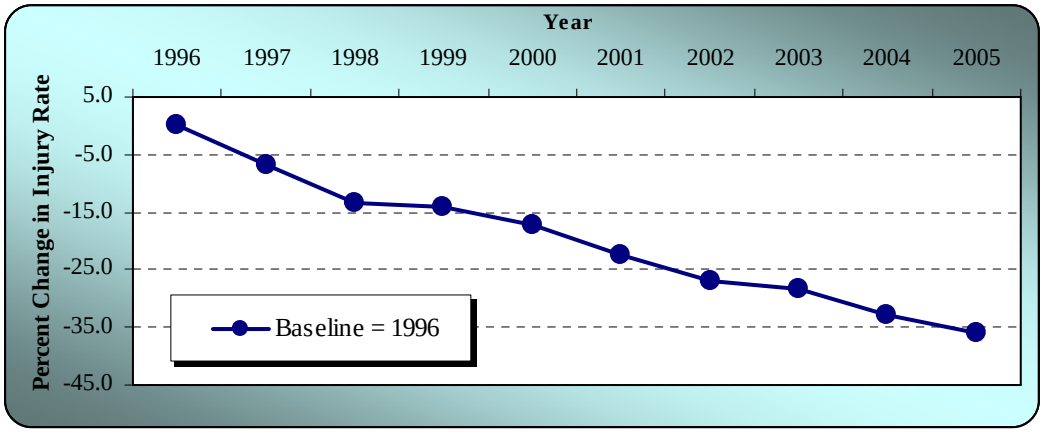
Source: NCSA, NHTSA, GES 1996-2005

Figure 11
Injury Rate per 100 Million VMT, by Year



Source: NCSA, NHTSA, GES 1996-2005 and FHWA, VMT data

Figure 12
Percent Change in Injury Rate per 100 Million VMT, By Year, Baseline=1996



Source: NCSA, NHTSA, GES 1996-2005 and FHWA, VMT data

Non-Fatal Injuries in SDS Crashes

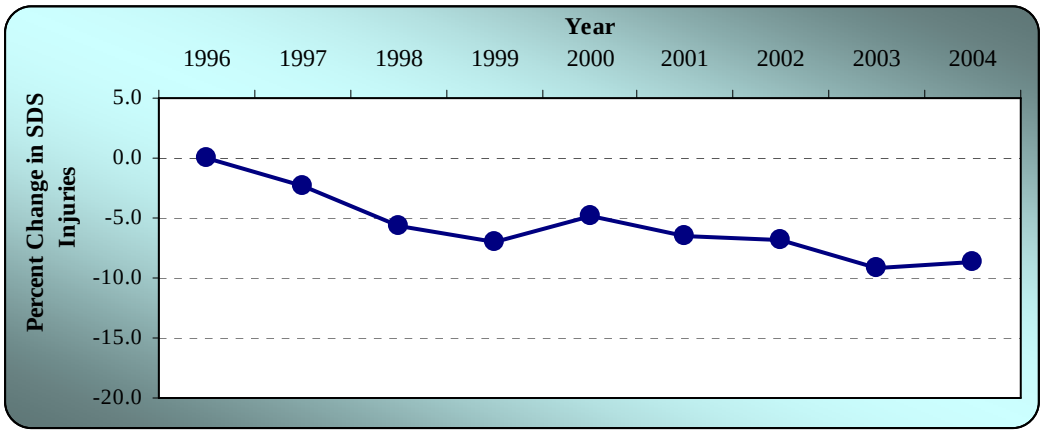
The injury counts that were displayed in Table 4 represent the entire Nation, as measured by the GES database. Another database that provides injury counts is the State Data System (SDS). Twenty-five States in the SDS had data available for some or all of the years from 1996 through 2004. A fixed-effects statistical model for longitudinal data analysis was used to aggregate the available State-years of data from 24 of these States into one model. The 24 States used for the model are Arkansas, California, Delaware, Florida, Georgia, Illinois, Indiana, Kansas, Kentucky, Maryland, Michigan, Missouri, Montana, New Mexico, New York, North Carolina, Pennsylvania, South Carolina, Texas, Utah, Virginia, Washington, Wisconsin, and Wyoming. State data from Ohio was not included due to coding issues that are discussed in the Limitations section of this report.

Table 5 shows the results of the fixed-effects model in calculating the percent decline in injury counts seen from 1996 through 2004 in the SDS database. This model calculated that SDS injuries declined by 8.6 percent, as shown in Figure 13. By comparison, the injury count in the GES database declined 19.9 percent during that time period (shown in Table 4). Please note that the following section in this report (beginning on page 21) stratifies these SDS and GES declines in injury counts into three levels of injury severity.

Table 5
Percent Change in State Data System Injuries,
As Calculated Through a Fixed Effects Model, by Year

Year	Percent Change in SDS Injuries, as Calculated Through A Fixed-Effects Model, (Baseline = 1996)
1996	Baseline
1997	-2.3
1998	-5.7
1999	-7.0
2000	-4.8
2001	-6.5
2002	-6.8
2003	-9.1
2004	-8.6
Source: NCSA, NHTSA, SDS 1996-2004	

Figure 13
Percent Change in State Data System Injuries,
As Calculated Through a Fixed Effects Model, by Year



Source: NCSA, NHTSA, SDS 1996-2004

Table 5 and Figure 13 display the percentage change in injury counts since 1996 as modeled in 24 SDS States. Below in Table 6 are the injury counts for the four States in the SDS that have consistent data for all nine of the years from 1996 through 2004 (Florida, Maryland, Montana, and New Mexico). Each of these States experienced a significant decline in injury counts, ranging from 6.6 percent in Florida to 18.1 percent in Maryland. Although Ohio collected State data for the years 1996 through 2004, it is not included in Table 6, due to data coding issues that are discussed in the Limitations section of this report.

Table 6
Injuries by State, Among SDS States with Data for 1996 through 2004

Year	Florida	Maryland	Montana	New Mexico
1996	243,320	69,142	10,683	31,263
1997	240,001	65,553	10,694	29,645
1998	241,863	60,596	10,061	28,096
1999	232,225	60,153	10,466	24,230
2000	231,588	59,032	10,805	27,380
2001	234,600	59,891	9,002	27,536
2002	229,611	59,861	10,089	26,441
2003	221,639	59,537	9,650	25,414
2004	227,192	56,658	9,263	26,481
Percent change from 1996 to 2004	**-6.6**	**-18.1**	**-13.3**	**-15.3**

Source: NCSA, NHTSA, SDS 1996-2004

Injury Severity

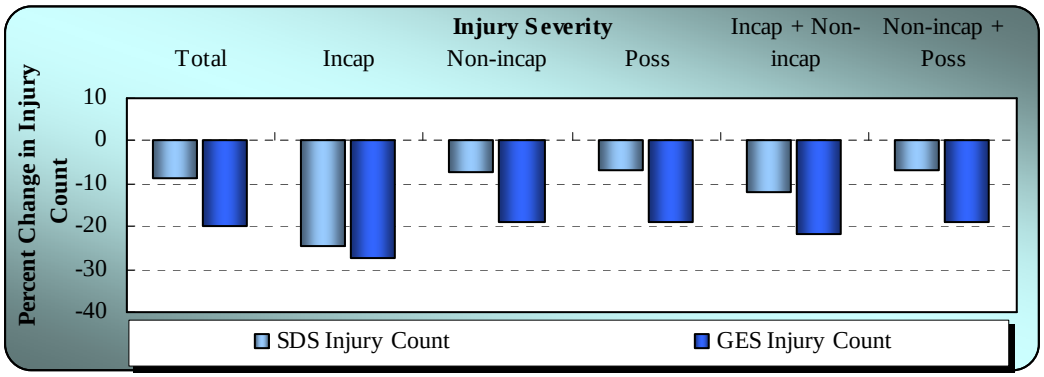
The injury counts in the State Data System are categorized into the following severities: incapacitating, non-incapacitating, and possible. These three injury severity categories are listed in decreasing order of level of injury severity. Table 7 shows that from 1996 to 2004, the fixed effects model found the decline in SDS injuries to be 8.6 percent. After stratifying the SDS injuries by injury severity, it was determined that the incapacitating injury count dropped 24.6 percent, while non-incapacitating injuries declined 7.4 percent, and possible injuries fell 6.8 percent, from 1996 to 2004. When aggregating the incapacitating and non-incapacitating injuries, the decline was 11.8 percent, while non-incapacitating and possible injuries combined fell 7.0 percent (see Table 7).

The percentage changes in the GES injury counts for these injury severity categories are also included in Table 7. The middle column displays the overall percentage changes for the years 1996 through 2004, to be consistent with the available years of data in the State Data System. The far right column shows the GES percentage changes from 1996 to 2005, as the 2005 GES data was available at the time of this report. A graph of the SDS and GES percentage changes from 1996 through 2004 is shown below in Figure 14. The GES injury counts for each year from 1996 through 2005, as used to produce the results in Table 7, are included in Table 8 and Figure 15.

Table 7
Percent Change in Injuries, by Injury Severity, Database and Period of Time

Injury Severity	Percent Change in SDS Injury Count from 1996 to 2004, as Calculated Through Fixed Effects Model	Percent Change in GES Injury Count from 1996 to 2004	Percent Change in GES Injury Count from 1996 to 2005
Total	-8.6	-19.9	-22.5
Incapacitating	-24.6	-27.6	-27.7
Non-incapacitating	-7.4	-18.9	-20.5
Possible	-6.8	-19.0	-22.7
Incapacitating + Non-incapacitating	-11.8	-21.6	-22.8
Non-incapacitating + Possible	-7.0	-18.9	-22.0
Source: NCSA, NHTSA, GES 1996-2005, SDS 1996-2004			

Figure 14
Percent Change in Injuries, by Injury Severity
And Database, From 1996 Through 2004



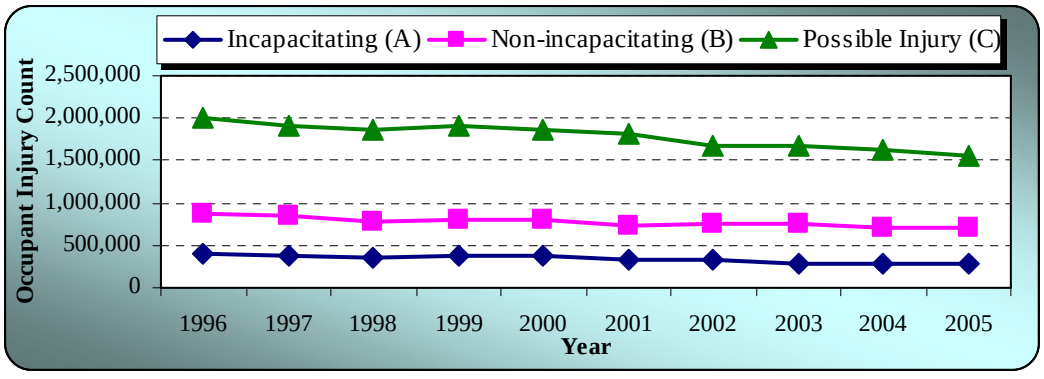
Source: NCSA, NHTSA, GES 1996-2004, SDS 1996-2004

Table 8
Non-Fatally Injured Occupants,
By Injury Severity and Year

Year	INJURY SEVERITY			Total
	Incapacitating (A)	Non-Incapacitating (B)	Possible Injury (C)	
1996	395,000	879,000	1,998,000	3,332,000
1997	382,000	856,000	1,901,000	3,201,000
1998	363,000	783,000	1,856,000	3,061,000
1999	375,000	805,000	1,907,000	3,097,000
2000	368,000	805,000	1,863,000	3,055,000
2001	338,000	740,000	1,807,000	2,901,000
2002	333,000	763,000	1,681,000	2,800,000
2003	290,000	761,000	1,684,000	2,764,000
2004	286,000	713,000	1,619,000	2,670,000
2005	286,000	698,000	1,545,000	2,581,000

Source: NCSA, NHTSA, GES 1996-2005
Note: Total includes injuries of unknown severity. Counts are rounded to the nearest thousand.

Figure 15
Non-Fatally Injured Occupants,
By Injury Severity and Year



Source: NCSA, NHTSA, GES 1996-2005

As expected, the shift in injury severity distribution among injured survivors of fatal crashes was different than injured survivors of GES and SDS non-fatal crashes, given that the fatal crashes are on average more severe crashes than the non-fatal crashes. From 1996 to 2005, the annual FARS count of incapacitating injuries dropped 25.0 percent, while non-incapacitating injuries declined only 2.9 percent, and possible injuries rose 2.8 percent (see Table 9 and Figure 16).

The years of 2003 and 2005 were the first times that incapacitating injuries were not the most common non-fatal injury severity among fatal crashes. The count of less severe non-incapacitating injuries was higher than the count of incapacitating injuries during these years, as shown in Table 9 and Figure 16.

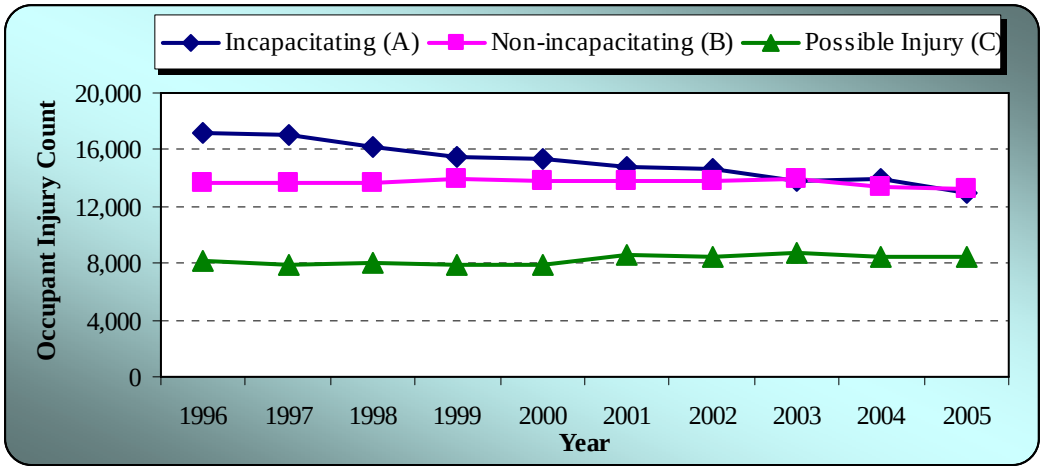
These trends display a clear shift in the distribution of non-fatal injury severities among fatal crashes, from more severe injuries to injuries of lesser severity. This shift is another example of the benefits seen from the increase in restraint use and the improvements in vehicle safety.

Table 9
Non-Fatally Injured Occupants in Fatal Crashes, by Injury Severity and Year

Year	INJURY SEVERITY			Total
	Incapacitating (A)	Non-Incapacitating (B)	Possible Injury (C)	
1996	17,250	13,596	8,171	39,243
1997	17,087	13,607	7,891	38,764
1998	16,177	13,692	8,072	38,138
1999	15,460	13,958	7,903	37,607
2000	15,415	13,826	7,946	37,496
2001	14,837	13,781	8,586	37,489
2002	14,651	13,846	8,488	37,103
2003	13,784	13,982	8,729	36,712
2004	13,958	13,417	8,447	36,090
2005	12,945	13,208	8,396	34,784

Source: NCSA, NHTSA, FARS 1996-2005
Note: Total includes injuries of unknown severity.

Figure 16
Non-Fatally Injured Occupants in Fatal Crashes, by Injury Severity and Year



Source: NCSA, NHTSA, FARS 1996-2005

Impact Point

Among both fatal and non-fatal crashes, the principal impact point of the crash (front, right side, left side, rear) did not play a significant role in the temporal changes in the injury severity distribution from 1996 through 2005. Table 10 and Figure 17 are for non-fatally injured occupants in front impact fatal crashes from the FARS database. Table 11 and Figure 18 are for front impact non-fatal crashes from the GES database. These tables and charts stratify the injured occupants in front impact crashes by injury severity. While only tables and charts for front impact crashes are presented in this Impact Point section, corresponding charts for right side impact, left side impact, and rear impact crashes are presented in the Appendix.

The three-year period from 2003 through 2005 was the first time that incapacitating injuries were not the most common non-fatal injury severity among front impact fatal crashes. The number of non-incapacitating and incapacitating injuries was nearly equal among side impact fatal crashes in 2005. In front, rear, and side impact fatal crashes, the incapacitating injury count declined significantly from 1996 through 2005. In rear impact fatal crashes, the incapacitating injury was the least likely injury to take place for each year since 1999.

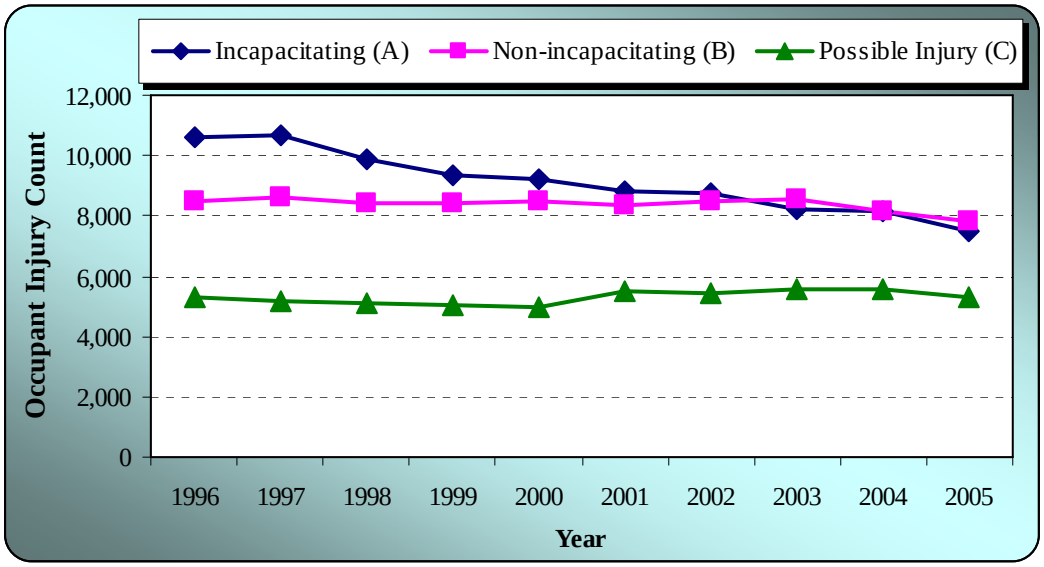
Displayed below are Table 10 and Figure 17 for fatal crashes where the impact occurred on the front side of the vehicle. Figure 17 shows the significant decline in incapacitating injuries in frontal crashes from 1996 through 2005, while the injuries of lesser severity showed far less change during that time.

Table 10
Non-Fatally Injured Occupants in Front Impact Fatal Crashes,
By Injury Severity and Year

Year	INJURY SEVERITY			Total
	Incapacitating (A)	Non-Incapacitating (B)	Possible Injury (C)	
1996	10,621	8,488	5,308	24,417
1997	10,697	8,588	5,144	24,429
1998	9,907	8,422	5,127	23,456
1999	9,352	8,446	5,013	22,811
2000	9,201	8,458	4,980	22,639
2001	8,838	8,332	5,507	22,677
2002	8,770	8,463	5,454	22,687
2003	8,243	8,525	5,589	22,357
2004	8,170	8,185	5,537	21,892
2005	7,481	7,842	5,319	20,642
Percent Change from 1996 to 2005	-29.6	-7.6	0.2	-15.5

Source: NCSA, NHTSA, FARS 1996-2005

Figure 17
Non-Fatally Injured Occupants in Front Impact Fatal Crashes, By Injury Severity and Year



Source: NCSA, NHTSA, FARS 1996-2005

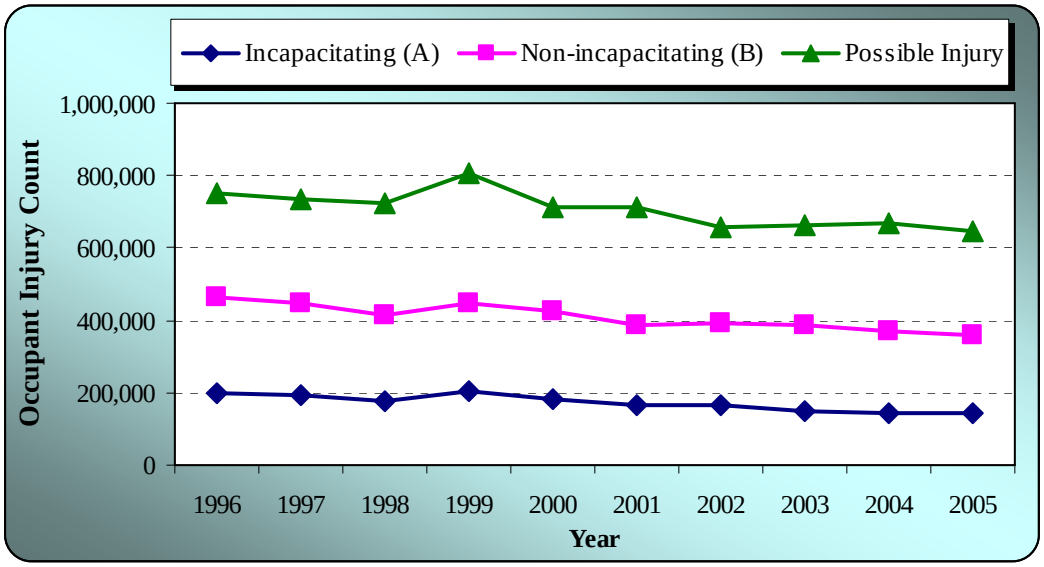
For non-fatal crashes, the injury severity trends over time were similar for all impact points. For front, rear, and side impact crashes, the counts of all levels of injury severity (incapacitating, non-incapacitating, and possible injuries) declined significantly from 1996 to 2005. Table 11 and Figure 18, shown below, are for non-fatal frontal crashes, as measured through the GES database. Despite a 1999 increase in the injury counts for all injury severities, the injury counts for non-fatal frontal crashes fell significantly from 1996 through 2005.

Table 11
Non-Fatally Injured Occupants in Front Impact Crashes, By Injury Severity and Year

Year	INJURY SEVERITY			Total
	Incapacitating (A)	Non-Incapacitating (B)	Possible Injury (C)	
1996	197,487	463,517	750,778	1,411,782
1997	195,047	449,744	735,530	1,380,321
1998	174,836	413,345	721,760	1,309,941
1999	204,353	448,300	805,741	1,458,394
2000	181,033	425,054	712,743	1,318,830
2001	166,146	386,765	712,743	1,265,654
2002	163,548	391,349	658,126	1,213,023
2003	148,594	389,093	664,509	1,202,196
2004	142,517	367,686	668,084	1,178,288
2005	145,928	360,368	648,505	1,154,801
Percent Change from 1996 to 2005	-26.1	-22.3	-13.6	-18.2

Source: NCSA, NHTSA, GES 1996-2005

Figure 18
Non-Fatally Injured Occupants in Front Impact Crashes,
By Injury Severity and Year



Source: NCSA, NHTSA, GES 1996-2005

Injury Rates per Crash

This report provides extensive information on injury counts in the FARS, GES, and SDS databases, and shows that the non-fatal injury counts in all three of these databases have declined since 1996. To put these declines in perspective, this section shows a calculation of injury rates per crash, for each database. The numerator of these rates is the number of injuries, as shown previously in this report. The denominator of these rates is the number of crashes.

The non-fatal injury rate per crash is lowest in FARS fatal crashes because this injury rate only measures non-fatal injuries, and thus excludes the large percentage of fatally injured occupants in the FARS fatal crashes. The injury rate for FARS crashes is approximately 1.0 non-fatal injury per crash. As expected, the injury rates for GES and SDS non-fatal crashes are higher, since there are more surviving occupants in these non-fatal crashes who are injured but not fatally injured. The injury rate for GES non-fatal crashes is quite similar to the injury rate for SDS non-fatal crashes, with both rates being approximately 1.5 injuries per crash. The trends in injury rates for each database are discussed below.

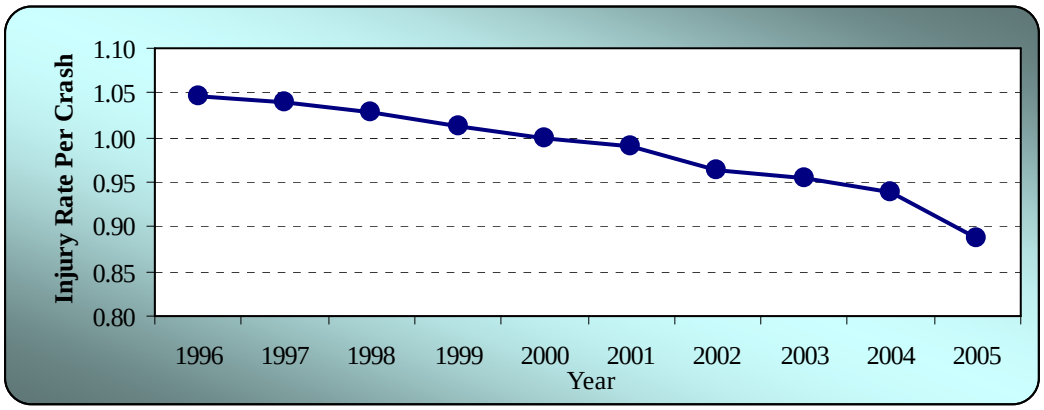
In Table 12, the number of non-fatally injured passengers in fatal crashes is divided by the number of fatal crashes, to calculate a non-fatal injury rate per fatal crash. This rate declined 15 percent from 1.05 in 1996 to 0.89 in 2005, as shown in Figures 19 and 20. The rate decline in injuries per fatal crash is due to both the reduction in injured occupants along with the increase in fatal crashes, which is shown below in Table 12.

Table 12
Non-Fatal Injury Rate per Fatal Crash, by Year

Year	Number Non-Fatally Injured in Fatal Crashes	Fatal crash count	Non-Fatal Injury Rate per Fatal Crash	Percent Change in Non-Fatal Injury Rate per Fatal Crash (Baseline=1996)
1996	39,243	37,494	1.05	Baseline
1997	38,764	37,324	1.04	-0.8
1998	38,138	37,107	1.03	-1.8
1999	37,607	37,140	1.01	-3.3
2000	37,496	37,526	1.00	-4.5
2001	37,489	37,862	0.99	-5.4
2002	37,103	38,491	0.96	-7.9
2003	36,712	38,477	0.95	-8.8
2004	36,090	38,444	0.94	-10.3
2005	34,784	39,189	0.89	-15.2

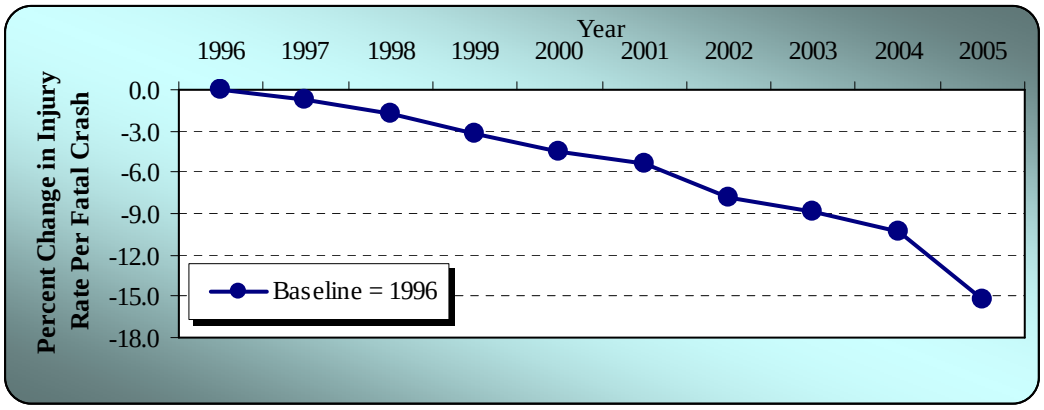
Source: NCSA, NHTSA, FARS 1996-2005

Figure 19
Non-Fatal Injury Rate per Fatal Crash, by Year



Source: NCSA, NHTSA, FARS 1996-2005

Figure 20
Percent Change in Non-Fatal Injury Rate per Fatal Crash, By Year, Baseline=1996



Source: NCSA, NHTSA, FARS 1996-2005

The injury rate in non-fatal GES crashes is shown in Table 13. This rate is equal to the number of GES injuries divided by the number of GES crashes where someone was injured. Note that property damage only (PDO) crashes are not included in this section or any other section of this report.

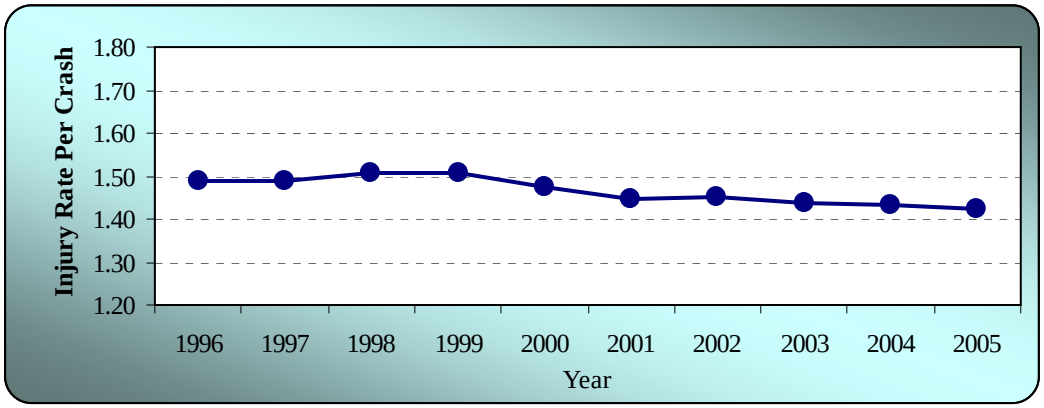
While it has been previously shown in Table 4 of this report that the number of injuries declined, Table 13 also shows that the number of non-fatal injury crashes also declined, from 2,238,000 in 1996 to 1,816,000 in 2005, a drop of 19 percent. The injury rate calculated here declined 4.5 percent from 1.49 in 1996 to 1.42 in 2005. Table 13 shows that while the injury counts and the crash counts both dropped, the number of injuries dropped faster than the number of crashes since 1999. The injury rate per crash fell from 1.51 in 1999 to 1.42 in 2005, a decline of 5.7 percent.

Table 13
GES Injury Rate per Non-Fatal Crash, by Year

Year	Number Non-Fatally Injured in GES Crashes	GES Crash count	Injury Rate per Crash	Percent Change in Injury Rate per Crash (Baseline=1996)
1996	3,332,000	2,238,000	1.49	Baseline
1997	3,201,000	2,149,000	1.49	0.0
1998	3,061,000	2,029,000	1.51	1.3
1999	3,097,000	2,054,000	1.51	1.3
2000	3,055,000	2,070,000	1.48	-0.9
2001	2,901,000	2,003,000	1.45	-2.7
2002	2,800,000	1,929,000	1.45	-2.5
2003	2,764,000	1,925,000	1.44	-3.6
2004	2,670,000	1,862,000	1.43	-3.7
2005	2,581,000	1,816,000	1.42	-4.5

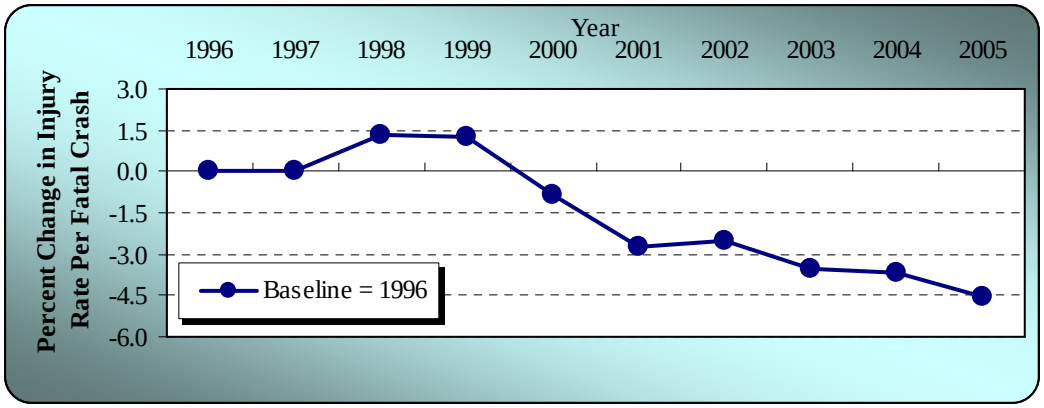
Source: NCSA, NHTSA, GES 1996-2005

Figure 21
GES Injury Rate per Non-Fatal Crash, by Year



Source: NCSA, NHTSA, GES 1996-2005

Figure 22
Percent Change in GES Injury Rate per Non-Fatal Crash, By Year, Baseline=1996



Source: NCSA, NHTSA, GES 1996-2005

Table 14 shows the injury rate per crash measured within the State Data System database. This rate is equal to the number of SDS injuries divided by the number of SDS crashes where someone was injured. These non-fatal crashes had an injury rate per crash that was quite similar to the GES non-fatal crashes. Table 14 and Figures 23 and 24 show that the SDS injury rate dropped from 1.58 in 1996 to 1.53 in 2004, a reduction of 3.2 percent. Note that the SDS data was not available for 2005 at the time of this report.

The State data injury counts and crash counts are not included in Table 14 because of the varying State-years of data available for different States in the State Data System. This inconsistency is due to the time when the State joined the State Data System, as well as the different times that each State processes and delivers the data to NHTSA.

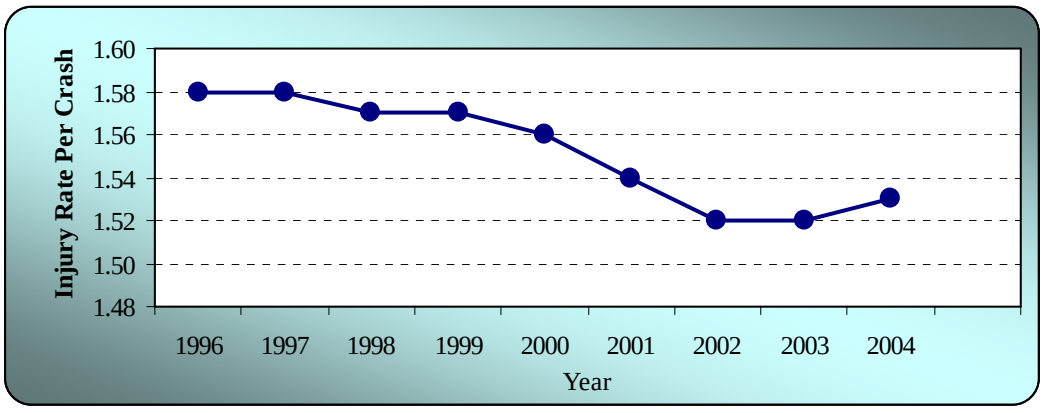
When comparing Table 13 and Table 14, it is clear that the injury rates per crash were, as expected, quite similar in both the GES and SDS databases. It is important to remember that the GES database represents a weighted count of crashes throughout the entire United States, while the SDS database is a measure of all available years of data from the States that provided data for some or all of the years from 1996 through 2004.

Table 14
SDS Injury Rate per Non-Fatal Crash, by Year

Year	SDS Injury Rate per Non-Fatal Crash	Percent Change in Injury Rate per Crash (Baseline=1996)
1996	1.58	Baseline
1997	1.58	-0.1
1998	1.57	-0.7
1999	1.57	-1.0
2000	1.56	-1.6
2001	1.54	-2.3
2002	1.52	-3.9
2003	1.52	-3.7
2004	1.53	-3.2

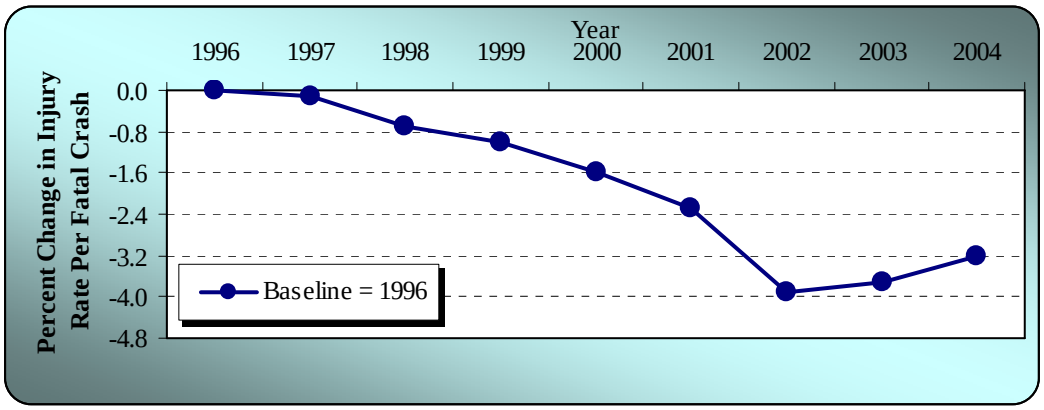
Source: NCSA, NHTSA, SDS 1996-2004

Figure 23
SDS Injury Rate per Non-Fatal Crash, by Year



Source: NCSA, NHTSA, SDS 1996-2004

Figure 24
Percent Change in SDS Injury Rate per Non-Fatal Crash,
By Year, Baseline=1996



Source: NCSA, NHTSA, SDS 1996-2004

VI. Discussion

This report was designed to examine trends in motor vehicle nonfatal injury counts over the last decade, with the utilization of three separate databases. The percentage decline in overall nonfatal injuries from 1996 through 2005 was calculated to be 23 percent in the GES database, 9 percent in the SDS database, and 11 percent in the FARS fatal crash database.

In addition to the fact that the three different databases each show significant overall declines in injuries over the last decade, attention should be placed on how these estimates of the decline in injuries vary when stratified by injury severity. The largest reduction in injuries occurred among incapacitating injuries, which is the most severe nonfatal injury category. Each database showed a reduction of 25 to 28 percent in incapacitating injuries. The percentage decline in less severe injuries was smaller for each database.

The fact that the largest percent decline in the injury counts occurred within the most severe injury category provides evidence about the many improvements in vehicle safety and driver and passenger behavior that have taken place in the last decade. This evidence suggests that these improvements provide the greatest safety benefit toward reducing the number of incapacitating injuries (i.e. traumatic brain injury, broken bone), compared to reducing the injuries of least severity (i.e. scrapes, cuts, and minor bruises). These improvements in vehicle safety and occupant behavior include, but are not limited to, an increased use of seat belts and child safety seats; reductions in drunk driving; as well as an expansion throughout the vehicle fleet of air bags, antilock brakes, and electronic stability control.

Additional research related to motor vehicle traffic trends over time has been completed in many different countries. Examples of this research include the following analyses of traffic in the United States, Australia, Great Britain, and France.

The Insurance Institute for Highway Safety analyzed passenger vehicle driver death rates per million vehicle registrations for the years 1985 through 2004 (Farmer and Lund, 2006). These rates have dropped during this entire time period, and Farmer and Lund suggested that much of this drop can be attributed to vehicle design improvements. Furthermore, the report suggested that without these vehicle design improvements, the driver fatality risk would have risen since 1993, and therefore more attention needs to be focused on improving roadway design and driver behavior.

Researchers in Australia looked into the relationship between vehicle age and risk of a car crash injury. This case-control study (Blows et al., 2003) measured the hospitalization or death of a vehicle occupant due to a car crash injury. The study conducted in New Zealand in 1999 found that after adjusting for potential confounders, vehicles constructed before 1984 were 2.88 times more likely to be involved in an injury crash than were vehicles constructed after 1994. These data provide evidence that vehicle improvements have contributed to reduced traffic injuries.

As seen in the United States, the injury counts in Great Britain declined significantly from 1996 to 2004, while the fatality counts in Great Britain changed very little (Broughton and Walter, 2007). The Co-operative Crash Injury Study analyzed vehicle crashes in Great Britain and determined that the proportion of crashes that were “unsurvivable” did not change between 1994 and 2004. They also concluded that while analyses of the use of restraint devices provided

valuable information, it did not explain the divergence of the trends in fatal crashes and serious injury crashes.

Between 2002 and 2005, the number of fatalities in France dropped 30 percent, as the average speed of travel was reduced by 7.2 percent (ONISR 2007). This is one of many examples that show the direct relationship between a decline in travel speed and a decline in injury counts.

VII. Limitations

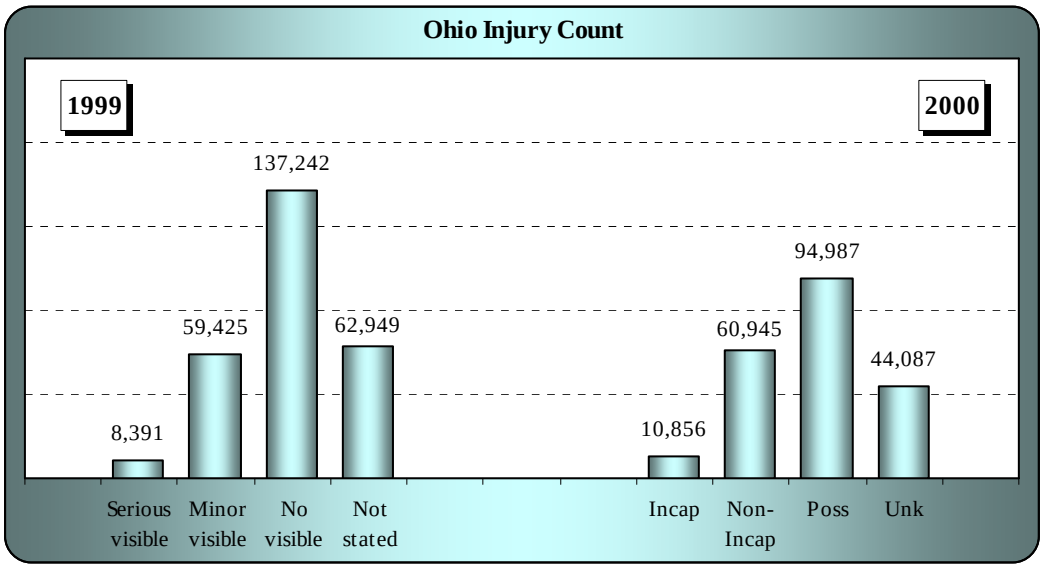
At the time of this report, the State Data System (SDS) collected data from 30 States, and this data was coded differently in many States. While the trend has been toward uniformity of the police crash reports from each State, that uniformity is not complete at the time of this report. In addition, some States changed their police crash reports during the years which are analyzed in this report, and these changes affect GES and SDS injury counts. In only one State did the change appear to significantly affect injury coding.

One change in a State's police crash report occurred in Ohio, where the categories of many variables were adjusted from 1999 to 2000. The variable for injury severity changed its categories, and this could have played a role in the large drop in Ohio injury counts from 1999 to 2000, as shown in Table 15 and Figure 25.

Table 15
Ohio Injuries, by Injury Severity, Comparing 1999 and 2000

State Data on Injury Severity From Ohio			
1999		**2000**	
Categories	**Counts**	**Categories**	**Counts**
Serious visible incapacitating Injury	8,391	Incapacitating injury	10,856
Minor visible injury	59,425	Non-incapacitating injury	60,945
No visible injury	137,242	Possible injury	94,987
Non-fatal injury SUBTOTAL	**205,058**	**Non-fatal injury SUBTOTAL**	**166,788**
Fatal Injury	1,430	Fatal Injury	1,361
Not stated	62,949	Unknown	44,087
Total	**269,437**	**Total**	**212,236**
Source: NCSA, NHTSA, SDS (Ohio) 1999-2000			

Figure 25
Ohio Injuries, by Injury Severity, 1999 and 2000



Source: NCSA, NHTSA, SDS (Ohio) 1999-2000

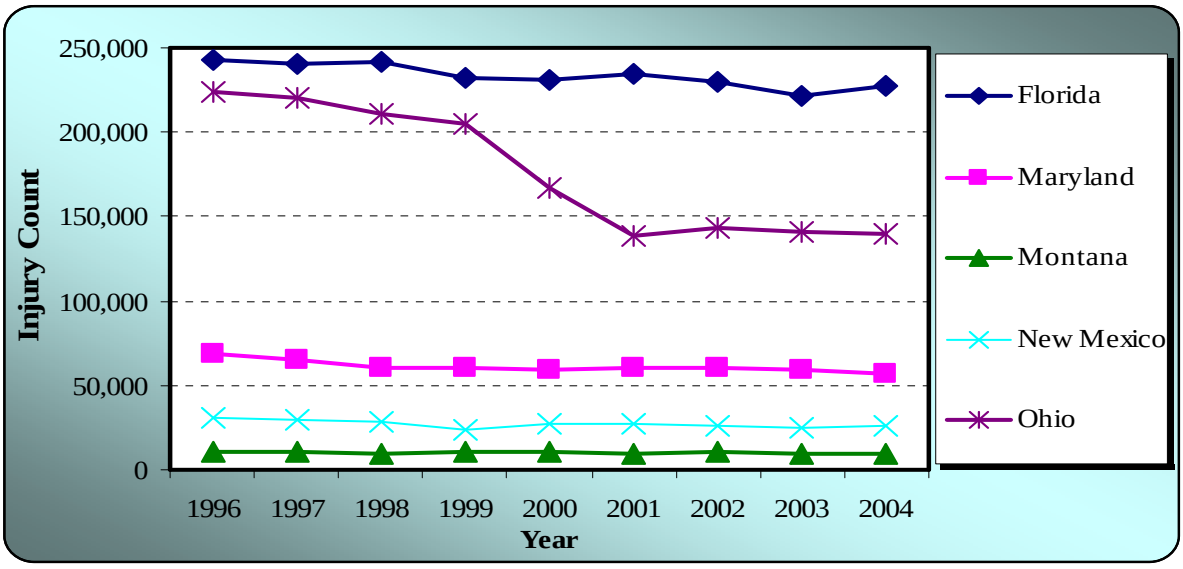
In 2000, the category "no visible injury" was replaced with "possible injury," and the injury count from those comparable categories dropped from 137,242 in 1999 to 94,987 in 2000, and to 71,993 in 2001, a reduction of nearly 50 percent. The possible injury count remained relatively constant from 2001 through 2004. The "unknown" category was first introduced in 2000. In 1999, there were 62,949 police crash reports where the injury severity variable was not coded, shown in Table 15 as "not stated," and only 44,087 injuries coded as "unknown" in 2000.

The drop in the total Ohio injury count from 205,058 in 1999 to 166,788 in 2000 (and then to 138,847 in 2001) is likely to be associated with the change in injury severity categories that took place on the 2000 Ohio State police crash report.

In addition to the drop seen in the Ohio injury counts, the number of non-fatal injury crashes in Ohio also dropped significantly during the years 1999 through 2001. The number of crashes where a non-fatal injury occurred declined from 121,755 in 1999, to 106,090 in 2000, to 95,389 in 2001, a drop of over 25,000 crashes, or 22 percent, in two years. The injury rate per crash in Ohio fell from 1.68 in 1999, to 1.57 in 2000, to 1.46 in 2001, a drop much larger than the drop seen in other SDS States during that time period. The number of crashes and the injury rate per crash in Ohio changed very little between 2001 through 2004.

Figure 26 displays the injury counts for Ohio and the other four States in the State Data System that had data available for all years from 1996 through 2004. These other four States showed a decline in injuries from 1996 through 2004 that ranged from 6.6 percent in Florida to 18.1 percent in Maryland (see Table 6). Figure 26 shows that the 37.4-percent decline in injuries seen in Ohio from 1996 through 2004 is due mostly to the drop in injury counts from 1999 to 2001. After 2001 the Ohio injury count remained relatively stable from 2002 through 2004 (see Figure 26).

Figure 26
State Injuries, Among SDS States with Data for 1996 through 2004



Source: NCSA, NHTSA, SDS 1996-2004

If the injury data from Ohio were included in the fixed effects model whose results are shown in Table 7, then the decline in total injuries would have been 17.0 percent, rather than the 8.6-percent decline that was calculated after Ohio was removed from the fixed effects model.

Injury severity coding for the police crash reports of many States were investigated over the years from 1996 through 2004. This change in the Ohio police crash report had by far the largest impact in injury counts that was associated with a State police crash report coding change.

In order to improve the uniformity of State data coding, NHTSA has established the Model Minimum Uniform Crash Criteria (MMUCC). The purpose of MMUCC is to help States produce motor vehicle crash data that can be properly aggregated between States. MMUCC represents a voluntary and collaborative effort to generate uniform crash data that are accurate, reliable, and credible for data-driven highway safety decisions within a State, between States, and at the national level. MMUCC recommends voluntary implementation of a "minimum set" of standardized data elements to promote comparability of data within the highway safety community. The implementation of MMUCC will help all States work together to contribute data that can lead to safer highway travel.

A different type of limitation was seen in Illinois State data, where incomplete data collection led to an injury count in 1996 that was quite different from adjacent years. Illinois had 151,642 injuries recorded in 1995 and 129,927 injuries in 1997, but the injury count for 1996 was a much smaller 66,051. The 1996 injury count was replaced with the average of the 1995 and 1997 injury counts, as a means to prevent the fixed effects model from being highly impacted by the 1996 data collection errors.

It is possible that an increase in police officer time constraints has lead to less coding of minor injuries in many States. This could impact the injury counts within the GES and SDS databases. It would take extensive efforts to test that hypothesis and therefore this potential limitation was not explored within this report. Also, even if the coding of minor injuries has dropped, this does not explain the large drop in incapacitating injuries seen in Tables 7, 8, and 9.

This report does not attempt to answer the question of why the safety advancements that have been made in motor vehicle traffic are leading to a larger percentage reduction in injury rates (see Table 4) as compared with the declines seen in fatality rates (see Table 1). This issue will be examined in future NHTSA reports.

VIII. Conclusion

An analysis of three major NHTSA databases shows that a significant decline in non-fatal motor vehicle injuries occurred from 1996 through 2005. A significant decline had been observed in the GES database, and this decline has been validated through an analysis which included two additional NHTSA databases. These three databases show a decrease of 25 to 28 percent in the average number of people suffering incapacitating injuries each year due to motor vehicle crashes. An incapacitating injury is a category of injury severity that represents the most severe non-fatal injuries, as coded by law enforcement officers on police crash reports.

This report examined the trend in non-fatal motor vehicle injuries over the ten-year period from 1996 through 2005. Data was individually analyzed from the three largest NHTSA crash databases: FARS, GES, and SDS. During that time period, a significant reduction was seen in the incapacitating injury counts as well as the overall non-fatal injury counts in each of the three databases. In addition to the estimated declines in the GES and SDS overall annual injury counts of 23 percent and 9 percent, respectively, an 11-percent drop in non-fatal injuries was seen in the FARS database of fatal crashes.

In the FARS, GES, and SDS databases, the estimated annual number of incapacitating injuries fell by 25 percent, 28 percent, and 25 percent respectively. This trend suggests that the improved safety equipment and occupant behavior that limits fatalities may be even more effective in reducing serious injuries. Among non-fatal crashes, the significant decline in annual injury counts has occurred among all injury severity levels (incapacitating, non-incapacitating, and possible injuries); comparatively, in fatal crashes, 90 percent of the reduction in non-fatal injury counts is seen among incapacitating injuries.

The years of 2003 and 2005 were the first times that incapacitating injuries were not the most common non-fatal injuries among fatal crashes. The count of less severe non-incapacitating injuries climbed higher than the count of incapacitating injuries during each of these two years.

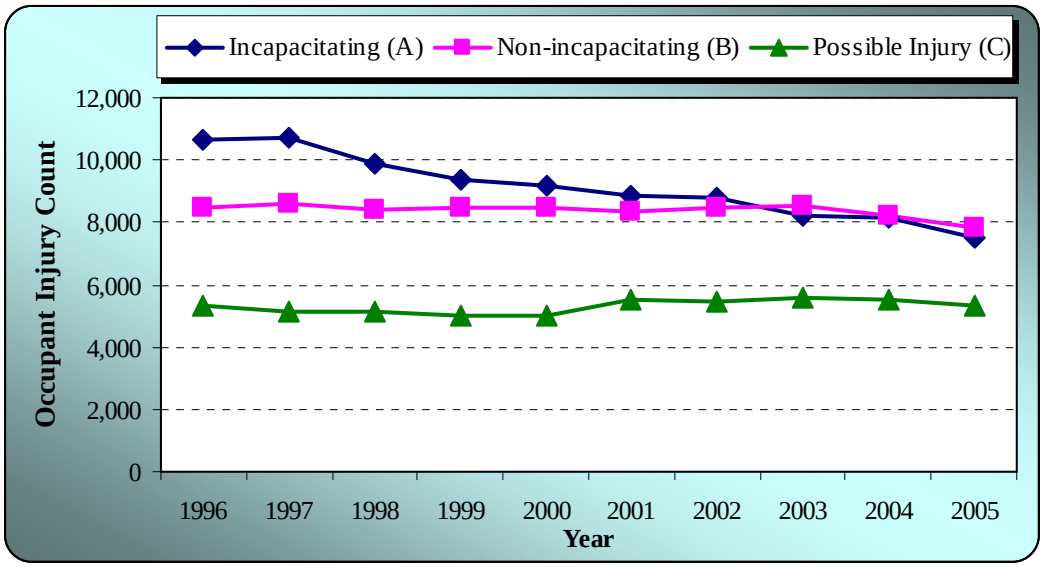
In each of the FARS, GES, and SDS databases, the rate of injuries per crash was also examined. The number of non-fatal crashes where a person was injured declined in GES and SDS, while an even larger percentage decline was seen in number of injuries from these crashes. These two concurrent trends led to a decline in the rate of injuries per crash of five percent in GES and three percent in SDS. In FARS, there was a 15-percent drop in the rate of non-fatal injuries per crash. These findings clarify that the reduction in injury counts was due to both a drop in the number of injury-related crashes, as well as a drop in the rate of injuries per crash.

These reductions in injury counts seen in FARS, GES, and SDS have taken place despite a 20-percent increase in vehicle miles traveled (VMT) in the United States. This tremendous progress in traffic safety improvement is likely linked to increased restraint use, reductions in drunk driving, as well as an expansion throughout the vehicle fleet of air bags and electronic stability control.

IX. Appendix

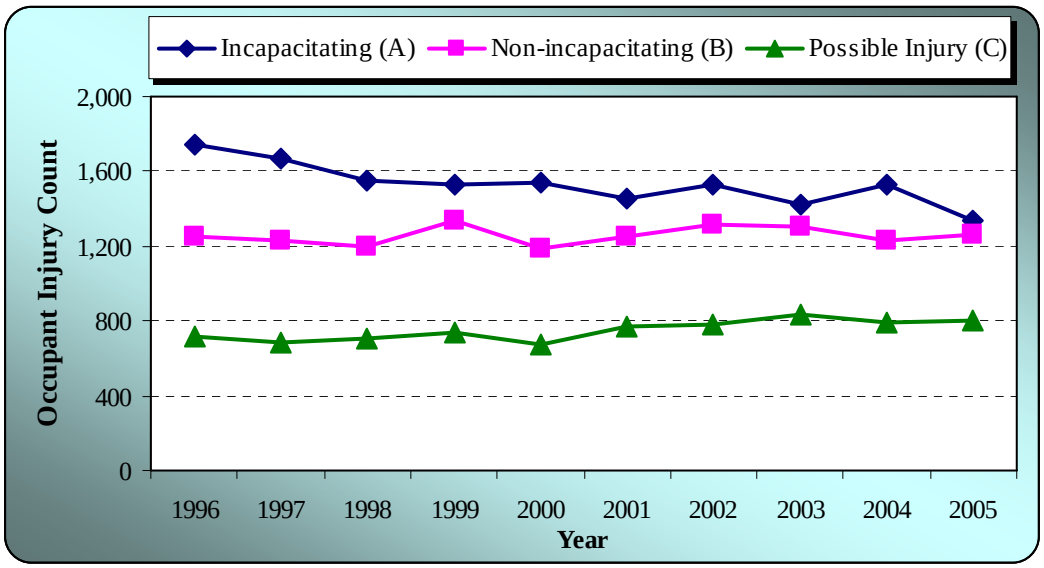
Figures 27 – 30: FARS Non-Fatal Injuries, by Impact Point and Injury Severity

Figure 27
Non-Fatally Injured Occupants in Front Impact Fatal Crashes, By Injury Severity and Year



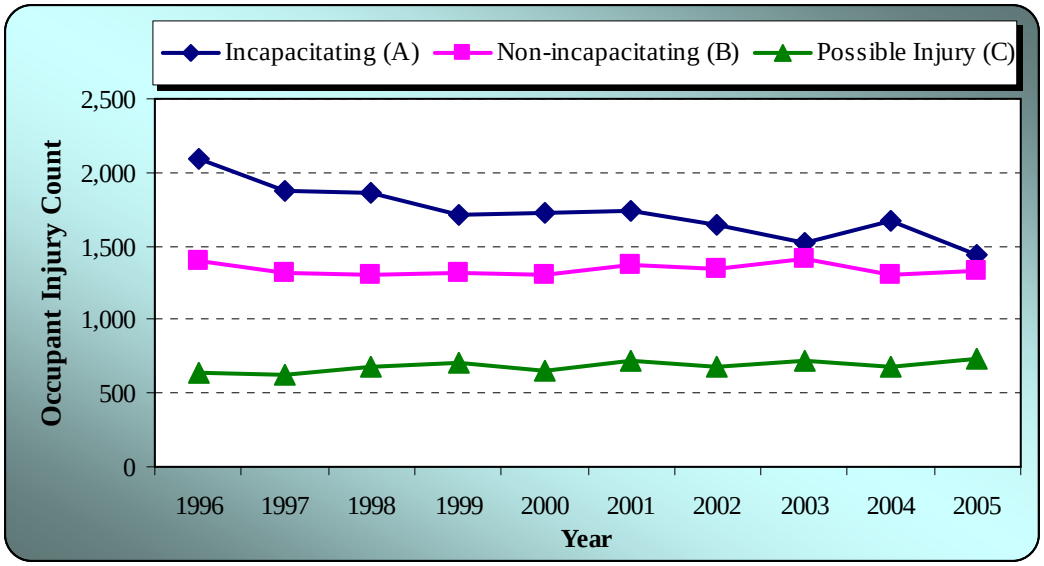
Source: NCSA, NHTSA, FARS 1996-2005

Figure 28
Non-Fatally Injured Occupants in Left-Side Impact Fatal Crashes, By Injury Severity and Year



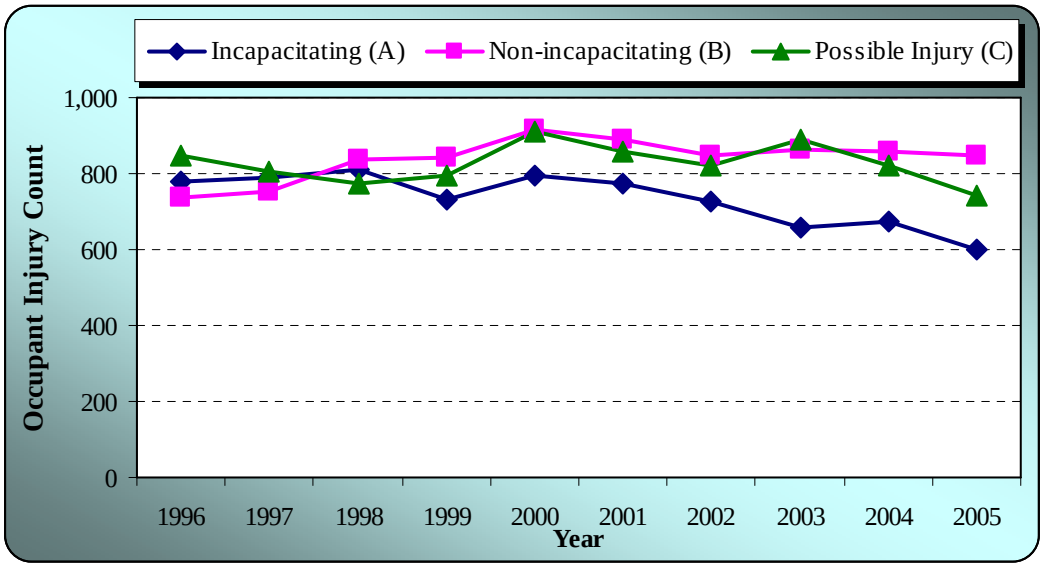
Source: NCSA, NHTSA, FARS 1996-2005

Figure 29
Non-Fatally Injured Occupants in Right-Side Impact Fatal Crashes, By Injury Severity and Year



Source: NCSA, NHTSA, FARS 1996-2005

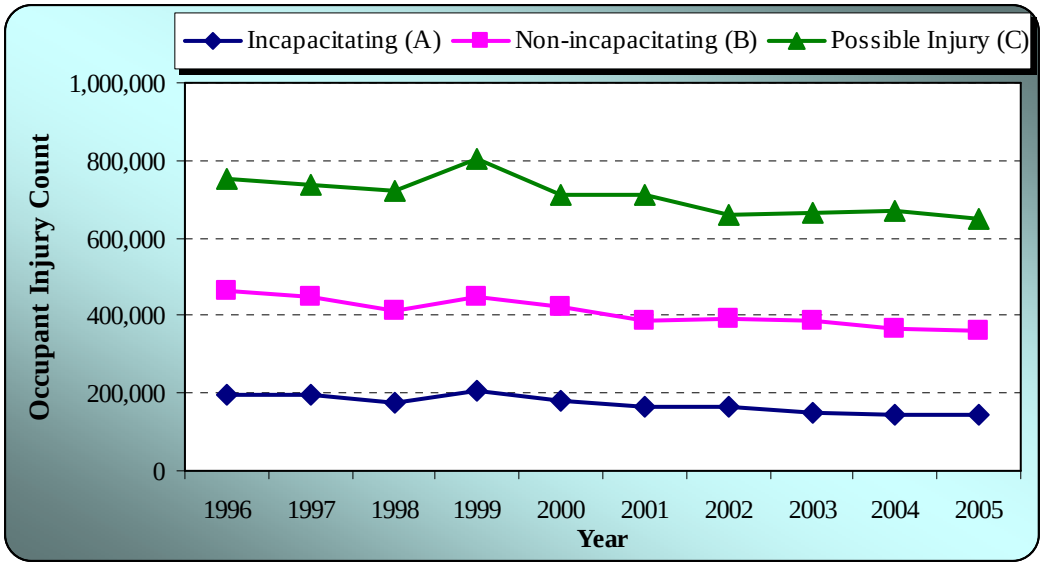
Figure 30
Non-Fatally Injured Occupants in Rear Impact Fatal Crashes, By Injury Severity and Year



Source: NCSA, NHTSA, FARS 1996-2005

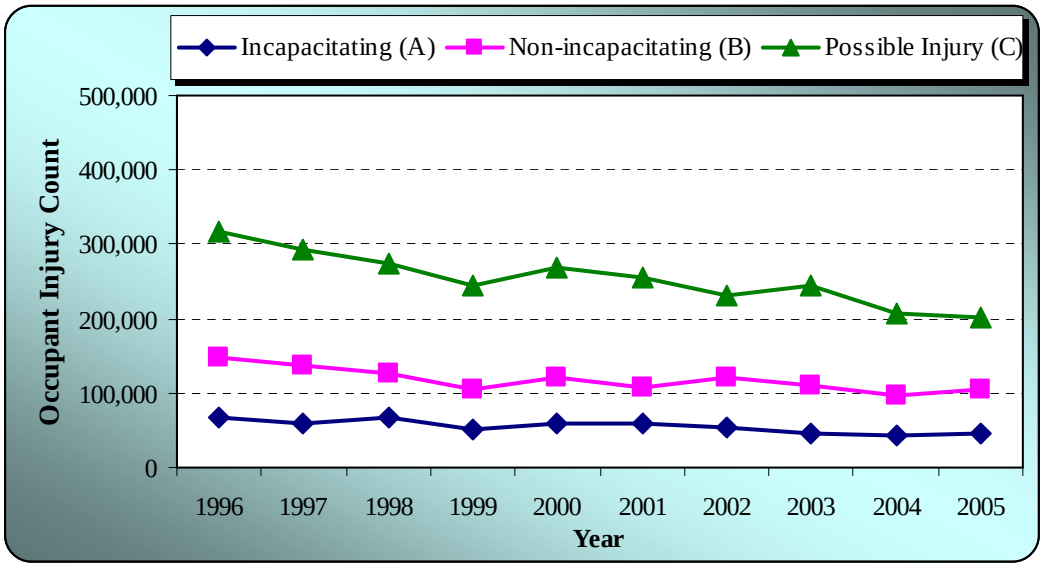
Figures 31 - 34: GES Non-Fatal Injuries, by Impact Point and Injury Severity:

Figure 31
Non-Fatally Injured Occupants in Front Impact Crashes,
By Injury Severity and Year



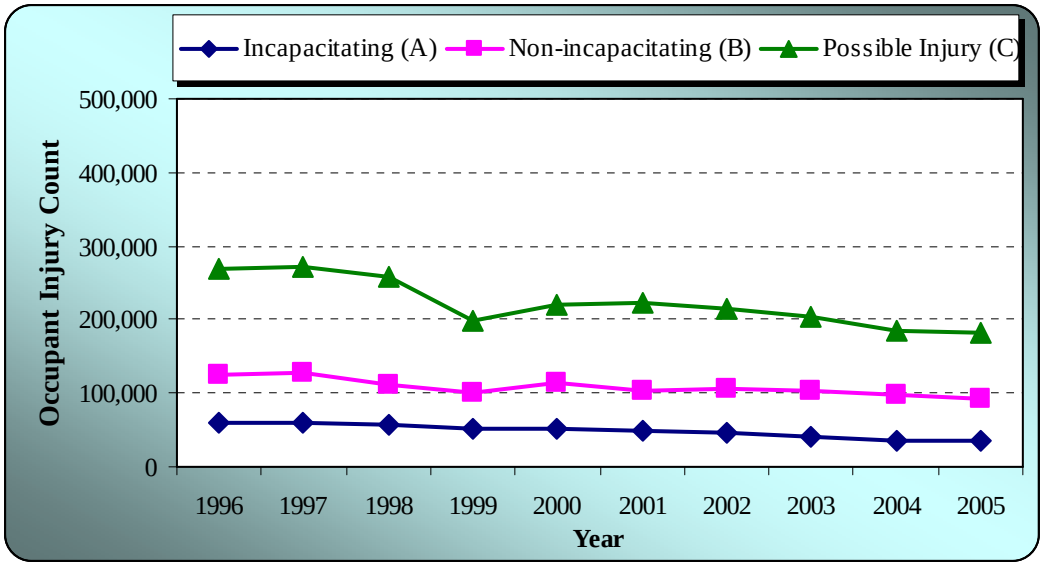
Source: NCSA, NHTSA, GES 1996-2005

Figure 32
Non-Fatally Injured Occupants in Left-Side Impact Crashes,
By Injury Severity and Year



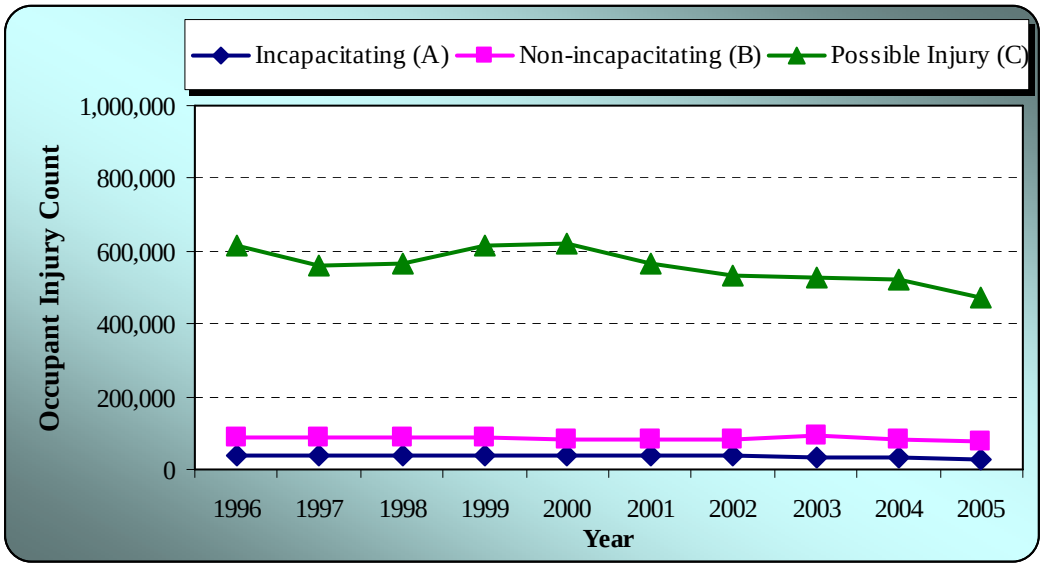
Source: NCSA, NHTSA, GES 1996-2005

Figure 33
Non-Fatally Injured Occupants in Right-Side Impact Crashes, By Injury Severity and Year



Source: NCSA, NHTSA, GES 1996-2005

Figure 34
Non-Fatally Injured Occupants in Rear Impact Crashes, By Injury Severity and Year



Source: NCSA, NHTSA, GES 1996-2005

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Links to State Data Systems Information

http://www.nhtsa.dot.gov/portal/site/nhtsa/menuitem.9fef9613e59b4dd24ec86e10dba046a0/

http://www.nhtsa.dot.gov/staticfiles/DOT/NHTSA/NCSA/Content/PDF/SDS_Usage.pdf

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