I-95 Corridor Coalition

Corridor-wide Safety Data Analysis and Identification of Existing Successful Safety Programs

Final Report

June 2010

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Prepared for:

I-95 Corridor Coalition

Sponsored by:

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The opinions expressed in this report are those of the authors and do not necessarily represent the views or opinions of the reviewers, sponsor, state agencies or jurisdictions involved in this project.

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1.0 INTRODUCTION

Many diverse factors contribute to motor vehicle crashes. States have multiple competing priorities and limited resources to address these priorities, so there is a need, particularly in our current economic climate, to prioritize interventions and solutions in order to maximize the effectiveness of programs and policies and improve outcomes. In order to target interventions, there is a need for an evidence-based approach in the implementation of best practices.

The purpose of this Safety Data Analysis project was to help identify the primary causes of fatal and serious injury crashes by studying crash characteristics and provide an inventory of effective traffic safety programs that can be implemented across the I-95 Corridor Coalition states and the District of Columbia to improve safety for the motoring public. The ultimate objective was to produce a set of best practices for State Departments of Transportation (DOTs), criminal justice agencies and other safety organizations for dealing effectively with the major causes of fatal and serious injury crashes that occur on their roads. The rationale underlying this objective is that a significant reduction in deaths, serious injuries, and traffic infractions can result from the implementation of these best practices, thus protecting the public and improving the efficient flow of transportation within the I-95 Corridor Coalition jurisdictions.

To achieve this goal, several tasks were completed as part of this project. First, available data on fatal and serious injury collisions in the sixteen Coalition states and the District of Columbia were analyzed to identify the major types of collisions and their characteristics. Second, information was gathered from Coalition member jurisdictions and other jurisdictions nationally and internationally about their current highway safety policies and programs (i.e., road user and road engineering) that target these major categories of crashes. These policies and programs were reviewed to determine their success and cost-effectiveness where feasible. This resulted in the development of “best practices” for addressing the major safety issues identified through the data analyses and information gathering process. Finally, a webinar was organized with representatives from the I-95 Coalition jurisdictions and interested others in order to present the results of the previous tasks and to seek their input on them.

Several key tasks were systematically and strategically organized to answer a set of key questions:

- What are the major categories of fatal and serious injury collisions in the I-95 Coalition states and the District of Columbia?
- Are there differences in the extent and characteristics of these problems across member states in the I-95 Corridor?
- What safety strategies and programs are currently in place to deal with them, both within Coalition states as well as other leading jurisdictions, and is there evidence about their safety and cost-effectiveness?
- What are considered to be best practices for dealing effectively with these problems?

Broader intended outcomes of the project include:

- Enhancing an understanding of the major safety problems among various safety agencies;
- Improving the safety and mobility of the motoring public;
- Improving partnerships, working relationships, and coordination of activities between and among jurisdictions;
- Increasing the effectiveness of information sharing between jurisdictions; and,
- Identifying information gaps and key research needs.

2.0 METHODOLOGY

The methodology is organized in four separate phases: 1) FARS analyses; 2) jurisdictional crash data analyses; 3) program survey; and 4) best practice recommendations. Each phase is described in more detail below.

First, to gain a better understanding of the magnitude and characteristics of fatal crashes in the I-95 Corridor Coalition jurisdictions, data from the National Highway Traffic Safety Administration's (NHTSA) Fatality Analysis Reporting System (FARS) were analyzed. Data from all sixteen I-95 Corridor Coalition states and the District of Columbia for the years 2005, 2006 and 2007 were included in the analyses (2007 is the most recent year for which FARS data are available).

The purpose of the analyses of the data in the FARS dataset was to examine the characteristics of fatal collisions occurring in the member jurisdictions of the I-95 Coalition. These analyses were useful to determine which characteristics were most prevalent in fatal crashes and identify where members differed regarding the characteristics and major types of collisions.

The FARS analyses results are grouped according to five regions: New England (Maine – ME, New Hampshire – NH, Vermont – VT, Massachusetts – MA, Connecticut – CT, Rhode Island – RI), North (New York – NY, New Jersey – NJ, Pennsylvania – PA), Central (Delaware – DE, Maryland – MD, District of Columbia – DC, Virginia – VA), South (North Carolina – NC, South Carolina – SC, Georgia – GA), and Florida (FL). The results of these regional analyses are presented first, followed by profiles of the fatal collision characteristics for each region. The characteristics of the collisions are grouped according to the following categories: type of collision, driver, road and vehicle, and temporal and environment.

In addition to the FARS data, collision data files that contain information on both fatal and serious injury collisions were also obtained from five states (GA, PA, VA, FL, and MA) for the years 2005, 2006, and 2007. It was possible to examine the data from one relatively large state from each of the I-95 regions identified above for the purposes of the FARS analyses. The characteristics of fatal and serious injury collisions were analyzed separately for each of these states.

The purpose of the state data analyses was to determine the characteristics of fatal and serious injury collisions in several representative member states within the I-95 Coalition. The results regarding the characteristics of fatal collisions were also compared with those obtained for these states using the FARS data where the variables were comparable.

The collision data from all I-95 jurisdictions were analyzed to compare fatal and injury collisions on as many as possible of the same characteristics used in the FARS analysis. Three levels of crash severity were created: fatal, serious injury, other injury. In some jurisdictions, serious injuries were referred to by different terms (e.g., severe injury, major injury, incapacitating injury) but in most cases, this level of injury means the victim had to stay overnight or longer in the hospital for treatment.

Only those collisions involving some level of injury or a fatality were included in the analyses given the underreporting of property damage only (PDO) collisions. It is true that underreporting can occur at any level of crash severity but it is generally the most prevalent with PDO collisions. The extent of underreporting of PDO collisions and the fact that it is not known why some collisions are reported and others are not renders their utility suspect. There is likely a bias in which PDO collisions are reported which would result in a lack of representation of the characteristics of such collisions.

As in the FARS analyses, the characteristics of the collisions are grouped according to the following categories: type of collision, driver, road and vehicle, and temporal and environment. It should be noted that for a number of variables, the categories were combined to simplify the presentation of the results.

2.1 Primary Features and Characteristics of Databases

Two types of databases were used for the I-95 Safety Data Analysis Project: the FARS data and state collision data. The FARS data system documents fatal crashes occurring within the 50 states, the District of Columbia, and Puerto Rico. The state data systems document fatal, injury and PDO crashes from each individual state. Only jurisdictions in the I-95 Corridor were included in the FARS analyses.

2.1.1 Fatality Analysis Reporting System (FARS). NHTSA has been collecting information regarding fatal crashes occurring in the United States since 1975. This FARS database, which is essentially a census of all fatal crashes occurring on public roads in the U.S., was downloaded from the NHTSA website (http://www-fars.nhtsa.dot.gov/). The FARS data are categorized by all 50 states as well as the District of Columbia. Standard FARS definitions for variables are used to ensure comparability across jurisdictions (i.e., variables from each state database are translated into FARS variables). All collisions in which at least one vehicle occupant or non-occupant (i.e., pedestrian, bicyclist) was killed are included in the FARS database.

The FARS database contains three principal files, namely the Accident, Vehicle, and Person files. These files include information about the crash (e.g., road characteristics, time, weather), the vehicles involved (e.g., type of vehicle, year of manufacture), and the persons involved (e.g., age, gender, belt use, driver condition). Also included in the Person file are driver record data on previous collisions, offenses, and suspensions in the three years prior to the fatal collision. These three files were merged to form one database for the purposes of this project. Data from the years 2005, 2006 and 2007 were appended and used in the analyses.

Table 2.1.1.1 shows the percentage of fatal crashes that occurred in each of 2005, 2006 and 2007 for all five regions. In four of the regions, the percentage of total fatal crashes declined slightly with each year indicating that the number of fatal crashes declined over this period. The only exception was the South region where the percentage decreased in 2006 but then increased somewhat in 2007 but was still lower than 2005. Since the three years were still fairly similar in numbers of fatal crashes for all regions, it was considered reasonable to combine the three years of data.

Table 2.1.1.1: Percentage of fatal collisions by year and region

Year	New England	North	Central	South	Florida	Total	Overall %
2005	35.09%	34.14%	33.53%	33.65%	35.15%	31572	34.24%
2006	33.88%	33.58%	33.28%	32.95%	33.54%	30764	33.36%
2007	31.03%	32.28%	33.19%	33.40%	31.31%	29871	32.40%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	92207	100.00%

Total	7151	23587	10565	28263	22641	92207
Overall %	7.76%	25.58%	11.46%	30.65%	24.55%	100.00%

There are some limitations associated with the FARS database. The FARS data only record information for fatal crashes, in other words, crashes that have resulted in the death of a person, either a vehicle occupant or non-motorist, within 30 days of the crash. It should be noted that there is a relatively high percentage of missing data or "Don't knows" for some of the variables in the dataset, for example blood alcohol concentration (BAC) of drivers. This, to some extent, undermines the quality and usefulness of these variables (information about missing data is provided along with results from the analyses).

Another limitation of the data is that they are based on police reports regarding collisions and, in some cases, the data are based on the investigating officer's assessment (e.g., estimated vehicle travel speed, estimate of whether a driver had been drinking). It should also be noted that state databases contain information that is not in FARS, which makes it useful to analyze state databases separately. Also, sometimes they have different variables than FARS and even if they have the same variables, the data are can be categorized differently. These differences make it difficult to directly compare the results obtained from FARS data with those obtained from state databases.

The key variables from the FARS database that were used in the analyses are shown below.

Key variables in FARS analyses:

- Collision state (e.g., FL, NY)
- Number of vehicles involved in crash
- Manner of collision (e.g., head-on, angle)
- First harmful event (e.g., rollover, fixed object)
- Number of rollover collisions
- Manner of leaving scene (vehicle towed, driven away)
- Initial collision impact point (clock points; e.g., 12=front)
- Age
- Gender
- Vehicle maneuver (e.g., passing, negotiating curve)
- Crash avoidance maneuver (e.g., braking, steering)
- Restraint use (e.g., lap belt, helmet)
- Driver drinking (yes/no)
- Number of drunk drivers
- Driver blood alcohol concentration (e.g., 0.08%, refused)
- Driver related factors - up to four different factors (e.g., drugs, physical impairment)
- Drug test results - up to three different drugs (e.g., type of drug present/not present)

- Driver violations charged - up to three different violations (e.g., impairment, speeding)
- Vehicle travel speed
- Driver license type compliance (e.g., not licensed, not valid)
- Previous accident (e.g., within three years prior to crash)
- Previous impaired driving conviction (e.g., within three years prior to crash)
- Previous speeding conviction (e.g., within three years prior to crash)
- Other previous conviction (e.g., within three years prior to crash)
- Previous suspension (e.g., within three years prior to crash)
- Number of travel lanes
- Trafficway flow (not divided, divided)
- Location of collision in relation to road (e.g., on-road, shoulder)
- Roadway function class (e.g., rural minor arterial, urban collector)
- Rural vs. urban area
- Speed limit
- Roadway profile (e.g., level, grade)
- Roadway alignment (e.g., straight, curved)
- Roadway surface condition (e.g., dry, wet)
- Relation to junction (e.g., intersection, non-intersection)
- Presence of traffic controls (e.g., no controls, stop sign)
- Vehicle body type (passenger car, motorcycle)
- Vehicle model year
- Vehicle license plate state
- Day of week
- Time of day (hours: 0-23)
- Time of day (minutes: 0-60)
- Date (month:1-12)
- Light conditions (dawn, daylight, dark)
- Weather condition (e.g., no adverse conditions, rain)

2.1.2 State crash databases. Crash databases were obtained from GA, PA, VA, FL and MA. Each of these databases is described in more detail in their respective sections below. One of the general limitations of the state data is that not all variables of interest are captured in each individual state data system. This makes comparisons to the FARS data somewhat cumbersome and challenging. Also, not all categories of each variable are the same as those in the FARS data, so not all levels of each variable can be compared across databases. On the other hand, one of the advantages of the state data is that the categories of variables are more detailed and the data allow for comparisons between different levels of injury crashes within states. Each state has a slightly different way of measuring injury severity limiting the conclusions that can be drawn from

comparisons of the individual states. For example, GA and PA distinguish between fatal and serious/major injury crashes whereas MA distinguishes between fatal and non-fatal, VA between visible versus non-visible injury crashes and FL between incapacitating injury crashes versus non-incapacitating. The injury severity variables for each state were re-coded as consistently as possible to ensure comparisons are valid as shown in the following table. Note that cases in the category "not injured" were re-coded into missing values. This was done because not all states had this particular variable category. In addition, it was assumed that this category with no injuries most likely captured property damage only (PDO) crashes. As noted in the methodology, PDO collisions were not included in the analyses due to underreporting of such crashes.

State injury severity variable	Recoded State injury severity variable
GA	
1. Not injured	1. Fatal (2)
2. Killed	2. Serious injury (3)
3. Serious injury	3. Other injury (4, 5)
4. Visible injury	4. Missing (1)
5. Complaint of pain	
PA	
1. Not injured	1. Fatal (2)
2. Killed	2. Serious injury (3)
3. Major injury	3. Other injury (4, 5, 6)
4. Moderate injury	4. Missing (1, 7)
5. Minor injury	
6. Injury/unknown severity	
7. Unknown	
VA	
1. Dead before report made	1. Fatal (1, 5)
2. Visible signs of injury (bleeding/distorted)	2. Serious injury (2)
3. Other visible injury (bruises/abrasions)	3. Other injury (3, 4)
4. Not visible injury but complaint of pain	
5. Died later	
FL	
1. No injury	1. Fatal (5)
2. Possible injury	2. Serious injury (4)
3. Non-incapacitating evident injury	3. Other injury (2, 3)
4. Incapacitating injury	4. Missing (1)
5. Fatal injury	
MA	
1. Fatal injury	1. Fatal injury (1)
2. Non-fatal injury	2. Non-fatal injury (2)
3. Not reported	3. Missing (3, 4, 5)
4. Property damage only (none injured)	
5. Unknown	

Georgia. The database was provided by the Georgia Department of Transportation. It is a relational database consisting of nine data sets. Four of the nine data sets were used: the accident data set, the occupant/driver data set, the vehicle data set, and the pedestrian data set (used to identify pedestrians involved in the crash so they could be dropped from the analysis to

maintain consistency across databases). Data from the years 2005, 2006 and 2007 were appended and used in the analyses. There are some limitations associated with this database. Variables of interest that were not captured by these data and that were captured by the FARS data include vehicle travel speed and whether the crash occurred in a rural or urban area. This limits comparisons to the FARS data as well as comparisons with the other states' data.

Key variables used in the analyses of Georgia data:

- Injury severity code (e.g., fatal, serious)
- Manner of collision (e.g., angle, rear-end)
- First harmful event (e.g., overturn, fixed object)
- Vehicle towed away (yes/no)
- Age
- Driver sex
- Vehicle maneuver (e.g., left turn, negotiating curve)
- Restraint use (e.g., lap belt, helmet)
- Driver condition (e.g., not drinking, alcohol involved)
- Contributing factors (e.g., distracted, exceeded speed limit)
- Location of collision in relation to road (e.g., on-road, shoulder)
- Trafficway flow (not divided, divided)
- Roadway surface condition (e.g., dry, wet)
- Presence of traffic controls (e.g., no controls, stop sign)
- Road character (e.g., straight, curve)
- Road character (e.g., level, grade)
- Vehicle body type (passenger car, motorcycle)
- Vehicle model year
- Driver license state (e.g., FL, PA)
- Date (month:1-12)
- Day of week
- Time of day (hours: 0-23) (minutes: 0-60)
- Light conditions (e.g., dawn, daylight, dark)
- Weather condition (e.g., no adverse conditions, rain)

Pennsylvania. The dataset was provided by the Pennsylvania Department of Transportation's Bureau of Highway Safety and Traffic Engineering. This is a relational database consisting of 12 data sets. Five of the 12 data sets were used: the crash data set containing information about the crash and counts of items involved; the driver actions data set containing de-normalized multiple data occurrences of driver actions; the flag data set containing a series of crash indicators that define the incident; the person data set containing

attribute data for each person involved in the crash; and the vehicle data set containing attribute data for each unit involved in the crash. Data from the years 2005, 2006 and 2007 were appended and used in the analyses.

There are some limitations associated with this database. Variables of interest that were not captured by these data and that were captured by the FARS data include light condition and number of travel lanes. This limits comparisons to the FARS data as well as comparisons with the other states' data.

As well, the level of impairment is only captured as the presence or absence of alcohol or drugs based on the investigating officer's judgment as opposed to actual BAC test results.

Key variables used in the analyses of Pennsylvania data:

- Maximum injury severity level (e.g., killed, serious)
- Number of vehicles involved in crash
- Collision type (e.g., angle, fixed object)
- Initial collision impact point (clock points; e.g., 12=front)
- Overturned vehicle indicator (yes/no)
- Driver age
- Sex
- Vehicle movement (e.g., passing, negotiating curve)
- Restraint use (e.g., lap belt, helmet)
- Ejection indicator (ejected/not ejected)
- Drinking driver indicator (yes/no)
- Alcohol related indicator (yes/no)
- Alcohol or drugs suspected
- Alcohol test result (BAC results)
- Vehicle travel speed
- Speeding indicator (yes/no)
- Speeding related indicator (yes/no)
- Aggressive driving indicator (yes/no)
- Distracted driver indicator (yes/no)
- Curve in road driver error indicator (yes/no)
- State of licensed driver (in state/out of state)
- Location of collision in relation to road (e.g., on-road, shoulder)
- Rural vs. urban area
- Roadway surface condition (e.g., dry, wet)
- Roadway alignment (e.g., straight, curved)
- Roadway profile (e.g., level, grade)
- Intersection indicator (yes/no)

- Vehicle body type (passenger car, motorcycle)
- Vehicle model year
- Date (month:1-12)
- Day of week
- Time of day (hours: 0-23)
- Weather condition (e.g., no adverse conditions, rain)
- Maximum injury severity level (e.g., killed, serious)
- Number of vehicles involved in crash
- Collision type (e.g., angle, fixed object)
- Initial collision impact point (clock points; e.g., 12=front)

Virginia. The Virginia database was provided by the Virginia Department of Transportation Traffic Engineering Division. This is a relational database consisting of three data sets: the crash file, the vehicle file and the injury file. All three data sets were used in the analyses. Data from the years 2005, 2006 and 2007 were appended and used in the analyses.

There are some limitations associated with this database too. Variables of interest that were not captured by these data and that were captured by the FARS data include driver BAC and whether the crash occurred at an intersection. This limits comparisons to the FARS data as well as comparisons with the other states' data.

There is a very high percentage of missing values for certain variables in this database, such as restraint use and functional road class (e.g., minor arterial, collector). These variables have few missing values in databases from other states.

As well, the level of impairment is only captured as the presence or absence of alcohol or drugs based on the investigating officer's judgment as opposed to actual BAC test results.

Key variables used in the analyses of Virginia data:

- Injury severity (e.g., fatal, serious)
- Number of vehicles involved in crash
- Collision type (e.g., fixed object, angle)
- Vehicle impact point (clock points; e.g., 12=front)
- Driver age
- Driver sex
- Driver restraint use (e.g., lap belt, helmet)
- Vehicle maneuver (e.g., straight, right turn)

- Driver action (e.g., speeding, following too close)
- Driver drinking (yes/no)
- Vehicle travel speed
- Major factor in collision (e.g., driver speeding, inattention/error)
- Number of travel lanes
- Roadway function class (e.g., rural minor arterial, urban collector)
- Facility description (e.g., not divided, divided)
- Roadway alignment (e.g., straight, curved)
- Roadway alignment (e.g., level, grade)
- Speed limit
- Rural vs. urban area
- Presence of traffic controls (e.g., no controls, stop sign)
- Roadway surface condition (e.g., dry, wet)
- Vehicle body type (passenger car, motorcycle)
- Time of day (hours: 0-23) (minutes: 0-60)
- Day of week
- Light conditions (dawn, daylight, dark)
- Weather condition (e.g., no adverse conditions, rain)
- Injury severity (e.g., fatal, serious)

Florida. The Florida database was provided by the Department of Highway Safety and Motor Vehicles Bureau of Crash Records. This is a relational database consisting of nine data sets. Five of the nine data sets were used: the Events data set containing information about the crash; the Drivers data set containing information about each driver involved in the crash; the Passengers data set containing information about each passenger involved in the crash; the Vehicles data set containing information about each vehicle involved in the crash; and the Pedestrians data set (used to identify pedestrians involved in the crash so they could be dropped from the analysis to maintain consistency across databases). Data from the years 2005, 2006 and 2007 were appended and used in the analyses.

Variables of interest that were not captured by these data and that were captured by the FARS data include roadway function class and whether the driver was properly licensed or not. This limits comparisons to the FARS data as well as comparisons with the other states' data.

There is a high level of missing values for the unique identifiers in this database. As a consequence, many cases had to be dropped from the analyses in order to properly merge

each data set and to ensure events pertaining to the same crashes but stored in different databases could be linked.

Key variables used in the analyses of Florida data:

- Crash injury severity (e.g., fatal, serious)
- Number of vehicles involved in crash
- First harmful event (e.g., overturned, fixed object)
- Initial collision impact point (clock points; e.g., 12=front)
- Age
- Sex
- Vehicle movement (e.g., straight, backing)
- Restraint use (e.g., lap belt, helmet)
- Occupant ejected (e.g., ejected, not ejected
- Alcohol or drug related crash (e.g., alcohol, drugs)
- Alcohol or drug use (e.g., alcohol, drugs)
- Driver blood alcohol concentration
- Estimated vehicle travel speed
- Contributing cause (e.g., driver distraction, alcohol)
- Vehicle State of registration (e.g., FL, GA)
- Number of lanes on road
- Divided or undivided highway (divided/undivided)
- On or off roadway (on roadway/off roadway)
- Rural vs. urban area
- Posted speed limit
- Roadway surface condition (e.g., dry, wet)
- Trafficway character (e.g., straight, curved)
- Trafficway character (e.g., level, grade)
- Site location (e.g., intersection, non-intersection)
- Vehicle body type (passenger car, motorcycle)
- Vehicle model year
- Date crash occurred; date (month:1-12)
- Day of week
- Time of day (hours: 0-23)
- Time of day (minutes: 0-60)
- Lighting condition (e.g., dawn, dark)
- Weather condition (e.g., no adverse conditions, rain)

Massachusetts. The Massachusetts database was provided by the Massachusetts Highway Department. The data are contained in one database at the level of the crash. Data from the years 2005, 2006 and 2007 were appended and used in the analyses.
There are some limitations associated with the database. Few variables of interest were captured by these data in comparison to the FARS data as well as the State data from the

other states. Variables not captured by this database include day of week, alcohol use, age, sex, restraint use and others.

Some variables were at the level of vehicles and other at the level of the crash. However, there were no unique identifiers to distinguish between these different levels. In order to perform analyses at the level of vehicles, a unique identifier at this level of analysis was created by TIRF using the available information.

Key variables used in the analyses of Massachusetts data:

- Crash injury severity (e.g., fatal, serious)
- Number of vehicles
- Most harmful event (e.g., rollover, fixed object)
- Manner of collision (e.g., angle, head-on)
- Vehicle action prior to crash (e.g., slowing/stopped, backing)
- Roadway surface condition (e.g., dry, wet)
- Vehicle body type (passenger car, motorcycle)
- Crash date (month:1-12)
- Time of day (hours: 0-23) (minutes: 0-60)
- Light conditions (dawn, daylight, dark)
- Weather condition (e.g., no adverse conditions, rain)

2.2 Data Analyses

The FARS and state data were analyzed using Stata, release 10 (see StataCorp, 2007). Bivariate analyses were conducted comparing the five I-95 regions on the various collision characteristics. Given the large number of cases in FARS as well as state data for the years 2005-2007, a significant regional difference was defined as a result which was statistically significant at the $p<0.001$ level and there was a difference of at least five percentage points between one or more regions on a particular variable category. It should be noted that for a number of variables, the categories were combined to simplify the presentation of the results.

2.3 Survey Methods

Following the completion of the crash analyses of I-95 Corridor jurisdictions, TIRF constructed a survey to gauge the types of programs and policies that are being applied in various jurisdictions along the I-95 Corridor to address the primary risk factors involved in fatal and serious injury crashes. The survey consisted of 53 questions that focused on the following seven topics: impaired driving, speeding, seat belt use, improperly licensed drivers, collision avoidance, and road engineering.

These questions were asked in order to provide responses that corresponded with the characteristics of collisions identified in the analyses.

The survey was distributed to lead transportation and law enforcement professionals identified through the I-95 Corridor Coalition members, Governors Highway Safety Offices, state Police agencies and state Departments of Transportation. All jurisdictions in the I-95 Corridor received copies of the survey and eleven of the seventeen jurisdictions subsequently responded to it -- a response rate of 64.71%. In addition, to expand on information about relevant programs and policies, the survey was also distributed to a select number of contacts in other U.S. states, provinces and territories in Canada, and jurisdictions in Australia. A total of 35 surveys were distributed outside of the Corridor and 24 responded. This resulted in a response rate of 68.57%. The overall response rate was 67.31%; 32 out of 52 jurisdictions responded to the surveys.

2.4 Best Practices

A literature review was conducted to find evidence of the effectiveness of promising measures suitable to help overcome problems identified based on the results from the crash analyses and the program survey. More precisely, using each region's crash profile and existing measures, recommendations regarding best practices are formulated including quantitative information about the effectiveness of suggested measures as well as references to relevant sources for more detailed information.

3.0 FARS CRASH ANALYSES

This section contains a summary of the FARS crash results by region. More detailed results can be found in Appendix A. To present the results from all I-95 Corridor jurisdictions in a comprehensive but more comprehendible fashion, the I-95 jurisdictions were grouped into the following five regions: New England (ME, NH, VT, RI, MA, CT), North (NY, PA, NJ), Central (DE, MD, DC, VA), South (NC, SC, GA) and Florida. Florida was selected as a separate region because approximately 25% of all the fatalities within the I-95 Corridor occurred in this State. Table 3.5.1 summarizes the key collision characteristics of fatal collisions identified in the analyses of the FARS data by region and overall. The results of the analyses of the FARS fatal collision data are presented according to the following characteristics: collision type, driver, road and vehicle, temporal and environmental. This section is followed by regional profiles which describe the major characteristics of the fatal collisions in each of the I-95 regions.

The characteristics of the fatal collisions occurring in the District of Columbia and the sixteen member states of the I-95 Corridor Coalition based on FARs data are summarized according to the following categories: type of collision, driver, road and vehicle, and temporal and environmental.

This table illustrates that while there is considerable consistency across jurisdictions, there are some obvious regional differences in relation to rollovers, drug use, negotiating a curve, road not divided and rural areas among others (note that a difference of at least five percentage points was used as a working criterion to report differences between one or more regions on a particular variable category — see paragraph 2.2). More detail about these differences is provided in the regional profiles. Note that the column entitled overall % shows the overall percentage of the key fatal crash characteristics for all the regions combined.

Table 3.5.1: Summary of key collision characteristics by region

Key fatal crash characteristics	New England	North	Central	South	Florida	Overall %
Collisions type						
Single vehicle	43.50%	40.44%	40.55%	38.70%	35.46%	38.98%
Angle impact	17.61%	23.84%	22.18%	24.36%	29.49%	24.48%
Rollover (harmful event)	7.06%	4.91%	5.40%	9.54%	14.40%	8.70%
Hit fixed object	46.82%	42.93%	41.33%	40.37%	29.10%	39.23%
Frontal impact	67.96%	66.29%	68.26%	60.66%	55.97%	62.40%
Driver characteristics						
Drivers aged 21-34	29.49%	29.95%	30.89%	31.28%	31.92%	30.89%
Male drivers	73.22%	75.16%	75.30%	72.70%	73.90%	73.98%
Negotiating a curve	16.28%	17.17%	15.55%	16.37%	4.56%	13.63%
No avoidance manuoeuvre	48.46%	48.83%	72.89%	54.78%	65.32%	57.46%
Unbelted drivers	33.57%	27.84%	33.50%	29.96%	30.86%	30.35%
Drinking driver	21.38%	19.79%	21.72%	20.02%	16.24%	19.37%
Drugs as contributing factor	12.00%	17.45%	7.64%	8.87%	2.75%	9.77%
Speeding as contributing factor	24.62%	22.50%	21.96%	21.27%	12.49%	19.88%
Not properly licensed	8.99%	10.28%	10.65%	14.12%	13.89%	12.25%
Previous collisions (1 or more)	15.18%	14.15%	8.60%	12.20%	6.35%	11.10%
Previous speeding convictions (1 or more)	19.33%	12.82%	22.66%	22.12%	24.88%	20.24%
High risk driver	12.67%	12.93%	14.72%	14.18%	13.34%	13.60%
Road and vehicle characteristics						
1-2 lane roads	83.43%	84.72%	63.26%	82.82%	76.06%	79.37%
Road not divided	73.96%	71.26%	57.07%	73.54%	43.09%	64.27%
Collision located on roadside	39.17%	39.85%	41.93%	33.87%	14.89%	32.70%
Collision on principal or minor arterials	59.69%	61.74%	60.79%	51.87%	61.68%	58.42%
Rural area	39.57%	46.98%	56.38%	70.79%	43.44%	54.10%
Curved road	35.37%	35.09%	38.95%	35.96%	20.59%	32.71%
Intersection	27.89%	30.35%	29.42%	23.80%	37.09%	29.40%
Pickup/light trucks	11.73%	10.35%	14.68%	19.27%	16.13%	15.04%
Late model vehicles (i.e., 2004+)	21.02%	22.31%	22.16%	17.66%	25.19%	21.47%
Temporal and environmental characteristics						
Fri-Sun collision	51.45%	50.03%	51.45%	50.25%	52.50%	50.94%
Night time (9pm-5:59am)	37.10%	35.98%	36.66%	33.72%	36.93%	35.65%
Weekend collision	41.95%	41.63%	42.88%	41.51%	44.60%	42.43%
Dark or dark with street lights	44.15%	43.81%	44.72%	42.99%	47.60%	44.52%

Type of collision. Overall, 39% of fatal collisions involved a single vehicle in transport. Approximately 40% of crashes involved the vehicle hitting a fixed object, and a vehicle rollover was involved in 20% of the crashes. The impact point was typically the front of the vehicle (62%) and the vast majority of the vehicles were towed away (90%). These results suggest that fatal collisions involving a single vehicle running off the road and hitting a fixed object is one common type of collision within the I-95 jurisdictions.

Driver characteristics. Drivers involved in fatal collisions in the I-95 Corridor tended to be male (74%) and aged 16-34 (44%). While 69% of the drivers were traveling straight at the time of the fatal collision, 14% were negotiating a curve. In response to the emergency situation, 57% of drivers failed to take evasive action prior to the collision. Drivers in fatal collisions had lower rates of safety belt use (54%) than that observed in seat belt use surveys (82%).

Approximately 17% of the drivers had been drinking alcohol prior to the fatal collision and of those tested for alcohol, 10% had a BAC of 0.08% or above. A surrogate measure of impaired driving created by TIRF based on the incidence of single vehicle night-time (9:00pm-5:59am) fatal collisions involving male drivers indicated that 11% of the crashes involved impaired driving. Drugs were considered a contributing factor in 10% of the collisions with stimulants and cannabinoids being the most commonly found drugs as a result of testing, although their prevalence was quite low (<2%).

In 18% of the fatal collisions, the drivers were considered by the police to have been speeding and the estimated travel speed at the time of the crash was most often in the 31-55 mph range (23%). In the three years prior to the fatal collision, 10% of the drivers had a previous collision, 2% had an impaired driving conviction, 20% had a speeding conviction, 20% had some other citation, and 14% had a license suspension. Approximately 12% of the drivers in fatal collisions were not properly licensed (i.e., never licensed, license suspended or revoked) and in 14% of the fatal collisions, the driver was considered to be high-risk since they had three or more previous collisions, impaired or traffic violation convictions, or suspensions in the three years prior to the fatal collision.

Road and vehicle characteristics. Fatal collisions tended to occur on one or two lane (79%) roads, undivided roads (64%), and the impact most often occurred on the roadway (51%). However, one-third of the collisions occurred on the roadside indicating that the vehicle had run-off-the-road. Overall, about 23% of fatal collisions occurred on principal arterial roads and 23% occurred on local roads or streets. In addition most of them occurred on rural roads (54%). Typically, the speed limit was 31-55 mph (76%). While 70% of the collisions occurred on straight and level roads, 28% of the roads had a grade, usually downhill, and 33% were curved where the collision occurred. Most of the collisions did not occur at intersections (71%) but if they did, traffic signals were present in 26% of cases or stop/yield signs were present in 30% of cases. The roads were dry in the vast majority of cases (84%). The vehicles involved in fatal crashes were typically passenger cars (45%) built before 2001 (58%), and had in-State license plates (88%).

Temporal and environmental characteristics. Many of the fatal collisions occurred Friday to Sunday (51%), at night between 9:00pm and 5:59am (36%), and on weekends-Friday 6:00pm to Sunday 5:59am (42%). There was not much difference in which quarter of

the year that the fatal collisions occurred ranging from 22% in January to March to 27% in April to June. Most fatal collisions occurred in daylight (51%) without any adverse weather conditions (89%).

The results of the regional profiles of FARS data are presented and discussed in the next section.

3.1 FARS Analyses Regional Profiles

Using the results of the analyses of the FARS data, profiles of the fatal collisions occurring in each of these five regions, New England (Maine – ME, New Hampshire – NH, Vermont – VT, Massachusetts – MA, Connecticut – CT, Rhode Island – RI), North (New York – NY, New Jersey – NJ, Pennsylvania – PA), Central (Delaware – DE, Maryland – MD, District of Columbia – DC, Virginia – VA), South (North Carolina – NC, South Carolina – SC, Georgia – GA), and Florida (FL), were developed based on the following characteristics: type of collision, driver, road and vehicle, and temporal and environmental. These profiles are presented by region below.

3.1.1 New England region profile.

Type of collision. Compared to other regions, the fatal collisions in New England (NE) were more often single vehicle (43%) and involved the vehicle hitting a fixed object (47%). However, fatal collisions in NE involved fewer incidents with one or more rollovers (7%), as well as fewer incidents with angle impacts (18%) than in other regions.

Driver characteristics. Almost three-quarters of the drivers were male and 43% were aged 16-34. Although two-thirds of the drivers were traveling on a straight road at the time of the collision, approximately 16% were negotiating a curve which was similar to other regions with the exception of Florida (FL) at 5%. Less than half of the drivers attempted to avoid the collision but if they did, they were more likely to make a steering maneuver (14%). Only 44% of the drivers were restrained by safety belts, but this is similar to the other regions.

Approximately 21% of the drivers had been drinking and over one-third of the collisions involved one or more drinking drivers. Approximately 18% of drivers had positive BACs, with

15% having BACs of 0.08% or higher. However, BAC tests were not known for about 50% of drivers in NE. TIRF used a surrogate measure of impaired driving (single vehicle, night-time, male driver) and found that fatal collisions involving impaired driving were most common (12%) in NE than in the other regions. Drug use was considered to be a contributing factor more often (12%) than the average of all the regions. For those drivers tested for drugs, the use of stimulants (3%) or cannabinoids (3%) was slightly more common in NE than in other regions.

The collisions more often involved speed as a contributing factor (25%) than in other regions. Only 12% of the collisions involved estimated speeds of 31mph or higher, considerably lower than other regions. It was less common for drivers to be improperly licensed at the time of the collision (9%) compared to other regions. Collisions during the three years prior to the fatal crash were most frequent among these drivers (15%) but there was little variation in previous convictions for impaired driving, speeding, other traffic offenses, or in previous license suspensions. Slightly less than 13% of the drivers involved in fatal crashes were considered to be high-risk (i.e., having three or more of the following events in the three years prior to the collision: impaired driving conviction, speed violation, another type of violation, collision, or license suspension), similar to other regions.

Road and vehicle characteristics. The fatal collisions typically occurred on one or two lane (83%) undivided roads (74%) and the impact most often happened on the roadway (44%). However, 39% of the collisions occurred on the roadside, higher than most other regions. Approximately 13% of the collisions occurred on principal arterial roads which was less common than in other regions. It was most common for fatal collisions to occur on principal arterial interstates (5%) or principal arterial other freeways or expressways (11%). More of the collisions occurred on urban roads (60%) than on rural roads, higher than in other regions. This result is consistent with the finding that the speed limit where the crash occurred was much more often 30 mph or lower in NE than in other regions (26%), suggesting more urban collisions. While the majority of the fatal collisions occurred on level and straight roads, 24% occurred on roads with a grade and 35% took place on curved roads. Most fatal collisions did not occur at intersections (72%). In 77% of the collisions, the roads were dry but they were more frequently wet or snow/ice covered in NE (22%) than in other regions, likely reflecting the climate.

Slightly less than one-half (49%) of the vehicles involved in the collisions were cars and the majority of the vehicles were manufactured in 2000 or earlier (57%). The vast majority (87%) of the vehicles were licensed in the state where the collision took place.

Temporal and environmental characteristics. One-half of the fatal collisions occurred Friday to Sunday and 37% occurred at night (i.e., 9:00pm-5:59am). Almost 42% occurred on weekends (Friday 6:00pm to Monday 5:59am) and about 30% took place during the summer months (July to September), all very similar to other regions.

Over one-half of the collisions occurred during daylight (52%) but they were more common in the dark where the roads had street lights (21%) compared to the average of all regions. While there were usually no adverse weather conditions, rain or snow/sleet were more common in this region (13%) than average, likely reflecting the climate.

Summary. Most fatal collisions in NE involved single vehicles on undivided one or two lane roads and many of them involved vehicles running off the roadway and hitting fixed objects. The collisions occurred on grades about one-quarter of the time and on curves about one-third of the time. These road characteristics may well have contributed to losing control of the vehicle and running off the road. In addition, TIRF used a surrogate measure of impaired driving (single vehicle, night-time, male driver) and found that fatal collisions involving impaired driving were most common (12%) in NE and safety belt use was relatively low (44%). Speeding was higher than in most other regions (25%) and 9% of the drivers were improperly licensed.

Given these characteristics of fatal collisions in NE, potential prevention strategies might include more intensive programs to increase seat belt use particularly among young drivers (e.g., Click It or Ticket), additional sobriety checkpoints targeted to high-risk times (e.g., weekend nights) and locations (e.g., areas where there are bars) and speed cameras to detect and ticket speeders. In addition, there could be wider use of rumble strips on the edges of rural roads to alert drivers that they are leaving the roadway and on the centre line of two lane roads to warn them that they are crossing into the oncoming lane. Given the higher incidence of poor weather and road conditions in NE, education programs about how to drive in poor conditions might be appropriate.

3.1.2 North region profile.

Type of collision. In the North region, single vehicle collisions were the more common (40%) type of collision. Angle collisions were also common (24%), similar to the average for all regions. There were fewer rollovers (5%) in the North region but there were more collisions involving vehicles hitting fixed objects (47%) compared to the average of all regions. Two-thirds of the collisions involved front end impacts which was similar to the other regions, except FL which was lower (56%).

Driver characteristics. Approximately 42% of the fatally injured victims were 16-34 years old and three-quarters were male, as was the case in other regions. Although two-thirds of the drivers were traveling straight at the time of the collision, about 17% were negotiating a curve which was highest of all the other regions. Slightly less than one-half of the drivers did not attempt to avoid the collisions but if they did, they most often tried to avoid the collision by trying to steer around the situation (12%). More than one-half of the drivers were belted (54%).

Approximately 20% of the drivers had been drinking and over one-third of the fatal collisions involved one or more drivers who were considered by the police to have been drinking, similar to other regions. Slightly more than 16% of the drivers in the North region who were tested had a positive BAC and 13% had BACs of 0.08% or higher which is very comparable to the percentage of drivers (11%) considered to have been drinking and driving based on the surrogate measure of impaired driving created by TIRF. However, the BAC test results were unknown for 57% of drivers in the North, making their usefulness questionable. Drug use was considered to be a contributing factor most often in the North (17%). For those drivers tested for drugs, cannabinoids were considerably more common in the North (3%) but stimulants were somewhat less frequent (2%).

Fatal collisions involved speed as a contributing factor in about 22% of the crashes which was similar to other regions, except FL which was lower (12%). The travel speed was estimated to be 31 mph or greater in about 26% of the collisions, somewhat lower than that for other regions. Slightly more than 10% of the drivers involved in the fatal collisions were improperly licensed, lower than most other regions. Regarding driver records for the three years prior to the fatal collision, the drivers in the North were similar to the average of all regions on all the

various previous events except for speeding where it was less common in the North (13%). High-risk drivers were involved in about 13% of the fatal crashes, similar to other regions.

Road and vehicle characteristics. Fatal collisions in the North region typically occurred on one or two lane roads (85%) which were not divided (71%), somewhat more common compared to the average of all regions. One-half of the crashes occurred on the roadway which is similar to the average but about 40% occurred on the roadside which was higher than average, suggesting a greater incidence of run-off-the-road crashes. Fatal collisions occurred least on principal arterial interstates (10%), and slightly less than half occurred on rural roads, which was comparable to the average. Speed limits in the 31-55 mph range (79%) were more frequent in the North but speed limits where the crash occurred of 70 mph or higher were quite rare (<1%). Approximately two-thirds of the roads were straight and level, similar to the other regions. However, crashes on curves and grades were still relatively common (35% and 30% respectively). Although in most crashes the roads were dry, they were more often wet or snowy/icy during crashes in the North region (20%), which is not surprising given the weather conditions in the North. Less than one-third of the fatal collisions occurred at intersections similar to the average across regions, and in most cases (44%), there were traffic controls present at these intersections, which was more than the average.

While approximately half of the vehicles involved in crashes were cars, fatal collisions in the North had the highest involvement of heavy trucks (9%) and the lowest involvement of pick-up trucks (10%). Given the large mass of heavy trucks, collisions involving these vehicles have a greater potential for causing considerable damage in terms of casualties. The majority of the vehicles (55%) were manufactured in 2000 or earlier and most (89%) were licensed in the state where the collision took place, similar to other regions.

Temporal and environmental characteristics. One-half of the fatal collisions in the North region occurred on Friday, Saturday, or Sunday and approximately 36% were at night. TIRF combined day of week and time and found that 42% of the collisions occurred on weekends. Slightly less than 30% of the collisions took place during the summer (i.e., July-September). The findings regarding temporal characteristics in the North were similar to those in the other regions.

Most of the fatal collisions occurred in daylight (52%) but there were somewhat more collisions in the dark without street lights (25%). While the majority of the collisions occurred when there were no adverse weather conditions, it was raining or snowing in the North (12%) more often than the other regions except NE, again likely reflecting the climate.

Summary. As was the case for the New England region, fatal collisions in the North region involved single vehicles on undivided one or two lane roads. Many of them involved vehicles running off the roadway and hitting fixed objects on the roadside of rural roads. In addition, about one-third of the crashes involved either a grade or a curve. These fatal collisions also often involved a lack of safety belt use, the use of alcohol, and speeding, which are generally considered characteristics of high-risk drivers.

Similar interventions identified for NE could be applied to the North region such as more intensive Click It or Ticket programs, more frequent sobriety checkpoints, use of speed cameras, and the installation of rumble strips on road edges and center lines. Since there was a higher incidence of poor weather and road conditions in the North region, as in NE, education programs about how to drive in poor conditions might be appropriate. Given the higher incidence of drug use as a contributing factor in fatal collisions, the police may want to increase drugged driving enforcement.

3.1.3 Central region profile.

Type of collision. Single vehicles were involved in 55% of the fatal collisions in the Central region which is slightly higher than the average; angle impacts were slightly less common (22%). Approximately 40% of the crashes involved hitting a fixed object which was similar to other regions. More than two-thirds of the collisions involved frontal impacts, higher than any other region.

Driver characteristics. More than 43% of the drivers were aged 16-34 and three-quarters were male, similar to other regions. Although almost 70% of the drivers were traveling straight at the time of the crash, 16% were negotiating curves, comparable to most other regions with the exception of FL (5%). Almost 73% of the drivers involved in these crashes did not do anything to try to avoid the collision, which was considerably higher than in other regions. If they tried to avoid the collision, they tended to brake rather than steer (19%

vs. 7%), in contrast to the other regions, where the reverse was observed. Belt use in the Central region was marginally lower (46%) than that for most other regions.

Almost 22% of the drivers had been drinking and one or more of the drivers involved in fatal collisions were considered by the police to have been drinking (37%) which was higher than in any of the other regions. In 16% of the collisions, the driver's BAC was positive and 11% of the drivers had a BAC of 0.08% or higher, both of which were similar to those observed in other regions. However, the BAC for some two-thirds of the drivers was not known. The incidence of impaired driving using the surrogate measure created by TIRF was also similar to that of other regions (11%). Drug use as a contributing factor was comparable in the Central region (8%) to the average. For those drivers that were tested for drugs, the use of stimulants (1%) and cannabinoids (1%) by drivers was low.

More than 45% of the crashes involved travel speeds of 31 mph or more which was similar to that observed in the other regions with the exception of FL (12%). At 22%, speed as a contributing factor was similar to the other regions. While the vast majority of the drivers had proper licenses, 11% did not, similar to other regions. The drivers involved in fatal crashes in the Central region tended to have fewer previous collisions (8%) but somewhat more convictions for other offenses compared to most other regions. High-risk drivers were involved in about 15% of the fatal crashes, similar to other regions.

Road and vehicle characteristics. Fatal collisions in this region occurred on four lane (31%) divided highways with barriers (28%) much more often than in other regions, although the majority still occurred on one or two lane roads (63%). These collisions took place more frequently on the roadside (42%) than was the case for other regions. Approximately 22% of the collisions occurred on principal arterial roads and more than half (56%) were on rural roads, similar to the average. The distribution of speed limits was quite similar to the average across regions with most roads having limits from 31-55 mph (79%). Two-thirds of the fatal collisions occurred on level roads which was similar to the other regions. Fatal collisions took place more often on curved roads (about 40%) in the Central region than in any other region. About 30% of the crashes occurred at intersections which was very similar to the other regions but these intersections did not have traffic controls more often (55%) compared to most other regions.

Almost 46% of the vehicles involved in fatal crashes were cars in the Central region and 57% were manufactured in 2000 or earlier, similar to the average. More of the vehicles also had out of State license plates than in other regions (17%).

Temporal and environmental characteristics. Slightly more than one-half of the fatal collisions occurred on Friday, Saturday or Sunday, which was similar to other regions. More than 40% of the collisions happened at night which is similar to the average. Approximately 43% of these crashes occurred on the weekend, similar to the other regions. There were more fatal crashes in the summer months (28%) than in the other seasons, similar to the other regions. One-half of the fatal crashes occurred in the daylight which is comparable to other regions but 30% occurred in the dark on roads that did not have street lights which was higher than most other regions. Crashes more often occurred during good weather conditions (92%) in the Central region than most other regions.

Summary. Most fatal collisions in the Central region involved single vehicles on undivided one or two lane roads. Many of them involved vehicles running off rural roads on the roadside and hitting fixed objects. In addition, about one-third of the crashes involved either a grade or a curve. These fatal collisions also quite often involved unbelted drivers, alcohol use, and speeding.

Similar interventions identified earlier for other regions could be applied in the Central region such as more intensive Click It or Ticket programs, more frequent sobriety checkpoints, and the use of speed cameras. In addition, the high percentage of drivers who did not attempt to avoid the collision in this region suggests the need for better training on evasive driving measures, as well as the need for measures focusing on fatigued and drowsy driving. Given the higher incidence of vehicles going off the road onto the roadside in the Central region, the installation of rumble strips on road edges and guard rails might also be warranted.

3.1.4 South region profile.

Type of collision. Fatal collisions in the South region were either mostly single vehicle (54%) or angle (24%) collisions, similar to the other regions. The collisions tended to involve vehicle to vehicle impacts (45%) or impacts with fixed objects (40%), again in line with the average of all the regions. Vehicle rollovers were more frequent in the South (23%).

Driver characteristics. Approximately 43% of the drivers in fatal crashes were aged 16-34 and three-quarters were male, similar to other regions. Although almost 70% of the drivers were traveling straight at the time of the crash, 16% were negotiating curves, comparable to most other regions with the exception of FL (5%). The lack of avoidance manoeuvres by drivers in the South (55%) was comparable to other regions but drivers tended to be less likely to steer or brake (3% for both) to prevent the collision than those in other regions. Safety belts were used by about 56% of the drivers, similar to the average.

Approximately 20% of the drivers had been drinking and one-third of the collisions involved one or more drivers who were considered by the police to have been drinking, both similar to the average across regions. About 14% of drivers had positive BACs based on testing and 12% had a BAC of 0.08% or higher which was also comparable to other regions. However, as noted in other regions, the rate of unknown BACs was quite high (64%). Using a surrogate measure created by TIRF, 11% of the drivers were impaired, similar to other regions. Drug use was considered a contributing factor in about 9% of the fatal collisions and in line with the average for all the other regions. For those drivers who were tested, the use of cannabinoids (2%) and stimulant drugs (2%) was quite low and similar to that in other regions.

Estimated travel speeds of 31 mph or higher were more common in the South (51%) which may have been influenced by the fact that there were fewer “Don’t knows” for this variable than in most other regions. Speed was considered a contributing factor in about 21% of the fatal collisions, similar to other regions with the exception of FL (12%). Somewhat more drivers were not properly licensed in the South (14%) compared to most other regions but the incidence of previous collisions, violations, and suspensions was quite comparable. The percentage of high-risk drivers in the South (14%) was also the similar to the average.

Road and vehicle characteristics. Most of the fatal collisions occurred on one or two lane roads (83%) that were undivided (74%). The vehicle impact usually occurred on the roadway (50%), although 34% of the impacts occurred on the roadside, suggesting run-off-the-road collisions. Fatal collisions on principal arterial other freeways or expressways least often occurred (1%) in the South, compared to other regions. Considerably more of these collisions took place on rural roads (71%) and on roads with speed limits in the range of 31-55 mph (84%) than was the case for other regions. The collisions tended to occur on grades (36%) more often in the South than elsewhere. Collisions occurring on curves (35%) were

comparable to most regions. Crashes were less likely to occur at intersections (24%) in the South than in other regions but if they did occur at intersections, the traffic control device was more often a stop or yield sign (42%).

Although drivers involved in crashes in the South were usually driving a car (42%), they were more often driving a pick-up (19%) and less often riding a motorcycle (8%) than those drivers in the other regions. Crash-involved drivers in the South were more often driving an older vehicle manufactured in 2000 or earlier (64%)

Temporal and environmental characteristics. The temporal characteristics of fatal collisions in the South were very comparable to other regions with about one-half of them occurring on Friday, Saturday or Sunday, one-third at night and 41% on the weekend. More crashes occurred in the spring months (28%) than in the winter months (22%). The light conditions were more often dark (35%) but less often dark with artificial lighting (8%) in the South than in other regions. Weather conditions were good in 90% of the collisions, similar to most other regions.

Summary. These results suggest that the majority of fatal collisions in the South region are occurring on two lane rural roads as opposed to highways and freeways. These collisions often took place on roads with a grade or a curve and involved a single vehicle going off the road on the roadside and striking a fixed object. As in the other regions, the drivers were usually male and quite often aged 16-34 and they were often unbelted. Alcohol and speeding were common contributing factors in the collisions.

Similar interventions identified earlier for the other regions could be applied in the South region including more intensive Click It or Ticket programs, more frequent sobriety checkpoints, use of speed cameras, and the installation of rumble strips on road edges and centerlines. Given the greater incidence of collisions on curves, consideration could be given to installing more guard rails on curved roads and using a compound on the pavement that increases tire friction, thereby reducing loss of control.

3.1.5 Florida profile.

Type of collision. FL was identified as a separate region for analysis since it accounts for about 25% of the fatal collisions in the I-95 jurisdictions, likely reflecting the size of the

population of the state and the amount of travel. Of some interest, FL appears to be the state which differs most from the other regions. There were fewer single vehicle fatal collisions (35%) and fewer impacts with fixed objects (29%). However, there were more angle collisions (29%), more vehicle to vehicle impacts (52%), and more left or right side vehicle impacts (25%). These results suggest that more intersection collisions occur in FL compared to other regions. This might lead to the conclusion that the higher incidence of intersection collisions is related to the fact that there are more senior drivers in FL and senior drivers are overrepresented in intersection collisions, however this is not supported by the data on driver characteristics below.

Driver characteristics. The age and gender distributions of the fatally injured drivers were similar in FL to that of other regions with about 44% aged 16-34 and three-quarters of the drivers were male. Despite the many retirement communities in FL, there was no evidence that there were more senior drivers (65+) involved in fatal collisions in FL (11%) compared to the other regions. More drivers were traveling straight ahead at the time of the crash (75%) or turning left (9%) and fewer were negotiating a curve (5%) compared to other regions. Two-thirds of the drivers did not try to avoid the collision, higher than most other regions and if they did, they usually tried to steer (12%). Safety belt use by drivers in fatal collisions was slightly higher (58%) than all of the regions.

In FL, drivers were less often considered to have been drinking by the police (16%) and there were fewer fatal collisions where one or more drivers were considered to have been drinking (30%) compared to other regions. Drivers were similar to those in other regions in terms of BACs over 0.08% (13%) but the incidence of the BACs being unknown was higher in FL than elsewhere (66%), which may have affected the BAC results. Drivers were least likely to have been impaired in FL based on TIRF's surrogate measure (10%) but this was similar to the average across regions. Drugs were considered a contributing factor in the collision less often in FL (3%) than in all the other regions. However, for tested drivers, the use of stimulants by the drivers in FL was similar to the average (2%) as was use of cannabinoids (2%) and other drugs (3%).

The estimated travel speeds were most often 30 mph or lower (19%) and speeding as a contributing factor was only half as common in FL (12%) compared to the other regions, suggesting lower speed urban environments. Only 6% of the FL drivers had previous

collisions and 1% had impaired driving convictions which is less common than in other regions. However, drivers had previous speeding convictions more often (25%) which seems a bit contradictory to the results on speed as a contributing factor. Drivers did not differ regarding other types of previous citations or on suspensions and the same percentage of drivers were considered to be high-risk drivers (13%) as in other regions. Drivers involved in fatal crashes were not properly licensed in 14% of the cases, which was higher than most other regions.

Road and vehicle characteristics. While most of the fatal collisions occurred on one or two lane roads (76%), they occurred on three lane roads twice as often in FL (17%) compared to other regions. More than half of the collisions took place on divided roads but they were more often divided roads without barriers in FL (42%). The crashes occurred on the roadway in about 60% of the cases, higher than other regions. Fewer collisions occurred on the roadside (15%), suggesting an urban environment. The collisions occurring on local roads were most common in FL (36%) compared to other regions. Fatal crashes more often occurred on urban roads in Florida (57%), somewhat higher than all regions. The speed limit was 31-55 mph in about two-thirds of the collisions, which is lower than the average. However, there were more collisions on roads with speed limits of 70 mph or higher (11%) than all other regions. The roads less often had a grade (15%) or a curve (21%) at the collision site compared to other regions which may reflect the topography of Florida (i.e., flatter with fewer mountains and hills to go over or around). Crashes on dry roads were more common in Florida (88%) than in other regions, likely reflecting the climate. The collisions more commonly took place at intersections (34%) and these intersections more often had traffic signals (34%) than in other regions, again suggesting an urban environment.

The vehicle being driven during a crash was less often a car (42%) and more often a motorcycle (12%) compared to other regions, the latter perhaps reflecting greater exposure due to the warmer climate. The vehicles were more commonly later models (2004 or later) in Florida (25%) than elsewhere. Out-of-state license plates were less common than in other states (8%).

Temporal and environmental characteristics. More than one-half of the fatal collisions occurred Friday to Sunday and about 37% were at night, similar to other regions. Somewhat more crashes took place on the weekend in Florida (45%). Fatal crashes were more frequent

(26%) in the winter (January-March) and less common in the summer (23%) compared to other regions. Collisions in Florida were somewhat less common in the daylight (48%) and somewhat more frequent in the dark with artificial lighting (22%) than in other regions. Crashes during adverse weather conditions were less common (7%) likely reflecting the climate.

Summary. The fatal collisions in Florida were somewhat different than those occurring in other states. Although single vehicle collisions were still common, they were less common in Florida, whereas angle collisions were more prevalent. The latter is consistent with more intersection collisions occurring in Florida and a higher proportion of collisions occurring in urban areas and on local roads. The drivers tended to be males and many of them were aged 16-34. While crashes involving non-use of safety belts, alcohol use, and speeding were common, they were less prevalent in Florida.

Given the greater incidence of urban intersection collisions in Florida, consideration should be given to measures to deal with this type of collision such as the use of roundabouts, left turn lanes with separate traffic light cycles, and the use of red light cameras to detect drivers who run red lights. Considering the higher prevalence of improperly licensed drivers in Florida, consideration might be given to technology such as Automated License Plate Recognition which reads the vehicle license plate, determines the name of the owner and then checks the owner's license status (e.g., suspended or revoked). In addition, more targeted Click It or Ticket programs and sobriety check points are warranted in Florida.

4.0 STATE CRASH ANALYSES

State collision data files were also obtained from five states (GA, PA, VA, FL, and MA) for the years 2005, 2006, and 2007. As such, it was possible to examine the data from one relatively large state from each of the I-95 regions identified above in the FARS analyses. This section contains a description of the key features of crashes occurring between 2005 and 2007 inclusive. The results for each state analysis are presented and structured according to the following categories: type of collision, driver characteristics, road and vehicle characteristics, and temporal and environmental characteristics. Within each category, results of the state analyses for the years 2005, 2006 and 2007 are reported according to the level of injuries associated with crashes (e.g., fatal injuries, serious injuries and other injuries). Each State's data were analyzed using Stata, release 10.

The purpose of the state data analyses was to determine the characteristics of fatal and serious injury collisions in representative member states within the I-95 Coalition. The State collision data were analyzed to compare fatal and injury collisions on as many as possible of the same characteristics used in the FARS analysis. A summary of the findings from each state is presented at the end of each section.

4.1 Georgia State Crash Analyses

State crash data were provided by the GA Department of Transportation. There are some limitations associated with this database. Variables of interest that were not captured by these data and that were captured by the FARS data include variables such as vehicle travel speed and whether the crash occurred in a rural or urban area. This limits comparisons to the FARS data as well as comparisons with the other states' data.

Type of collision. A quarter of all injury collisions involved a single vehicle, but this was considerably more frequent in fatal (54%) and serious injury (45%) collisions than in other injury collisions. Angle impacts were less frequent for fatal (25%) and serious injury collisions (27%) than for other injury collisions (31%) and rear-end collisions were much less common for fatal (6%) and serious injury crashes (14%) compared to other injury crashes (36%). In addition, head-on collisions were more common for fatal (11%) and serious injury collisions (8%) compared to other injury collisions (4%). Overall, 74% of the collisions involved a vehicle

to vehicle impact; however, striking a fixed object was more common among fatal and serious injury collisions (33% and 27% respectively) compared to other injury collisions (16%). While approximately half of the vehicles were towed away, vehicles were more often towed away for fatal (84%) and serious injury (65%) collisions than other injury collisions (47%).

Driver characteristics. Almost half of the drivers involved in all injury collisions were aged 16-34. There was a tendency for older drivers (55+) to more often be involved in fatal collisions (24%) compared to serious collisions (19%) or other injury crashes (19%). Overall, male drivers were involved in about 56% of all injury collisions but they were more often involved in fatal (72%) and serious injury collisions (65%) compared to other injury collisions (55%). Most drivers were traveling straight at the time of the collision but they were more often negotiating curves in fatal and serious injury collisions (23% and 14% respectively) compared to those involved in other injury crashes (7%). Restraint use was lower in fatal (49%) and serious injury collisions (55%) than in other injury collision (75%). While alcohol was rarely involved, it was more frequent in serious injury collisions (8%) compared to other injury collisions (3%). The driver losing control was more common for fatal and serious injury collisions (28% and 19% respectively) than for other injury collisions (8%). Crashes where drivers were following too close were the least common for fatal and serious injury collisions (3% and 7% respectively) compared to other injury collisions (18%). Both exceeding the speed limit or driving too fast for conditions were more common in fatal (6% and 8% respectively) and serious injury collisions (3% and 7% respectively) compared to other injury collisions (0.8% and 4%).

Road and vehicle characteristics. Most collisions occurred on the roadway, but a sizeable minority (32% and 24% respectively for fatal and serious injury) took place off the roadway compared to other injury collisions (14%). Overall, 63% of the roads were two-way roads with no physical separation but these types of roads were less common in fatal collisions (54%) compared to serious injury and other injury collisions (62% and 63% respectively). Two-way roads with a physical separation were more common in fatal collisions (38%) compared to serious (29%) and other injury collisions (25%). The majority of the fatal and serious injury collisions occurred on dry roads (82%) — this was somewhat more frequent in fatal collisions; conversely, collisions in which roads were wet were less common in fatal collisions. While the road was straight in the majority of injury collisions, fatal and serious injury collisions more often occurred on curved roads (31% and 23% respectively) compared

to other injury collisions (13%). In two-thirds of all injury collisions, the road was level but the roads more frequently had a grade in fatal (54%) and serious injury collisions (39%) compared to other injury collisions (33%). The vehicles involved were most often passenger cars (56%). Large trucks were more commonly involved and motorcycles were somewhat more commonly involved in fatal (10% and 6% respectively) and serious injury collisions (5% and 6%) compared to other injury collisions (3% and 2%). Sixty percent of the vehicles were manufactured in 2000 or earlier and this did not vary as a function of collision severity. Most drivers had licenses within GA and there was little variation across categories of injury severity.

Temporal and environmental characteristics. Overall, 42% of all collisions occurred on Friday, Saturday, or Sunday, but fatal and serious injury collisions were more common from Friday to Sunday (48% for both) compared to lower severity collisions (42%). The majority of injury collisions occurred between 3:00pm and 5:59pm (24%), the evening rush hour, but this was less common for fatal collisions (16%) compared to serious and other injury collisions (21% and 24% respectively). Sixteen percent of all injury collisions occurred at night (9:00pm to 5:59am) and fatal and severe collisions were more common at this time (32% and 25% respectively) compared to other injury collisions (15%). The majority of collisions occurred during the week (70%) but fatal and serious injury crashes occurred more often during the weekend (40% and 38% respectively) compared to other injury collisions (29%). The weather conditions were clear (67%) or cloudy (20%) most of the time for all injury collisions, but when rain was present during the crash, it was somewhat less likely to occur in fatal injury collisions (8%) compared to other injury collisions (12%). Most collisions occurred in daylight (72%); however, fatal and serious injury collisions more often occurred when it was dark and there were no street lights (33% and 21% respectively) compared to other injury collisions (12%).

Summary. Most fatal collisions in GA involved a single vehicle where the vehicle hit a fixed object. Fatal collisions more often occurred on curved roads with grades. These road characteristics may well have contributed to losing control of the vehicle and running off the road. Older drivers (55+) and males were more often involved in fatal collisions. In addition, although the majority of collisions occurred during the week and during daylight, fatal and serious injury crashes occurred more often during the weekend and at night during dark conditions.

Table 4.1.1: Comparison of FARS and Georgia state crash results.[1]

Key fatal crash characteristics	Fatal crashes in South region	Fatal crashes in GA	All inj. cr in GA
Collisions type			
Single vehicle	38.70%	53.64%	25.34%
Angle impact	24.36%	25.13%	30.88%
Rollover (harmful event)	9.54%	9.71%	4.25%
Hit fixed object	40.37%	33.02%	16.72%
Frontal impact	60.66%		
Driver characteristics			
Drivers aged 21-34	31.28%	29.73%	32.78%
Male drivers	72.70%	72.44%	55.65%
Negotiating a curve	16.37%	23.06%	7.12%
No avoidance manuoeuvre	54.78%		
Unbelted drivers	29.96%	34.43%	8.18%
Drinking driver	20.02%	5.97%	3.12%
Drugs as contributing factor	8.87%		
Speeding as contributing factor	21.27%	13.93%	4.91%
Not properly licensed	14.12%		
Previous collisions (1 or more)	12.20%		
Previous speeding convictions (1 or more)	22.12%		
High risk driver	14.18%		
Road and vehicle characteristics			
1-2 lane roads	82.82%		
Road not divided	73.54%	54.02%	63.03%
Collision located on roadside	33.87%	31.54%	14.52%
Collision on principal or minor arterials	51.87%		
Rural area	70.79%		
Curved road	35.96%	31.41%	14.15%
Intersection	23.80%		
Pickup/light trucks	19.27%	19.89%	15.42%
Late model vehicles (i.e., 2004+)	17.66%	18.47%	18.70%
Temporal and environmental characteristics			
Fri-Sun collision	50.25%	48.38%	42.04%
Night time (9pm-5:59am)	33.72%	32.11%	15.84%
Weekend collision	41.51%	39.98%	29.85%
Dark or dark with street lights	42.99%	43.24%	24.63%

Table 4.1.1, shows the percent of fatal crashes (according to each of the variables examined) as determined by the FARS analysis of the South region compared to the percent obtained by the examination of the GA State data where available. Also presented is the percent of crashes involving any injury. The percentage of fatal crashes involving a single vehicle was lower in the South region (39%) than in GA alone (54%), and both were higher than the percentage for all injuries in GA (25%). The percentage of collisions involving the vehicle hitting a fixed object was higher in the South (40%) compared to GA (33%) which were both much higher than the percentage for all injuries in GA (17%). The percentage of fatal collisions where the driver was negotiating a curve was lower in the South region (16%) compared to GA (23%), but this percentage was much lower for all injuries in GA (7%). The percentage of unbelted drivers was somewhat lower in the South (30%) compared to GA (34%) and was much lower for all injuries in GA (8%). The percentage of fatal collisions

[1] Note that the data in the last column of this table may be less accurate compared to the first and the second column; this can likely be explained by lower levels of accuracy of data for less severe crashes/injuries.

involving a drinking driver was higher in the South region (20%) compared to GA (6%) which could partly be explained by the 31% of cases where this was not known for fatal collisions in GA (see Appendix B). Speeding as a contributing factor also had a higher percentage in the South region (21%) than in GA (14%).The percentage of cases where the fatal collision occurred on an undivided road was higher in the South region (73%) compared to GA (54%). There was a higher percentage of fatal collisions occurring on a curved road in the South (36%) compared to GA (31%). No other notable differences were found between the South region determined by the FARS analysis and the GA state data.

4.2 Pennsylvania State Crash Analyses

State crash data were provided by the PA Department of Transportation's Bureau of Highway Safety and Traffic Engineering. There are some limitations associated with this database. Variables of interest that were not captured by these data and that were captured by the FARS data include variables such as light condition and number of travel lanes. This limits comparisons to the FARS data as well as comparisons with the other states' data. As well, the level of impairment is only captured as the presence or absence of alcohol or drugs based on the investigating officer's judgment as opposed to actual BAC test results as in the FARS data.

Type of collision. In summary, fatal and severe injury collisions in PA more often involved a single vehicle (53% and 52% respectively) and hitting a fixed object (41% and 38% respectively) than other injury collisions of a lower severity (42% for single vehicle crashes and 32% for hitting a fixed object). As for point of impact, rear-end impacts were less common in fatal (8%) and serious injury collisions (10%) compared to other less severe injury collisions (19%). Vehicle rollovers occurred considerably more often in fatal and severe injury collisions as well (25% and 17% respectively) compared to other injury collisions (8%).

Driver characteristics. Almost one-half (47%) of drivers involved in injury collisions were aged 16-34. There was not much difference in terms of age between fatal, serious and other injury collisions. However, drivers aged 55 and older were more often involved in fatal injury collisions (24%) than serious (18%) and other injury collisions (18%). Overall, 60% of the drivers involved in injury collisions were male and males were more often involved in fatal (75%) and serious injury collisions (70%) than other less severe injury collisions (60%).

At the time of the collision, most drivers (56%) were going straight followed by slowing or being stopped in the traffic lane (13%) and negotiating a curve (12%). Vehicle collisions where the driver was slowing or stopped in the traffic lane were less common in fatal (5%) and serious injury collisions (6%) compared to other injury collisions (14%). Negotiating a curve more often occurred in fatal and serious injury collisions (28% and 21% respectively) than in other injury collisions (11%). For all collisions, overall driver restraint use was 70% but it was considerably lower in fatal (43%) and serious injury (48%) collisions than other injury collisions (71%). While ejections from the vehicle were rare (<1%), they were more common in fatal (12%) and serious injury collisions (5%) compared to 0.2% for other injury collisions. Although only 10% of collisions involved a drinking driver, the percentage was considerably higher among fatal (37%) and serious injury collisions (25%) than in other injury collisions (9%). While suspicion of alcohol or drugs was low (5% and 1% respectively) in all collisions, alcohol was suspected more often in fatal and serious injury collisions (18% and 15%) than other injury collisions (5%) and drugs were somewhat more often suspected in fatal collisions (5%) compared to other injury collisions (1%). Positive BACs were found in just 3% of all injury collisions but BAC levels over the legal limit of 0.08% were more common in fatal (18%) collisions compared to serious injury (7%) and other injury collisions (2%).

Estimated travel speeds higher than 55 mph were somewhat more common in fatal and serious injury collisions (9% and 7% respectively) than was the case for collisions of lesser severity (4%). Fewer fatal and serious injury collisions (10% and 15% respectively) occurred at speeds below 30 mph than other injury collisions (23%). Collisions occurring at speeds between 31 and 55 mph were more common for fatal (29%) and serious injury collisions (31%) compared to other injury collisions (23%). Speed was considered to be a contributing factor in only 4% of all injury collisions, but in fatal and serious injury collisions, speed was much more common (23% and 13% respectively) than in other injury collisions (4%). Overall, 28% of the collisions were considered to be speeding related. However, the collisions were considered to be speeding related more often in fatal (50%) and serious injury collisions (37%) than other injury collisions (28%). Aggressive driving was somewhat more common for fatal injury collisions (68%) than for serious injury (61%) and other injury (60%) collisions. Driver distraction was less common among fatal collisions (5%) and serious injury collisions (6%) than in the other injury collisions (10%). Drivers involved in fatal and serious injury collisions more often made errors negotiating curves (16% and 12% respectively) compared to the

drivers in the lower severity collisions (5%). Overall, most drivers were licensed within PA (90%) and there was not much difference in terms of injury severity.

Road and vehicle characteristics. Overall, 62% of injury collisions occurred on the roadway and 23% occurred off the traffic way. More fatal and serious injury collisions occurred off the roadway (35% and 30% respectively) compared to other injury collisions (22%). Injury collisions occurred on rural roads about 21% of the time and fatal and serious injury collisions were much more common on rural roads (45% and 33% respectively) than other injury collisions (21%). Road conditions overall were dry in injury collisions in 70% of cases but this was more commonly the case in fatal and serious injury collisions (79% and 79% respectively) than for other injury collisions (70%). It is interesting to note that wet or snow/slush/ice covered roads were less prevalent among fatal (19%) and serious injury collisions (20%) than the other injury severity collisions (29%). While the roads were curved in only 15% of all injury collisions, curved roads were more common in fatal (31%) and serious (24%) injury collisions compared to other injury collisions (14%). Roads with a grade were involved in 25% of injury collisions and were more frequent in fatal and serious injury collisions (37% and 31% respectively) compared to collisions resulting in other injuries (25%). Most collisions did not occur at intersections (61%), but this was more common in fatal (78%) and serious injury collisions (69%) than in other injury collisions (60%).

Temporal and environmental characteristics. Serious injury collisions were less common during the late fall and winter months (October to December – 22%; and January to March – 21%) compared to other injury collisions (October to December – 27%; and January to March – 26%). The distribution across days of the week is fairly even with Friday being slightly higher at 17%. There was little variation across levels of injury severity. The most common time of day for collisions was between 3:00pm and 5:59pm, the evening rush hour (22%). Collisions occurring during this time were the least common for fatal collisions (16%) and the most common for other injury collisions (22%). Collisions occurring at night (i.e., 9:00pm to 5:59am) were more common in fatal (29%) and serious injury collisions (25%) than other injury collisions (17%). Weekend collisions were also more common in fatal (41%) and serious injury collisions (42%) than in other injury collisions (32%). Adverse weather conditions were less common in fatal and serious injury collisions (13% and 6%) than in other injury collisions (21%).

Summary. Most fatal and serious injury collisions in PA involved a single vehicle hitting a fixed object. Curved roads and grades were more common in fatal and serious injury collisions compared to other injury collisions. Fatal and serious injury collisions were also more common on rural roads and at non-intersections where speed limits may be high and the presence of traffic controls low. In addition higher travel speeds were somewhat more common for fatal and serious injury collisions. These characteristics may well have contributed to drivers losing control of the vehicle and running off the road.

Table 4.2.1: Comparison of FARS and Pennsylvania state crash results[2]

Key fatal crash characteristics	Fatal crashes in North region	Fatal crashes in PA	All inj. cr in PA
Collisions type			
Single vehicle	40.44%	53.16%	42.62%
Angle impact	23.84%	22.24%	26.68%
Rollover (harmful event)	4.91%	25.01%	8.62%
Hit fixed object	42.93%	41.50%	32.37%
Frontal impact	66.29%	58.73%	58.07%
Driver characteristics			
Drivers aged 21-34	29.95%	28.78%	31.09%
Male drivers	75.16%	75.27%	60.25%
Negotiating a curve	17.17%	27.83%	11.87%
No avoidance manuoeuvre	48.83%		
Unbelted drivers	27.84%	38.35%	12.35%
Drinking driver	19.79%	37.26%	9.91%
Drugs as contributing factor	17.45%	5.43%	0.90%
Speeding as contributing factor	22.50%	23.94%	4.52%
Not properly licensed	10.28%		
Previous collisions (1 or more)	14.15%		
Previous speeding convictions (1 or more)	12.82%		
High risk driver	12.93%		
Road and vehicle characteristics			
1-2 lane roads	84.72%		
Road not divided	71.26%		
Collision located on roadside	39.85%	35.18%	22.63%
Collision on principal or minor arterials	61.74%		
Rural area	46.98%	45.03%	21.52%
Curved road	35.09%	30.55%	14.75%
Intersection	30.35%	22.37%	39.12%
Pickup/light trucks	10.35%	13.05%	11.08%
Late model vehicles (i.e., 2004+)	22.31%	20.15%	18.34%
Temporal and environmental characteristics			
Fri-Sun collision	50.03%	49.45%	44.44%
Night time (9pm-5:59am)	35.98%	36.96%	22.42%
Weekend collision	41.63%	41.33%	33.15%
Dark or dark with street lights	43.81%		

Table 4.2.1 shows the percent of fatal crashes (according to each of the variables examined) as determined by the FARS analysis of the North region compared to the percent obtained by the examination of the PA state data where available. Also presented is the percent of crashes

[2] Note that the data in the last column of this table may be less accurate compared to the first and the second column; this can likely be explained by lower levels of accuracy of data for less severe crashes/injuries.

involving any injury. The percentage of single vehicle collisions was lower in the North region (40%) compared to PA (53%), whereas the percentage of fatal collisions where the vehicle rolled over was much lower in the North (5%) compared to PA (25%). The percentage of frontal impact collisions was higher for fatal crashes in the North (66%) compared to PA (59%). The percentage of cases where the driver was negotiating a curve at the time of the fatal collisions was lower in the North region (17%) compared to PA (28%) as was the case with unbelted drivers (28% vs. 38%) and drinking drivers (20% vs. 37%). The percentage of cases where drugs were a contributing factor was higher in the North region (17%) compared to PA (5%). The percentage of fatal collisions occurring on the roadside was more common in the North (40%) than in PA (35%) as were collisions occurring at intersections (30% vs. 22%). No other notable differences between the North region and PA were found.

4.3 Virginia State Crash Analyses

Virginia. State crash data were provided by the VA Department of Transportation Traffic Engineering Division. Variables of interest that were not captured by these data and that were captured by the FARS data include variables such as driver BAC and whether the crash occurred at an intersection. This limits comparisons to the FARS data as well as comparisons with the other states' data. There is a very high percentage of missing values for certain variables in this database, such as restraint use and functional class (e.g., minor arterial, collector). These variables have few missing values in the other states. As well, the level of impairment is only captured as the presence or absence of alcohol or drugs based on the investigating officer's judgment as opposed to actual BAC test results as in the FARS data.

Type of collision. Most injury collisions in VA involved multiple vehicles (71%) but fatal collisions more often involved single vehicles (58%). Although the most common harmful event overall was rear-end collisions, hitting fixed objects was more prevalent in fatal collisions (44%), indicative of a run-off-road type of collision. The front of the vehicle was the most common point of impact but this was more common for fatal and serious injury collisions (60% and 65% respectively) compared to other injury collisions (56%). The point of impact was more commonly the right side of the vehicle in serious injury collisions (17%) compared to fatal and other injury collisions (8% and 8% respectively). Rear end impacts were less common for fatal and serious injury collisions (7% and 8% respectively) than for other injury collisions (25%). The point of impact was considerably more often the top of the vehicle in

fatal collisions (15%) compared to serious and other injury collisions (1% and 2% respectively).

Driver characteristics. Drivers involved in injury collisions were aged 16-34 in 45% of cases. In terms of differences across injury severity, more fatal collisions and other injury collisions (42% and 45% respectively) involved drivers aged 16 to 34, compared to 36% for serious injury collisions. There was a tendency for drivers involved in fatal collisions to more often be aged 55 or older (21%) compared to other injury collisions (16%). While 54% of drivers were male overall, in fatal collisions male drivers were more common (72%). Restraint use was considerably lower in fatal collisions (30%) compared to serious injury (52%) and other injury collisions (58%).

Overall, the most common action was drivers traveling straight ahead or starting up in their lane (47%) but this was more common for serious injury collisions (56%) compared to fatal and other injury collisions (47% and 47% respectively). The vehicle was making a right turn more often in serious injury collisions (8%) than in fatal and other injury collisions (1% and 3% respectively). The vehicle was making a left turn more often in serious injury collisions (12%) compared to fatal collisions (5%). The vehicle was slowing or was stopped considerably less often in fatal and serious injury crashes (4% and 3% respectively) compared to other injury collisions (21%). Running off the road was more common among drivers involved in fatal collisions (36%) than in serious injury (2%) and other injury collisions (9%). Only 4% of drivers had been drinking but there were more drinking drivers involved in fatal collisions (16%) compared to serious injury (4%) and other injury collisions (4%). Crashes where the vehicle travel speed was 30 mph or below were the least common in fatal collisions (12%) compared to serious injury (65%) and other injury collisions (42%).

Crashes with travel speeds above 31 mph were more common for fatal collisions (62%) than for serious injury (14%) and other injury collisions (31%). Speed was identified as a driver action more often in fatal collisions (15%) compared to the other injury collisions as was failing to maintain control of the vehicle (28%). Not having the right of way or following too closely were factors that were more common in other injury level collisions (11% for both). The driver failing to maintain control of the vehicle was cited more often in the fatal collisions (28%) compared to serious (3%) and other injury collisions (10%). Although inattention was cited as a major factor in injury collisions overall (74%), driver inattention was less common in fatal

collisions. Alcohol or drugs and speeding were cited much more often in fatal collisions (17% and 26% respectively).

Road and vehicle characteristics. Overall, 31% of injury collisions occurred on one or two lane roads and this was more common in fatal collisions (62%) compared to serious (15%) and other injury collisions (31%). Fatal collisions were higher than serious and other injury collisions for each road function class and were especially higher than the serious injury category. Two-way non-divided (69%) roads were less common in fatal collisions (62%) and other injury collisions (68%) compared to serious injury collisions (90%), and divided roadways were more common in fatal collisions (37%) compared to serious injury collisions (10%) and other injury collisions (30%). While most collisions occurred on straight (84%) and level (77%) roads, fatal collisions more often occurred on curved roads (40%) compared to serious injury (5%) and other injury collisions (16%), or on a grade (36%) compared to serious injury (14%) and other injury collisions (22%). Typically, the speed limit was between 31 mph and 55 mph (70%) but this was more common in fatal collisions (79%) compared to serious injury collisions (37%) and other injury collisions (70%), and speed limits of 56-65 mph were more common in fatal collisions (14%) than serious injury (1%) and other injury collisions (7%). Most collisions occurred on rural roads (61%) but this was more common in fatal collisions (80%) than serious injury (38%) and other injury collisions (61%). Collisions where there were no passing signs present were much more common in fatal collisions (22%) compared to serious (3%) and other injury collisions (7%). Road conditions were usually dry (79%) which was slightly more common in fatal (85%) and serious injury crashes (86%) compared to other injury crashes (79%). Collisions in which the roads were wet were somewhat less common in fatal (13%) and serious injury (12%) than in other injury crashes (17%). Most of the vehicles involved in injury collisions were passenger cars (58%) but heavy trucks and motorcycles were more often involved in fatal collisions (9% and 8% respectively) compared to serious injury (2% and 0.5%) and other injury collisions (4% and 1%).

Temporal and environmental characteristics. Collisions occurred on Friday, Saturday, or Sunday in 42% of injury collisions. Collisions occurring on Saturday and Sunday were more frequent among fatal collisions (36%) compared to serious (23%) and other injury collisions (24%). The most common time of day in which collisions occurred was between 3:00pm and 5:59pm (24%). This was less common in fatal collisions (16%) compared to serious injury (23%) and other injury collisions (24%). Collisions occurring between 6:00pm

and 8:59pm were the most common for serious injury collisions (21%) compared to fatal and other injury collisions (14% and 15% respectively). In addition, fatal collisions occurred more often at night between 9:00pm to 5:59am (36%) than did serious injury (20%) and other injury collisions (18%). Thirty percent of injury collisions occurred on weekends but this was more common in fatal collisions (42%). While two-thirds of all collisions occurred in daylight, this was less common for fatal collisions (51%) followed by serious injury (58%) and other injury collisions (66%). Fatal collisions more frequently occurred when conditions were dark and not lighted (34%) compared to serious (12%) and other injury collisions (15%). On the other hand, when conditions were dark and lights were present, fatal collisions and other injury collisions occurred less often. In 84% of injury collisions, there were no adverse weather conditions. Collisions where it was raining were less common in fatal collisions and somewhat less common in serious injury collisions

Summary. Most fatal collisions in VA involved single vehicles on undivided roads and many of them involved vehicles running off the roadway and hitting fixed objects. Fatal collisions more often occurred on curves and on a grade. These road characteristics may well have contributed to the driver losing control of the vehicle and running off the road. In addition, fatal collisions more often involved a drinking driver or a driver speeding.

Table 4.3.1 shows the percent of fatal crashes (according to each of the variables examined) as determined by the FARS analysis of the Central region compared to the percent obtained by the examination of the VA State data where available. Also presented is the percent of crashes involving any injury. The percentage of fatal collisions involving a single vehicle was lower in the Central region (41%) than in VA (58%). The percentage of angle impacts, however, was higher in the Central region (22%) than in VA (14%) as was the percentage of frontal impacts (68% vs. 60%). The percentage of unbelted drivers was higher in the Central region (33%) compared to VA (46%). Similarly, the percentage of drinking drivers was also higher in the Central region (22%) than in VA (16%). The percentage of fatal collisions where speeding was a contributing factor was somewhat lower in the Central region (22%) compared to VA (26%). The percentage of fatal collisions that occurred on an undivided road was lower in the Central region (57%) compared to VA (62%) and collisions on principal or minor arterials was higher in the Central region (61%) than in VA (43%). For fatal collisions occurring in a rural area, the percentage was lower in the Central region (56%) compared to VA (80%). No other notable differences were found between the Central region and VA.

Table 4.3.1: Comparison of FARS and Virginia state crash results.[3]

Key fatal crash characteristics	Fatal crashes in Central region	Fatal crashes in VA	All inj. cr in VA
Collisions type			
Single vehicle	40.55%	57.67%	28.95%
Angle impact	22.18%	12.94%	25.20%
Rollover (harmful event)	5.40%		
Hit fixed object	41.33%	39.88%	24.29%
Frontal impact	68.26%	60.26%	55.98%
Driver characteristics			
Drivers aged 21-34	30.89%	29.76%	30.52%
Male drivers	75.30%	71.54%	53.63%
Negotiating a curve	15.55%		
No avoidance manuoeuvre	72.89%		
Unbelted drivers	33.50%	46.23%	35.19%
Drinking driver	21.72%	15.70%	4.16%
Drugs as contributing factor	7.64%		
Speeding as contributing factor	21.96%	25.84%	2.64%
Not properly licensed	10.65%		
Previous collisions (1 or more)	8.60%		
Previous speeding convictions (1 or more)	22.66%		
High risk driver	14.72%		
Road and vehicle characteristics			
1-2 lane roads	63.26%	61.52%	30.65%
Road not divided	57.07%	61.77%	68.58%
Collision located on roadside	41.93%		
Collision on principal or minor arterials	60.79%	42.82%	26.76%
Rural area	56.38%	79.78%	61.16%
Curved road	38.95%	40.04%	15.86%
Intersection	29.42%		
Pickup/light trucks	14.68%	16.43%	13.34%
Late model vehicles (i.e., 2004+)	22.16%		
Temporal and environmental characteristics			
Fri-Sun collision	51.45%	50.92%	42.21%
Night time (9pm-5:59am)	36.66%	34.86%	18.44%
Weekend collision	42.88%	42.57%	29.90%
Dark or dark with street lights	44.72%	43.64%	28.15%

4.4 Florida State Crash Analyses

Florida. State crash data were provided by the FL Department of Highway Safety and Motor Vehicles Bureau of Crash Records. There are some limitations associated with this database. Variables of interest that were not captured by these data and that were captured by the FARS data include variables such as roadway function class and whether the driver was properly licensed or not. This limits comparisons to the FARS data as well as comparisons with the other states' data. There is a high level of missing values for the unique identifiers in this database. As a consequence, these cases had to be dropped from the analyses in order to properly merge each data set and to ensure events pertaining to the same crashes but stored in different databases could be linked.

Type of collision. The majority of injury collisions in FL involve multiple vehicles; however, both fatal and serious injury crashes were more likely to involve a single vehicle

[3] Note that the data in the last column of this table may be less accurate compared to the first and the second column; this can likely be explained by lower levels of accuracy of data for less severe crashes/injuries.

(48% and 32% respectively) compared to other injury crashes (19%). Rear-end collisions occurred less often in fatal collisions (9%) compared to serious injury (20%) and other injury collisions (30%). Angle collisions and collisions where the vehicle hit a fixed object were somewhat more common in fatal collisions compared to serious injury other injury collisions. Although the most common point of impact on the vehicle in a crash was the front end of the vehicle (61%), injury crashes where vehicles were struck in the rear were less common among fatal injury collisions (11%) compared to serious (20%) and other injury collisions (28%).

Driver characteristics. Drivers were aged 16-34 in 42% of all of the injury collisions, but older drivers (55+) tended be somewhat more often involved in fatal collisions (21%) compared to other injury crashes (17%). Almost 60% of the drivers involved in all injury collisions were male. Males were more often involved in fatal (74%) and serious injury collisions (63%) than in other less severe injury collisions (58%). Fatal crashes were more common when the vehicle was driving straight at the time of the collision (74%) compared to serious injury (62%) and other injury crashes (56%). Vehicle collisions where the driver was slowing or stopped in the traffic lane were less common for fatal (6%) compared to serious injury collisions (15%) and other injury collisions (22%). The non-use of seat belts was more common in fatal (30%) than serious injury collisions (16%) and other injury collisions (9%). Collisions involving an ejected occupant were more common for fatal (23%) and serious injury collisions (11%) compared to 4% for other injury collisions. The detection of both alcohol and drugs was more common in fatal collisions compared to serious and other injury collisions.

While the BAC level of drivers was unknown in 99% of cases, when the BAC was above the legal limit of 0.08%, it was more frequently the case in fatal collisions (9%) compared to serious injury (1%) and other injury collisions (1%). For fatal and serious injury collisions, speeds higher than 55 mph were more common in fatal collisions (24%) compared to serious and other injury collisions (10% and 5% respectively). Exceeding a safe speed limit was more common for fatal crashes (6%) than in other injury crashes (1%) and exceeding the stated speed limit was somewhat more commonly a factor in fatal collisions (5%) compared to serious (1%) and other injury collisions (<1%). In addition, fatal collisions more often involved alcohol or drugs as a contributing factor (17%) compared to serious (3%) and other injury collisions (2%). Likewise, fatal collisions more often involved speed (10%) compared to serious (4%) and other injury collisions (2%).

Road and vehicle characteristics. Although the majority of injury collisions occurred on roads with four or more lanes, crashes that occurred on one or two lanes roads were somewhat more common among fatal (39%) and serious collisions (36%) compared to other injury collisions (32%). The road on which collisions occurred was divided in 54% of all injury collisions and there was little difference between levels of injury severity for this variable. When the collision occurred on the roadway, it occurred more often in fatal collisions (29%) compared to serious injury (22%) and other injury collisions (16%). When the collisions occurred in a rural area, fatal (61%) and serious injury collisions (56%) were more common compared to other injury collisions (45%). At speeds above 55 mph, fatal collisions were more common (20%) compared to serious injury (11%) and other injury collisions (8%). Although in the majority of injury collisions the roadway was dry at the time of collision (86%), this was somewhat more common for fatal collisions (90%) compared to other injury collisions (86%). The majority of (92%) of injury collisions occurred on straight roads; however, when the collision occurred on a curved road, fatal collisions were more common (17%) compared to serious (11%) and other injury collisions (7%). In the majority of all injury collisions, the road was level (90%) and there was little variation across categories of injury severity. When the collision was not at an intersection, fatal collisions were more common (61%) compared to serious (47%) and other injury collisions (42%). While the majority of injury collisions involved a passenger car, this was less common in fatal collisions (50%) compared to serious injury (57%) and other injury collisions (64%). Collisions involving a motorcycle were somewhat more common among fatal collisions (11%) compared to serious (7%) and other injury collisions (3%).

Temporal and environmental characteristics. Injury collisions were fairly evenly distributed across the four quarters of the year with not much difference as a function of collision severity. Fatal collisions were more common on Saturday and Sunday (24%) compared to serious injury (19%) and other injury collisions (16%). The most common time of day in which a collision occurred was between 3:00pm and 5:59pm (23%). This was less common in fatal collisions (14%) compared to serious injury (21%) and other injury collisions (23%). In addition, fatal collisions occurred more often at night between 9:00pm and 5:59am (39%) than did serious injury (23%) and other injury collisions (18%). Collisions occurring between 12:00pm and 2:59pm were less frequent for fatal collisions (12%) compared to serious injury and other injury collisions (17% and 18% respectively). While the majority of all

injury collisions occur on weekdays (68%), weekend collisions were more common among fatal collisions (45%) compared to serious injury (36%) and other injury (30%) collisions. Although the majority of all injury collisions occurred during the daylight (68%), fatal collisions were more common when it was dark with no lighting (26%) or dark with some lighting (26%) compared to serious injury (13% and 20% respectively) and other injury collisions (7% and 19% respectively). In the majority of injury collisions there were no adverse weather conditions at the time of the crash (90%) and there was little variation across categories of injury severity in terms of weather conditions.

Summary. Fatal collisions in FL were more often single vehicle crashes, with a driver hitting a fixed object and involving head-on impact collisions. In addition, fatal crashes were more common when the driver was driving straight at the time of the collision. The detection of both alcohol and drugs was more common in fatal collisions compared to serious and other injury collisions. Crashes that occurred on one or two lane roads were somewhat more common among fatal injuries. At speeds above 55 mph, fatal collisions were more common. Curved roads and grades were also more common in fatal injury collisions.

Table 4.4.1 shows the percent of fatal crashes (according to each of the variables examined) as determined by the FARS analysis of the Florida region data compared to the percent obtained by the examination of the state data for FL where available. Also presented is the percent of crashes involving any injury. The percentage of fatal collisions involving a single vehicle was lower in the Florida region from the FARS analysis (35%) compared to the FL state data (48%). The percentage of angle impact collisions, however, was higher in the FARS analysis (29%) compared to the state analysis (21%) as was the percentage of vehicle rollovers (14% vs. 5%) and collisions where the vehicle hit a fixed object (29% vs. 12%). The percentage of fatal collisions with frontal impacts was lower in the FARS analysis (56%) compared the state analysis of FL (65%). As for the number of lanes on the road, the percentage of fatal collisions occurring on one or two lane roads was higher in the Florida region (76%) compared to the FL state data (39%). The percentage of fatal collisions occurring in a rural area, however, was lower in the Florida region (43%) that in the FL state data (61%). In terms of whether the road was curved, the percentage was somewhat higher in the Florida region (21%) than in the FL state data (17%). The percentage of fatal collisions occurring at an intersection was higher in the Florida region (37%) compared to the FL state data (30%). For the type of vehicle, the percentage of pickup or light trucks was lower in the

FARS analysis (16%) than in the FL state analysis (22%). Finally, the percentage of fatal collisions occurring on Friday, Saturday, or Sunday was higher in the Florida region (52%) compared to FL alone (34%). No other notable differences were found between the Florida region determined by the FARS data analysis and the FL state data analysis.

Table 4.4.1: Comparison of FARS and Florida state crash results.[4]

Key fatal crash characteristics	Fatal crashes in Florida region	Fatal crashes in FL	All inj. cr in FL
Collisions type			
Single vehicle	35.46%	47.70%	21.68%
Angle impact	29.49%	21.16%	17.73%
Rollover (harmful event)	14.40%	5.14%	1.65%
Hit fixed object	29.10%	11.72%	5.96%
Frontal impact	55.97%	65.48%	60.81%
Driver characteristics			
Drivers aged 21-34	31.92%	29.72%	29.23%
Male drivers	73.90%	74.33%	58.54%
Negotiating a curve	4.56%		
No avoidance manuoeuvre	65.32%		
Unbelted drivers	30.86%	30.33%	10.38%
Drinking driver	16.24%	14.25%	3.52%
Drugs as contributing factor	2.75%	3.80%	0.22%
Speeding as contributing factor	12.49%	10.64%	2.05%
Not properly licensed	13.89%		
Previous collisions (1 or more)	6.35%		
Previous speeding convictions (1 or more)	24.88%		
High risk driver	13.34%		
Road and vehicle characteristics			
1-2 lane roads	76.06%	38.87%	32.76%
Road not divided	43.09%	45.99%	46.12%
Collision located on roadside	14.89%	71.16%	82.96%
Collision on principal or minor arterials	61.68%		
Rural area	43.44%	60.87%	47.15%
Curved road	20.59%	17.22%	7.54%
Intersection	37.09%	29.91%	44.77%
Pickup/light trucks	16.13%	22.36%	20.07%
Late model vehicles (i.e., 2004+)	25.19%	24.18%	22.84%
Temporal and environmental characteristics			
Fri-Sun collision	52.50%	34.04%	27.76%
Night time (9pm-5:59am)	36.93%	38.60%	18.94%
Weekend collision	44.60%	44.74%	31.54%
Dark or dark with street lights	47.60%	52.11%	27.69%

4.5 Massachusetts State Crash Analyses

Massachusetts. State crash data were provided by the MA Highway Department. The MA data allowed for only two levels of crash severity to be created: fatal injury and non-fatal injury which will limit comparisons with the other states' data. There are some limitations associated with the database. Few variables of interest were captured by these data in comparison to the FARS data as well as the state data from the other states, especially variables relating to driver characteristics. Variables not captured by this database include day of week, alcohol use, age, gender, restraint use and others. Also, for many of the variables that were available,

[4] Note that the data in the last column of this table may be less accurate compared to the first and the second column; this can likely be explained by lower levels of accuracy of data for less severe crashes/injuries.

there was a high incidence of missing values. Some variables were at the level of vehicles; however, there were no unique identifiers to distinguish between different levels. In order to perform analyses at the level of vehicles, a unique identifier at this level of analysis was created by TIRF using the available information.

Type of collision. Although the majority of all injury collisions involved multiple vehicles (75%), it was more common for fatal collisions to involve a single vehicle (61%) compared to non-fatal injury collisions (25%). When the most harmful event was known, it was somewhat more common for fatal collisions to involve a collision with another motor vehicle (6%) than among non-fatal collisions (10%). Rear-end collisions occurred less frequently in fatal collisions (4%) compared to non-fatal collisions (34%). Angle collisions were also less common in fatal (16%) vs. non-fatal collisions (28%). Finally, single vehicle crashes were more common among fatal collisions (58%) than non-fatal collisions (22%), as were head-on collisions (11% vs. 5%).

Driver characteristics. Only one variable describing driver characteristics was available for analysis. The vehicle manoeuvre performed by the driver prior to the crash for the majority of cases was unfortunately not known (95%). When the vehicle manoeuvre was known, the driver was most often travelling straight at the time of the collision (3%). Drivers were less commonly slowing or were stopped in fatal collisions compared to non-fatal injury collisions.

Road and vehicle characteristics. Only two variables pertaining to road and vehicle characteristics were available for analysis. The road conditions were dry in the majority of injury collisions (72%). When the roads were covered in snow, slush or ice, fatal collisions (3%) were somewhat less common than non-fatal injury collisions (7%). When the type of vehicle was known the most common vehicle involved in collisions was a passenger car (3%) followed by a van, pickup truck, or SUV (1%).

Temporal and environmental characteristics. There was little difference between fatal injury collisions and non-fatal injury collisions with regards to the time of the year. Collisions occurring on Friday, Saturday or Sunday were more common among fatal injury collisions (51%) compared to non-fatal injury collisions (42%). Collisions occurring between 3:00pm and 5:59pm (21%) were less common in fatal collisions (16%) compared to non-fatal injury collisions (21%). Collisions occurring during the day (6:00am to 2:59pm) were also less

common for fatal collisions (31%) compared to non-fatal collisions (47%). In addition, fatal collisions occurred more often at night (9:00pm-5:59am) (38%) than did non-fatal injury collisions (19%). While the majority of injury collisions occurred on weekdays (70%), fatal collisions were more common on weekends (41%) compared to non-fatal injury collisions (30%). Although most injury collisions occurred during daylight (69%), this was less common in fatal injury collisions (47%) compared to non-fatal injury collisions (69%). Fatal collisions were also more common when it was dark with no lighting (18%) and when it was dark with lighting (28%) compared to non-fatal injury collisions (5% and 20% respectively). The majority of injury collisions occurred when there were no adverse weather conditions (87%) but this was much more common among fatal injury collisions (89%) compared to non-fatal injury collisions (37%).

Summary. It was more common for fatal collisions to involve a single vehicle (61%) compared to non-fatal injury collisions. When the most harmful event was known, it was somewhat more common for fatal collisions to involve a collision with another motor vehicle (6%) than among non-fatal collisions (10%). Fatal collisions occurred more often at night (9:00pm-5:59am) and when it was dark. Furthermore, fatal collisions were more common on the weekend.

Table 4.5.1 shows the percent of fatal crashes (according to each of the variables examined) as determined by the FARS analysis of the New England region compared to the percent obtained by the examination of the MA state data where available. Also presented is the percent of crashes involving any injury. The percentage of fatal collisions involving a single vehicle was lower in the NE region (43%) compared to MA (61%), whereas, the percentage of vehicle rollovers was higher in NE (7%) than in MA (1%). No other notable differences were found between the NE region and MA.

Table 4.5.1: Comparison of FARS and Massachusetts state crash results.[5]

Key fatal crash characteristics	Fatal crashes in New England region	Fatal crashes in MA	All inj. cr in MA
Collisions type			
Single vehicle	43.50%	61.07%	25.40%
Angle impact	17.61%	16.45%	27.46%
Rollover (harmful event)	7.06%	0.86%	0.17%
Hit fixed object	46.82%	3.40%	1.40%
Frontal impact	67.96%		
Driver characteristics			
Drivers aged 21-34	29.49%		
Male drivers	73.22%		
Negotiating a curve	16.28%		
No avoidance manuoeuvre	48.46%		
Unbelted drivers	33.57%		
Drinking driver	21.38%		
Drugs as contributing factor	12.00%		
Speeding as contributing factor	24.62%		
Not properly licensed	8.99%		
Previous collisions (1 or more)	15.18%		
Previous speeding convictions (1 or more)	19.33%		
High risk driver	12.67%		
Road and vehicle characteristics			
1-2 lane roads	83.43%		
Road not divided	73.96%		
Collision located on roadside	39.17%		
Collision on principal or minor arterials	59.69%		
Rural area	39.57%		
Curved road	35.37%		
Intersection	27.89%		
Pickup/light trucks	11.73%		
Late model vehicles (i.e., 2004+)	21.02%		
Temporal and environmental characteristics			
Fri-Sun collision	51.45%	50.74%	42.14%
Night time (9pm-5:59am)	37.10%	38.03%	19.66%
Weekend collision	41.95%	41.29%	30.32%
Dark or dark with street lights	44.15%	45.72%	25.02%

[5] Note that the data in the last column of this table may be less accurate compared to the first and the second column; this can likely be explained by lower levels of accuracy of data for less severe crashes/injuries.

5.0 PROGRAM SURVEY RESULTS

This section contains the results of an international survey of road safety programs designed to identify those that specifically target the key crash characteristics identified in the previous section. An overview of program responses can be found in Appendix D. Examples that highlight some of the most promising and or unique programs that were identified are presented.

As described in Section 4.0, most fatal and serious injury collisions involved a single vehicle, frontal impact, running off the road or hitting a fixed object. Drivers tended to be male, aged 16-34, unbelted, speeding, traveling straight, using no avoidance maneuvers, or under the influence of alcohol or drugs. These collisions tended to occur on one or two lane rural roads that were undivided. Most collisions did not occur at intersections. Collisions most often occurred on weekends, at night, with good road conditions.

As a consequence, this section is structured according to the following crash characteristics -- impaired driving, speeding, fatigue, seat belt use, improperly licensed drivers, collision avoidance, and road engineering. Each topic is discussed separately and includes a summary of relevant survey responses which are reported first; this is followed by a breakdown of responses between the I-95 Corridor jurisdictions and other jurisdictions. Some of the interesting and unique programs and policies that were identified by the survey are also briefly discussed in relation to each topic in order to provide a snapshot of the variety of programs that are available. A more detailed summary of each of the key programs mentioned in this section can be found in Appendix E. Due to space constraints, it was not possible to include a description of each individual program that was identified, many of which were similar.

5.1 Impaired Driving

This section of the survey focused mainly on enforcement of impaired driving, educational programs, and innovative measures designed to reduce impaired driving. The survey did not specifically ask about common programs that almost all jurisdictions

have in place, where permissible by law, such as Administrative License Revocation, ignition interlocks, and sobriety checkpoints.

Enforcement is the most common strategy employed by jurisdictions to address impaired driving. Most of the responding I-95 Corridor jurisdictions (82%) reported that enforcement initiatives are often conducted, most commonly on weekend nights and holiday weekends. However, the frequency or consistency of these initiatives throughout the year is unknown. Responding Corridor jurisdictions also reported that these enforcement programs generally target specific areas where there are typically higher levels of drinking activity (e.g., bars, sporting events). Almost two-thirds of respondents (64%) reported that these enforcement programs are often conducted on two lane rural roads. A majority of responding jurisdictions (90%) also reported that education and awareness initiatives often accompany the enforcement program. All eleven of the Corridor jurisdictions that responded to the survey, reported that they also have zero-tolerance policies for youth.

A number of responding Corridor jurisdictions reported some type of innovative enforcement measure to reduce impaired driving. Florida reported that it conducts sustained DWI[6] enforcement throughout the year. The goal is to reduce the number of alcohol-related fatalities, injuries, and crashes that occur on Florida's roadways by conducting high visibility DWI enforcement operations and increasing public awareness of the state's alcohol-related crash problem. Florida's Sustained Enforcement Program rewards agencies for conducting high visibility DWI enforcement operations. Several law enforcement agencies are involved, however, it varies by county. The program was piloted in ten counties in 2003 and by 2009 had grown to include 35 counties.

Maryland reported that State police conduct low manpower sobriety checkpoints and also conduct checkpoints in border locations**.** Lacey et al. (2005) found that a sobriety checkpoint enforcement program using only three to five police officers can be a very effective deterrent against drinking and driving.

[6] The abbreviation DWI (driving while impaired or intoxicated) is used throughout this report as a convenient descriptive label, even though some jurisdictions use other terms such as OUI (operating under the influence) and DUI (driving under the influence), and in some cases these terms refer to the severity of the offense. We have used DWI to maintain consistency throughout the report.

In New York, the Special Traffic Options Program for Driving While Intoxicated (STOP-DWI) program was enacted by the State Legislature in 1981 to empower county governments to coordinate local efforts to reduce alcohol and other drug-related traffic crashes within the context of a comprehensive and financially self-sustaining alcohol and highway safety program. A NHTSA Technical Report reviewed New York's STOP-DWI program as the Nation's first and, to date, only self-sustaining impaired driving program (Williams et al., 2005). Other States have implemented components of self-sufficient programs but none to the degree of New York State. The STOP-DWI program has made significant contributions to local efforts to reduce impaired driving. In addition, the Last Drink program provides information on the last location where arrested impaired drivers consumed alcohol. STOP-DWI programs and law enforcement agencies use the last drink location data to work with local liquor licensees to prevent intoxicated patrons from being served and from leaving their establishments in an impaired condition and then driving.

Finally, a majority of the responding I-95 Corridor jurisdictions reported that they routinely participate in NHTSA DWI enforcement initiatives and sobriety checkpoints where permitted by state law.

Jurisdictions outside of the I-95 Corridor also reported a variety of innovative measures to reduce impaired driving, including Michigan, Minnesota, New Mexico, Alberta, and Great Britain. Michigan is piloting a High Visibility Enforcement program that focuses on roadways with a high prevalence of alcohol-involved crashes. During pre-determined dates and times, officers conduct late-night traffic patrols on a dedicated corridor, using special awareness tactics to ensure motorists recognize patrols that emphasize impaired driving enforcement. Minnesota reported that they have identified specific enforcement zones to conduct year-long sustained high visibility DWI enforcement saturation patrols in the thirteen deadliest alcohol-related counties. They employ changeable roadway message signs in conjunction with high visibility saturation patrols. New Mexico reported that they coordinate regular impaired driving enforcement efforts involving local, state, and tribal law agencies across several counties.

Alberta, Canada reported that it conducts an enhanced Alberta Checkstop program; a province-wide impaired driving checkstop initiative that was rolled out in late 2008.

Officers who are not scheduled to work are invited to work overtime to conduct checkstops. The program is delivered in the form of a Joint Forces Operation between police services and Alberta Highway Sherriff Patrol through coordinated checkstops in various locations across the province. In addition, a number of municipal police services and government agencies in Alberta reported that they conduct their own impaired driving enforcement programs. Finally, Great Britain has implemented the Think! Campaign, a road safety campaign focusing on the need for drivers and other road users to take responsibility for their own safety as well as for the safety of others on the road (http://www.dft.gov.uk/think/).

Seven responding Corridor jurisdictions (Delaware, Maine, Maryland, New York, North Carolina, Virginia, and the District of Columbia) reported that there has been some form of evaluation to examine the effectiveness of their impaired driving enforcement programs. Of particular interest is the New York State's Division of Criminal Justice Services which released a Last Drink Report and NHTSA released a review of New York State's STOP-DWI program. New York State's 2008 Highway Safety Annual Report can be found at http://www.safeny.com/annualRpt/GTSC2008AnnualFULL.pdf. The NHTSA STOP-DWI review is located at: http://www.nhtsa.dot.gov/people/injury/alcohol/nystopdwiprogram/pages/TRD.html. The NHTSA report concluded that the STOP-DWI program could serve as a model for many communities and regions. Aspects of STOP-DWI can be applied using various methods, but in particular by examining the population and resource characteristics of a community and/or region. Furthermore, the STOP-DWI program has helped New York State maintain its lower-than-average alcohol-related fatality rate. The program is self-sustaining and does not require the use of tax revenue, with impaired-driving arrests generating its funding source.

NHTSA also conducted an evaluation of a regional Checkpoint Strike which was prepared by the Pacific Institute for Research and Evaluation. The region included Pennsylvania, Delaware, Maryland, Virginia, the District of Columbia, and West Virginia. The evaluation found that the Checkpoint Strikeforce program illustrated for the first time that a sustained region wide impaired driving checkpoint program can be implemented. A brief review of the study can be found at:

http://www.nhtsa.gov/DOT/NHTSA/Communication%20&%20Consumer%20Information/Traffic%20Tech%20Publications/Associated%20Files/tt358.pdf

Maryland has also conducted an evaluation of their low manpower sobriety checkpoints; however, it is an internal document and not yet publically available. North Carolina's Governor's Highway Safety Program conducted an impaired driving enforcement evaluation; however, the report does not appear to be available. Maine reported that NHTSA had conducted an evaluation of their impaired driving enforcement campaign; however, no further information was available and efforts to locate the document were unsuccessful.

5.2 Speeding

The average speed limit that was reported by a majority (73%) of responding Corridor respondents on two lane rural roads ranges from 45 to 55 mph. Three responding states, New York, New Jersey, and Maryland, have reduced speed limits on rural roads, within the past five years. More than half (55%) of State and local police often (55%) conduct speed enforcement programs on rural two lane roads and most of the responding jurisdictions (82%) reported that they conduct some form of education in conjunction with speed enforcement efforts.

Only three responding jurisdictions (Florida, Maryland and the District of Columbia) reported that they used speed cameras as part of their enforcement efforts (28%). In Florida speed cameras are utilized by locals on local roads. Those states that have cameras reported varying usage on two lane rural roads (e.g., Maryland sometimes uses them, and the District of Columbia often uses them).

Six responding jurisdictions (Florida, Maryland, New Jersey, North Carolina, Virginia, and Washington, DC) reported there have been some evaluations of speed enforcement programs. North Carolina's No Need 2 Speed program has been evaluated and shows that the program seems to have been more effective on two-lane roadways. The evaluation report is located at http://www.ncdot.org/doh/PRECONSTRUCT/traffic/safety/Reports/completed_files/docs/speed2.pdf.

The Smooth Operator program targets aggressive drivers in the District of Columbia, Maryland, New Jersey, Pennsylvania, Virginia and New Jersey. The program is a public safety initiative, which aims to provide education, information and solutions for the problem of aggressive driving. An annual evaluation is conducted to assess the program and study the problem and solutions. The evaluation conducted in 2008 focused primarily on the campaign itself, rather than the effectiveness of the program. The annual report can be accessed at: http://smoothoperatorprogram.com/materials/2008/SO_08Annual_final.pdf.

Maryland's DOT plans to conduct speed studies and an engineering evaluation to determine whether the use of traffic calming devices or other traffic safety measures is justified. New Jersey reported that it conducted evaluations; however it appears that the reports are not available to the public. Florida reported an evaluation, but it could not be located.

Innovative measures to reduce speeding are being used in a number of the responding I-95 Corridor jurisdictions. Delaware has a neighborhood speed campaign which focuses on reducing speed-related crashes involving children; it is delivered by the Delaware Department of Transportation.

Florida is piloting an enhanced speeding zone initiative that involves increased fines, and focuses enforcement efforts on roads that have a high incidence of speed-related crashes. The program is delivered by Florida's Department of Transportation and local law enforcement**.**

New Jersey has the Obey Signs or Pay the Fines program. The Department of Highway Traffic Safety conducts region-wide speed crackdowns with its law enforcement partners. The State Police also have an enhanced enforcement program, involving statewide speed limit enforcement during the summer months. New Jersey reported conducting evaluations; reports cannot be accessed.

New York uses neighborhood traffic calming initiatives. This involves strategic physical changes to roadways to reduce vehicle speeds, such as street narrowing, speed humps, and speed-timed traffic signals. New York State's Department of Transportation, in

collaboration with local communities, is undertaking this traffic calming initiative to improve safety and slow speeds.

Finally, North Carolina has two speed programs. The first one is the No Need 2 Speed program, discussed previously, which aims to decrease the frequency and severity of speed related crashes on all roads in North Carolina. The second is Operation Slowdown, an interstate initiative which tickets speeders on North Carolina's interstates. The Governor's Highway Safety Program delivers both programs with the assistance of the North Carolina Highway Patrol.

Many jurisdictions outside the I-95 Corridor also have some innovative measures to reduce speeding. Illinois uses speed enforcement in work zones; New Mexico conducts 100 days and nights enforcement program that targets all driving behaviors; Alberta, Canada has a province-wide two to three day enforcement blitz by all major enforcement agencies during the month of April and the No Fun Being Dead campaign; Saskatchewan, Canada uses speed trailers in high-risk zones; and Great Britain has hi-tech SPECS cameras which calculate a car's average speed over a specific distance. Police use these data to determine where enforcement is needed. Great Britain has a four-year evaluation report on the national safety camera program. Overall, this report concludes that safety cameras have continued to reduce collisions, casualties and deaths. The report can be accessed at: http://www.dft.gov.uk/pgr/roadsafety/speedmanagement/nscp/nscp/.

5.3 Fatigued Driving

Fatigue has been defined as a "disinclination to continue performing the task at hand" (Brown, 1994), caused by physical labor or repetitive and monotonous activities, such as monitoring a display screen or driving long distances (Stutts et al., 1999). To that end, fatigued driving can be referred to as a "disinclination to continue performing the driving task at hand" (Robertson et al., 2009). Drowsiness or sleepiness normally refers to "the urge to fall asleep" (Beirness et al., 2005) as the result of a biological need; it is a physiological state of the body that is irreversible in the absence of sleep. It is governed by a circadian sleep-wake cycle that makes most people feel sleepy twice a day – at night and in the afternoon (Dement and Vaughan, 1999). Drivers that operate a vehicle

at these times are more likely to feel drowsy (Robertson et al., 2009). Although fatigue and drowsiness have different causes and are governed by different processes, they are usually considered together because the results are the same – the person suffering from fatigue or drowsiness becomes less alert or attentive and can, in the extreme, fall asleep (Vanlaar et al., 2007).

Within the I-95 Corridor jurisdictions, New York State is of particular interest. New York began a program to alert the public to the dangers of driving while drowsy/fatigued as early as 1994. Then, in 2004, it implemented the New York State Partnership Against Drowsy Driving (NYPDD), a joint effort to educate the public and high-risk groups about the dangers of drowsy driving and promote the adoption of preventive strategies. New Jersey is the only state that has enacted a law regarding driving while drowsy. The law specifically states that sleep-deprived drivers who cause fatal crashes can be convicted of vehicular homicide.

Other jurisdictions have initiated methods for capturing information on fatigued driving for purposes of determining the extent of the problem and addressing it. For example, New Jersey requires the recording of driver distraction, including fatigue, on accident forms.

Jurisdictions outside the Corridor, which have fatigued driving enforcement, include Minnesota, which encourages the State Patrol to utilize a Fatigued Driving Evaluation Checklist to recognize fatigue at the roadside. The checklist can be found at the following website http://www.mntruck.org/pdf/fatigueflier.pdf.

Michigan includes driving while fatigued in their definition of reckless driving. In Illinois a driver who causes a fatal accident as a result of being fatigued is guilty of reckless homicide. Oregon has created an offense of driving while fatigued, which is punishable by a maximum of five years imprisonment, $125,000 fine, or both. Oregon requires that questions about fatigue be included on driver's license tests. The UK Department for Transport featured tiredness in its Think! Road Safety campaign which began in 2000.

5.4 Seat Belt Usage

A number of the responding I-95 Corridor jurisdictions reported having a primary seat belt law for enforcement purposes. These jurisdictions are Connecticut, Delaware, Florida, Maine, Maryland, New Jersey, New York, North Carolina, and the District of Columbia. Two states (Vermont and Virginia) reported having only a secondary seat belt law. The average fine reported for a seat belt violation was $74 USD, however fines ranged from $25- $250 USD across jurisdictions.

The District of Columbia was the only jurisdiction to report the use of demerit points in conjunction with seat belt violations.

Nearly two thirds of the responding jurisdictions (64%) reported that they conduct seat belt enforcement programs on two lane rural roads, most often on weekdays. A majority of the responding jurisdictions (82%) also reported that seat belt enforcement is delivered in conjunction with some form of educational component. All eleven jurisdictions reported that, in particular, they have enforcement campaigns targeted at young male drivers, whom research shows are typically less likely to wear seat belts and more likely to be involved in fatal and serious injury crashes as a result (Mayhew and Simpson, 1995; Williams et al., 2003; McCartt and Northrup, 2004).

Six responding Corridor jurisdictions (Delaware, Florida, Maryland, New Jersey, North Carolina, and New York) reported that they employ innovative measures to increase seat belt use. Delaware focuses on nighttime seat belt use enforcement. Delaware Office of Highway Safety is launching their first Click It or Ticket campaign; focusing on increasing seat belt use at night, with a public awareness component and increased enforcement efforts.

Florida participates in the NHTSA rural safety belt initiative. The campaign consists of high-visibility enforcement, messages and materials tailored towards rural populations regarding enforcement of seat belt laws.

Street Smart is a program presented by Florida S.A.F.E. (Stay Alive From Education, http://www.safeprogram.com/) which takes audiences into the real-life drama

experienced by firefighter paramedics as they work to save the lives of those who have made poor choices when it comes to seat belt non-utilization, underage drinking, drunk driving, or using illegal drugs. The I-95 Corridor Coalition and co-sponsor Anheuser Busch analyzed seat belt usage statistics and conducted The StreetSmart Sessions in targeted jurisdictions throughout the Corridor. Well over 6,000 high school students have attended sessions to date. During the presentation, a team of two certified paramedics walks students through what happens at a trauma scene using the medical equipment they employ daily in their jobs. Graphic videos and presentations provide the audience with an understanding of the consequences of failure to use seat belts. From taking a pulse, to loading the victim onto a backboard, to simulating an intravenous line being inserted, the audience can see and feel what it is like to try to save a life, as well as what it's like to be the victim suffering the consequences of seat belt non-utilization. More information about this project can be found at: http://www.i95coalition.org/i95/Projects/ProjectDatabase/tabid/120/agentType/View/PropertyID/244/Default.aspx.

Maryland targets pickup truck drivers with the program Buckle Up, Tough Guy targeting one of Maryland's most notoriously difficult to reach audiences. This campaign provides a mechanism to reach out to pickup truck drivers with specific messaging and media.

New Jersey focuses media efforts on the use of seat belts in rear passenger seats, with a media campaign focusing on the importance of all passengers wearing seat belts.

Both New York and North Carolina conduct safety challenges for seat belts targeted towards youth. New York's program is called Battle of the Belts, a fast-paced seatbelt buckling contest that is a race against the clock. North Carolina's RUBuckled is a high school program that ties parking privileges with seat belt use.

Jurisdictions outside the I-95 Corridor that have strong examples of seat belt use initiatives include Washington State, Michigan, and Alberta, Canada. Washington State has achieved a very high seat belt use (96%) by combining a primary seat belt law with strong enforcement efforts. Prior to the combination of the primary law and strong enforcement, the average seat belt use was approximately 82%. Michigan has developed guidelines for conducting safety belt enforcement zones. These zones

concentrate enforcement in a specific area to increase the visibility and perceived likelihood of getting caught. Each zone has signs announcing entry into the enforcement zone, a spotter to identify unbelted drivers, and several patrol cars that stop drivers and issue citations. Alberta, Canada has a two to three day province-wide enforcement blitz that is carried out by all enforcement agencies during the months of March, May, and October. These months are dedicated to increase seat belt usage in their annual traffic safety calendar.

Ten responding Corridor jurisdictions (Connecticut, Delaware, Florida, Maine, Maryland, New Jersey, New York, North Carolina, Vermont, and Virginia) reported that evaluations have been completed on their seat belt programs. Florida's program evaluation is incomplete at this time and therefore unavailable. North Carolina does self evaluations by the schools, which are not publically available. Vermont's evaluation included tracking of seat belt use rate, penetration of message, and number of tickets, arrests, contacts and hours of enforcement, but is not available online.

New Jersey conducts pre- and post-belt use surveys to assess the impact of initiative on increasing belt use. The report concluded that the seat belt usage rate has risen for the 13th consecutive year. The report can be found at http://www.state.nj.us/oag/hts/downloads/ciot-mobilization-rpt-09.pdf.

Connecticut's evaluation was conducted by the Preusser Research Group (Solomon, 2001; an electronic link could not be accessed).

Delaware conducts an annual statewide observational Seat Belt Use Survey. It showed for the first time in more than a decade that Delaware's statewide seat belt use rate has declined. The executive summary is available at http://ohs.delaware.gov/general_pr_2009/de_seatbelt_use_rate_declines-mobilization_to_enforce_laws_begins_Aug1.pdf.

Maine's seat belt law change was evaluated by NHTSA (Chaudhary et al., 2009; an electronic version could not be accessed). This is an upcoming report that is expected to be released shortly.

Maryland reported to have an evaluation; however, the report could not be accessed.

New York's annual statewide seat belt observational survey is available through the Institute for Traffic Safety Management and Research website (www.itsmr.org and http://www.itsmr.org/pdf/2009%20NY%20OBSERVATIONAL%20SURVEY%20OF%20SEAT%20BELT%20USE.pdf). The results of the survey indicate a statewide seat belt use rate of 88%.

Virginia requires a statewide seat belt survey; however, no report could be located.

5.5 Improperly Licensed Drivers

A majority of the responding I-95 Corridor jurisdictions (73%) reported having some measure of penalties for improperly licensed drivers (i.e., those drivers whose license is suspended or revoked and who have been caught driving). The range of penalties respondents provided is in Table 1 below. Almost two-thirds (63%) of the responding Corridor jurisdictions enforce an extended driver license suspension, and more than half (55%) reported vehicle impoundment or forfeiture. Some of the responding Corridor jurisdictions also reported "other" types of penalties which typically involved jail or prison for repeat offenders.

Table 5.5.1: Fines for improperly licensed drivers by State.

State	Fines	State	Fines
Connecticut	$100-$8,000	**New York**	$200-$5,000
Delaware	$500-$1,000	**North Carolina**	$500-$2,500
Florida	$500	**Pennsylvania**	$200
Georgia	up to $1,000	**Rhode Island**	up to $5000
Maine	$250-$500	**South Carolina**	up to $1000
Maryland	$500	**Vermont**	$225
Massachusetts	$500	**Virginia**	$1,000
New Hampshire	$1000	**District of Columbia**	$1,000
New Jersey	$550-$750		

Three states (Connecticut, New York, and Virginia) reported using license plate recognition technology as part of their enforcement efforts for improperly licensed drivers.

Only two responding states (Connecticut and New York) reported conducting an evaluation of their Automated License Plate Recognition, however, neither of these reports could be located.

Nine responding states (82%) reported that police do have the ability to identify unlicensed drivers at roadside by accessing driver records. Police officers are able to check to see if the driver's license is valid at the roadside during both routine traffic stops as well as other enforcement activities that identify unlicensed drivers.

Outside the Corridor jurisdictions, California has implemented new technology, facial scanning biometrics in police vehicles to determine someone's identity. Biometrics is a method of identifying a person based on physiological or behavioral characteristics using automated identification tools. The following is a link to an interview discussing the on-board biometric facial comparisons in police vehicles in Los Angeles http://www.ct.gov/dmv/cwp/view.asp?a=2600&q=317362&dmvPNavCtr=|.

5.6 Collision Avoidance

Almost half (45%) of the responding jurisdictions indicated the knowledge test for driver licensing asks new drivers questions on collision avoidance techniques. In addition, nearly two-thirds (64%) of responding jurisdictions reported that their knowledge test for obtaining a driver's license includes questions about what to do if new drivers are driving on the highway and the wheels of their vehicle go off the pavement onto the shoulder. In particular, Connecticut, New York, and New Jersey all reported that their driver manual also contains information about maneuvers in the event the wheels of the vehicle go off the road. Virginia asks questions about over-correction; and Maine describes what can happen and how to respond.

Moreover, almost half (46%) of the responding I-95 Corridor jurisdictions reported that their driver education courses often teach new drivers how to maneuver in situations when the wheels of the vehicle go off the highway and onto the shoulder while they are driving. These lessons are included in the driver education manual and delivered during driving sessions.

Outside of the Coalition states, Arizona and Saskatchewan also have driver education courses that teach drivers how to maneuver in situations when the wheels of the vehicle go off the highway and onto the shoulder. Arizona specifically addresses over-correction in both dry and wet conditions (in driver education courses). Saskatchewan provides specific detail about what one should do in the event that the wheels go off a sharp edge. Both Alberta and Ontario include information in their Drivers' Handbooks. Alberta addresses this issue with professional drivers and through the knowledge test. Lastly, Michigan's knowledge test uses a pool of questions regarding collision avoidance techniques and over-correction maneuvers, including space and speed management questions.

5.7 Road Engineering

Almost half of the responding Corridor jurisdictions (45%) reported that road safety audits are performed to identify high-risk collision locations as a means of determining where changes are needed. A road safety audit is a formal safety performance examination of an existing or future road or intersection by an independent audit team. An equal percentage of jurisdictions also reported that they use road safety audits on two lane rural roads.

A number of responding I-95 Corridor jurisdictions reported a variety of engineering improvements that are used to address the risk of crashing. Slightly more than half (55%) of Corridor jurisdictions responding to the survey reported that highways often have paved shoulders, and more than one-third (36%) reported that guard rails are sometimes employed. More than one-third (36%) of the responding Corridor jurisdictions reported that rumble strips are sometimes used on the outer edge of highways, and one-third also reported that rumble strips are rarely used in the center of the highway. Just 18% of responding Corridor jurisdictions reported that rumble strips are sometimes used in the center of the highway.

Approximately one-third of responding Corridor jurisdictions reported that roundabouts are sometimes used instead of standard intersections on two lane rural roads. On urban and suburban roads, 55% of the responding Corridor jurisdictions reported roundabouts are sometimes used. Finally, slightly more than one-quarter (27%) reported that

highway pavement on some curves is treated with a compound to increase tire friction to help vehicle tires grip the road.

Several jurisdictions outside of the I-95 Corridor reported that they employ rather innovative road engineering measures. Perhaps the most unique and advanced jurisdiction was British Columbia, Canada. It reported the use of transverse rumble strips, which are grooved or raised corrugations that are placed on the highway pavement surface perpendicular to the path of travel. Vehicles passing over the corrugations simultaneously generate audible and vibratory stimuli. Transverse rumble strips are used in British Columbia to warn drivers of an imminent and unusual change in the driving environment that requires greater driver awareness, such as approaches to stop controlled intersections, roundabouts, and work zones. British Columbia also employs Collision Prediction Models, a regression model that produces an estimate of the collision frequency for a location based on the site-specific characteristics of the location. Also in use are Collision Modification Factors, a multiplicative factor used to reflect the expected change in safety performance associated with the corresponding change in highway design and/or the traffic control feature. British Columbia also has upgraded sign sheeting materials to improve retro-reflectivity to make the signs more visible. Similarly, the use of Clear View font also improves sign legibility. British Columbia has also introduced an un-interrupted power supply for traffic signals to ensure that traffic signals are not affected during power outages. Finally, British Columbia has implemented colored pavement markings in conflict areas for cyclists and the use of high visibility wet night road markings such as rain-line to provide improved delineations.

Other jurisdictions that have introduced road engineering improvements include Illinois which uses off-set turning lanes and system wide application of safety countermeasures, involving law enforcement and engineering representatives working to identify operational safety concerns.

Michigan uses indirect left turns to increase capacity and reduce delays. Indirect left turns are used when a left turn at an intersection is not allowed and in order to turn left the driver must drive straight or turn right, then make a U-turn at a median crossover.

Prince Edward Island has widened traffic lanes on highways, increased roadway lighting, and constructed more sidewalks for pedestrians.

Finally, Germany has introduced the use of self explaining roads. This concept, which originated in the Netherlands, encourages the driver to naturally adopt driving behavior to coordinate with the design and function of the road. Drivers perceive the type of road and instinctively know how to behave. The environment distinguishes the type of road, requiring less of a need for separate traffic control devices such as additional traffic signs to regulate traffic behavior (ERSO, 2009).

6.0 CONCLUSION

The purpose of this report was to identify the primary causes of fatal and serious injury crashes in I-95 Corridor Coalition States and the District of Columbia and to provide an inventory of promising traffic safety programs that may be implemented in those jurisdictions to improve safety along the I-95 Corridor. The main body of this report contains the summary results of the crash analyses broken down according to key crash characteristics and organized into five regions. It also contains an overview of the most promising programs to address these crash characteristics as identified through an international program survey. More detailed information about the crash analyses and the program survey are located in the appendices of this report.

Based on the results of the crash analyses and the program survey it can be concluded that there are many opportunities for jurisdictions to improve road safety along the I-95 Corridor.

Most fatal collisions in New England (ME, NH, VT, MA, CT, RI) involved single vehicles on undivided one or two lane roads and many of them involved vehicles running off the roadway and hitting fixed objects. The collisions occurred on grades about one-quarter of the time and on curves about one-third of the time. These road characteristics may well have contributed to losing control of the vehicle and running off the road. In addition, fatal collisions involving impaired driving were most common (12%) in NE and safety belt use was relatively low (44%). Speeding was higher than in most other regions (25%) and 9% of the drivers were improperly licensed.

Given these characteristics of fatal collisions in NE, potential prevention strategies might include:

- More intensive programs to increase seat belt use, particularly among young drivers, e.g., Click It or Ticket, NHTSA's rural safety belt initiative, Street Smart, etc. (see section 5.4) — widely advertized enforcement campaigns have been shown to be very cost-efficient (see e.g., Elvik, 2001); Kim and Yamashita (2003) noted that after increased enforcement and publicity during Hawaii's Click It or Ticket campaign, there was an increase of 6.9% of seat belt use;
- Additional and/or sustained sobriety checkpoints (e.g., Florida's Sustained Enforcement Program — see section 5.1) targeted to high-risk times (e.g., weekend nights) and locations (e.g., areas where there are bars) — several review studies of

the literature have found that this can lead to a 20% reduction in alcohol-related fatalities (see e.g., Shults et al., 2001; Elder et al., 2002; Scopatz, 2008);

- Speed cameras to detect and ticket speeders as well as traffic calming measures (see section 5.2) — many studies of photo enforcement found significant decreases in average speed, speeding violations, red light running violations, speeding collisions, and right-angle crashes, with some studies finding minor increases in rear-end crashes but these are often much less severe than right-angle crashes (see e.g., Retting and Kyrychenko, 2002; Retting et al., 1999; Chen et al., 2000; Shin and Washington, 2007; Pilkington and Kinra, 2005; Ng et al.,1997; Blakey, 2003; Ministry of Transportation Ontario, 1995; Calgary Police Service, 2005; Andreassen, 1995);
- Increased use of rumble strips on the edges of rural roads to alert drivers that they are leaving the roadway and on the centre line of two lane roads to warn them that they are crossing into the oncoming lane.
- Educational programs on fatigue might also be beneficial (e.g., the New York State Partnership Against Drowsy Driving — see section 5.3).
- Given the higher incidence of poor weather and road conditions in NE, education programs about how to drive in poor conditions might be appropriate (e.g., AZ's educational collision avoidance course specifically addresses both dry and wet conditions — see section 5.6).

Regarding fatal collisions in the North region (NY, NJ, PA) single vehicles on undivided one or two lane roads were overrepresented in crashes. Many of these crashes involved vehicles running off the roadway and hitting fixed objects on the roadside of rural roads. In addition, about one-third of the crashes involved either a grade or a curve. These fatal collisions also often involved a lack of safety belt use, the use of alcohol, and speeding, which are generally considered characteristics of high-risk drivers. Similar interventions identified for New England could be applied to the North region such as more intensive Click It or Ticket programs, more frequent sobriety checkpoints, use of speed cameras, and the installation of rumble strips on road edges and center lines. Since there was a higher incidence of poor weather and road conditions in the North region, as in New England, education programs about how to drive in poor conditions might be appropriate. Given the higher incidence of drug use as a contributing factor in fatal collisions, increased drugged driving enforcement is appropriate.

Most fatal collisions in the Central region (DE, MD, DC, VA) involved single vehicles on undivided one or two lane roads. Many of them involved vehicles running off rural roads on the roadside and hitting fixed objects. In addition, about one-third of the crashes involved either a grade or a curve. These fatal collisions also quite often involved unbelted drivers, alcohol use, and speeding. Similar interventions identified earlier for other regions could be applied in the Central region. In addition, the high percentage of drivers who did not attempt to

avoid the collision in this region suggests the need for better training on evasive driving measures as well as the need for measures focusing on fatigued and drowsy driving. Given the higher incidence of vehicles running off the road onto the roadside in the Central region, the installation of rumble strips on road edges and guard rails is warranted.

The results from the crash analyses suggest that the majority of fatal collisions in the South region (NC, SC, GA) occurred on two lane rural roads as opposed to highways and freeways. These collisions often took place on roads with a grade or a curve and involved a single vehicle going off the road on the roadside and striking a fixed object. As in the other regions, the drivers were usually males and quite often aged 16-34 and they were often unbelted. Alcohol and speeding were common contributing factors in the collisions. Again, similar interventions identified earlier for the other regions could be applied in the South region. Given the greater incidence of collisions on curves, consideration could be given to installing more guard rails on curved roads and using a compound on the pavement that increases tire friction, thereby reducing loss of control (see section 5.7 for concrete examples of road engineering).

Finally, the fatal collisions in Florida were somewhat different than those that occurred in other regions. Although single vehicle collisions were still common, they were less common in Florida, whereas angle collisions were more prevalent. The latter is consistent with more intersection collisions occurring in Florida and a higher proportion of collisions occurring in urban areas and on local roads. The drivers tended to be males and many of them were aged 16-34. While crashes involving non-use of safety belts, alcohol use, and speeding were common, they were less prevalent in Florida than in other regions. Given the greater incidence of urban intersection collisions in Florida, consideration should be given to measures to deal with this type of collision such as the use of roundabouts (see Elvik and Vaa, 2004), left turn lanes with separate traffic light cycles (see section 5.7 for examples of safety audits as well as engineering measures), and the use of red light cameras to detect drivers who run red lights. Considering the higher prevalence of improperly licensed drivers in Florida, consideration might also be given to technology such as Automated License Plate Recognition which reads the vehicle license plate, determines the name of the owner and then checks the owner's license status (see section 5.5 for examples). In addition, more targeted Click It or Ticket programs and sobriety check points are warranted in Florida.

In conclusion, there are many opportunities for jurisdictions to improve road safety along the I-95 Corridor. Given the fact that jurisdictions are facing competing priorities in a challenging economical climate, directing resources to the most significant problems and ensuring that solutions are evidence-based is of the utmost importance. Therefore, it is recommended that any solution that will be adopted to overcome the challenges in each of the regions — as identified in this report — will be evaluated to provide the insights and guidance needed to deliver these solutions in the most effective and efficient way. Ultimately this will help ensure a return on investment.

APPENDIX A:

REGIONAL FARS CRASH ANALYSES

Tables: 1-49

Collision Type

Table 1 indicates that overall approximately 39% of fatal collisions involved a single vehicle in transport (see overall column %). Note that parked vehicles are not included. This characteristic of fatal crashes was the most common in New England (43%) and the least common in Florida (35%), followed by the South region (39%). The North and Central regions had the same percentage of single vehicle accidents (40%).

Table 1: Number of vehicles in fatal crashes by Region

No. of vehicles	New England	North	Central	South	Florida	Total	Overall %
Single vehicle	43.50%	40.44%	40.55%	38.70%	35.46%	23414	38.98%
Multiple vehicle	56.50%	59.56%	59.45%	61.30%	64.54%	36647	61.02%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	60061	100.00%
Total	4869	15501	7257	17999	14435	60061	
Overall %	8.11%	25.81%	12.08%	29.97%	24.03%	100.00%	

In Table 2, the overall column percentage on the right shows that 53% of the fatal crashes involved no other vehicle (either in transport, or parked). This was most common in New England (59%) and least common in Florida (47%). Note that when the crash did involve another vehicle, the manner of collision was recorded only for the first harmful event between two motor vehicles in transport. Angle impacts were involved in 24% of the collisions involving two or more vehicles and were more frequent in Florida (29%) and less common in New England (18%).

Table 2: Manner of collision by region

Manner of collision	New England	North	Central	South	Florida	Total	Overall %
No other vehicle	59.42%	52.58%	54.97%	54.25%	47.06%	17264	52.81%
Front/rear	5.58%	7.37%	7.15%	6.02%	10.52%	2433	7.44%
Head-on	14.07%	12.50%	13.16%	11.40%	10.04%	3868	11.83%
Angle	17.61%	23.84%	22.18%	24.36%	29.49%	8004	24.48%
Sideswipe	3.02%	3.43%	1.89%	3.60%	2.44%	993	3.04%
Other	0.32%	0.28%	0.65%	0.37%	0.45%	130	0.40%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	32692	100.00%
Total	2851	8170	4126	10416	7129	32692	
Overall %	8.72%	24.99%	12.62%	31.86%	21.81%	100.00%	

Table 3 indicates that fatal collisions involved one vehicle hitting another vehicle in 46% of the cases and involved an impact with a fixed object in 39% (see overall column %). Collisions with fixed objects were more common in New England (47%) and less common in Florida (29%). Fatal crashes involving a vehicle to vehicle collision or a vehicle rollover were more common in Florida (52% and 14% respectively).

Table 3: Harmful event by region

Harmful event	New England	North	Central	South	Florida	Total	Overall %
Rollover	7.06%	4.91%	5.40%	9.54%	14.40%	2848	8.70%
Vehicle-vehicle collision	39.06%	45.53%	43.77%	44.96%	51.67%	15022	45.90%
Fixed object	46.82%	42.93%	41.33%	40.37%	29.10%	12839	39.23%
Other	7.06%	6.63%	9.50%	5.13%	4.83%	2016	6.16%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	32725	100.00%
Total	2860	8172	4128	10424	7141	32725	
Overall %	8.74%	24.97%	12.61%	31.85%	21.82%	100.00%	

Table 4 shows that 19% of vehicles involved in a fatal crash rolled over (see overall column %). This percentage is higher than in the previous table since it is based on the number of vehicles rolling over rather than on the number of fatal collisions involving one or more rollovers. Vehicles rolling over were more common in the South region (23%) and least common in the North region (15%).

Table 4: Vehicles rolling over by region

Rollover	New England	North	Central	South	Florida	Total	Overall %
No rollover	82.51%	85.26%	82.14%	76.81%	80.84%	74408	81.01%
One or more	17.49%	14.74%	17.86%	23.19%	19.16%	17442	18.99%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	91850	100.00%
Total	7120	23438	10557	28182	22553	91850	
Overall %	7.75%	25.52%	11.49%	30.68%	24.55%	100.00%	

In approximately 90% of crashes (see overall column %), the vehicle(s) were towed away, indicating a fairly severe impact. However, this was somewhat less common in Florida (87%) and the Northern region (88%), as can be seen in Table 5.

Table 5: Vehicle tow away by region

Towed away	New England	North	Central	South	Florida	Total	Overall %
Driven	6.79%	11.84%	7.20%	8.47%	12.70%	5905	10.07%
Towed	93.21%	88.16%	92.80%	91.53%	87.30%	52753	89.93%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	58658	100.00%
Total	4744	15299	7155	17475	13985	58658	
Overall %	8.09%	26.08%	12.20%	29.79%	23.84%	100.00%	

Table 6 shows the point of impact on the vehicles involved in fatal collisions according to region. As indicated by the overall column percent, the majority of vehicles (62%) were impacted frontally, although this was less often the case in Florida (56%). The category non-

collision pertains to events that did not involve a vehicle striking another vehicle or a fixed object (e.g., vehicle going off a cliff).

Table 6: Collision impact point by region

Impact Point	New England	North	Central	South	Florida	Total	Overall %
Non-collision	2.72%	1.88%	2.87%	5.39%	5.59%	3684	4.04%
Front	67.96%	66.29%	68.26%	60.66%	55.97%	56837	62.40%
Right	8.46%	10.24%	10.50%	10.59%	12.72%	9877	10.84%
Rear	6.58%	8.38%	7.24%	8.48%	9.63%	7690	8.44%
Left	10.28%	10.24%	10.15%	12.53%	12.78%	10528	11.56%
Other	4.00%	2.97%	0.97%	2.35%	3.31%	2466	2.71%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	91082	100.00%
Total	6947	23354	10540	28144	22097	91082	
Overall %	7.63%	25.64%	11.57%	30.90%	24.26%	100.00%	

Driver Characteristics

The age and gender of drivers fatally injured in crashes are presented in Tables 7. and 8. The drivers were most often aged 25-34 (19%), followed closely by the 35-44 age group (18%). About 43% of the drivers were aged 16-34. There were no notable differences among the regions in driver age. Almost three-quarters of the drivers were male and there was little variation by region.

These results on driver age and gender are similar to those for the whole of the U.S. Using the 2007 FARS data for all U.S. states, 44% of the drivers involved in fatal collisions were aged 16-34 and 71% were male (NHTSA, 2007). The percent of drivers involved in fatal crashes who were male has remained fairly stable from 2003 to 2007, ranging from 68% to 71% (NHTSA, 2007). Similarly, there has been little variation in the percentage of drivers aged 16-34.

Table 7: Age of fatally injured driver by region

Driver age	New England	North	Central	South	Florida	Total	Overall %
<15	0.21%	0.25%	0.24%	0.49%	0.31%	194	0.33%
16-20	13.43%	11.61%	12.43%	12.16%	12.53%	7173	12.24%
21-24	11.45%	11.70%	12.12%	10.77%	11.76%	6716	11.46%
25-34	18.04%	18.25%	18.77%	20.51%	20.16%	11387	19.43%
35-44	16.66%	19.03%	19.32%	18.36%	18.22%	10828	18.48%
45-54	16.93%	15.69%	15.51%	16.21%	15.36%	9286	15.85%
55-64	11.11%	10.95%	10.68%	10.69%	10.19%	6252	10.67%
65-74	5.34%	5.45%	5.73%	6.06%	5.77%	3360	5.73%
75+	6.84%	7.07%	5.21%	4.76%	5.70%	3400	5.80%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	58596	100.00%
Total	4779	15079	7106	17667	13965	58596	
Overall %	8.16%	25.73%	12.13%	30.15%	23.83%	100.00%	

Table 8: Gender of fatally injured driver by region

Driver gender	New England	North	Central	South	Florida	Total	Overall %
Male	73.22%	75.16%	75.30%	72.70%	73.90%	43450	73.98%
Female	26.78%	24.84%	24.70%	27.30%	26.10%	15285	26.02%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	58735	100.00%
Total	4787	15103	7116	17719	14010	58735	
Overall %	8.15%	25.71%	12.12%	30.17%	23.85%	100.00%	

Table 9 shows that some two-thirds of the drivers involved in fatal crashes (69%; see overall column %) were traveling straight or accelerating in the lane and approximately 14% were negotiating a curve. Drivers in Florida were more often driving straight (75%) and less often negotiating a curve (5%). The other four regions did not differ substantially.

Table 9: Vehicle manoeuvre by region

Vehicle manoeuvre	New England	North	Central	South	Florida	Total	Overall %
Going straight/starting in traffic lane	65.53%	64.54%	68.96%	68.82%	74.61%	41035	68.86%
Slowing/stopped	3.16%	4.24%	4.04%	3.74%	5.28%	2519	4.23%
Passing	3.27%	2.15%	1.29%	1.52%	1.67%	1091	1.83%
Turning left	5.85%	6.54%	4.91%	5.76%	8.92%	3947	6.62%
Negotiating a curve	16.28%	17.17%	15.55%	16.37%	4.56%	8123	13.63%
Other	5.91%	5.37%	5.26%	3.78%	4.96%	2873	4.82%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	59588	100.00%
Total	4804	15320	7230	17927	14307	59588	
Overall %	8.06%	25.71%	12.13%	30.08%	24.01%	100.00%	

Table 10 shows that 57% of the drivers made no effort to avoid the collision (see overall column %). If they did make an avoidance manoeuvre, they more often attempted to avoid the crash by steering (9%). Drivers in the Central region more often did not try to avoid the collision (73%). However, the large difference among regions in the number of “Not reported” cases may have accounted for this difference, so these results should be interpreted with caution.

Table 10: Avoidance manoeuvre by region

Avoidance manoeuvre	New England	North	Central	South	Florida	Total	Overall %
No avoid manoeuvre	48.46%	48.83%	72.89%	54.78%	65.32%	34373	57.46%
Braking	7.46%	6.99%	19.11%	3.24%	3.16%	3859	6.45%
Steering	13.59%	11.62%	7.23%	3.40%	12.44%	5369	8.98%
Other	0.58%	0.45%	0.07%	0.08%	0.33%	164	0.27%
Not reported	29.91%	32.11%	0.70%	38.50%	18.76%	16052	26.84%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	59817	100.00%
Total	4841	15398	7251	17949	14378	59817	
Overall %	8.09%	25.74%	12.12%	30.01%	24.04%	100.00%	

Restraint use is presented in Table 11. Overall, 54% of drivers involved in fatal crashes were belted. Belt use was highest in Florida (58%) followed by the South region (56%) and lowest in New England (44%) followed by the Central region (46%), and was 54% in the North. This level of driver belt usage (54%) is lower than the 82% observed in the 2007 National Occupant Protection Use Survey (NOPUS), which provides nationwide probability-based observed data on seat belt use in all of the U.S. (NHTSA, 2008). The 2007 data are referenced since they are closer in time to the current FARS data. For the North East region, which includes nine of the I-95 member states, (i.e., CT, MA, ME, NH, NJ, NY, PA, RI, VT), the 2007 survey indicated that driver belt use was about 82%. These NOPUS survey results also clearly showed that states with primary seat belt laws had higher occupant belt use (88%) than states with secondary laws or no law (77%). Florida does not have primary seat belt laws, however, in the current study, Florida has the highest percentage of seat belt use (58%). This is followed by the South region (56%) which includes only states with primary seat belt laws. New England includes mostly states with secondary laws or no laws which may explain why New England has the lowest level of restraint use of all the regions.

Table 11: Driver restraint use by region

Restraint use	New England	North	Central	South	Florida	Total	Overall %
No restraint	33.57%	27.84%	33.50%	29.96%	30.86%	18096	30.35%
Seat belt	43.81%	54.36%	46.46%	55.80%	57.85%	32089	53.82%
Helmet	6.03%	6.70%	7.13%	5.42%	5.59%	3604	6.04%
Don't know	16.59%	11.11%	12.91%	8.83%	5.70%	5834	9.78%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	59623	100.00%
Total	4823	15339	7226	17890	14345	59623	
Overall %	8.09%	25.73%	12.12%	30.01%	24.06%	100.00%	

As shown in Table 12, only 10% of vehicle occupants were ejected from the vehicle during the fatal crash. This was somewhat more common in the South region (12%) than in the North region (8%).

Table 12: Occupant ejection by region

Ejected	New England	North	Central	South	Florida	Total	Overall %
No	89.30%	92.01%	89.83%	87.64%	90.02%	89019	89.74%
Yes	10.70%	7.99%	10.17%	12.36%	9.98%	10174	10.26%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	99193	100.00%
Total	7596	25682	11334	29755	24826	99193	
Overall %	7.66%	25.89%	11.43%	30.00%	25.03%	100.00%	

FARS includes a drinking driver variable based on the presence of any amount of alcohol in a BAC test or a determination by the police that the driver had been drinking. Table 13 reveals that 19% of the drivers had been drinking. Drinking drivers were more common in the Central region (22%) than in Florida (16%).

Table 13: Driver drinking by region

Driver drinking	New England	North	Central	South	Florida	Total	Overall %
No	78.62%	80.21%	78.28%	79.98%	83.76%	48230	80.63%
Yes	21.38%	19.79%	21.72%	20.02%	16.24%	11587	19.37%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	59817	100.00%
Total	4841	15398	7251	17949	14378	59817	
Overall %	8.09%	25.74%	12.12%	30.01%	24.04%	100.00%	

The number of drinking drivers involved in fatal collisions is shown in Table 14. A driver was considered to be drinking if they had a positive BAC, i.e., any amount of alcohol, or were thought by the police to have been drinking. While approximately a third of the fatal crashes involved one or more drinking drivers (see overall column %), the percentage was somewhat lower in Florida (30%) than in the Central region (37%). The percentage of collisions with one or more drinking drivers is higher than the percentage of drivers who had been drinking since for the former measure, only one of the drivers would have had to have been drinking to consider the collision to have involved a drinking driver whereas for the latter variable, each driver's drinking is considered separately.

Table 14: Number of drinking drivers involved by region

No. Drinking Drivers	New England	North	Central	South	Florida	Total	Overall %
0	64.85%	64.91%	62.86%	66.64%	70.01%	21711	66.31%
1	29.84%	31.03%	32.15%	30.14%	29.05%	9937	30.35%
2+	5.31%	4.06%	4.99%	3.21%	0.94%	1092	3.34%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	32740	100.00%
Total	2865	8177	4128	10424	7146	32740	
Overall %	8.75%	24.98%	12.61%	31.84%	21.83%	100.00%	

The BAC of fatally injured drivers is presented in Table 15. As can be seen, about 15% of the fatally injured drivers had positive BACs and 13% had BACs over 0.08%. These results did not differ much among regions. The percentage of drivers with BACs over 0.08% is about five times higher than that observed in a recent roadside survey of drinking and drug use by drivers which is indicative of the increased risk for fatal crashes when drinking and driving, especially at higher BAC levels (Compton and Berning, 2009).

While BAC tests are a more accurate measure of driver impairment than the assessments by the police, there was a large percentage of drivers for whom it was not known if they were tested and if they were tested, what the results were. The BAC was unknown for about 61% of the drivers, particularly in the South region and Florida (64% and 66% respectively).

Table 15: Driver blood alcohol concentration by region

BAC level	New England	North	Central	South	Florida	Total	Overall %
.00	31.74%	27.06%	20.91%	21.55%	18.58%	13712	23.00%
.01-.07	2.94%	2.88%	3.03%	2.11%	2.48%	1536	2.58%
.08-.15	5.72%	4.51%	4.64%	3.75%	4.73%	2652	4.45%
.16+	9.58%	8.79%	7.97%	8.26%	8.48%	5081	8.52%
Refused	0.41%	0.07%	0.01%	0.15%	0.03%	63	0.11%
Don't know	49.60%	56.69%	63.44%	64.19%	65.70%	36579	61.35%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	59623	100.00%
Total	4823	15339	7226	17890	14345	59623	
Overall %	8.09%	25.73%	12.12%	30.01%	24.06%	100.00%	

A surrogate measure of impaired driving was created by TIRF by identifying those male drivers who were involved in single vehicle crashes at night (9:00pm-5:59am). This type of measure has been used in other studies of impaired driving when information regarding alcohol involvement was not complete (Mayhew, et al., 2008). Such a measure is also justified by a recent roadside survey using oral fluid and blood tests that have shown that drinking and driving is much more common among males and at night between (9:00pm and 3:00am (Compton and Berning, 2009). Single vehicle fatal collisions are also more likely to involve alcohol impairment (NHTSA, 2008).

The regional differences in this surrogate measure of impaired driving appear in Table 16. Overall, about 11% of the drivers were considered to have been impaired by alcohol using this surrogate measure. There was not much variation between the regions in terms of impaired driving.

Table 16: Impaired driving based on surrogate measure by region

Impaired Driving	New England	North	Central	South	Florida	Total	Overall %
No	87.62%	89.33%	88.67%	89.42%	90.21%	53180	89.35%
Yes	12.38%	10.67%	11.33%	10.58%	9.79%	6337	10.65%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	59517	100.00%
Total	4808	15317	7217	17878	14297	59517	
Overall %	8.08%	25.74%	12.13%	30.04%	24.02%	100.00%	

The presence of drugs (illicit or licit) was considered by the police to be a contributing factor in almost 10% of the fatal collisions as shown in Table 18. Drugs were more often reported in fatal crashes in the North region (17%) than in Florida (3%). These numbers are similar to the results of a recent roadside survey in the U.S. which showed that 11% (daytime) to 14% (night-time) of drivers had been using one or more drugs based on oral fluid tests. Combining both oral fluid and blood test results revealed that 16% of the night-time drivers tested positive for drugs (Compton and Berning, 2009).

Table 18: Driver drug use by region

Drugs	New England	North	Central	South	Florida	Total	Overall %
Yes	12.00%	17.45%	7.64%	8.87%	2.75%	5746	9.77%
No	88.00%	82.55%	92.36%	91.13%	97.25%	53072	90.23%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	58818	100.00%
Total	4683	15345	7226	17764	13800	58818	
Overall %	7.96%	26.09%	12.29%	30.20%	23.46%	100.00%	

The presence of drugs other than alcohol in the body of fatally injured drivers as determined by chemical tests is presented in Table 19. In the vast majority of cases, tests for drugs were either not conducted or if they were conducted, the results were not reported and these cases appear as “Don’t know” in the table. Given the high incidence of missing values, these results should be interpreted with caution. Overall, drug use was quite low (<3%). Stimulant use was somewhat more common in New England (3%), while cannabinoids was more frequently used in the New England (3%) and the North region (3%). Other drug use was higher in New England (9%). Compton and Berning (2009) reported that marijuana was most commonly found (9%) followed by cocaine (4%) and methamphetamine (1%).

Table 19: Presence of drugs by region

Drugs	New England	North	Central	South	Florida	Total	Overall %
Stimulant							
Yes	2.60%	1.76%	1.33%	1.54%	1.95%	1618	1.75%
No	1.05%	7.02%	9.89%	0.30%	0.33%	2936	3.18%
Don't know	96.35%	91.22%	88.77%	98.16%	97.72%	87653	95.06%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	92207	100.00%
Total	7151	23587	10565	28263	22641	92207	
Overall %	7.76%	25.58%	11.46%	30.65%	24.55%	100.00%	
Cannabinol							
Yes	2.64%	2.69%	1.05%	1.56%	1.62%	1741	1.89%
No	1.20%	6.91%	9.68%	0.51%	0.63%	3026	3.28%
Don't know	96.15%	90.40%	89.27%	97.93%	97.76%	87440	94.83%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	92207	100.00%
Total	7151	23587	10565	28263	22641	92207	
Overall %	7.76%	25.58%	11.46%	30.65%	24.55%	100.00%	
Other							
Yes	9.19%	3.04%	1.69%	1.89%	2.77%	2714	2.94%
No	0.49%	6.58%	9.68%	0.12%	0.14%	2675	2.90%
Don't know	90.32%	90.38%	88.62%	98.00%	97.08%	86818	94.16%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	92207	100.00%
Total	7151	23587	10565	28263	22641	92207	
Overall %	7.76%	25.58%	11.46%	30.65%	24.55%	100.00%	

The estimated travel speed of vehicles involved in fatal crashes appears in Table 20. About 25% of collisions involved estimated vehicle travel speeds between 31 and 55 mph, 7% involved speeds between 55 and 69 mph and about 11% involved speeds of 70 mph or higher (see overall column %). Estimated travel speeds that were 56 mph or higher were more common in Florida (29%) than any of the other regions. It should be noted that there were large differences in the incidence of “Don’t knows” across regions (Florida-15%, New England-85%) which may have affected these regional differences. Therefore, these results on travel speed should be interpreted carefully.

Table 20: Estimated travel speed by region

Travel speed	New England	North	Central	South	Florida	Total	Overall %
<=30	2.88%	5.09%	7.32%	8.13%	18.56%	5602	9.33%
31-55	5.32%	14.55%	26.72%	29.49%	38.24%	15281	25.44%
56-69	1.97%	4.19%	8.21%	7.98%	11.85%	4489	7.47%
70+/no limit	4.74%	6.92%	10.32%	13.21%	16.74%	6846	11.40%
Don't know	85.09%	69.25%	47.43%	41.20%	14.61%	27843	46.36%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	60061	100.00%
Total	4869	15501	7257	17999	14435	60061	
Overall %	8.11%	25.81%	12.08%	29.97%	24.03%	100.00%	

Table 21 indicates that overall some 20% of collisions involved speed (i.e., exceeding speed limit, racing, too fast for conditions) as a contributing factor. Crashes involving speed as a factor were highest in New England (25%) and lowest in Florida (12%).

Table 21: Speeding as a contributing factor by region

Speeding	New England	North	Central	South	Florida	Total	Overall %
Yes	24.62%	22.50%	21.96%	21.27%	12.49%	11693	19.88%
No	75.38%	77.50%	78.04%	78.73%	87.51%	47125	80.12%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	58818	100.00%
Total	4683	15345	7226	17764	13800	58818	
Overall %	7.96%	26.09%	12.29%	30.20%	23.46%	100.00%	

Overall, approximately 12% of the drivers were either not licensed (i.e., never licensed, license suspended or revoked) or did not have a valid license at the time of the collision, as shown in Table 22. This group of improperly licensed drivers was somewhat larger in the South region (14%) and in Florida (14%).

Based on nationwide FARS data for 2001 through 2005, the AAA Foundation for Traffic Safety (2008) reported that 14% of drivers involved in fatal collisions were definitely or possibly driving with an invalid license, a percentage similar to the 12% observed for I-95 states for 2005-2007. Watson (2004) reported that unlicensed drivers in Queensland, Australia were 2.72 times more often involved in a fatal collision than licensed drivers and 2.75 times more often involved in a serious injury collisions. The highest risk was found for drivers never licensed (risk 3.93 times higher) followed by those disqualified or suspended (risk 3.38 times higher). Clearly, the research suggests that the driver who is not properly licensed is at greater risk of being involved in a fatal or serious injury collision. This poses a challenge for Departments of Motor Vehicles (or their equivalent) to identify and deter these drivers. Given that the major penalty for drivers convicted of impaired driving or having too many collisions or citations is a license suspension or even revocation, there should be a considerable concern that many drivers are continuing to drive without being properly licensed.

Table 22: Driver license status by region

Driver licensed	New England	North	Central	South	Florida	Total	Overall %
Not licensed	2.38%	2.38%	3.39%	4.29%	4.47%	2073	3.58%
Licensed	91.01%	89.72%	89.35%	85.88%	86.11%	50784	87.75%
Not valid	6.61%	7.90%	7.26%	9.83%	9.42%	5017	8.67%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	57874	100.00%
Total	4672	14775	7023	17586	13818	57874	
Overall %	8.07%	25.53%	12.13%	30.39%	23.88%	100.00%	

The FARS data includes previous events on the records of those drivers involved in fatal crashes (i.e., collisions, impaired driving convictions, speeding convictions) during the three years prior to the fatal collisions. Approximately 11% of the drivers had been involved in one or more crashes during the three years prior to the fatal collision. Drivers with previous convictions involved in fatal crashes were most prevalent in New England (14%) and much less common in Florida (6%), as can be seen in Table 23.

Table 23: Previous collision by region

Previous collision	New England	North	Central	South	Florida	Total	Overall %
None	56.29%	80.60%	86.96%	48.33%	87.98%	42945	71.50%
1 or more	15.18%	14.15%	8.60%	12.20%	6.35%	6669	11.10%
Don't know	28.53%	5.25%	4.44%	39.47%	5.67%	10447	17.39%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	60061	100.00%
Total	4869	15501	7257	17999	14435	60061	
Overall %	8.11%	25.81%	12.08%	29.97%	24.03%	100.00%	

While states vary in their look back period from three to ten years for impaired driving convictions, all states can at least look back three years, which is the look back period for FARS. Only some 2% of drivers had one or more impaired driving convictions in the past three years, and this percentage did not differ among regions (Table 24). Nevertheless, previous DWI convictions were 2.6 times more common in the South region (3.01%) than in Florida (1.14%).

Table 24: Previous impaired driving conviction by region

Previous DWI	New England	North	Central	South	Florida	Total	Overall %
None	97.36%	97.71%	97.99%	96.99%	98.86%	56223	97.78%
1 or more	2.64%	2.29%	2.01%	3.01%	1.14%	1279	2.22%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	57502	100.00%
Total	4614	14770	6950	17366	13802	57502	
Overall %	8.02%	25.69%	12.09%	30.20%	24.00%	100.00%	

Table 25 reveals that 20% of drivers in fatal collisions had one or more speeding convictions in the past three years and that these prior convictions were much less common in the North region (13%) than in other regions, particularly Florida (25%). These results are different from those in Table 3.2.15 which shows Florida with a much lower incidence of speeding as a contributing factor in fatal crashes. However, these two measures are different since the latter addresses the speeding offenses in the past and the former addresses speed as a contributing factor in the fatal collision being investigated.

Table 25: Previous speeding conviction by region

Previous speeding	New England	North	Central	South	Florida	Total	Overall %
None	80.67%	87.18%	77.34%	77.88%	75.12%	45866	79.76%
1 or more	19.33%	12.82%	22.66%	22.12%	24.88%	11637	20.24%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	57503	100.00%
Total	4614	14770	6950	17367	13802	57503	
Overall %	8.02%	25.69%	12.09%	30.20%	24.00%	100.00%	

Table 26 reveals that approximately 20% of drivers had previous convictions for offenses other than speeding, although the nature of these offenses was not specified in the FARS data. These offenses were somewhat more common in the Central region (22%) than in New England (16%).

Table 26: Other previous convictions by region

Other previous conviction	New England	North	Central	South	Florida	Total	Overall %
None	83.62%	81.42%	77.94%	80.02%	80.18%	46263	80.45%
1 or more	16.38%	18.58%	22.06%	19.98%	19.82%	11239	19.55%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	57502	100.00%
Total	4614	14770	6950	17366	13802	57502	
Overall %	8.02%	25.69%	12.09%	30.20%	24.00%	100.00%	

Table 27 shows that 14% of drivers had one or more previous license suspensions but there was little variation by region.

Table 27: Previous suspension by region

Previous suspension	New England	North	Central	South	Florida	Total	Overall %
None	86.95%	84.90%	85.81%	85.36%	86.24%	49241	85.63%
1 or more	13.05%	15.10%	14.19%	14.64%	13.76%	8261	14.37%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	57502	100.00%
Total	4614	14770	6950	17366	13802	57502	
Overall %	8.02%	25.69%	12.09%	30.20%	24.00%	100.00%	

TIRF created a high-risk driver category which included those drivers who were involved in three or more of the following events in the past three years: convictions for impaired driving, speeding, or other offenses, collisions, or license suspensions. This definition is based on a report from the High-Risk Driver Task Force of the Canadian Council of Motor Transport Administrators (CCMTA, 2001), a profile of high-risk drivers (Beirness and Simpson, 1997), and a review of the literature on high-risk drivers (Vezina, 2001). The original definition of high-risk drivers included multiple impaired driving offenses, refusals to provide a breath test, and high BACs but since these data could not be reliably reported in FARS they were not included in the current definition.

Table 28 indicates that almost 14% of drivers involved in fatal collisions can be considered high-risk. There was not much difference in this percentage across the regions. However, there was considerable variability in the percentage of cases where it was not known if the driver was high-risk due to missing cases for the variables making up this measure. The rate of missing values was higher in New England (26%) and the South region (35%).

Table 28: High-risk drivers by regions

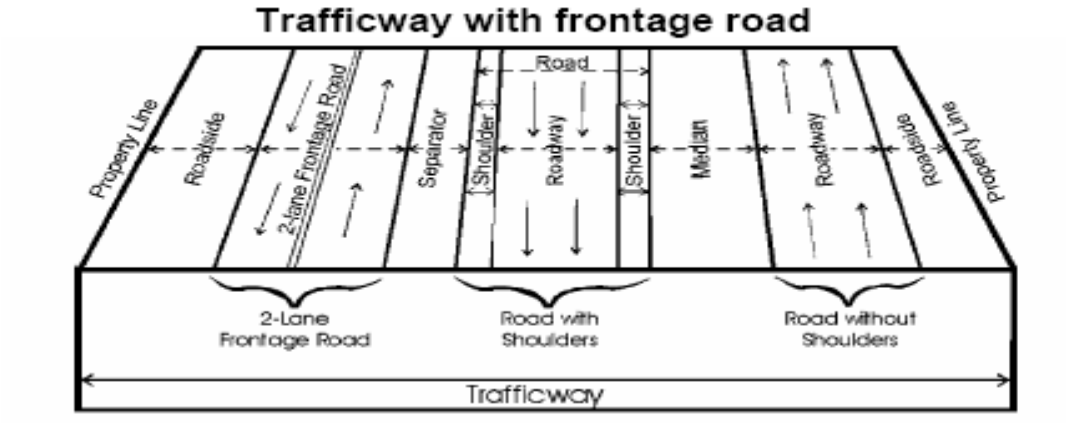
High risk driver	New England	North	Central	South	Florida	Total	Overall %
No	61.46%	82.86%	81.26%	50.77%	81.74%	42354	71.04%
Yes	12.67%	12.93%	14.72%	14.18%	13.34%	8108	13.60%
Don't Know	25.88%	4.21%	4.01%	35.05%	4.92%	9161	15.36%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	59623	100.00%
Total	4823	15339	7226	17890	14345	59623	
Overall %	8.09%	25.73%	12.12%	30.01%	24.06%	100.00%	

Road and Vehicle Characteristics

The characteristics of the roads on which the fatal collisions occurred and those of the vehicle(s) involved are described in this section.

The traffic way can be separated into different components as shown in Figure 3.3.1 below. The roadway is the component of the traffic way, usually paved, on which vehicles typically travel. The shoulder is a strip of paved or unpaved surface immediately next to the roadway. Beyond the shoulder is the roadside on the right side of the traffic way which may include ditches, culverts, trees, poles, or other fixed objects. For those roads that are divided there is either a strip of unpaved open space between the opposing lanes of traffic or there are concrete barriers that separate the opposing lanes.

Figure 3.3.1: Description of traffic way components



Fatal collisions most often occurred on the roadway (51%), followed by the roadside at 33%, as shown in Table 29. They occurred most often on the roadway (59%) in Florida and least often in New England (44%). Collisions on the shoulder occurred most often in Florida (20%) and much less often in the North (7%) and Central region (7%). Collisions on the roadside occurred more often in the Central (42%), North (40%), and New England regions (39%) compared to the South (33%) region and Florida (15%).

Table 29: Location of collision in traffic way by region

Road location	New England	North	Central	South	Florida	Total	Overall %
On-road	44.11%	49.82%	49.47%	49.73%	58.87%	16758	51.22%
Shoulder	10.42%	7.20%	6.61%	14.18%	20.31%	4087	12.49%
Median/left turning lane	6.30%	3.13%	1.99%	2.22%	5.93%	1172	3.58%
Roadside	39.17%	39.85%	41.93%	33.87%	14.89%	10699	32.70%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	32716	100.00%
Total	2859	8168	4128	10422	7139	32716	
Overall %	8.74%	24.97%	12.62%	31.86%	21.82%	100.00%	

Table 30 shows the number of lanes on the roads where fatal collisions occurred. While almost 80% of fatal crashes occurred on roads with one or two lanes, fatal collisions on roads with one or two lanes were the least common in the Central region (63%). Fatal crashes occurring on roads with three lanes were most common in Florida (17%) and least common in the South region (4%). On roads with four or more lanes fatal crashes were more common (31%) in the Central region relative to other regions.

Table 30: Number of road lanes by region

No. of Lanes	New England	North	Central	South	Florida	Total	Overall %
1-2	83.43%	84.72%	63.26%	82.82%	76.06%	25722	79.37%
3	8.16%	9.08%	5.59%	3.63%	17.47%	2804	8.65%
4+	8.41%	6.20%	31.15%	13.55%	6.47%	3880	11.97%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	32406	100.00%
Total	2818	7983	4115	10380	7110	32406	
Overall %	8.70%	24.63%	12.70%	32.03%	21.94%	100.00%	

Table 31 reveals that 64% of fatal crashes occurred on undivided roads. However, this was less frequent in Florida (43%) and the Central region (57%). Collisions on divided roads without barriers were much more common in Florida (42%) than in other regions while fatal collisions on divided roads with barriers were more common in the Central region (28%). These differences may well reflect differences among the regions in the extent to which roads are divided and have barriers to separate opposing traffic. Lynam et al. (2004) have shown that the collision rate per distance traveled on two lane rural roads is about six times that of

motorways with divided lanes. The greater safety of these divided roads supports the twinning of two lane roads, i.e., widening of a road by constructing another one next to it.

Table 31: Road divided/not divided by region

Divided/undivided roadway	New England	North	Central	South	Florida	Total	Overall %
Not divided	73.96%	71.26%	57.07%	73.54%	43.09%	20927	64.27%
Divided/no barrier	8.85%	15.81%	12.33%	15.66%	41.63%	6628	20.36%
Divided/barrier	13.76%	10.02%	28.08%	9.13%	11.41%	4119	12.65%
Other	3.44%	2.91%	2.52%	1.67%	3.86%	886	2.72%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	32560	100.00%
Total	2849	8066	4121	10407	7117	32560	
Overall %	8.75%	24.77%	12.66%	31.96%	21.86%	100.00%	

The road function is presented in Table 32. Overall, about 23% of fatal collisions occurred on principal arterial roads, 23% occurred on local roads or streets, 19% occurred on minor arterial roads, and 19% occurred on collector roads. Fatal collisions occurring on principal arterial roads were most common in Florida (31%) and least common in the New England region. Collisions occurring on local roads or streets were also most common in Florida (36%) compared to all other regions. There was little variation between most of the regions in terms of fatal collisions occurring on minor arterial roads with percentages of 20% or 21% for all regions except Florida (12%). Fatal collisions occurring on collector roads were most common in the South region (30%) and least common in Florida (2%) with the other regions ranging between 18% and 22%.

Table 32: Roadway function by region

Road function	New England	North	Central	South	Florida	Total	Overall %
Principal arterial interstate	15.11%	9.94%	13.31%	11.26%	14.96%	3935	12.35%
Principal arterial other frwy/exprwy	10.64%	5.38%	3.55%	0.98%	3.78%	1247	3.91%
Principal arterial	12.91%	25.63%	22.49%	19.44%	30.76%	7442	23.35%
Minor arterial	21.03%	20.79%	21.44%	20.19%	12.18%	5994	18.81%
Collector	17.91%	18.44%	21.98%	29.64%	1.91%	5930	18.60%
Local road or street	22.41%	19.81%	17.24%	18.50%	36.41%	7326	22.98%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	31874	100.00%
Total	2820	8157	4118	9720	7059	31874	
Overall %	8.85%	25.59%	12.92%	30.50%	22.15%	100.00%	

Table 33 shows that fatal collisions occurred on rural roads almost 55% of the time, but these collisions were much more common in the South region (71%). This difference is likely a function of the road network of each of the regions with some states having more rural roads than others. These results for the I-95 jurisdictions are similar to those for the all of the U.S. (56% rural) based on the FARS data for 2007 (NHTSA, 2008).

Table 33: Rural/urban road by region

Rural/urban	New England	North	Central	South	Florida	Total	Overall %
Rural	39.57%	46.98%	56.38%	70.79%	43.44%	17363	54.10%
Urban	60.43%	53.02%	43.62%	29.21%	56.56%	14729	45.90%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	32092	100.00%
Total	2833	8168	4122	9908	7061	32092	
Overall %	8.83%	25.45%	12.84%	30.87%	22.00%	100.00%	

Table 34 indicates that slightly more than 75% of fatal crashes occurred on roads with a speed limit of 31-55 mph, but in Florida they were more common on roads with a speed limit of 70 mph (11%) compared to the other regions. This may reflect the fact that there are fewer highways in those regions with such speed limits. Fatal collisions occurring on roads with a speed limit of 30 mph or less were most common in New England (26%) and least common in the South region (4%).

Table 34: Speed limit by region

Speed limit	New England	North	Central	South	Florida	Total	Overall %
<=30	26.11%	11.32%	11.08%	4.07%	11.94%	3304	10.38%
31-55	60.46%	79.23%	78.69%	84.10%	65.06%	24183	75.94%
56-69	12.15%	9.08%	10.18%	6.18%	12.17%	2941	9.24%
70+	1.28%	0.37%	0.05%	5.64%	10.83%	1417	4.45%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	31845	100.00%
Total	2815	7503	4087	10365	7075	31845	
Overall %	8.84%	23.56%	12.83%	32.55%	22.22%	100.00%	

As can be seen in Table 35, almost 70% of fatal crashes occurred on level roads although this was much more common in Florida (85%) than the other regions. This regional difference may simply reflect the fact that there are fewer hills in Florida compared to other regions. Roads with grades were more common in the South region (36%).

Table 35: Road profile by region

Road profile	New England	North	Central	South	Florida	Total	Overall %
Level	72.73%	66.33%	68.75%	60.23%	85.41%	22584	69.41%
Grade	23.67%	29.72%	28.21%	35.78%	14.59%	8995	27.64%
Hill crest/sag	3.60%	3.94%	3.05%	3.99%	0.00%	960	2.95%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	32539	100.00%
Total	2725	8165	4102	10411	7136	32539	
Overall %	8.37%	25.09%	12.61%	32.00%	21.93%	100.00%	

Road alignment in fatal collisions by region is presented in Table 36. Although almost a third of fatal collisions occurred on curved roads, this was much less common in Florida (21%) than

in the Central region (39%). Again, the regional differences may reflect the fact that there are fewer curved roads in Florida. Curves have implications for drivers losing control of their vehicles since traveling around a curve too quickly can result in the loss of tire friction.

Table 36: Road alignment by region

Road alignment	New England	North	Central	South	Florida	Total	Overall %
Straight	64.63%	64.91%	61.05%	64.04%	79.41%	21965	67.29%
Curved	35.37%	35.09%	38.95%	35.96%	20.59%	10676	32.71%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	32641	100.00%
Total	2805	8170	4113	10415	7138	32641	
Overall %	8.59%	25.03%	12.60%	31.91%	21.87%	100.00%	

Road condition in fatal crashes, which is shown in Table 37, indicates that fatal crashes happened primarily on dry roads (84%) but they were most common in Florida (88%) and the South region (87%) and least common in the New England region (77%). Fatal crashes occurring on wet or snow covered roads were most common in New England and the North region (22% and 20% respectively) and least common in Florida (12%) which likely reflects the climate in those regions.

Table 37: Road surface condition by region

Road condition	New England	North	Central	South	Florida	Total	Overall %
Dry	77.50%	79.91%	84.17%	87.38%	88.21%	27534	84.43%
Wet	15.77%	14.62%	13.84%	12.13%	11.67%	4299	13.18%
Snow/slush/ice	5.98%	5.01%	1.82%	0.33%	0.00%	686	2.10%
Other	0.75%	0.45%	0.17%	0.16%	0.13%	91	0.28%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	32610	100.00%
Total	2809	8160	4119	10400	7122	32610	
Overall %	8.61%	25.02%	12.63%	31.89%	21.84%	100.00%	

The proportion of fatal crashes at intersections is shown in Table 38. Although approximately 29% of crashes occurred at intersections, these crashes at intersections were most frequent in Florida (37%) and least frequent in the South region (24%).

Table 39: Collision at an intersection by region

Intersection	New England	North	Central	South	Florida	Total	Overall %
No	72.11%	69.65%	70.58%	76.20%	62.91%	23099	70.60%
Yes	27.89%	30.35%	29.42%	23.80%	37.09%	9620	29.40%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	32719	100.00%
Total	2861	8177	4127	10423	7131	32719	
Overall %	8.74%	24.99%	12.61%	31.86%	21.79%	100.00%	

In instances when fatal collisions occurred at intersections, some 62% of crashes occurred at intersections with traffic controls (e.g., traffic signal, stop or yield signs, etc.), as shown in Table 40. The presence of some type of intersection traffic control in fatal crashes was most common in Florida (76%) and least common in New England (41%). Elvik (2007) has found that the benefit-cost ratio for installing traffic signals at X intersections (i.e., four leg intersections) is about 4:1 and 5:1 for installing them at T intersections (i.e., three leg intersections).

Table 40: Presence of traffic controls by region

Traffic controls	New England	North	Central	South	Florida	Total	Overall %
No controls	58.71%	43.89%	54.85%	32.33%	23.64%	3619	37.88%
Traffic signal	15.78%	25.55%	27.38%	22.61%	33.62%	2525	26.43%
Stop/yield	20.45%	27.49%	16.58%	42.48%	28.54%	2842	29.75%
Other	5.05%	3.08%	1.19%	2.58%	14.19%	568	5.95%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	9554	100.00%
Total	792	2470	1176	2481	2635	9554	
Overall %	8.29%	25.85%	12.31%	25.97%	27.58%	100.00%	

Turning to vehicle characteristics of vehicles in fatal collisions, Table 41 presents the type of vehicle involved in fatal collisions by region. It can be seen that some 45% of the vehicles were cars, followed by sport utility vehicles (15%) and pick-up trucks (15%). The vehicle type was more commonly a car in fatal crashes in New England and the North region (49% and 47% respectively) and more often a pick-up truck in the South region (19%). The type of vehicle involved in a fatal collision clearly is a function of how many of these vehicles are on the road in the various regions.

Table 41: Type of vehicles involved in fatal collisions by region

Vehicle type	New England	North	Central	South	Florida	Total	Overall %
Car	48.98%	47.43%	45.96%	42.29%	42.27%	26391	44.61%
Utility	15.08%	14.62%	15.71%	15.58%	14.93%	8967	15.16%
Van	5.59%	7.46%	6.26%	6.10%	6.30%	3832	6.48%
Truck	11.73%	10.35%	14.68%	19.27%	16.13%	8900	15.04%
Heavy truck/bus	5.77%	9.53%	7.96%	8.44%	7.65%	4885	8.26%
Motorcycle	11.30%	9.41%	8.39%	7.57%	11.77%	5588	9.45%
Other	1.55%	1.20%	1.03%	0.74%	0.95%	598	1.01%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	59161	100.00%
Total	4833	15296	7186	17825	14021	59161	
Overall %	8.17%	25.85%	12.15%	30.13%	23.70%	100.00%	

The model year of vehicles involved in fatal crashes is shown in Table 42. Although most vehicles were manufactured in 2000 or earlier (58%), late model vehicles (2004+) were more common in fatal crashes in Florida (25%) and less common in the South region (18%).

Table 42: Model year of vehicles involved by region

Model year	New England	North	Central	South	Florida	Total	Overall %
<=1997	36.25%	35.95%	37.37%	42.81%	34.18%	22217	37.80%
1998-2000	21.11%	19.21%	20.03%	21.13%	19.58%	11833	20.13%
2001-2003	21.63%	22.53%	20.45%	18.40%	21.06%	12113	20.61%
2004+	21.02%	22.31%	22.16%	17.66%	25.19%	12618	21.47%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	58781	100.00%
Total	4795	15167	7135	17745	13939	58781	
Overall %	8.16%	25.80%	12.14%	30.19%	23.71%	100.00%	

As can be seen in Table 43, 88% of the vehicles involved in fatal collisions were licensed within the state where the collision occurred. Out-of-state vehicles involved in fatal collisions were more prevalent in the Central region (17%) than in Florida (8%), which is somewhat surprising given the large number of tourists going to Florida. On the other hand, Florida is mostly a peninsula without many contiguous states compared to other states. The fact that more vehicles were from out of state in the other regions may be a reflection of the ease with which people can travel from one state to another.

Table 43: License plate within the state by region

Vehicle license	New England	North	Central	South	Florida	Total	Overall %
In state	87.25%	88.75%	82.65%	88.17%	91.98%	51737	88.48%
Out of state	12.75%	11.25%	17.35%	11.83%	8.02%	6733	11.52%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	58470	100.00%
Total	4770	15068	7078	17634	13920	58470	
Overall %	8.16%	25.77%	12.11%	30.16%	23.81%	100.00%	

Temporal and Environmental Characteristics

Table 44 displays the day of the week on which the fatal crashes occurred. The most frequent days for fatal crashes were Saturday (18%), followed by Sunday (17%) and Friday (16%), relative to 11-12% of fatal crashes on other days. There was little difference across regions. These results are similar to other studies which have looked at fatal crashes by day of week for all of the U.S. using FARS data (NHTSA, 2008).

Table 44: Day of week of collision by region

Day of week	New England	North	Central	South	Florida	Total	Overall %
Sunday	16.79%	16.33%	16.98%	16.12%	18.98%	5553	16.96%
Monday	11.13%	12.58%	12.09%	13.11%	11.99%	4071	12.43%
Tuesday	11.97%	12.30%	11.65%	11.64%	11.07%	3834	11.71%
Wednesday	12.01%	12.07%	12.33%	12.19%	11.74%	3950	12.06%
Thursday	13.44%	13.01%	12.48%	12.81%	12.69%	4206	12.85%
Friday	16.09%	15.92%	15.38%	15.58%	15.16%	5105	15.59%
Saturday	18.57%	17.78%	19.09%	18.55%	18.37%	6021	18.39%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	32740	100.00%

Total	2865	8177	4128	10424	7146	32740
Overall %	8.75%	24.98%	12.61%	31.84%	21.83%	100.00%

Table 45 presents the time of day that fatal collisions occurred by three hour blocks of time beginning at midnight. Over a third (36%) of the fatal crashes occurred at night (i.e., between 9:00pm and 5:59am). There was very little difference across regions in the time of the collision. These results are similar to other studies which have looked at the time of day in fatal crashes for all of the U.S. using FARS (NHTSA, 2008).

Table 45: Time of day by region

Time	New England	North	Central	South	Florida	Total	Overall %
12am-2:59am	15.83%	14.00%	14.16%	12.01%	14.18%	4427	13.58%
3am-5:59am	7.62%	8.79%	8.38%	8.42%	8.66%	2767	8.49%
6am-8:59am	8.18%	9.57%	9.82%	10.81%	8.82%	3165	9.71%
9am-11:59am	10.46%	10.18%	9.31%	10.17%	9.91%	3270	10.03%
12pm-2:59pm	14.29%	14.08%	14.07%	13.38%	13.29%	4466	13.70%
3pm-5:59pm	16.57%	16.25%	16.35%	17.21%	15.55%	5359	16.44%
6pm-8:59pm	13.41%	13.95%	13.80%	14.71%	15.51%	4714	14.46%
9pm-11:59pm	13.65%	13.19%	14.12%	13.30%	14.09%	4425	13.58%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	32593	100.00%

Total	2849	8144	4116	10409	7075	32593
Overall %	8.74%	24.99%	12.63%	31.94%	21.71%	100.00%

NHTSA (2008) has found that the incidence of impaired driving (i.e., BAC is 0.08% or higher) is more frequent among drivers during the weekend, particularly in single vehicle collisions. Therefore, TIRF combined time of day and day of week to examine the distribution of fatal crashes during weekdays and weekends (i.e., Friday from 6:00pm to Monday 5.59am). It can be seen in Table 46 that the majority of the fatal crashes occurred during weekdays (58%), although weekends (42%) are somewhat over-represented given that the weekend only comprises 36% of the time in the week. There were no differences across the regions. This weekend effect is consistent with alcohol involvement in fatal collisions (NHTSA, 2008). However, based on these data it cannot be concluded that the risk of a fatal crash is greater during weekends since exposure data (i.e., amount of travel during weekends versus weekdays) would be needed to make such risk comparisons.

Table 46: Collision on weekday or weekend by region

Weekday/end	New England	North	Central	South	Florida	Total	Overall %
Weekday	58.05%	58.37%	57.12%	58.49%	55.40%	18838	57.57%
Weekend	41.95%	41.63%	42.88%	41.51%	44.60%	13882	42.43%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	32720	100.00%
Total	2863	8172	4128	10423	7134	32720	
Overall %	8.75%	24.98%	12.62%	31.86%	21.80%	100.00%	

An examination of fatal crashes according to the quarters of the year, which roughly correspond to seasons (Table 47) shows that overall, fatal collisions were slightly more common in the spring and the summer, i.e., April to June and July to September. There was a tendency for fatal crashes to be more common from July to September in New England and the North regions (30% and 29%, respectively), whereas they were more frequent in Florida during January to March (26%). The latter finding is consistent with tourists traveling to Florida during this time period.

Table 47: Quarter of year by region

Quarter of year	New England	North	Central	South	Florida	Total	Overall %
Jan-Mar	20.87%	20.94%	21.08%	21.77%	25.85%	7296	22.28%
Apr-Jun	26.70%	26.09%	25.12%	27.76%	26.53%	8725	26.65%
Jul-Sep	29.91%	28.98%	27.93%	25.35%	22.77%	8650	26.42%
Oct-Dec	22.51%	23.99%	25.87%	25.12%	24.85%	8069	24.65%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	32740	100.00%
Total	2865	8177	4128	10424	7146	32740	
Overall %	8.75%	24.98%	12.61%	31.84%	21.83%	100.00%	

Light conditions at the time of the fatal collision are shown in Table 48. Just over 50% of the collisions occurred during daylight. Fatal collisions during dark conditions were more common in the South region (35%) and less common in New England (23%). Collisions occurring in the dark where the road had street lights were more frequent in Florida (22%) and least frequent in the South region (8%).

Table 48: Light conditions by region

Light conditions	New England	North	Central	South	Florida	Total	Overall %
Daylight	51.90%	51.87%	51.13%	53.02%	48.23%	16761	51.35%
Dark	23.45%	25.27%	30.48%	35.41%	25.32%	9471	29.02%
Dark & lighted	20.70%	18.54%	14.24%	7.58%	22.28%	5061	15.51%
Dawn/dusk	3.94%	4.32%	4.15%	4.00%	4.17%	1348	4.13%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	32641	100.00%
Total	2840	8144	4121	10412	7124	32641	
Overall %	8.70%	24.95%	12.63%	31.90%	21.83%	100.00%	

Weather conditions in fatal crashes are presented in Table 49. In almost 90% of fatal collisions, there were no adverse conditions. Fatal crashes in rain, sleet, or snow were more common in New England (13%) or the North region (12%) than in Florida (7%) which is a function of the difference in climate.

Table 49: Weather conditions by region

Weather conditions	New England	North	Central	South	Florida	Total	Overall %
No adverse weather	85.84%	86.42%	91.82%	89.99%	91.78%	29133	89.36%
Rain	9.25%	8.52%	6.12%	8.42%	6.80%	2566	7.87%
Sleet/snow	3.42%	3.65%	1.29%	0.22%	0.00%	469	1.44%
Other	1.49%	1.41%	0.78%	1.37%	1.42%	433	1.33%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	32601	100.00%

Total	2810	8146	4120	10409	7116	32601
Overall %	8.62%	24.99%	12.64%	31.93%	21.83%	100.00%

APPENDIX B:

STATE CRASH ANALYSES

Tables: 50-182

Georgia State Crash Results

Table 50 shows year by collision severity. The overall row percentage shows that nearly 2% of all injury collisions in GA for the years 2005, 2006, and 2007 were fatal collisions, 5% were serious injury collisions, and 93% were other injury collisions. There was little difference across categories of injury severity in relation to year.

Table 50: Year by collisions severity

Year	Fatal	Serious injury	Other injury	Total	Overall %
2005	34.56%	33.10%	34.59%	90773	34.51%
2006	33.58%	33.29%	33.14%	87210	33.16%
2007	31.86%	33.61%	32.26%	85021	32.33%
Total	100.00%	100.00%	100.00%	263004	100.00%
Total	4193	13502	245309	263004	
Overall %	1.59%	5.13%	93.27%	100.00%	

Type of collision. As can be seen in Table 51, approximately 25% of all injury collisions involved a single vehicle. This type of collision was much more common when there were fatalities (54%) or serious injuries involved (45%) compared to other injuries (24%). When more than one vehicle was involved in the crash, 31% of injury collisions involved angle collisions, suggesting intersection type collisions. Angle impacts were less frequent for fatal (25%) and serious injury collisions (27%) than for other injury collisions (31%) and rear-end collisions were much less common for fatal (6%) and serious injury crashes (14%) compared to other injury crashes (36%). In addition, head-on collisions were more common for fatal (11%) and serious injury collisions (8%) compared to other injury collisions (4%).

Table 51: Manner of collision by collision severity

Manner of collision	Fatal	Serious injury	Other Injury	Total	Overall %
Angle	25.13%	27.61%	31.18%	83044	30.88%
Head on	11.54%	7.71%	3.77%	11074	4.12%
Rear end	6.17%	13.77%	35.66%	91366	33.97%
Side-swipe	3.52%	6.00%	5.72%	15319	5.70%
No other vehicle	53.64%	44.91%	23.67%	68136	25.34%
Total	100.00%	100.00%	100.00%	268939	100.00%
Total	4655	14510	249774	268939	
Overall %	1.73%	5.40%	92.87%	100.00%	

Table 52 reveals that while most collisions were vehicle to vehicle (74%; see overall column %), hitting a fixed object was more common for fatal (33%) and serious injury (27%) collisions compared to other injury collisions (16%). Crashes in which the vehicle overturned were more common for fatal and serious injury collisions (10% and 8% respectively) compared to other

injury collisions (4%) as were collisions with pedestrians (10% and 7% for fatal and serious injuries) compared to other injuries (2%).

Table 52: Harmful event by collision severity

Harmful event	Fatal	Serious injury	Other Injury	Total	Overall %
Overturn	9.71%	8.30%	3.91%	11428	4.25%
Pedestrian	9.60%	6.62%	1.69%	5639	2.10%
Vehicle-vehicle collision	44.08%	53.26%	75.35%	197973	73.61%
Fixed object	33.02%	26.66%	15.84%	44958	16.72%
Other	3.59%	5.16%	3.21%	8941	3.32%
Total	100.00%	100.00%	100.00%	268939	100.00%
Total	4655	14510	249774	268939	
Overall %	1.73%	5.40%	92.87%	100.00%	

A vehicle was towed away in almost half of all injury collisions (49%). Not surprisingly, vehicles were more likely to be towed away in fatal and serious injury collisions (84% and 65% respectively) than in other injury collisions (48%) as shown in Table 53.

Table 53: Tow away by collision severity

Towed away	Fatal	Serious injury	Other Injury	Total	Overall %
No	15.98%	34.97%	52.29%	260545	50.92%
Yes	84.02%	65.03%	47.71%	251096	49.08%
Total	100.00%	100.00%	100.00%	511641	100.00%
Total	7542	24500	479599	511641	
Overall %	1.47%	4.79%	93.74%	100.00%	

In summary, 25% of the collisions involved a single vehicle, but this was considerably more frequent in fatal (54%) and serious injury (45%) collisions. Angle impacts were less frequent for fatal (25%) and serious injury collisions (27%) than for other injury collisions (31%) and rear-end collisions were much less common for fatal (6%) and serious injury crashes (14%) compared to other injury crashes (36%). In addition, head-on collisions were more common for fatal (11%) and serious injury collisions (8%) compared to other injury collisions (4%). Overall, 74% of the collisions involved a vehicle to vehicle impact; however, striking a fixed object was more common among fatal and serious injury collisions (33% and 27% respectively) compared to other injury collisions (16%). While approximately half of the vehicles were towed away, vehicles were more often towed away for fatal (84%) and serious injury (65%) collisions than other injury collisions (47%).

Driver characteristics. Drivers were aged 16-34 in little over 46% of all injury collisions, but they were involved in only 41% of the fatal collisions compared to 46% of serious injury

and 46% of other injury collisions (Table 4.1.2.1). There was a tendency for older drivers (55+) to more often be involved in fatal collisions (24%) compared to serious injury (19%) or other injury collisions (19%), indicative of greater frailty among older people.

Table 54: Driver age by collision severity

Driver age	Fatal	Serious injury	Other Injury	Total	Overall %
<15	1.16%	1.54%	0.61%	3451	0.67%
16-20	11.54%	12.82%	13.61%	70189	13.54%
21-24	9.65%	11.31%	10.87%	56352	10.87%
25-34	20.08%	21.73%	21.95%	113590	21.91%
35-44	17.84%	18.92%	19.51%	100848	19.46%
45-54	15.80%	14.23%	14.67%	76041	14.67%
55-64	10.82%	8.16%	8.87%	45945	8.86%
65-74	5.53%	3.64%	3.85%	20042	3.87%
75+	7.58%	7.65%	6.05%	31906	6.16%
Total	100.00%	100.00%	100.00%	518364	100.00%
Total	8049	25650	484665	518364	
Overall %	1.55%	4.95%	93.50%	100.00%	

With regard to the gender of the drivers in injury collisions, male drivers were involved in 56% of all injury collisions and they were more often involved in fatal (72%) and serious injury collisions (65%) compared to other injury collisions (55%) as shown in Table 55.

Table 55: Driver gender by collision severity

Gender	Fatal	Serious injury	Other Injury	Total	Overall %
Female	27.56%	34.87%	45.13%	229893	44.35%
Male	72.44%	65.13%	54.87%	288471	55.65%
Total	100.00%	100.00%	100.00%	518364	100.00%
Total	8049	25650	484665	518364	
Overall %	1.55%	4.95%	93.50%	100.00%	

The vehicle manoeuvre performed by the driver at the time of the crash is presented in Table 56. Most drivers (55%) were traveling straight at the time of the collision but crashes where any drivers were negotiating curves were more common in fatal and serious injury collisions (23% and 14% respectively) compared to those involved in other injury crashes (7%). Drivers less often stopped at the time of the collision in fatal and serious injury crashes (3% and 7%) compared to the other injury collisions (16%).

Table 56: Vehicle manoeuvre by collision severity

Vehicle manoeuvre	Fatal	Serious injury	Other Injury	Total	Overall %
Left turn	7.28%	11.72%	12.34%	62620	12.24%
Right turn	0.53%	1.93%	3.41%	16892	3.30%
Stopped	3.31%	6.75%	16.05%	78866	15.41%
Straight	58.07%	56.13%	54.96%	281729	55.06%
Changing lanes	3.16%	4.26%	3.13%	16297	3.19%
Negotiating curve	23.06%	14.13%	6.51%	36426	7.12%
Other	4.59%	5.07%	3.59%	18811	3.68%
Total	100.00%	100.00%	100.00%	511641	100.00%
Total	7542	24500	479599	511641	
Overall %	1.47%	4.79%	93.74%	100.00%	

Table 57 shows that overall, about 74% of drivers in injury collisions were wearing a seat belt at the time of the collision. However, restraint use was lower for the fatal (49%) and serious injury (55%) collisions than for other injury collisions (75%). It was much more common for no restraint to be used in fatal (34%) and serious injury collisions (21%) than for other injury collisions.

Table 57: Restraint use by collision severity

Restraint use	Fatal	Serious injury	Other Injury	Total	Overall %
None used	34.43%	21.29%	7.05%	42424	8.18%
Seat belt	48.70%	55.37%	75.10%	382099	73.71%
Helmet	5.23%	4.81%	1.38%	8344	1.61%
Unknown	11.64%	18.53%	16.47%	85497	16.49%
Total	100.00%	100.00%	100.00%	518364	100.00%
Total	8049	25650	484665	518364	
Overall %	1.55%	4.95%	93.50%	100.00%	

The driver's condition at the time of the crash in terms of alcohol involvement is presented in Table 58. It can be seen that overall, 3% of all injury collision involved a driver who was drinking, but this was more common for serious injury collisions (8%) compared to other injury collisions (3%).

Table 58: Driver condition by collision severity

Driver condition	Fatal	Serious injury	Other Injury	Total	Overall %
Not drinking	60.85%	80.26%	92.03%	465605	91.00%
Not known if drinking	30.76%	9.95%	4.04%	24155	4.72%
Alcohol involved	5.97%	7.66%	2.85%	15985	3.12%
Other	2.43%	2.13%	1.08%	5896	1.15%
Total	100.00%	100.00%	100.00%	511641	100.00%
Total	7542	24500	479599	511641	
Overall %	1.47%	4.79%	93.74%	100.00%	

Factors that contributed to the crash are presented in Table 59. The most prevalent contributing factors appear to be drivers following too close (17%), failing to yield (12%), losing control of the vehicle (9%), and driving under the influence (3%). Crashes where drivers were following too close were the least common for fatal and serious injury collisions (3% and 7% respectively) compared to other injury collisions (18%). For crashes where drivers failed to yield, there was little variation in terms of collision severity. Crashes where drivers lost control were more common in fatal and serious injury collisions (28% and 19% respectively) than in other injury collisions (8%). Driving under the influence was the most common in serious injury collisions (8%) followed by fatal injury collisions (6%) and other injury collisions (3%).

Table 59: Contributing factors by collision severity

Contributing factors	Fatal	Serious	Other	Total	Overall %
DUI					
No	93.79%	92.13%	97.27%	496154	96.97%
Yes	6.21%	7.87%	2.73%	15487	3.03%
Total	100.00%	100.00%	100.00%	511641	100.00%
Total	7542	24500	479599	511641	
Overall %	1.47%	4.79%	93.74%	100.00%	
Following too close					
No	96.94%	92.91%	82.41%	425335	83.13%
Yes	3.06%	7.09%	17.59%	86306	16.87%
Total	100.00%	100.00%	100.00%	511641	100.00%
Total	7542	24500	479599	511641	
Overall %	1.47%	4.79%	93.74%	100.00%	
Failed to yield					
No	90.93%	88.33%	87.81%	449631	87.88%
Yes	9.07%	11.67%	12.19%	62010	12.12%
Total	100.00%	100.00%	100.00%	511641	100.00%
Total	7542	24500	479599	511641	
Overall %	1.47%	4.79%	93.74%	100.00%	
Driver lost control					
No	72.30%	81.39%	91.58%	464628	90.81%
Yes	27.70%	18.61%	8.42%	47013	9.19%
Total	100.00%	100.00%	100.00%	511641	100.00%
Total	7542	24500	479599	511641	
Overall %	1.47%	4.79%	93.74%	100.00%	

In less than 1% of all injury crashes the driver was exceeding the speed limit, and in nearly 4% of all injury collisions the driver was driving too fast for conditions. Both exceeding the speed limit or driving too fast for conditions were more common in fatal (6% and 8% respectively) and serious injury collisions (3% and 7% respectively) compared to other injury collisions (0.8% and 4%).

Table 60: Speeding as a contributing factor by collision severity

Speeding	Fatal	Serious injury	Other injury	Total	Overall %
Exceeding speed limit					
No	94.21%	97.01%	99.25%	506894	99.07%
Yes	5.79%	2.99%	0.75%	4747	0.93%
Total	100.00%	100.00%	100.00%	511641	100.00%
Total	7542	24500	479599	511641	
Overall row %	1.47%	4.79%	93.74%	100.00%	
Too fast for conditions					
No	91.86%	92.92%	96.25%	491303	96.02%
Yes	8.14%	7.08%	3.75%	20338	3.98%
Total	100.00%	100.00%	100.00%	511641	100.00%
Total	7542	24500	479599	511641	
Overall %	1.47%	4.79%	93.74%	100.00%	

In summary, almost half of the drivers involved in all injury collisions were aged 16-34. There was a tendency for older drivers (55+) to more often be involved in fatal collisions (24%) compared to serious collisions (19%) or other injury crashes (19%). Overall, male drivers were involved in about 56% of all injury collisions but they were more often involved in fatal (72%) and serious injury collisions (65%) compared to other injury collisions (55%). Most drivers were traveling straight at the time of the collision but they were more often negotiating curves in fatal and serious injury collisions (23% and 14% respectively) compared to those involved in other injury crashes (7%). Restraint use was lower in fatal (49%) and serious injury collisions (55%) than in other injury collision (75%). While alcohol was rarely involved, it was more frequent in serious injury collisions (8%) compared to other injury collisions (3%). The driver losing control was more common for fatal and serious injury collisions (28% and 19% respectively) than for other injury collisions (8%). Crashes where drivers were following too close were the least common for fatal and serious injury collisions (3% and 7% respectively) compared to other injury collisions (18%). Both exceeding the speed limit or driving too fast for conditions were more common in fatal (6% and 8% respectively) and serious injury collisions (3% and 7% respectively) compared to other injury collisions (0.8% and 4%).

Road and vehicle characteristics. Table 61 presents the location of the collision impact in relation to the roadway by collision severity. The majority of collisions occurred on the roadway (79%) but a sizeable minority (32% and 24% respectively for fatal and serious injury) took place off the roadway compared to other injury collisions (14%). This is consistent with run off the road types of collisions.

Table 61: Location of impact by collision severity

Collision location	Fatal	Serious injury	Other Injury	Total	Overall %
On roadway	59.14%	66.56%	79.98%	212177	78.89%
On shoulder	7.26%	7.32%	4.67%	13075	4.86%
Off roadway	31.54%	24.18%	13.64%	39051	14.52%
Other	2.06%	1.94%	1.70%	4636	1.72%
Total	100.00%	100.00%	100.00%	268939	100.00%
Total	4655	14510	249774	268939	
Overall %	1.73%	5.40%	92.87%	100.00%	

Table 62 indicates whether the roadway at the crash location was separated or not. Overall, 63% of the roads were two-way roads with no physical separation but these types of roads were less common for fatal collisions (54%) compared to serious injury and other injury collisions (62% and 63% respectively). Two-way roads with a physical separation were more common for the fatal collisions (38%) compared to serious (29%) and other injury collisions (25%). These roads are more likely to have higher speed limits so fatalities would be more likely in the event of a collision.

Table 62: Type of road way by collision severity

Type of road	Fatal	Serious injury	Other Injury	Total	Overall %
Two way-no physical separation	54.02%	61.59%	63.28%	168797	63.03%
Two way-physical separation	37.89%	28.98%	25.43%	69204	25.84%
Two way-physical barrier	5.85%	5.07%	6.01%	15954	5.96%
One way	2.24%	4.37%	5.27%	13839	5.17%
Total	100.00%	100.00%	100.00%	267794	100.00%
Total	4648	14466	248680	267794	
Overall %	1.74%	5.40%	92.86%	100.00%	

Table 63 shows that the majority of the fatal and serious injury collisions occurred on dry roads (82%) and this was somewhat more common in fatal (86%) and serious injury collisions (86%) than in other injury collisions (82%). On the other hand, collisions in which the roads were wet were less common in fatal (13%) and somewhat more common among serious injury collisions (14%) compared to other injury collisions (18%). This may suggest that drivers are more cautious when driving in the presence of less favorable road conditions.

Table 63: Road condition by collision severity

Road condition	Fatal	Serious injury	Other Injury	Total	Overall %
Dry	86.38%	85.54%	81.88%	220954	82.16%
Wet	13.13%	13.84%	17.51%	46349	17.23%
Other	0.49%	0.62%	0.61%	1636	0.61%
Total	100.00%	100.00%	100.00%	268939	100.00%
Total	4655	14510	249774	268939	
Overall %	1.73%	5.40%	92.87%	100.00%	

The presence of various traffic controls during injury crashes is shown in Table 64. The most common traffic controls in all collisions were lane markings (50%) and traffic signals (24%). Traffic signals were less often present in fatal (8%) and serious injury collisions (16%) than in other injury collisions (25%). No passing zone signs were more common in fatal collisions (23%) followed by serious injury (13%) and other injury collisions (9%).

Table 64: Traffic control by collision severity

Traffic controls	Fatal	Serious injury	Other Injury	Total	Overall %
No control present	5.30%	9.85%	7.47%	38637	7.55%
Traffic signal	8.34%	16.08%	24.52%	122171	23.88%
Stop or yield sign	7.04%	7.96%	8.78%	44604	8.72%
No passing zone	22.95%	13.00%	7.83%	42474	8.30%
Lanes	54.93%	51.69%	50.36%	258324	50.49%
Other	1.43%	1.42%	1.04%	5431	1.06%
Total	100.00%	100.00%	100.00%	511641	100.00%
Total	7542	24500	479599	511641	
Overall %	1.47%	4.79%	93.74%	100.00%	

Table 65 indicates whether the road at the crash location was straight or curved. While the road was straight in the majority of injury collisions, fatal and serious injury collisions more often occurred on curved roads (31% and 23% respectively) compared to other injury collisions (13%) suggesting the driver losing control of the vehicle.

Table 65: Road alignment by collision severity

Road alignment	Fatal	Serious injury	Other Injury	Total	Overall %
Straight	68.59%	77.11%	86.68%	230885	85.85%
Curved	31.41%	22.89%	13.32%	38054	14.15%
Total	100.00%	100.00%	100.00%	268939	100.00%
Total	4655	14510	249774	268939	
Overall %	1.73%	5.40%	92.87%	100.00%	

Whether the road was level or graded at the crash location is presented in Table 66. In two-thirds of all injury collisions, the road was level, but the roads more frequently had a grade in fatal (54%) and serious injury collisions (39%) compared to other injury collisions (33%).

Table 66: Road profile by collision severity

Road profile	Fatal	Serious injury	Other Injury	Total	Overall %
Level	46.25%	61.48%	67.19%	178908	66.52%
Grade	53.75%	38.52%	32.81%	90031	33.48%
Total	100.00%	100.00%	100.00%	268939	100.00%
Total	4655	14510	249774	268939	
Overall %	1.73%	5.40%	92.87%	100.00%	

The vehicle type is presented in Table 67. Passenger cars were involved in about 56% of all injury collisions. The next most common vehicles in crashes were pick-up trucks (15%) and utility vehicles (15%). Large trucks were more commonly involved and motorcycles were somewhat more commonly involved in fatal (10% and 6% respectively) and serious injury collisions (5% and 6%) compared to other injury collisions (3% and 2%).

Table 67: Vehicle type by collision severity

Vehicle type	Fatal	Serious injury	Other Injury	Total	Overall %
Passenger car	41.00%	48.94%	57.00%	288444	56.38%
Pickup truck	19.89%	17.13%	15.26%	78886	15.42%
Large truck	9.68%	5.04%	3.30%	17777	3.47%
Van	5.33%	5.55%	6.16%	31298	6.12%
Utility	14.40%	13.64%	14.80%	75424	14.74%
Motorcycle	6.28%	5.82%	1.57%	9421	1.84%
Other	3.42%	3.88%	1.91%	10391	2.03%
Total	100.00%	100.00%	100.00%	511641	100.00%
Total	7542	24500	479599	511641	
Overall %	1.47%	4.79%	93.74%	100.00%	

Sixty percent of the vehicles involved in injury collisions were manufactured in 2000 or earlier as indicated in Table 68. There were no notable differences across levels of collision severity in terms of vehicle model year.

Table 68: Model year by collision severity

Model year	Fatal	Serious injury	Other Injury	Total	Overall %
<=1997	40.48%	39.94%	38.33%	191301	38.44%
1998-2000	21.75%	21.06%	21.88%	108679	21.84%
2001-2003	19.30%	20.41%	21.08%	104622	21.02%
2004+	18.47%	18.59%	18.71%	93062	18.70%
Total	100.00%	100.00%	100.00%	497664	100.00%
Total	7337	23528	466799	497664	
Overall %	1.47%	4.73%	93.80%	100.00%	

Most (91%) vehicles involved in all injury collisions were licensed in Georgia (see Table 69). There was little variation across categories of injury severity.

Table 69: Vehicle licensing State by collision severity

Vehicle license	Fatal	Serious injury	Other Injury	Total	Overall %
In state	87.89%	90.13%	91.20%	433097	91.10%
Out of state	12.11%	9.87%	8.80%	42318	8.90%
	100.00%	100.00%	100.00%	475415	100.00%
Total	6960	21903	446552	475415	
Overall %	1.46%	4.61%	93.93%	100.00%	

In summary, most collisions occurred on the roadway, but a sizeable minority (32% and 24% respectively for fatal and serious injury) took place off the roadway compared to other injury collisions (14%). Overall, 63% of the roads were two-way roads with no physical separation but these types of roads were less common in fatal collisions (54%) compared to serious injury and other injury collisions (62% and 63% respectively). Two-way roads with a physical separation were more common in fatal collisions (38%) compared to serious (29%) and other injury collisions (25%). The majority of the fatal and serious injury collisions occurred on dry roads (82%) and this was somewhat more frequent in fatal collisions and collisions in which roads were wet were less common in fatal collisions. While the road was straight in the majority of injury collisions, fatal and serious injury collisions more often occurred on curved roads (31% and 23% respectively) compared to other injury collisions (13%). In two-thirds of all injury collisions, the road was level but the roads more frequently had a grade in fatal (54%) and serious injury collisions (39%) compared to other injury collisions (33%). The vehicles involved were most often passenger cars (56%). Large trucks were more commonly involved and motorcycles were somewhat more commonly involved in fatal (10% and 6% respectively) and serious injury collisions (5% and 6%) compared to other injury collisions (3% and 2%). Sixty percent of the vehicles were manufactured in 2000 or earlier and this did not vary as a function of collision severity. Most drivers had licenses within Georgia and there was little variation across categories of injury severity.

Temporal and environmental characteristics. Collisions were fairly evenly distributed across the four quarters of the year and there was not much difference as a function of collision severity as can be seen in Table 70.

Table 70: Quarter of year by collision severity

Quarter of year	Fatal	Serious injury	Other Injury	Total	Overall %
Jan-Mar	22.66%	23.07%	23.99%	64334	23.92%
Apr-Jun	26.66%	26.38%	25.40%	68510	25.47%
Jul-Sep	24.25%	25.42%	24.84%	66868	24.86%
Oct-Dec	26.42%	25.12%	25.76%	69227	25.74%
Total	100.00%	100.00%	100.00%	268939	100.00%

Total	4655	14510	249774	268939
Overall %	1.73%	5.40%	92.87%	100.00%

Overall, injury collisions occurred somewhat more frequently on Fridays (17%), and 42% of all collisions occurred on Friday, Saturday or Sunday (Table 71). Fatal and serious injury

collisions were more common from Friday to Sunday (48% for both) compared to other injury collisions (42%).

Table 71: Day of week by collision severity

Day of week	Fatal	Serious injury	Other Injury	Total	Overall %
Sunday	15.81%	14.33%	10.51%	29060	10.81%
Monday	14.31%	13.41%	14.55%	38966	14.49%
Tuesday	11.92%	13.01%	14.57%	38828	14.44%
Wednesday	11.92%	12.49%	14.54%	38684	14.38%
Thursday	13.47%	13.24%	14.76%	39419	14.66%
Friday	15.19%	16.37%	17.39%	46518	17.30%
Saturday	17.38%	17.15%	13.68%	37464	13.93%
Total	100.00%	100.00%	100.00%	268939	100.00%
Total	4655	14510	249774	268939	
Overall %	1.73%	5.40%	92.87%	100.00%	

The time at which the collision occurred is shown in Table 72. The majority of injury collisions occurred between 3:00pm and 5:59pm (24%), the evening rush hour, but this was less common for fatal collisions (16%) compared to serious and other injury collisions (21% and 24% respectively). Sixteen percent of all injury collisions occurred at night (9:00pm to 5:59am), but fatal and severe collisions were more common at this time (32% and 25% respectively) compared to other injury collisions (15%).

Table 72: Time of collision by collision severity

Time	Fatal	Serious injury	Other Injury	Total	Overall %
12am-2:59am	10.74%	7.53%	3.85%	11205	4.17%
3am-5:59am	8.14%	6.06%	3.16%	9148	3.40%
6am-8:59am	11.71%	10.49%	13.24%	35132	13.06%
9am-11:59am	10.25%	10.39%	12.94%	34298	12.75%
12pm-2:59pm	13.34%	15.20%	18.70%	49528	18.42%
3pm-5:59pm	16.46%	21.23%	24.54%	65148	24.22%
6pm-8:59pm	16.13%	17.37%	15.60%	42242	15.71%
9pm-11:59pm	13.23%	11.74%	7.97%	22238	8.27%
Total	100.00%	100.00%	100.00%	268939	100.00%
Total	4655	14510	249774	268939	
Overall %	1.73%	5.40%	92.87%	100.00%	

As presented in Table 73, 30% of all injury collisions occurred on the weekend (Friday 6:00pm to Sunday 5:59am) but fatal and severe injury collisions were more frequent during this time (40% and 38% respectively) compared to other injury collisions (29%).

Table 73: Week/end by collision severity

Weekday/end	Fatal	Serious injury	Other Injury	Total	Overall %
Weekend	39.98%	38.29%	29.17%	80284	29.85%
Week	60.02%	61.71%	70.83%	188655	70.15%
Total	100.00%	100.00%	100.00%	268939	100.00%
Total	4655	14510	249774	268939	
Overall %	1.73%	5.40%	92.87%	100.00%	

Over two-thirds (67%) of fatal and serious injury collisions occurred when the weather conditions were clear (Table 74). When rain was present during the crash, it was somewhat less likely to occur in fatal collisions (8%) compared to other injury collisions (12%).

Table 74: Weather conditions by collision severity

Weather conditions	Fatal	Serious injury	Other Injury	Total	Overall %
Clear	69.11%	71.24%	67.18%	181349	67.43%
Cloudy	21.35%	18.65%	20.23%	54219	20.16%
Rain	8.01%	8.97%	11.74%	31007	11.53%
Other	1.53%	1.14%	0.85%	2364	0.88%
Total	100.00%	100.00%	100.00%	268939	100.00%
Total	4655	14510	249774	268939	
Overall %	1.73%	5.40%	92.87%	100.00%	

The majority of all injury collisions occurred during daylight (72%) but this was less common in fatal and serious injury collisions (53% and 62% respectively) than for other injury collisions (73%). Fatal and serious injury collisions were more common when it was dark and there were no street lights (33% and 21% respectively) compared to other injury collisions (12%) as shown in Table 75.

Table 75: Light conditions by collision severity

Light conditions	Fatal	Serious injury	Other Injury	Total	Overall %
Daylight	52.93%	61.73%	73.04%	193859	72.08%
Dusk or dawn	3.82%	3.48%	3.27%	8840	3.29%
Dark-lighted	9.92%	13.55%	11.48%	31114	11.57%
Dark-not lighted	33.32%	21.24%	12.21%	35126	13.06%
Total	100.00%	100.00%	100.00%	268939	100.00%
Total	4655	14510	249774	268939	
Overall %	1.73%	5.40%	92.87%	100.00%	

In summary, 42% of all collisions occurred on Friday, Saturday, or Sunday, but fatal and serious injury collisions were more common from Friday to Sunday (48% for both) compared to lower severity collisions (42%). The majority of injury collisions occurred between 3:00pm and 5:59pm (24%), the evening rush hour, but this was less common for fatal collisions (16%) compared to serious and other injury collisions (21% and 24% respectively). Sixteen percent of all injury collisions occurred at night (9:00pm to 5:59am) and fatal and severe collisions were more common at this time (32% and 25% respectively) compared to other injury collisions (15%). The majority of collisions occurred during the week (70%) but fatal and serious injury crashes occurred more often during the weekend (40% and 38% respectively) compared to other injury collisions (29%). The weather conditions were clear (67%) or cloudy (20%) most of the time for all injury collisions, but when rain was present during the crash, it

was somewhat less likely to occur in fatal injury collisions (8%) compared to other injury collisions (12%). Most collisions occurred in daylight (72%); however, fatal and serious injury collisions more often occurred when it was dark and there were no street lights (33% and 21% respectively) compared to other injury collisions (12%).

Pennsylvania State Crash Results

As shown in Table 76, only 1% of all injury collisions in Pennsylvania for the years 2005, 2006, and 2007 were fatal injury collisions (see overall row %). In addition, nearly 3% of all injury collisions were severe injury collisions, and the remaining 96% were other injury collisions. There was little difference between the years in relation to categories of injury severity (e.g., 35% of all fatal crashes happened in 2005, 33% in 2006, and 32% in 2007).

Table 76: Year by collision severity

Year	Fatal	Severe injury	Other injury	Total	Overall %
2005	35.11%	34.15%	33.81%	121160	33.83%
2006	32.54%	33.10%	32.58%	116720	32.59%
2007	32.35%	32.75%	33.62%	120270	33.58%
Total	100.00%	100.00%	100.00%	358150	100.00%
Total	3765	9265	345120	358150	
Overall %	1.05%	2.59%	96.36%	100.00%	

Type of collision. Table 77 shows that 43% of all injury collisions involved a single vehicle (see overall column %). In addition, both fatal and serious injury crashes were more likely to involve a single vehicle (53% and 52% respectively) compared to other less severe injury crashes (42%).

Table 77: Number of vehicles by severity

No. of vehicles	Fatal	Serious injury	Other injury	Total	Overall %
Single vehicle	53.16%	51.73%	42.26%	152619	42.62%
Multiple vehicle	46.84%	48.27%	57.74%	205508	57.38%
Total	100.00%	100.00%	100.00%	358127	100.00%
Total	3755	9258	345114	358127	
Overall %	1.05%	2.59%	96.37%	100.00%	

As shown in Table 78, the types of collisions that were most prevalent in Pennsylvania were those crashes that involved a vehicle hitting a fixed object (32%) and angle impacts (27%). However, fatal and serious injury collisions more often involved a vehicle hitting a fixed object (41% and 38% respectively) than collisions involving less severe injuries (32%). Fatal (6%) and serious injury collisions (8%) less often involved rear-end impacts compared to other

injury collisions (21%). In addition, fatal and serious injury collisions (10% and 11% respectively) more often involved head-on impacts compared to other injury collisions (4%). Fatal and serious injury collisions also more often involved a vehicle hitting a pedestrian (10% and 8% respectively) compared to other injury collisions (3%).

Table 78: Collision type by severity

Collision type	Fatal	Serious injury	Other injury	Total	Overall %
Non collision	5.89%	6.48%	4.18%	16267	4.26%
Rear-end	5.58%	8.32%	21.17%	78822	20.64%
Head-on	9.75%	10.58%	3.99%	16179	4.24%
Angle	22.24%	23.30%	26.83%	101856	26.68%
Sideswipe	3.79%	3.95%	5.82%	21945	5.75%
Hit fixed object	41.50%	37.51%	32.12%	123584	32.37%
Hit pedestrian	10.40%	8.22%	3.07%	12558	3.29%
Other or Unknown	0.86%	1.63%	2.83%	10590	2.77%
Total	100.00%	100.00%	100.00%	381801	100.00%
Total	4299	10411	367091	381801	
Overall %	1.13%	2.73%	96.15%	100.00%	

The point of impact on the vehicle during the crash is shown in Table 79. The most common point of impact for all collisions was the front of the vehicle (58%) followed by rear-end impacts (19%). In terms of frontal impact, there was not much difference between levels of injury severity. However, rear-end impacts were less common in fatal (8%) and serious injury collisions (10%) compared to other less severe injury collisions (19%).

Table 79: Point of impact by severity

Point of impact	Fatal	Serious injury	Other injury	Total	Overall %
Non-collision	4.68%	4.02%	2.60%	16164	2.66%
Front	58.73%	60.98%	57.99%	353084	58.07%
Right	11.91%	10.96%	9.49%	58073	9.55%
Rear	8.16%	9.53%	19.38%	115695	19.03%
Left	12.72%	11.74%	8.25%	50929	8.38%
Other	3.80%	2.76%	2.28%	14051	2.31%
Total	100.00%	100.00%	100.00%	607996	100.00%
Total	6029	14789	587178	607996	
Overall %	0.99%	2.43%	96.58%	100.00%	

Although the majority of injury collisions did not involve a vehicle rollover, Table 80 reveals that almost 9% of all casualty collisions involved a vehicle that rolled over. In fact, rollovers were almost three times more common in fatal collisions (25%) and about twice as common for serious injury collisions (17%) compared to other injury collisions (8%).

Table 80: Rollover by severity

Rollover	Fatal	Serious injury	Other injury	Total	Overall %
No	74.99%	82.95%	91.78%	327271	91.38%
Yes	25.01%	17.05%	8.22%	30881	8.62%
Total	100.00%	100.00%	100.00%	358152	100.00%
Total	3755	9259	345138	358152	
Overall %	1.05%	2.59%	96.37%	100.00%	

In summary, fatal and severe injury collisions in PA more often involved a single vehicle (53% and 52% respectively) and hitting a fixed object (41% and 38% respectively) than other injury collisions of a lower severity (42% for single vehicle crashes and 32% for hitting a fixed object). As for point of impact, rear-end impacts were less common in fatal (8%) and serious injury collisions (10%) compared to other less severe injury collisions (19%). Vehicle rollovers occurred considerably more often in fatal and severe injury collisions as well (25% and 17% respectively) compared to other injury collisions (8%).

Driver characteristics. The age of drivers involved in injury collisions in Pennsylvania are presented in Table 81. Overall, approximately 47% of the drivers were aged 16-34. There was not much difference in terms of age between fatal, serious and other injury collisions, although other injuries are more frequent among drivers aged 16-20 (17%) compared to fatal injuries (12%). Also, drivers aged 55 and older were more often involved in fatal injury collisions (24%) than serious (18%) and other injury collisions (18%). This may be a function of increased frailty of drivers as they age.

Table 81: Age by collision severity

Driver age	Fatal	Serious injury	Other injury	Total	Overall %
<15	0.75%	1.06%	0.39%	2449	0.41%
16-20	12.17%	15.28%	16.52%	98987	16.45%
21-24	11.31%	12.22%	12.05%	72506	12.05%
25-34	17.47%	18.42%	19.07%	114556	19.04%
35-44	18.91%	18.84%	18.06%	108865	18.09%
45-54	15.47%	16.50%	15.76%	94924	15.77%
55-64	10.97%	9.39%	9.62%	57955	9.63%
65-74	5.68%	4.64%	4.60%	27779	4.62%
75+	7.28%	3.66%	3.93%	23786	3.95%
Total	100.00%	100.00%	100.00%	601807	100.00%
Total	6006	14785	581016	601807	
Overall %	1.00%	2.46%	96.55%	100.00%	

Table 82 shows that 60% of the drivers involved in injury collisions were male. With regards to differences across injury severity, males were more often involved in fatal (75%) and serious injury collisions (70%) than other injury collisions (60%). The opposite is true for females who were less often involved in fatal (25%) and serious injury collisions (30%) than other injury collisions (40%).

Table 82: Gender by collision severity

Gender	Fatal	Serious injury	Other injury	Total	Overall %
Female	24.73%	29.91%	40.15%	240271	39.75%
Male	75.27%	70.09%	59.85%	364249	60.25%
Total	100.00%	100.00%	100.00%	604520	100.00%
Total	6013	14856	583651	604520	
Overall %	0.99%	2.46%	96.55%	100.00%	

The vehicle manoeuvre performed by the driver prior to the crash is shown in Table 83. In most cases (56%), the drivers were driving straight at the time of the collision. In addition, drivers were also commonly slowing down or were stopped in the traffic lane (13%) or were negotiating a curve (12%). In terms of crashes among drivers who were driving straight, there was not much difference in relation to the level of injury severity. Vehicle collisions where the driver was slowing or stopped in the traffic lane were less common for fatal (5%) and serious injury collisions (6%) compared to other injury collisions (14%). This can be expected as less severe injuries occur at lower speeds. Studies conducted in the United States found that higher posted speed limits were associated with an increase in road fatalities (IIHS, 2003; Evans, 2006). Crashes in which the driver was negotiating a curve more often involved fatal and serious injury collisions (28% and 21% respectively) than other injury collisions (11%).

Table 83: Vehicle manoeuvre by collision severity

Vehicle manoeuvre	Fatal	Serious injury	Other injury	Total	Overall %
Going straight	52.69%	53.96%	56.48%	342690	56.38%
Slowing or stopped in lane	4.76%	6.09%	13.72%	81720	13.45%
Passing or overtaking	3.02%	2.01%	1.09%	6866	1.13%
Turning right	0.73%	1.14%	1.98%	11822	1.95%
Turning left	7.04%	9.15%	9.41%	57004	9.38%
Negotiating curve	27.83%	21.04%	11.48%	72173	11.87%
Other	3.93%	6.61%	5.84%	35499	5.84%
Total	100.00%	100.00%	100.00%	607774	100.00%
Total	6033	14797	586944	607774	
Overall %	0.99%	2.43%	96.57%	100.00%	

As shown in Table 84, drivers were using a restraint in 70% of all injury collisions. Restraint use was considerably lower in fatal (43%) and serious injury (48%) collisions than other injury collisions (71%). So, it can be expected that the non-use of restraints was more common in fatal (38%) and serious injury collisions (31%) than other injury collisions (12%).

Table 84: Restraint/helmet use by collision severity

Restraint use	Fatal	Serious injury	Other injury	Total	Overall %
None used or N/A	38.35%	30.72%	11.61%	75406	12.35%
Restraint used	43.22%	47.70%	70.82%	427450	69.98%
Helmet used	5.68%	6.07%	1.12%	7843	1.28%
Don't know	12.75%	15.51%	16.45%	100100	16.39%
Total	100.00%	100.00%	100.00%	610799	100.00%
Total	6039	14945	589815	610799	
Overall %	0.99%	2.45%	96.56%	100.00%	

Table 85 shows occupant ejection from the vehicle. Less than 0.5% of all injury collisions involved an ejected occupant, 31% did not involve an ejection from the vehicle and in 69% of injury collisions ejection was not applicable to the collision, for example in collisions with lower

levels of injury severity. Collisions involving an ejected occupant were more common among fatal (12%) and serious injury collisions (5%) compared to 0.2% for other injury collisions. This is likely a result of the lower seat belt use in fatal and serious injury collisions.

Table 85: Occupant ejection by collision severity

Ejected	Fatal	Severe injury	Other injury	Total	Overall %
Not applicable	32.85%	58.40%	69.40%	605375	68.72%
Not ejected	55.12%	36.91%	30.42%	271787	30.85%
Ejected	12.03%	4.69%	0.18%	3729	0.42%
Total	100.00%	100.00%	100.00%	880891	100.00%
Total	9254	23387	848250	880891	
Overall %	1.05%	2.65%	96.29%	100.00%	

Table 86 indicates that overall almost 10% of injury collisions involved a drinking driver as a crash indicator. Drinking drivers as a crash indicator were more commonly involved in fatal (37%) and serious injury collisions (25%) compared to other injury collisions (9%).

Table 86: Drinking driver by collision severity

Drinking driver	Fatal	Serious injury	Other injury	Total	Overall %
No	62.74%	75.33%	90.79%	322669	90.09%
Yes	37.26%	24.67%	9.21%	35483	9.91%
Total	100.00%	100.00%	100.00%	358152	100.00%
Total	3755	9259	345138	358152	
Overall %	1.05%	2.59%	96.37%	100.00%	

As shown in Table 87, alcohol was suspected to be a factor in approximately 5% of the collisions, and drugs in about 1% of them. However, alcohol was much more likely to be suspected in fatal (19%) and serious injury collisions (15%) than other injury collisions (5%). Drugs were also somewhat more likely to be suspected in fatal injury collisions (5%) than in other injury collisions (1%).

Table 87: Alcohol/drugs suspected by collision severity

Alcohol/drugs	Fatal	Serious injury	Other injury	Total	Overall %
None	75.93%	82.18%	94.12%	801838	93.65%
Alcohol	18.64%	14.70%	5.08%	46697	5.45%
Drugs	5.43%	3.12%	0.80%	7702	0.90%
Total	100.00%	100.00%	100.00%	856237	100.00%
Total	7704	22070	826463	856237	
Overall %	0.90%	2.58%	96.52%	100.00%	

Table 88 shows the reported BAC level for drivers who were tested for alcohol. Overall, just 3% of drivers had positive BAC values meaning that the driver has consumed some amount of alcohol. However, there was a very high percentage of cases in which the BAC value was not

known (94%), so this likely underestimates the BAC of drivers in injury collisions in Pennsylvania. In terms of differences with regard to the level of injury severity, BAC levels over the legal limit of 0.08% were more prevalent in fatal (18%) collisions compared to serious injury (7%) and other injury collisions (2%).

Table 88: BAC by collision severity

BAC	Fatal	Serious injury	Other injury	Total	Overall %
.00	28.07%	2.74%	2.35%	23285	2.63%
.01-.07	2.92%	1.20%	0.28%	2905	0.33%
.08-.15	5.89%	2.96%	0.82%	8202	0.93%
.16+	11.98%	4.37%	1.67%	16387	1.85%
Don't know	51.14%	88.73%	94.89%	835247	94.27%
Total	100.00%	100.00%	100.00%	886026	100.00%
Total	9339	23643	853044	886026	
Overall %	1.05%	2.67%	96.28%	100.00%	

The estimated travel speed at the time of the collision is shown in Table 89. Although speed at the time of the crash was unknown in some 39% of cases, the estimated travel speed was 31-55 mph in 23% of injury collisions and under 30 mph in 23% of injury collisions. Collisions occurring at speeds between 31 and 55 mph were more common for fatal (29%) and serious injury collisions (31%) compared to other injury collisions (23%). Among fatal and serious injury collisions, speeds greater than 55 mph were somewhat more common (9% and 7% respectively) compared to other injury collisions (4%). Fewer fatal and serious injury collisions (10% and 15% respectively) occurred at speeds below 30 mph than other injury collisions (23%). No other notable differences were found in relation to speed and injury severity.

Table 89: Collision speed by collision severity

Travel speed	Fatal	Serious injury	Other injury	Total	Overall %
<=30	9.86%	15.38%	23.21%	140609	22.89%
31-55	29.07%	30.86%	22.85%	141942	23.10%
56-69	8.69%	6.60%	3.82%	24203	3.94%
70+/no limit	11.92%	10.00%	11.71%	71726	11.67%
Don't Know	40.46%	37.16%	38.40%	235881	38.39%
Total	100.00%	100.00%	100.00%	614361	100.00%
Total	6065	15045	593251	614361	
Overall %	0.99%	2.45%	96.56%	100.00%	

As shown in Table 90, speed was considered to be an indicator in only 5% of all injury collisions; however, in fatal and serious injury collisions, speed as a crash indicator was much more common at 23% and 13% respectively than for other injury collisions (4%).

Table 90: Speed as crash indicator by collision severity

Speeding	Fatal	Serious injury	Other injury	Total	Overall %
No	76.06%	87.42%	95.91%	341959	95.48%
Yes	23.94%	12.58%	4.09%	16193	4.52%
Total	100.00%	100.00%	100.00%	358152	100.00%
Total	3755	9259	345138	358152	
Overall %	1.05%	2.59%	96.37%	100.00%	

As shown in Table 91, 28% of the collisions were considered to be speed related. However, the collisions were considered to be speed related more often in fatal (50%) and serious injury collisions (37%) than in other injury collisions (28%).

Table 91: Speed related by collision severity

Speeding related	Fatal	Serious injury	Other injury	Total	Overal %
No	50.36%	63.01%	72.41%	257632	71.93%
Yes	49.64%	36.99%	27.59%	100520	28.07%
Total	100.00%	100.00%	100.00%	358152	100.00%
Total	3755	9259	345138	358152	
Overall %	1.05%	2.59%	96.37%	100.00%	

As indicated in Table 92, aggressive driving was considered to be a contributing factor in 60% of all injury collisions, but it was more common in fatal injury collisions (68%) than in serious injury (61%) and other injury (60%) collisions.

Table 92: Aggressive driving as contributing factor by collision severity

Aggressive driving	Fatal	Serious injury	Other injury	Total	Overal %
No	31.98%	38.97%	39.86%	142372	39.75%
Yes	68.02%	61.03%	60.14%	215780	60.25%
Total	100.00%	100.00%	100.00%	358152	100.00%
Total	3755	9259	345138	358152	
Overal %	1.05%	2.59%	96.37%	100.00%	

Driver distraction was identified as a contributing factor in almost 10% of all injury collisions; however, it was less common in fatal collisions (5%) and serious injury collisions were somewhat less common (6%) than in the other injury category (10%) (see Table 93).

Table 93: Driver distraction as a contributing factor by collision severity

Driver Distraction	Killed	Severe injury	Other injury	Total	Overall %
No	95.07%	93.98%	90.28%	323878	90.43%
Yes	4.93%	6.02%	9.72%	34274	9.57%
Total	100.00%	100.00%	100.00%	358152	100.00%
Total	3755	9259	345138	358152	
Overall %	1.05%	2.59%	96.37%	100.00%	

As shown in Table 94, the driver making an error while negotiating a curve was considered to be a contributing factor in slightly more than 5% of injury collisions. Driver error on a curve, however, was more prevalent in fatal (16%) and serious injury collisions (12%) than other injury collisions (5%). This is consistent with the earlier finding that drivers involved in the more serious collisions were more often negotiating a curve than drivers involved in other injury collisions.

Table 94: Driver error on curve as contributing factor by collision severity

Driver error on curve	Fatal	Serious injury	Other injury	Total	Overall %
No	83.46%	87.68%	94.80%	338456	94.50%
Yes	16.54%	12.32%	5.20%	19696	5.50%
Total	100.00%	100.00%	100.00%	358152	100.00%
Total	3755	9259	345138	358152	
Overall %	1.05%	2.59%	96.37%	100.00%	

As shown in Table 95, almost 90% of drivers involved in injury collisions were licensed in the State of PA. There was little variation in terms of differences across injury severity.

Table 95: State issuing driver's license by collision severity

Driver license	Fatal	Serious injury	Other injury	Total	Overall %
In state	87.21%	89.66%	89.64%	782263	89.62%
Out of state	12.79%	10.34%	10.36%	90615	10.38%
Total	100.00%	100.00%	100.00%	872878	100.00%
Total	9211	23097	840570	872878	
Overall %	1.06%	2.65%	96.30%	100.00%	

In summary, 47% of drivers involved in injury collisions were aged 16-34. There was not much difference in terms of age between fatal, serious and other injury collisions. However, drivers aged 55 and older were more often involved in fatal injury collisions (24%) than serious (18%) and other injury collisions (18%). Overall, 60% of the drivers involved in injury collisions were male and males were more often involved in fatal (75%) and serious injury collisions (70%) than other less severe injury collisions (60%).

At the time of the collision, most drivers (56%) were going straight followed by slowing or being stopped in the traffic lane (13%) and negotiating a curve (12%). Vehicle collisions where the driver was slowing or stopped in the traffic lane were less common in fatal (5%) and serious injury collisions (6%) compared to other injury collisions (14%). Negotiating a curve more often occurred in fatal and serious injury collisions (28% and 21% respectively) than in other injury collisions (11%). For all collisions, overall driver restraint use was 70% but

it was considerably lower in fatal (43%) and serious injury (48%) collisions than other injury collisions (71%). While ejections from the vehicle were rare (<1%), they were more common in fatal (12%) and serious injury collisions (5%) compared to 0.2% for other injury collisions. Although only 10% of collisions involved a drinking driver, the percentage was considerably higher among fatal (37%) and serious injury collisions (25%) than in other injury collisions (9%). Although suspicion of alcohol or drugs was low (5% and 1% respectively) in all collisions, alcohol was suspected more often in fatal and serious injury collisions (18% and 15%) than other injury collisions (5%) and drugs were somewhat more often suspected in fatal collisions (5%) compared to other injury collisions (1%). Positive BACs were found in just 3% of all injury collisions but BAC levels over the legal limit of 0.08% were more common in fatal (18%) collisions compared to serious injury (7%) and other injury collisions (2%).

Estimated travel speeds higher than 55 mph were somewhat more common in fatal and serious injury collisions (9% and 7% respectively) than was the case for collisions of other severity (4%). Fewer fatal and serious injury collisions (10% and 15% respectively) occurred at speeds below 30 mph than other injury collisions (23%). Collisions occurring at speeds between 31 and 55 mph were more common for fatal (29%) and serious injury collisions (31%) compared to other injury collisions (23%). Speed was considered to be a contributing factor in only 4% of all injury collisions, but in fatal and serious injury collisions, speed was much more common (23% and 13% respectively) than in other injury collisions (4%). Overall, 28% of the collisions were considered to be speeding related. However, the collisions were considered to be speeding related more often in fatal (50%) and serious injury collisions (37%) than other injury collisions (28%). Aggressive driving was somewhat more common for fatal injury collisions (68%) than for serious injury (61%) and other injury (60%) collisions. Driver distraction was less common among fatal (5%) collisions (5%) and serious injury collisions were somewhat less common (6%) than in the other injury collisions (10%). Drivers involved in fatal and serious injury collisions more often made errors negotiating curves (16% and 12% respectively) compared to the drivers in the lower severity collisions (5%). Overall, most drivers were licensed within Pennsylvania (90%) and there was not much difference in terms of injury severity.

Road and vehicle characteristics. Table 96 shows that 62% of the collisions occurred on the roadway and 23% occurred off the roadway but this was least common for fatal collisions (49%) followed by serious injury (54%) and other injury collisions (63%). In relation

to fatal and serious injury collisions, more of them occurred off the roadway (35% and 30% respectively) compared to other injury collisions (22%).

Table 96: Collision location by collision severity

Crash location	Fatal	Serious injury	Other injury	Total	Overall %
On roadway	49.45%	53.91%	62.61%	222590	62.24%
Shoulder	11.20%	13.08%	11.48%	41188	11.52%
Off trafficway	35.18%	30.26%	22.29%	80937	22.63%
Other	4.16%	2.75%	3.62%	12891	3.60%
Total	100.00%	100.00%	100.00%	357606	100.00%
Total	3749	9243	344614	357606	
Overall %	1.05%	2.58%	96.37%	100.00%	

Overall, approximately 21% of the collisions occurred on rural roads, 45% occurred on urban roads and the location was not known in 33% of injury collisions (see Table 97). Fatal and serious injury collisions were much more likely to occur on rural roads (45% and 33% respectively) than other injury collisions (21%). Conversely fatal and serious injury collisions (37% for both) were less common on urban roads compared to other injury collisions (46%).

Table 97: Urban/rural by collision severity

Rural/urban	Fatal	Serious injury	Other injury	Total	Overall %
Rural	45.03%	32.84%	20.96%	77060	21.52%
Urban	37.12%	37.13%	45.74%	162684	45.42%
Don't Know	17.84%	30.02%	33.31%	118408	33.06%
Total	100.00%	100.00%	100.00%	358152	100.00%
Total	3755	9259	345138	358152	
Overall %	1.05%	2.59%	96.37%	100.00%	

As shown in Table 98, overall, road conditions were dry in 70% of injury collisions but this was more commonly the case in fatal and serious injury collisions (79% and 79% respectively) than for other injury collisions (70%). It is interesting to note that wet or snow/slush/ice covered roads were less common in fatal (19%) and serious injury collisions (20%) than in the other injury severity collisions (29%).

Table 98: Road conditions by collision severity

Road condition	Killed	Serious injury	Other injury	Total	Overall %
Dry	78.99%	78.99%	70.23%	252393	70.54%
Wet	14.41%	14.60%	18.66%	66214	18.51%
Snow/slush/ice	5.51%	5.47%	10.41%	36603	10.23%
Other	1.09%	0.94%	0.71%	2567	0.72%
Total	100.00%	100.00%	100.00%	357777	100.00%
Total	3755	9252	344770	357777	
Overall %	1.05%	2.59%	96.36%	100.00%	

As shown in Table 99, most injury collisions occurred on straight roads (85%). Straight roads were less common in fatal (69%) and serious injury collisions (75%) than in other injury collisions (83%). Curved roads, on the other hand, were more common in fatal (31%) and serious (24%) injury collisions compared to other injury collisions (14%).

Table 99: Road alignment by collision severity

Road alignment	Fatal	Serious injury	Other injury	Total	Overall %
Straight	69.45%	76.08%	85.65%	509634	85.25%
Curved	30.55%	23.92%	14.35%	88164	14.75%
Total	100.00%	100.00%	100.00%	597798	100.00%
Total	6058	14759	576981	597798	
Overall %	1.01%	2.47%	96.52%	100.00%	

The roads had a grade in 25% of all injury collisions (see Table 100). This was more common for collisions resulting in fatalities or serious injuries (37% and 31% respectively) compared to collisions resulting in other injuries (25%). It was less common for the roads to be level in fatal and serious injury collisions (62% and 62% respectively) compared to other injury collisions (68%).

Table 100: Profile of road by collision severity

Profile of road	Fatal	Serious injury	Other injury	Total	Overall %
Level	62.42%	62.49%	67.59%	414161	67.41%
Grade	37.35%	30.58%	25.00%	155151	25.25%
Don't know	0.23%	6.93%	7.42%	45049	7.33%
Total	100.00%	100.00%	100.00%	614361	100.00%
Total	6065	15045	593251	614361	
Overall %	0.99%	2.45%	96.56%	100.00%	

As shown in Table 101, most collisions did not occur at intersections (61%). This was more common for fatal (78%) and serious injury collisions (69%) than for other injury collisions (60%). On the other hand, collisions occurring at intersections were less common for fatal (22%) and serious injury collisions (31%) compared to other injury collisions (39%).

Table 101: Intersection related by collision severity

Intersection	Fatal	Serious injury	Other injury	Total	Overall %
No	77.63%	68.80%	60.48%	218032	60.88%
Yes	22.37%	31.20%	39.52%	140120	39.12%
Total	100.00%	100.00%	100.00%	358152	100.00%
Total	3755	9259	345138	358152	
Overall %	1.05%	2.59%	96.37%	100.00%	

Vehicle type is presented in Table 102. In over 60% of injury collisions, the vehicles involved were passenger cars. This was less prevalent among fatal and serious injury collisions (48%

and 52% respectively) than for other injury collisions (61%). However, fatal and serious injury collisions (10% and 10% respectively) more often involved motorcycles than other injury collisions (2%). Fatal collisions more often involved heavy trucks (8%) compared to serious injury (4%) and other injury collisions (3%).

Table 102: Vehicle type by collision severity

Vehicle type	Fatal	Serious injury	Other injury	Total	Overall %
Car	48.02%	51.78%	61.01%	367754	60.66%
Utility	18.04%	17.86%	20.46%	123500	20.37%
Motorcycle	9.93%	10.55%	1.60%	11510	1.90%
Bus	0.28%	0.20%	0.24%	1453	0.24%
Van	1.19%	1.34%	1.63%	9785	1.61%
Pickup	13.05%	11.93%	11.04%	67169	11.08%
Light truck	0.75%	0.86%	0.91%	5503	0.91%
Heavy truck	8.06%	4.46%	2.94%	18323	3.02%
Other	0.69%	1.01%	0.18%	1241	0.20%
Total	100.00%	100.00%	100.00%	606238	100.00%
Total	5971	14680	585587	606238	
Overall %	0.98%	2.42%	96.59%	100.00%	

Table 103 reveals that the most common vehicle models involved in injury collisions were from 1997 and earlier, although it should be noted that in 15% of collisions the model year was not known. There was little difference across injury severity categories in the model years of the vehicles involved in injury collisions.

Table 103: Vehicle model year by collision severity

Model year	Fatal	Serious injury	Other injury	Total	Overall %
<=1997	37.54%	33.66%	30.57%	188724	30.72%
1998-2000	17.66%	15.70%	17.78%	108917	17.73%
2001-2003	20.74%	16.34%	18.48%	113359	18.45%
2004+	20.15%	16.98%	18.35%	112652	18.34%
Don't know	3.91%	17.31%	14.81%	90709	14.76%
Total	100.00%	100.00%	100.00%	614361	100.00%
Total	6065	15045	593251	614361	
Overall %	0.99%	2.45%	96.56%	100.00%	

In summary, 62% of injury collisions occurred on the roadway and 23% occurred off the traffic way. More fatal and serious injury collisions occurred off the roadway (35% and 30% respectively) compared to other injury collisions (22%). Injury collisions occurred on rural roads about 21% of the time and fatal and serious injury collisions were much more common on rural roads (45% and 33% respectively) than other injury collisions (21%). Road conditions overall were dry in injury collisions in 70% of cases but this was more commonly the case in fatal and serious injury collisions (79% and 79% respectively) than for other injury collisions (70%). It is interesting to note that wet or snow/slush/ice covered roads were less prevalent among fatal (19%) and serious injury collisions (20%) than the other injury severity collisions

(29%). While the roads were curved in only 15% of all injury collisions, curved roads were more common in fatal (31%) and serious (24%) injury collisions compared to other injury collisions (14%). Roads with a grade were involved in 25% of injury collisions and were more frequent in fatal and serious injury collisions (37% and 31% respectively) compared to collisions resulting in other injuries (25%). Most collisions did not occur at intersections (61%), but this was more common in fatal (78%) and serious injury collisions (69%) than in other injury collisions (60%).

Temporal and environmental characteristics. Overall, injury crashes are fairly evenly distributed across the year (see overall column % in Table 104). Serious injury collisions were less common during the late fall and winter months (October to December – 22%; and January to March – 21%) compared to other injury collisions (October to December – 27%; and January to March – 26%). Although one might expect more severe injuries in motor-vehicle crashes during the winter, it is possible that drivers are more cautious when driving in adverse weather conditions, for example, slowing down, which would result in less severe injuries.

Table 104: Quarter of year by collision severity

Quarter of year	Fatal	Serious injury	Other injury	Total	Overall %
Jan-Mar	21.89%	20.93%	25.62%	91197	25.46%
Apr-Jun	26.21%	27.95%	23.64%	85163	23.78%
Jul-Sep	27.30%	29.14%	23.30%	84153	23.50%
Oct-Dec	24.61%	21.98%	27.43%	97639	27.26%
Total	100.00%	100.00%	100.00%	358152	100.00%
Total	3755	9259	345138	358152	
Overall %	1.05%	2.59%	96.37%	100.00%	

The day of the week during which injury collisions occurred appears in Table 105. It can be seen that overall, the distribution across days of the week is fairly even with Friday being slightly higher at 17% (see overall column %). There was little variation across levels of injury severity.

Table 105: Day of week by collision severity

Day of week	Fatal	Severe injury	Other injury	Total	Overall %
Sunday	15.47%	16.49%	12.41%	44943	12.55%
Monday	12.78%	12.42%	13.53%	48337	13.50%
Tuesday	12.52%	11.80%	13.70%	48834	13.64%
Wednesday	11.80%	12.59%	14.17%	50519	14.11%
Thursday	13.45%	12.70%	14.39%	51330	14.33%
Friday	16.22%	16.19%	17.19%	61445	17.16%
Saturday	17.76%	17.80%	14.61%	52739	14.73%
Total	100.00%	100.00%	100.00%	358147	100.00%
Total	3755	9258	345134	358147	
Overall %	1.05%	2.58%	96.37%	100.00%	

Considering the time of day in injury collisions (see Table 106), the most common time of day for collisions was between 3:00 and 5:59pm, the evening rush hour (22%). Collisions occurring during this time were the least common for fatal collisions (16%) and the most common for other injury collisions (22%). Collisions occurring at night (i.e., 9:00pm to 5:59am) were more common in fatal (29%) and serious injury collisions (25%) than other injury collisions (17%).

Table 106: Time of day by collision severity

Time of day	Fatal	Serious injury	Other injury	Total	Overall %
12am-2:59am	15.16%	12.02%	7.43%	26878	7.63%
3am-5:59am	7.60%	6.06%	4.65%	16625	4.72%
6am-8:59am	8.67%	8.84%	12.76%	44443	12.61%
9am-11:59am	9.55%	9.82%	12.55%	43869	12.45%
12pm-2:59pm	13.61%	14.77%	16.89%	59212	16.80%
3pm-5:59pm	16.53%	20.01%	22.51%	78860	22.38%
6pm-8:59pm	14.68%	15.70%	13.26%	46987	13.33%
9pm-11:59pm	14.20%	12.78%	9.95%	35485	10.07%
Total	100.00%	100.00%	100.00%	352359	100.00%

Total	3726	9102	339531	352359
Overall %	1.06%	2.58%	96.36%	100.00%

As can be seen in Table 107, 67% of injury collisions occurred during the week and 33% occurred on the weekend (Friday 6:00pm to Sunday 5:59am). Weekend collisions were more common in fatal (41%) and serious injury collisions (42%) than in other injury collisions (32%).

Table 107: Weekday/end by collision severity

Week/end	Fatal	Serious injury	Other injury	Total	Overall %
Weekend	41.33%	41.78%	32.83%	117355	33.15%
Week	58.67%	58.22%	67.17%	236653	66.85%
Total	100.00%	100.00%	100.00%	354008	100.00%

Total	3741	9145	341122	354008
Overall %	1.06%	2.58%	96.36%	100.00%

The weather conditions at the time of the collision are shown in Table 108. Overall, 78% of injury collisions occurred when there were no adverse weather conditions. Interestingly, there was a tendency for rain/sleet/snow to be less common in fatal (13%) and serious injury collisions (6%) than in other injury collisions (21%).

Table 108: Weather conditions by collision severity

Weather conditions	Fatal	Serious injury	Other injury	Total	Overall %
No adverse conditions	84.67%	85.22%	77.61%	277937	77.88%
Rain	9.20%	9.16%	12.88%	45502	12.75%
Sleet/snow	4.33%	4.13%	7.95%	27901	7.82%
Other	1.79%	1.50%	1.55%	5544	1.55%
Total	100.00%	100.00%	100.00%	356884	100.00%

Total	3738	9226	343920	356884
Overall %	1.05%	2.59%	96.37%	100.00%

In summary, serious injury collisions were less common during the late fall and winter months (October to December – 22%; and January to March – 21%) compared to other injury collisions (October to December – 27%; and January to March – 26%). The distribution across days of the week is fairly even with Friday being slightly higher at 17% (see overall column %). There was little variation across levels of injury severity. The most common time of day for collisions was between 3:00pm and 5:59pm, the evening rush hour (22%). Collisions occurring during this time were the least common for fatal collisions (16%) and the most common for other injury collisions (22%). Collisions occurring at night (i.e., 9:00pm to 5:59am) were more common in fatal (29%) and serious injury collisions (25%) than other injury collisions (17%). Weekend collisions were more common in fatal (41%) and serious injury collisions (42%) than in other injury collisions (32%). Adverse weather conditions were also less common in fatal and serious injury collisions (13% and 6%) than in other injury collisions (21%).

Virginia State Crash Results

As shown in Table 109, less than 1% of all injury collisions in VA in the years 2005, 2006, and 2007 were fatal collisions; only 1% of all injury collisions were serious injury collisions and the remaining 98% of collisions were other injury collisions (see overall row %). There was little difference from year to year in relation to categories of injury severity.

Table 109: Year by collisions severity.

Year	Fatal	Serious injury	Other injury	Total	Overall %
2005	32.38%	32.92%	34.14%	153765	34.12%
2006	32.42%	34.71%	33.64%	151618	33.64%
2007	35.20%	32.37%	32.23%	145327	32.24%
Total	100.00%	100.00%	100.00%	450710	100.00%

Total	2443	4653	443614	450710
Overall %	0.54%	1.03%	98.43%	100.00%

Type of collision. Table 110 shows that while 71% of the injury collisions in VA involved multiple vehicles and only 29% involved a single vehicle. Single vehicle collisions were much more common in fatal collisions (58%) and serious injury collisions (98%) than in other injury collisions (28%).

Table 110: Single vs. multiple by collision severity

No. of vehicles	Fatal	Serious injury	Other injury	Total	Overall %
Single vehicle	57.67%	97.66%	28.07%	130461	28.95%
Multiple vehicle	42.33%	2.34%	71.93%	320249	71.05%
Total	100.00%	100.00%	100.00%	450710	100.00%

Total	2443	4653	443614	450710
Overall %	0.54%	1.03%	98.43%	100.00%

Table 111 reveals that the most common harmful events in injury crashes were rear-end collisions (31%), angle collisions (25%), and a vehicle hitting a fixed object (24%). However, rear-end collisions were much less common among fatal collisions (5%) compared to serious and other injury collisions (17% and 38% respectively) as were angle collisions (13%) compared to serious and other injury collisions (22% and 27% respectively). Hitting a fixed object, on the other hand, was much more common in fatal and serious injury collisions (40% and 37% respectively) compared to collisions of other severity (18%). In addition cases that fell into the other category (e.g., overturned) were more common in fatal collisions (28%) followed by serious and other injury collisions (13% and 8% respectively).

Table 111: Harmful event by collision severity

Harmful event	Fatal	Serious injury	Other injury	Total	Overall %
Rear-end	5.15%	16.84%	37.61%	48426	30.80%
Angle	12.94%	22.49%	26.70%	39620	25.20%
Head-on	9.10%	2.40%	1.18%	2642	1.68%
Sideswipe	5.23%	8.04%	7.97%	12488	7.94%
Fixed Object off road	39.88%	37.47%	18.08%	38183	24.29%
Other	27.69%	12.76%	8.46%	15849	10.08%
Total	100.00%	100.00%	100.00%	157208	100.00%
Total	2658	47359	107191	157208	
Overall %	1.69%	30.13%	68.18%	100.00%	

As indicated in Table 112, the most common point of impact on the vehicle in an injury crash was the front of the vehicle (56%) but this was more common for fatal and serious injury collisions (60% and 65% respectively) compared to other injury collisions (56%). The point of impact was more commonly the right side of the vehicle in serious injury collisions (17%) compared to fatal and other injury collisions (8% and 8% respectively). Rear end impacts were less common for fatal and serious injury collisions (7% and 8% respectively) than for other injury collisions (25%). The table below also shows that the point if impact was considerably more often the top of the vehicle in fatal collisions (15%) compared to serious and other injury collisions (1% and 2% respectively).

Table 112: Point of impact by collision severity

Point of impact	Fatal	Serious injury	Other injury	Total	Overall %
Front	60.26%	65.02%	55.91%	447070	55.98%
Right	7.93%	17.13%	8.40%	67399	8.44%
Rear	7.11%	8.47%	25.07%	198858	24.90%
Left	9.91%	8.57%	9.03%	72147	9.03%
Top	14.79%	0.81%	1.59%	13130	1.64%
Total	100.00%	100.00%	100.00%	798604	100.00%
Total	3644	4214	790746	798604	
Overall %	0.46%	0.53%	99.02%	100.00%	

To summarize, most injury collisions in Virginia involved multiple vehicles (71%) but fatal collisions more often involved single vehicles (58%). Although the most common harmful event overall was rear-end collisions, hitting fixed objects was more prevalent in fatal collisions (44%), indicative of a run-off-road type of collision. The front of the vehicle was the most common point of impact but this was more common for fatal and serious injury collisions (60% and 65% respectively) compared to other injury collisions (56%). The point of impact was more commonly the right side of the vehicle in serious injury collisions (17%) compared to fatal and other injury collisions (8% and 8% respectively). Rear end impacts were less common for fatal and serious injury collisions (7% and 8% respectively) than for other injury collisions (25%). The table below also shows that the point if impact was considerably more often the top of the vehicle was in fatal collisions (15%) compared to serious and other injury collisions (1% and 2% respectively).

Driver characteristics. Drivers were aged 16-34 in 45% of all injury collisions (Table 113). In terms of differences across injury severity, more fatal collisions and other injury collisions (42% and 45% respectively) involved drivers aged 16 to 34, compared to 36% for serious injury collisions. There was a tendency for drivers involved in fatal collisions to more often be aged 55 or older (21%) compared to other injury collisions (16%).

Table 113: Driver age by collision severity

Driver age	Fatal	Serious injury	Other injury	Total	Overall %
<15	0.49%	0.19%	0.22%	1832	0.22%
16-20	12.22%	9.53%	14.31%	117536	14.27%
21-24	12.22%	8.78%	11.12%	91506	11.11%
25-34	17.54%	17.25%	19.43%	159870	19.41%
35-44	16.78%	15.39%	17.73%	145839	17.71%
45-54	15.84%	14.03%	14.84%	122230	14.84%
55-64	10.86%	9.91%	9.04%	74537	9.05%
65-74	5.97%	4.75%	4.08%	33678	4.09%
75+	5.46%	3.87%	2.60%	21561	2.62%
Don't know	2.62%	16.31%	6.63%	54949	6.67%
Total	100.00%	100.00%	100.00%	823538	100.00%
Total	3700	4783	815055	823538	
Overall %	0.45%	0.58%	98.97%	100.00%	

As shown in Table 114, 54% of the drivers were male but this percentage was higher for fatal collisions (72%) compared to serious injury (49%) and other injury collisions (54%).

Table 114: Driver gender by collision severity

Driver gender	Fatal	Serious injury	Other injury	Total	Overall %
Male	71.54%	48.76%	53.58%	441672	53.63%
Female	25.54%	35.15%	39.78%	326884	39.69%
Don't know	2.92%	16.10%	6.64%	54982	6.68%
Total	100.00%	100.00%	100.00%	823538	100.00%
Total	3700	4783	815055	823538	
Overall %	0.45%	0.58%	98.97%	100.00%	

As shown in Table 115, drivers were wearing a seat belt in 57% of all injury collisions. Seat belt use was considerably lower in fatal collisions (30%) compared to serious injury (52%) and other injury collisions (58%).

Table 115: Seat belt use by collision severity

Restraint use	Fatal	Serious injury	Other injury	Total	Overall %
No restraint	46.23%	33.85%	34.98%	52666	35.19%
Seat belt	29.63%	52.31%	57.95%	85915	57.41%
Helmet	4.42%	6.15%	2.44%	3710	2.48%
Other	0.25%	0.00%	0.14%	216	0.14%
Don't Know	19.47%	7.69%	4.49%	7140	4.77%
Total	100.00%	100.00%	100.00%	149647	100.00%
Total	2825	65	146757	149647	
Overall %	1.89%	0.04%	98.07%	100.00%	

The vehicle manoeuvre prior to injury collisions is shown in Table 116. Overall, the most common action was drivers traveling straight ahead or starting up in their lane (47%) but this was more common for serious injury collisions (56%) compared to fatal and other injury collisions (47% and 47% respectively). The vehicle was making a right turn more often in serious injury collisions (8%) than in fatal and other injury collisions (1% and 3% respectively). The vehicle was making a left turn more often in serious injury collisions (12%) compared to fatal collisions (5%). The vehicle was slowing or was stopped considerably less often in fatal and serious injury crashes (4% and 3% respectively) compared to other injury collisions (21%). Running off the road was more common among drivers involved in fatal collisions (36%) than in the serious injury (2%) and other injury collisions (9%). The category ‘other’ includes actions such as backing up, passing or changing lanes. Such actions were more common in serious injury collisions (17%) compared to fatal and other injury collisions (7% and 11% respectively).

Table 116: Vehicle manoeuvre by collision severity

Vehicle manoeuvre	Fatal	Serious injury	Other injury	Total	Overall %
Going straight/starting in traffic lane	47.38%	57.99%	46.84%	382130	46.91%
Right turn	0.76%	8.21%	3.28%	26823	3.29%
Left turn	5.18%	11.79%	9.33%	75958	9.32%
Slowing/stopped	4.02%	3.35%	20.87%	168619	20.70%
Run off road	35.50%	1.94%	9.08%	74640	9.16%
Other	7.16%	16.72%	10.60%	86512	10.62%
Total	100.00%	100.00%	100.00%	814682	100.00%
Total	3685	4689	806308	814682	
Overall %	0.45%	0.58%	98.97%	100.00%	

Table 117 reveals that overall only 4% of drivers were considered to have been drinking, but this percentage was considerably higher in fatal collisions (16%) compared to serious injury (4%) and other injury collisions (4%).

Table117: Drinking driver by collision severity

Drinking driver	Fatal	Serious injury	Other injury	Total	Overall %
N/A	22.70%	16.83%	7.72%	64563	7.84%
Had not been drinking	61.59%	79.30%	88.17%	724687	88.00%
Drinking	15.70%	3.87%	4.11%	34284	4.16%
Total	100.00%	100.00%	100.00%	823534	100.00%
Total	3700	4783	815051	823534	
Overall %	0.45%	0.58%	98.97%	100.00%	

The estimated travel speed at the time of the collision was 30 mph or lower in 42% of all injury collisions followed by travel speeds between 31 mph and 55 mph (26%) and cases where the vehicle travel speed was not known (26%). Crashes where the vehicle travel speed was 30 mph or below were the least common in fatal collisions (12%) compared to serious injury (65%) and other injury collisions (42%). Crashes with travel speeds above 31 mph were more common for fatal collisions (62%) than for serious injury (14%) and other injury collisions (31%) (see Table 118).

Table 118: Estimated travel speed by collision severity

Travel speed	Fatal	Serious injury	Other injury	Total	Overall %
<=30	11.95%	65.19%	42.16%	347155	42.15%
31-55	36.05%	13.30%	26.09%	214646	26.06%
56-69	13.81%	0.48%	4.20%	34806	4.23%
70+	12.30%	0.10%	1.03%	8842	1.07%
Don't know	25.89%	20.93%	26.52%	218089	26.48%
Total	100.00%	100.00%	100.00%	823538	100.00%
Total	3700	4783	815055	823538	
Overall %	0.45%	0.58%	98.97%	100.00%	

Driver actions prior to injury collisions are presented in Table 119. In 47% of injury collisions, no specific action was identified, but this was less common in fatal collisions (31%) compared

to serious (53%) and other injury collisions (47%). Driver speeding was identified more often in fatal collisions (15%) compared to the serious (1%) and other injury collisions (3%). The driver following too closely was also less common in fatal and serious injury collisions (both under 1%) than other injury collisions (11%). The driver failing to maintain control of the vehicle was cited more often in the fatal collisions (28%) compared to serious (3%) and other injury collisions (10%).

Table 119: Contributing factors by collision severity

Contributing factors	Fatal	Serious injury	Other injury	Total	Overall %
None	31.34%	52.78%	46.98%	374559	46.94%
Speeding	15.01%	1.31%	3.08%	24919	3.12%
Did not have right of way	8.35%	7.99%	11.17%	88903	11.14%
Following too close	0.50%	0.09%	11.05%	87307	10.94%
Fail to maintain control	27.67%	3.36%	9.95%	79744	9.99%
Other	17.14%	34.47%	17.77%	142524	17.86%
Total	100.00%	100.00%	100.00%	797956	100.00%
Total	3571	4581	789804	797956	
Overall %	0.45%	0.57%	98.98%	100.00%	

Major factors involved in the collisions are presented in Table 120. Driver inattention/driver error was the most common factor in all injury collisions (74%). However, driver inattention was less common in fatal collisions (45%) compared to serious (67%) and other injury collisions (74%). While alcohol and drugs were only cited in 4% of the collisions overall, they were more often cited as major factors in fatal collisions (17%) compared to serious injury (6%) and other injury collisions (4%). Speeding was also more common among fatal collisions (26%) compared to serious and other injury collisions (0.6% and 4% respectively). In addition, weather or visibility conditions were less often a factor in fatal collisions (<1%) compared to serious injury and other injury collisions (4% and 5% respectively).

Table 120: Major factors by collision severity

Major factors	Fatal	Serious injury	Other injury	Total	Overall %
Alcohol/drugs/other agents	16.57%	5.59%	4.09%	18715	4.17%
Driver speeding	25.84%	0.57%	2.53%	11827	2.64%
Inattention/error	45.49%	68.70%	74.19%	331976	73.98%
Weather/visibility condition	0.53%	8.86%	4.59%	20685	4.61%
Other	11.57%	16.28%	14.60%	65531	14.60%
Total	100.00%	100.00%	100.00%	448734	100.00%
Total	2438	4594	441702	448734	
Overall %	0.54%	1.02%	98.43%	100.00%	

In summary, drivers involved in injury collisions were aged 16-34 in 45% of cases. In terms of differences across injury severity, more fatal collisions and other injury collisions (42% and

45% respectively) involved drivers aged 16 to 34, compared to 36% for serious injury collisions. There was a tendency for drivers involved in fatal collisions to more often be aged 55 or older (21%) compared to other injury collisions (16%). While 54% of drivers were male overall, in fatal collisions male drivers were more common (72%). Restraint use was considerably lower in fatal collisions (30%) compared to serious injury (52%) and other injury collisions (58%). Overall, the most common action was drivers traveling straight ahead or starting up in their lane (47%) but this was more common for serious injury collisions (56%) compared to fatal and other injury collisions (47% and 47% respectively). The vehicle was making a right turn more often in serious injury collisions (8%) than in fatal and other injury collisions (1% and 3% respectively). The vehicle was making a left turn more often in serious injury collisions (12%) compared to fatal collisions (5%). The vehicle was slowing or was stopped considerably less often in fatal and serious injury crashes (4% and 3% respectively) compared to other injury collisions (21%). Running off the road was more common among drivers involved in fatal collisions (36%) than in the serious injury (2%) and other injury collisions (9%). Only 4% of drivers had been drinking but there were more drinking drivers involved in fatal collisions (16%) compared to serious injury (4%) and other injury collisions (4%). Crashes where the vehicle travel speed was 30 mph or below were the least common in fatal collisions (12%) compared to serious injury (65%) and other injury collisions (42%). Crashes with travel speeds above 31 mph were more common for fatal collisions (62%) than for serious injury (14%) and other injury collisions (31%). Speed was identified as a driver action more often in fatal collisions (15%) compared to the other injury collisions as was failing to maintain control of the vehicle (28%). Not having the right of way or following too closely were factors that were more common in other injury level collisions (11% for both). The driver failing to maintain control of the vehicle was cited more often in the fatal collisions (28%) compared to serious (3%) and other injury collisions (10%). Although inattention was cited as a major factor in injury collisions overall (74%), driver inattention was less common in fatal collisions. Alcohol or drugs and speeding were cited much more often in fatal collisions (17% and 26% respectively).

Road and vehicle characteristics. Table 121 indicates that overall, 31% of the injury collisions occurred on one or two lane roads and this was more common in fatal collisions (62%) compared to serious (15%) and other injury collisions (31%). However, the number of lanes was not known in approximately 40% of collisions and especially for serious and other injury collisions so these results should be interpreted with caution.

Table 121: Number of lanes by collision severity

No. of lanes	Fatal	Serious injury	Other injury	Total	Overall %
Don't Know	4.46%	70.36%	40.34%	182321	40.45%
1-2	61.52%	14.85%	30.65%	138156	30.65%
3	4.83%	0.71%	5.07%	22631	5.02%
4+	29.19%	14.08%	23.95%	107602	23.87%
Total	100.00%	100.00%	100.00%	450710	100.00%
Total	2443	4653	443614	450710	
Overall %	0.54%	1.03%	98.43%	100.00%	

Fatal collisions were higher than serious and other injury collisions for each road function class and were especially higher than the serious injury category. However, this is because the results were not known for 70% of injury collisions and 40% of other injury collisions.

Table 122: Road function by collision severity

Road function	Fatal	Serious injury	Other injury	Total	Overall %
Interstate/freeway/expressway	16.21%	0.92%	14.30%	63888	14.17%
Principal arterial	19.61%	8.79%	13.92%	62660	13.90%
Minor arterial	23.21%	8.23%	12.83%	57853	12.84%
Collector	24.36%	5.27%	11.08%	49992	11.09%
Local rd. or st.	12.16%	6.43%	7.53%	33997	7.54%
Don't know	4.46%	70.36%	40.34%	182320	40.45%
Total	100.00%	100.00%	100.00%	450710	100.00%
Total	2443	4653	443614	450710	
Overall %	0.54%	1.03%	98.43%	100.00%	

As shown in Table 123, for all injury collisions the roads were typically two-way and non-divided (69%), although this was less common for fatal collisions (62%) and other injury collisions (68%) compared to serious injury collisions (90%). Divided roadways with either no control of access (i.e., access to the road is not limited) or control of access (i.e., access to the road is limited in some way, e.g., freeways or expressways) were more common in fatal collisions (19% and 18% respectively) compared to serious injury collisions (8% and 2% respectively) and other injury collisions (14% and 16%).

Table 123: Type of road by collision severity

Type of road	Fatal	Serious injury	Other injury	Total	Overall %
Two-way, non-divided	61.77%	89.28%	68.40%	309088	68.58%
Divided-no control of access	18.83%	7.91%	13.75%	61828	13.72%
Divided-partial/full control of access	17.72%	2.43%	16.27%	72729	16.14%
Other	1.68%	0.39%	1.58%	7065	1.57%
Total	100.00%	100.00%	100.00%	450710	100.00%
Total	2443	4653	443614	450710	
Overall %	0.54%	1.03%	98.43%	100.00%	

As shown in Table 124, the majority of injury collisions occurred on a straight road (84%). Crashes occurring on a curved road, however, were more common among fatal collisions (40%) compared to serious injury (5%) and other injury collisions (16%).

Table 124: Road alignment by collision severity

Road alignment	Fatal	Serious injury	Other injury	Total	Overall %
Straight	59.88%	93.52%	83.94%	373692	83.91%
Curved	40.04%	5.48%	15.84%	70647	15.86%
Other	0.08%	1.00%	0.22%	1022	0.23%
Total	100.00%	100.00%	100.00%	445361	100.00%
Total	2415	4616	438330	445361	
Overall %	0.54%	1.04%	98.42%	100.00%	

In most injury collisions, the road was level (77%) as can be seen in Table 125. However, roads more often had a grade in fatal collisions (36%) compared to serious injury (14%) and other injury collisions (22%).

Table 125: Road profile by collision severity

Road profile	Fatal	Serious injury	Other injury	Total	Overall %
Level	62.82%	84.21%	76.78%	341970	76.78%
Grade	36.23%	14.10%	22.27%	99152	22.26%
Other	0.95%	1.69%	0.94%	4239	0.95%
Total	100.00%	100.00%	100.00%	445361	100.00%
Total	2415	4616	438330	445361	
Overall %	0.54%	1.04%	98.42%	100.00%	

The speed limit on the road where injury collisions occurred is presented in Table 126. The speed limit at the time of collision was most often between 31 mph and 55 mph (70%) and this was more common in fatal collisions (79%) compared to serious injury collisions (37%) and other injury collisions (70%). In addition, speed limits of 56-65 mph were also more common in the fatal collisions (14%) than serious injury (1%) and other injury collisions (7%).

Table 126: Speed limit by collision severity

Speed Limit	Fatal	Serious injury	Other injury	Total	Overall %
<=30	6.75%	62.68%	22.61%	100650	22.90%
31-55	79.27%	36.64%	69.94%	306298	69.68%
56-65	13.99%	0.67%	7.45%	32623	7.42%
Total	100.00%	100.00%	100.00%	439571	100.00%
Total	2431	4151	432989	439571	
Overall %	0.55%	0.94%	98.50%	100.00%	

Table 127 indicates that overall injury collisions most often occurred on rural roads (61%). Fatal collisions occurred much more commonly on rural roads (80%) than serious injury (38%) and other injury collisions (61%). Conversely, fatal collisions occurred much less often on urban roads (20%) compared to serious and other injury collisions (62% and 39% respectively).

Table 127: Rural/urban by collision severity

Rural/urban	Fatal	Serious injury	Other injury	Total	Overall %
Rural	79.78%	37.57%	61.30%	275652	61.16%
Urban	20.22%	62.43%	38.70%	175058	38.84%
Total	100.00%	100.00%	100.00%	450710	100.00%
Total	2443	4653	443614	450710	
Overall %	0.54%	1.03%	98.43%	100.00%	

The type of traffic control present at the injury collision site is presented in Table 128. The most common type of traffic control was marked traffic lanes (43%). Collisions where there were signs indicating that no passing was allowed were much more common in fatal collisions (22%) compared to serious (3%) and other injury collisions (7%). Signs indicating that no passing was allowed are common on two lane rural roads where fatal collisions were also more frequent (see Tables 4.3.3.1 and 4.3.3.7).

Table 128: Traffic controls by collision severity

Traffic controls	Fatal	Serious injury	Other injury	Total	Overall %
No traffic control	13.30%	37.98%	18.19%	82303	18.37%
Stop/yield sign	6.40%	6.26%	9.41%	41971	9.37%
Traffic signal	5.33%	16.34%	19.65%	87549	19.54%
Traffic lanes marked	51.25%	26.14%	43.54%	194494	43.40%
No passing lanes	21.58%	2.95%	7.16%	32243	7.19%
Other	2.13%	10.33%	2.05%	9585	2.14%
Total	100.00%	100.00%	100.00%	448145	100.00%
Total	2437	4571	441137	448145	
Overall %	0.54%	1.02%	98.44%	100.00%	

Almost 79% of collisions occurred on dry roads (see Table 129) which was more common in fatal (85%) and serious injury crashes (86%) compared to other injury crashes (79%). Collisions in which the roads were wet were somewhat less common in fatal (13%) and serious injury collisions (12%) than in other injury crashes (17%).

Table 129: Road conditions by collision severity

Road conditions	Fatal	Serious injury	Other injury	Total	Overall %
Dry	85.27%	86.39%	79.31%	356429	79.42%
Wet	12.71%	12.25%	17.16%	76701	17.09%
Other	2.02%	1.36%	3.52%	15682	3.49%
Total	100.00%	100.00%	100.00%	448812	100.00%
Total	2431	4630	441751	448812	
Overall %	0.54%	1.03%	98.43%	100.00%	

Passenger cars were involved in 58% of injury collisions as presented in Table 130, and these cases were least common in fatal injury collisions (43%) compared to serious injury (60%) and other injury crashes (57%). Heavy trucks and motorcycles were more often involved in fatal collisions (9% and 8% respectively) compared to serious injury (2% and 0.5%) and other injury collisions (4% and 1%).

Table 130: Vehicle type by collision severity

Vehicle type	Fatal	Serious injury	Other injury	Total	Overall %
Car	43.48%	60.26%	57.76%	463942	57.71%
Utility	14.45%	14.97%	15.52%	124713	15.51%
Van	5.43%	8.78%	6.97%	56054	6.97%
Truck	16.43%	11.20%	13.34%	107267	13.34%
Heavy truck	9.32%	2.01%	3.79%	30625	3.81%
Bus	0.52%	1.21%	0.54%	4409	0.55%
Motorcycle	7.58%	0.52%	1.01%	8331	1.04%
Other	2.80%	1.05%	1.06%	8578	1.07%
Total	100.00%	100.00%	100.00%	803919	100.00%

Total	3682	4383	795854	803919
Overall %	0.46%	0.55%	99.00%	100.00%

To summarize, 31% of injury collisions occurred on one or two lane roads and this was more common in fatal collisions (62%) compared to serious (15%) and other injury collisions (31%). Fatal collisions were higher than serious and other injury collisions for each road function class and were especially higher than the serious injury category. Two-way non-divided (69%) roads were less common in fatal collisions (62%) and other injury collisions (68%) compared to serious injury collisions (90%), and divided roadways were more common in fatal collisions (37%) compared to serious injury collisions (10%) and other injury collisions (30%). While most collisions occurred on straight (84%) and level (77%) roads, fatal collisions more often occurred on curved roads (40%) compared to serious injury (5%) and other injury collisions (16%), or on a grade (36%) compared to serious injury (14%) and other injury collisions (22%). Typically, the speed limit was between 31 mph and 55 mph (70%) but this was more common in fatal collisions (79%) compared to serious injury collisions (37%) and other injury collisions (70%), and speed limits of 56-65 mph were more common in fatal collisions (14%) than serious injury (1%) and other injury collisions (7%). Most collisions occurred on rural roads (61%) but this was more common in fatal collisions (80%) than serious injury (38%) and other injury collisions (61%). Collisions where there were no passing signs present were much more common in fatal collisions (22%) compared to serious (3%) and other injury collisions (7%). Road conditions were usually dry (79%) which was slightly more common in fatal (85%) and serious injury crashes (86%) compared to other injury crashes (79%), Collisions in which the roads were wet were somewhat less common in fatal (13%) and serious injury (12%) than in other injury crashes (17%). Most of the vehicles involved in injury collisions were passenger cars (58%) but heavy trucks and motorcycles were more often involved in fatal collisions (9% and 8% respectively) compared to serious injury (2% and 0,5%) and other injury collisions (4% and 1%).

Temporal and environmental characteristics. Overall, collisions occurred most often from October to December (28%) as shown in Table 131. There was little variation across categories of injury severity in terms of time of year.

Table 131: Quarter of year by collision severity

Quarter of year	Fatal	Serious injury	Other injury	Total	Overall %
Jan-Mar	19.98%	21.77%	23.25%	104658	23.22%
Apr-Jun	25.79%	25.34%	25.03%	112848	25.04%
Jul-Sep	27.30%	24.18%	23.72%	107030	23.75%
Oct-Dec	26.93%	28.71%	27.99%	126174	27.99%
Total	100.00%	100.00%	100.00%	450710	100.00%
Total	2443	4653	443614	450710	
Overall %	0.54%	1.03%	98.43%	100.00%	

The day of the week on which injury collisions occurred is presented in Table 132. The collisions were more prevalent on Fridays (18%). Collisions occurred Friday, Saturday, or Sunday in 42% of the cases. Collisions occurring on Saturday and Sunday were more frequent among fatal collisions (36%) compared to serious (23%) and other injury collisions (24%).

Table 132: Day of week by collision severity

Day of week	Fatal	Serious injury	Other injury	Total	Overall %
Monday	11.87%	14.44%	14.15%	63727	14.14%
Tuesday	11.87%	14.36%	14.36%	64668	14.35%
Wednesday	12.65%	14.94%	14.55%	65572	14.55%
Thursday	12.69%	15.11%	14.77%	66538	14.76%
Friday	15.19%	17.60%	17.68%	79619	17.67%
Saturday	19.07%	14.14%	13.75%	62104	13.78%
Sunday	16.66%	9.41%	10.74%	48482	10.76%
Total	100.00%	100.00%	100.00%	450710	100.00%
Total	2443	4653	443614	450710	
Overall %	0.54%	1.03%	98.43%	100.00%	

Table 133 reveals that overall, the most common time of day in which injury collisions occurred was between 3:00pm and 5:59pm (24%), the evening rush hour. This was less common in fatal collisions (16%) compared to serious injury (23%) and other injury collisions (24%). Collisions occurring between 6:00pm and 8:59pm were the most common for serious injury collisions (21%) compared to fatal and other injury collisions (14% and 15% respectively). In addition, fatal collisions occurred more often at night between 9:00pm and 5:59am (36%) than did serious injury (20%) and other injury collisions (18%).

Table 133: Time by collision severity

Time	Fatal	Serious injury	Other injury	Total	Overall %
12am-2:59am	14.26%	5.87%	5.93%	26915	5.98%
3am-5:59am	7.82%	2.11%	3.83%	17245	3.83%
6am-8:59am	10.49%	11.28%	13.25%	59508	13.22%
9am-11:59am	9.87%	10.44%	12.84%	57603	12.79%
12pm-2:59pm	14.34%	14.29%	17.85%	80097	17.79%
3pm-5:59pm	16.26%	22.83%	23.65%	106278	23.61%
6pm-8:59pm	14.17%	21.20%	14.08%	63715	14.15%
9pm-11:59pm	12.78%	11.99%	8.57%	38859	8.63%
Total	100.00%	100.00%	100.00%	450220	100.00%

Total	2441	4647	443132	450220
Overall %	0.54%	1.03%	98.43%	100.00%

Although most collisions occurred on a weekday (70%), fatal collisions occurred more often on the weekend (Friday 6:00pm to Sunday 5:59am) (43%) than serious injury (31%) and other injury collisions (30%) (see Table 134).

Table 134: Weekday/weekend by collision severity

Weekday/end	Fatal	Serious injury	Other injury	Total	Overall %
Weekday	57.43%	69.38%	70.17%	315824	70.10%
Weekend	42.57%	30.62%	29.83%	134737	29.90%
Total	100.00%	100.00%	100.00%	450561	100.00%

Total	2443	4650	443468	450561
Overall %	0.54%	1.03%	98.43%	100.00%

The light conditions at the time of the collision are presented in Table 135. Two-thirds of injury collisions occurred in the daylight but this was less common for fatal collisions (51%) followed by serious injury (58%) and other injury collisions (66%). Fatal collisions more frequently occurred when conditions were dark and not lighted (34%) compared to serious (12%) and other injury collisions (15%). When light conditions were dark and lighted, fatal collisions and other injury collisions occurred less often (10% and 13% respectively) than serious injury collisions (24%).

Table 135: Light conditions by collision severity

Light conditions	Fatal	Serious injury	Other injury	Total	Overall %
Daylight	51.07%	58.26%	66.47%	297590	66.30%
Dark	33.54%	11.96%	14.90%	67209	14.97%
Dark & lighted	10.10%	24.02%	13.09%	59169	13.18%
Dawn/dusk	5.30%	5.75%	5.54%	24873	5.54%
Total	100.00%	100.00%	100.00%	448841	100.00%

Total	2436	4641	441764	448841
Overall %	0.54%	1.03%	98.42%	100.00%

The weather conditions at the time of injury collisions is shown in Table 136. There were no adverse weather conditions in 84% of collisions but this was more commonly the case for fatal

and serious injury collisions (89% and 89% respectively) compared to other injury collisions (84%). Collisions where it was raining were less common in fatal collisions and somewhat less common in serious injury collisions (8% and 9% respectively) compared to other injury collisions (13%).

Table 136: Weather conditions by collision severity

Weather conditions	Fatal	Serious injury	Other injury	Total	Overall %
No adverse weather	89.18%	89.42%	83.88%	377342	83.97%
Rain	8.48%	9.48%	12.90%	57706	12.84%
Other	2.35%	1.10%	3.21%	14326	3.19%
Total	100.00%	100.00%	100.00%	449374	100.00%
Total	2430	4642	442302	449374	
Overall %	0.54%	1.03%	98.43%	100.00%	

In summary, collisions occurred on Friday, Saturday, or Sunday in 42% of injury collisions. Collisions occurring on Saturday and Sunday were more frequent among fatal collisions (36%) compared to serious (23%) and other injury collisions (24%). The most common time of day in which collisions occurred was between 3:00pm and 5:59pm (24%). This was less common in fatal collisions (16%) compared to serious injury (23%) and other injury collisions (24%). Collisions occurring between 6:00pm and 8:59pm were the most common for serious injury collisions (21%) compared to fatal and other injury collisions (14% and 15% respectively). In addition, fatal collisions occurred more often at night between 9:00pm and 5:59am (36%) than did serious injury (20%) and other injury collisions (18%). Thirty percent of injury collisions occurred on weekends but this was more common in fatal collisions (42%). While two-thirds of all collisions occurred in daylight, but this was less common for fatal collisions (51%) followed by serious injury (58%) and other injury collisions (66%). Fatal collisions more frequently occurred when conditions were dark and not lighted (34%) compared to serious (12%) and other injury collisions (15%). When light conditions were dark and lighted, fatal collisions and other injury collisions occurred less often. In 84% of injury collisions, there were no adverse weather conditions. Collisions where it was raining were less common in fatal collisions and somewhat less common in serious injury collisions.

Florida State Crash Results

Table 137 shows that a little over 2% of all injury collisions in Florida during the years 2005, 2006, and 2007 were fatal injury collisions (see overall row %). There were far more serious injury collisions in Florida (14%) compared to the other states, which all had percentages of serious injuries that were below 6%. Exactly 83% of injury collisions in Florida were other

injury collisions. In terms of differences in relation to the year in which the crash occurred, there was little variation across categories of injury severity.

Table 137: Year by collision severity

Year	Fatal	Serious injury	Other injury	Total	Overall %
2005	34.49%	35.11%	35.06%	151107	35.06%
2006	33.56%	33.86%	32.59%	141372	32.80%
2007	31.95%	31.03%	32.35%	138558	32.15%
Total	100.00%	100.00%	100.00%	431037	100.00%
Total	9220	64052	357765	431037	
Overall %	2.14%	14.86%	83.00%	100.00%	

Type of collision. Table 138 shows that 22% of all injury collisions involved a single vehicle. In addition, both fatal and serious injury crashes were more likely to involve a single vehicle (48% and 32% respectively) compared to other less severe injury crashes (19%). Conversely, multiple vehicle collisions were less common for fatal and serious injury collisions (52% and 68% respectively) compared to other injury collisions (81%).

Table 138: Number of vehicles by collision severity

No. of vehicles	Fatal	Serious injury	Other injury	Total	Overall %
Single vehicle	47.70%	32.00%	19.16%	93444	21.68%
Multiple vehicle	52.30%	68.00%	80.84%	337587	78.32%
Total	100.00%	100.00%	100.00%	431031	100.00%
Total	9220	64050	357761	431031	
Overall %	2.14%	14.86%	83.00%	100.00%	

Table 139 indicates that most injury crashes involved other harmful events, such as colliding with a parked car or hitting an animal (33%) followed by rear-end collisions (28%) and angle collisions (18%). Rear-end collisions occurred less often in fatal collisions (9%) compared to serious injury (20%) and other injury collisions (30%). Head-on collisions on the other hand were somewhat less common in fatal collisions (8%) compared to serious and other injury collisions (4% and 3% respectively). Angle collisions were somewhat more common in fatal (21%) and serious injury collisions (21%) compared to other injury collisions (17%). Likewise, collisions where the vehicle hit a fixed object were somewhat more common for fatal collisions (12%) compared to serious injury (8%) other injury collisions (5%).

Table 139: Harmful event by collision severity

Harmful event	Fatal	Serious injury	Other injury	Total	Overall %
Rear-end	9.29%	20.39%	29.51%	235724	27.86%
Head-on	7.52%	4.16%	2.71%	25368	3.00%
Angle	21.16%	21.23%	17.07%	149954	17.73%
Left turn	5.72%	7.58%	6.55%	56478	6.68%
Right turn	0.22%	0.61%	0.83%	6686	0.79%
Sideswipe	3.29%	3.40%	3.91%	32402	3.83%
Hit fixed object	11.72%	8.01%	5.49%	50392	5.96%
Overturn	5.14%	3.25%	1.31%	13937	1.65%
Other	35.94%	31.37%	32.63%	275059	32.51%
Total	100.00%	100.00%	100.00%	846000	100.00%
Total	15220	118840	711940	846000	
Overall %	1.80%	14.05%	84.15%	100.00%	

As indicated in Table 140, the most common point of impact on the vehicle in an injury crash was the front of the vehicle (61%) and this was more common for fatal injury collisions (65%) compared to other injury collisions (60%). Vehicles in injury crashes were also often struck in the rear (26%); however, this was less common in fatal (11%) injury collisions compared to serious (20%) and other injury collisions (28%).

Table 140: Point of impact by collision severity

Point of impact	Fatal	Serious injury	Other injury	Total	Overall %
Non-collision	6.06%	3.84%	1.89%	18552	2.25%
Front	65.48%	63.44%	60.27%	502474	60.81%
Right	7.02%	5.64%	4.73%	40457	4.90%
Rear	10.71%	19.73%	27.70%	216970	26.26%
Left	8.15%	6.20%	4.64%	40678	4.92%
Other	2.58%	1.15%	0.78%	7166	0.87%
Total	100.00%	100.00%	100.00%	826297	100.00%
Total	15177	116759	694361	826297	
Overall %	1.84%	14.13%	84.03%	100.00%	

In summary, the majority of injury collisions in Florida involve multiple vehicles; however, both fatal and serious injury crashes were more likely to involve a single vehicle (48% and 32% respectively) compared to other injury crashes (19%). Rear-end collisions occurred less often in fatal collisions (9%) compared to serious injury (20%) and other injury collisions (30%). Angle collisions and collisions where the vehicle hit a fixed object were somewhat more common in fatal collisions compared to serious injury other injury collisions. Although the most common point of impact on the vehicle in a crash was the front end of the vehicle (61%), injury crashes where vehicles were struck in the rear were less common among fatal injury collisions (11%) compared to serious (20%) and other injury collisions (28%).

Driver characteristics. As shown in Table 141, drivers were aged 16-34 in 42% of all injury collisions and there was little variation across categories of injury severity. There was a tendency for older drivers (55+) to be somewhat more often involved in fatal collisions (21%) other injury crashes (17%) suggesting greater frailty among older people.

Table 141: Age by collision severity

Driver age	Fatal	Serious injury	Other injury	Total	Overall %
<15	0.47%	0.83%	0.60%	5350	0.63%
16-20	11.63%	12.81%	12.59%	106752	12.60%
21-24	10.94%	10.41%	10.27%	87249	10.30%
25-34	18.78%	18.78%	18.95%	160318	18.93%
35-44	17.29%	18.07%	18.04%	152733	18.03%
45-54	14.79%	15.10%	14.85%	126086	14.88%
55-64	9.74%	9.49%	9.16%	78050	9.21%
65-74	5.40%	4.95%	4.74%	40531	4.78%
75+	5.37%	3.85%	3.57%	30839	3.64%
Don't know	5.57%	5.71%	7.23%	59175	6.99%
Total	100.00%	100.00%	100.00%	847083	100.00%

Total	15438	119028	712617	847083
Overall %	1.82%	14.05%	84.13%	100.00%

As shown in Table 142, 58% of drivers involved in all injury collisions were male. With regard to differences across injury severity categories, males were more often involved in fatal (74%) and serious injury collisions (63%) than in other injury collisions (58%). The opposite is true for females who were less often involved in fatal injury collisions (26%) than serious (37%) and other injury collisions (40%).

Table 142: Gender by collision severity

Driver gender	Fatal	Serious injury	Other injury	Total	Overall %
Male	74.33%	62.54%	57.53%	472204	58.54%
Female	25.67%	37.46%	42.47%	334368	41.46%
Total	100.00%	100.00%	100.00%	806572	100.00%

Total	14727	114155	677690	806572
Overall %	1.83%	14.15%	84.02%	100.00%

The vehicle manoeuvre performed by drivers prior to the injury crash is shown in Table 143. In most cases (57%), drivers were driving straight at the time of the collision but this was more commonly the case in fatal collisions (74%) compared to serious and other injury collisions (62% and 56% respectively). In addition, drivers were also commonly slowing down or were stopped in the traffic lane (21%) and this was less common in fatal crashes (6%) compared to serious injury and other injury crashes (15% and 22% respectively). This can be expected as less severe injuries occur at lower speeds.

Table 143: Vehicle manoeuvre by collision severity

Vehicle manoeuvre	Fatal	Serious injury	Other injury	Total	Overall %
Straight	73.55%	61.83%	55.66%	481480	56.85%
Slowing/stopped/stalled	5.67%	15.31%	22.39%	178620	21.09%
Left turn	8.65%	11.33%	10.08%	86617	10.23%
Right turn	1.04%	2.26%	2.92%	23636	2.79%
Other	11.08%	9.27%	8.96%	76590	9.04%
Total	100.00%	100.00%	100.00%	846943	100.00%
Total	15416	119012	712515	846943	
Overall %	1.82%	14.05%	84.13%	100.00%	

As shown in Table 144, drivers were wearing a seat belt in 81% of all injury collisions. Restraint use was considerably lower in fatal (54%) than in serious injury (74%) and other injury collisions (82%). Conversely, a restraint was not used more commonly in fatal collisions (30%) compared to serious injury and other injury collisions (16% and 9% respectively).

Table 144: Restraint/helmet use by collision severity

Restraint use	Fatal	Serious injury	Other injury	Total	Overall %
Not in use	30.33%	15.57%	9.08%	87937	10.38%
Seat belt	54.57%	73.99%	82.53%	684613	80.82%
Other	10.10%	5.86%	2.66%	27461	3.24%
Don't know	5.00%	4.57%	5.73%	47072	5.56%
Total	100.00%	100.00%	100.00%	847083	100.00%
Total	15438	119028	712617	847083	
Overall %	1.82%	14.05%	84.13%	100.00%	

Table 145 shows whether an occupant was ejected from the vehicle at the time of the injury crash. Almost 5% of all injury collisions involved an ejected occupant and 95% did not. Collisions involving an ejected occupant were more common among fatal (23%) and serious injury collisions (11%) compared to other injury collisions (4%). This is likely a result of the lower seat belt use in fatal and serious injury collisions.

Table 145: Occupant ejection by collision severity

Ejected	Fatal	Serious injury	Other injury	Total	Overall %
No	77.21%	89.47%	96.45%	773385	95.12%
Yes	22.79%	10.53%	3.55%	39706	4.88%
Total	100.00%	100.00%	100.00%	813091	100.00%
Total	14814	114928	683349	813091	
Overall %	1.82%	14.13%	84.04%	100.00%	

In the majority of injury crashes (90%), no alcohol or drugs were detected according to the investigating officer's judgment of at the time of the crash as shown in Table 146. When a substance was detected it was most often alcohol (7%), but this was far more common in fatal collisions (27%) compared to serious injury (11%) and other injury collisions (6%). Drugs were

also more often detected in fatal collisions (6%) compared to serious and other injury collisions, both with percentages lower than 1%. Likewise the detection of a combination of alcohol and drugs was more common in fatal collisions (8%) compared to serious and other injury collisions which were again both under 1%.

Table 146: Presence of alcohol/drugs by collision severity

Alcohol/drugs	Fatal	Serious injury	Other injury	Total	Overall %
No alcohol or drugs	55.80%	84.98%	92.23%	389551	90.38%
Alcohol	27.48%	10.68%	6.32%	31968	7.42%
Drugs	5.95%	0.54%	0.31%	2013	0.47%
Alcohol and drugs	7.68%	0.93%	0.55%	3266	0.76%
Undetermined	3.08%	2.87%	0.59%	4239	0.98%
Total	100.00%	100.00%	100.00%	431037	100.00%
Total	9220	64052	357765	431037	
Overall %	2.14%	14.86%	83.00%	100.00%	

As shown in Table 147, the majority of injury collisions did not involve a driver drinking or using drugs (90%) according to alcohol and drug tests, but this was less commonly the case for fatal collisions (70%) compared to serious and other injury collisions (88% and 90% respectively). When the driver was found to be under the influence of alcohol and/or drugs in a collision, it was more commonly the case in fatal collisions (21%) compared to serious and other injury collisions (5% and 3% respectively).

Table 147: Alcohol/drug use by collision severity

Alcohol/drug use	Fatal	Serious injury	Other injury	Total	Overall %
Not drinking or using drugs	70.89%	87.88%	90.47%	760288	89.75%
Alcohol-under influence	14.25%	4.98%	3.05%	29855	3.52%
Drugs-under influence	3.80%	0.25%	0.14%	1882	0.22%
Alcohol & drugs-under influence	3.37%	0.28%	0.15%	1898	0.22%
Pending BAC test results	3.03%	2.13%	0.45%	6178	0.73%
Don't know	4.66%	4.49%	5.74%	46988	5.55%
Total	100.00%	100.00%	100.00%	847089	100.00%
Total	15438	119030	712621	847089	
Overall %	1.82%	14.05%	84.13%	100.00%	

Table 148 shows driver BAC levels in injury collisions, for which the majority were unknown (99%). When BAC levels were known, particularly when the BAC was above the legal limit of 0.08%, it was more frequently the case in fatal collisions (9%) compared to serious injury (1%) and other injury collisions (1%).

Table 148: BAC level by collision severity

BAC level	Fatal	Serious injury	Other injury	Total	Overall %
.00	0.58%	0.04%	0.01%	230	0.03%
.001-.070	1.40%	0.10%	0.04%	630	0.07%
.080-.159	3.47%	0.49%	0.23%	2745	0.32%
.160+	5.99%	0.77%	0.37%	4482	0.53%
Don't know	88.55%	98.59%	99.35%	838996	99.05%
Total	100.00%	100.00%	100.00%	847083	100.00%
Total	15438	119028	712617	847083	
Overall %	1.82%	14.05%	84.13%	100.00%	

The estimated travel speed at the time of the injury collision is shown in Table 149. Although speed was unknown in some 27% of cases, the estimated travel speed was under 30 mph in 39% of all injury collisions with fewer fatal collisions occurring at this speed (20%) than serious (34%) and other injury collisions (40%). The estimated travel speed was 31-55 mph in 27% of injury collisions but this was more common for fatal and serious injury collisions (36% and 33% respectively) compared to other injury collisions (26%). Among fatal and serious injury collisions, speeds higher than 55 mph were more common in fatal collisions (24%) compared to serious and other injury collisions (10% and 5% respectively).

Table 149: Estimated travel speed by collision severity

Travel speed	Fatal	Serious injury	Other injury	Total	Overall %
<=30	19.50%	34.42%	40.29%	331066	39.08%
31-55	36.02%	33.16%	25.64%	227751	26.89%
56-69	11.27%	5.55%	3.21%	31210	3.68%
70+	12.36%	4.76%	2.28%	23847	2.82%
Don't know	20.85%	22.11%	28.58%	233215	27.53%
Total	100.00%	100.00%	100.00%	847089	100.00%
Total	15438	119030	712621	847089	
Overall %	1.82%	14.05%	84.13%	100.00%	

Table 150 shows that drivers exceeded a safe speed limit in 2% of all injury crashes and exceeded the stated speed limit in <1% of injury crashes. Exceeding a safe speed limit was more common for fatal injury crashes (6%) than in other injury crashes (1%), and exceeding the stated speed limit was somewhat more commonly a factor in fatal collisions (5%) compared to serious (1%) and other injury collisions (<1%).

Table 150: Speed as contributing factor by collision severity

Speeding	Fatal	Serious injury	Other injury	Total	Overall %
Exceeded safe speed limit					
Yes	5.68%	2.73%	1.29%	13321	1.57%
No	94.32%	97.27%	98.71%	833768	98.43%
Total	100.00%	100.00%	100.00%	847089	100.00%
Total	15438	119030	712621	847089	
Overall row %	1.82%	14.05%	84.13%	100.00%	
Exceeded stated speed limit					
Yes	4.96%	0.96%	0.30%	4036	0.48%
No	95.04%	99.04%	99.70%	843053	99.52%
Total	100.00%	100.00%	100.00%	847089	100.00%
Total	15438	119030	712621	847089	
Overall %	1.82%	14.05%	84.13%	100.00%	

The most often occurring contributing factor in all injury collisions was careless driving (21%) followed by the driver making an improper turn (12%), following too closely (5%), or disregarding a traffic sign or signal (3%). There was not much difference across injury severity categories for any of these factors (see Table 151). Fatal collisions more often involved alcohol or drugs as a contributing factor (17%) compared to serious (3%) and other injury collisions (2%). Likewise, fatal collisions more often involved speed (10%) compared to serious (4%) and other injury collisions (2%).

Table 151: Contributing factors by collision severity

Contributing factor	Fatal	Serious Injury	Other Injury	Total	Overall %
Careless driving					
Yes	20.75%	20.12%	21.28%	178809	21.11%
No	79.25%	79.88%	78.72%	668280	78.89%
Total	100.00%	100.00%	100.00%	847089	100.00%
Total	15438	119030	712621	847089	
Overall %	1.82%	14.05%	84.13%	100.00%	
Improper turn					
Yes	9.89%	13.20%	11.52%	99304	11.72%
No	90.11%	86.80%	88.48%	747785	88.28%
Total	100.00%	100.00%	100.00%	847089	100.00%
Total	15438	119030	712621	847089	
Overall %	1.82%	14.05%	84.13%	100.00%	
Alcohol/drugs					
Yes	16.50%	3.04%	1.53%	17069	2.02%
No	83.50%	96.96%	98.47%	830020	97.98%
Total	100.00%	100.00%	100.00%	847089	100.00%
Total	15438	119030	712621	847089	
Overall %	1.82%	14.05%	84.13%	100.00%	
Followed too closely					
Yes	2.01%	3.37%	4.80%	38550	4.55%
No	97.99%	96.63%	95.20%	808539	95.45%
Total	100.00%	100.00%	100.00%	847089	100.00%
Total	15438	119030	712621	847089	
Overall %	1.82%	14.05%	84.13%	100.00%	
Disregarded traffic sign/signal					
Yes	3.72%	4.15%	3.43%	29970	3.54%
No	96.28%	95.85%	96.57%	817119	96.46%
Total	100.00%	100.00%	100.00%	847089	100.00%
Total	15438	119030	712621	847089	
Overall %	1.82%	14.05%	84.13%	100.00%	
Speeding					
Yes	10.10%	3.55%	1.55%	16816	1.99%
No	89.90%	96.45%	98.45%	830273	98.01%
Total	100.00%	100.00%	100.00%	847089	100.00%
Total	15438	119030	712621	847089	
Overall %	1.82%	14.05%	84.13%	100.00%	
Wrong side/left of centre					
Yes	3.72%	1.40%	0.73%	7427	0.88%
No	96.28%	98.60%	99.27%	839662	99.12%
Total	100.00%	100.00%	100.00%	847089	100.00%
Total	15438	119030	712621	847089	
Overall %	1.82%	14.05%	84.13%	100.00%	

As shown in Table 152, 86% of drivers involved in injury collisions were licensed in the state of Florida. There was little variation across categories of injury severity.

Table 152: State issuing driver's license by collision severity

Driver license	Fatal	Serious injury	Other injury	Total	Overall %
In state	84.36%	86.06%	86.18%	729597	86.13%
Out of state	10.64%	9.19%	7.80%	68136	8.04%
Don't know	4.99%	4.75%	6.02%	49356	5.83%
Total	100.00%	100.00%	100.00%	847089	100.00%
Total	15438	119030	712621	847089	
Overall %	1.82%	14.05%	84.13%	100.00%	

In summary, drivers were aged 16-34 in 42% of all of the injury collisions, but older drivers (55+) tended be somewhat more often involved in fatal collisions (21%) compared to other injury crashes (17%). Almost 60% of the drivers involved in all injury collisions were male. Males were more often involved in fatal (74%) and serious injury collisions (63%) than in other less severe injury collisions (58%). Fatal crashes were more common when the vehicle was driving straight at the time of the collision (74%) compared to serious injury (62%) and other injury crashes (56%). Vehicle collisions where the driver was slowing or stopped in the traffic lane were less common for fatal (6%) compared to serious injury collisions (15%) and other injury collisions (22%). The non-use of seat belts was more common in fatal (30%) than serious injury collisions (16%) and other injury collisions (9%). Collisions involving an ejected occupant were more common for fatal (23%) and serious injury collisions (11%) compared to 4% for other injury collisions. The detection of both alcohol and drugs was more common in fatal collisions compared to serious and other injury collisions. While the BAC level of drivers was unknown in 99% of cases, when the BAC was above the legal limit of 0.08%, it was more frequently the case in fatal collisions (9%) compared to serious injury (1%) and other injury collisions (1%). For fatal and serious injury collisions, speeds higher than 55 mph were more common in fatal collisions (24%) compared to serious and other injury collisions (10% and 5% respectively). Exceeding a safe speed limit was more common for fatal crashes (6%) than in other injury crashes (1%) and exceeding the stated speed limit was somewhat more commonly a factor in fatal collisions (5%) compared to serious (1%) and other injury collisions (<1%). In addition, fatal collisions more often involved alcohol or drugs as a contributing factor (17%) compared to serious (3%) and other injury collisions (2%). Likewise, fatal collisions more often involved speed (10%) compared to serious (4%) and other injury collisions (2%).

Road and vehicle characteristics. Table 153 reveals that overall, 58% of injury collisions occurred on roads with four or more lanes and there was little variation across injury severity categories. Crashes that occurred on one or two lanes roads were somewhat more common in fatal and serious collisions (39% and 36% respectively) compared to other injury collisions (32%).

Table 153: Number of road lanes by collision severity

No. of lanes	Fatal	Serious injury	Other injury	Total	Overall %
1-2	38.87%	36.52%	31.93%	141223	32.76%
3	1.69%	2.30%	3.31%	13482	3.13%
4+	57.07%	56.18%	58.25%	249654	57.92%
Don't know	2.36%	5.00%	6.50%	26678	6.19%
Total	100.00%	100.00%	100.00%	431037	100.00%
Total	9220	64052	357765	431037	
Overall %	2.14%	14.86%	83.00%	100.00%	

Table 154 indicates that the road on which injury collisions occurred was divided in 54% of all injury collisions and undivided in 46%. There was little variation across categories of injury severity for this variable.

Table 154: Road divided/not divided by collision severity

Divided/Undivided Highway	Fatal	Serious injury	Other injury	Total	Overall %
Divided	54.01%	52.09%	54.20%	224296	53.88%
Undivided	45.99%	47.91%	45.80%	191972	46.12%
Total	100.00%	100.00%	100.00%	416268	100.00%
Total	9093	62199	344976	416268	
Overall %	2.18%	14.94%	82.87%	100.00%	

Table 155 presents the location of the injury collision impact in relation to the roadway by collision severity. The majority of collisions occurred off the roadway (83%) and this was least common among fatal collisions (71%) compared to serious injury and other injury collisions (78% and 84% respectively). When the collision occurred on the roadway, it occurred more often in fatal collisions (29%) compared to serious injury (22%) and other injury collisions (16%). This may be indicative of drivers crossing the centre line and striking another vehicle or object on the road.

Table 155: Collision location by collision severity

Crash location	Fatal	Serious injury	Other injury	Total	Overall %
Off roadway	71.16%	77.62%	84.22%	357600	82.96%
On roadway	28.84%	22.38%	15.78%	73437	17.04%
Total	100.00%	100.00%	100.00%	431037	100.00%
Total	9220	64052	357765	431037	
Overall %	2.14%	14.86%	83.00%	100.00%	

As can be seen in Table 156, injury collisions most often occurred in an urban area (53%) but this was less common in fatal and serious injury collisions (39% and 44% respectively) compared to other injury collisions (55%). When the collisions occurred in a rural area, fatal (61%) and serious injury collisions (56%) were more common compared to other injury collisions (45%).

Table 156: Rural/urban by collision severity

Rural/urban	Fatal	Serious injury	Other injury	Total	Overall %
Rural	60.87%	56.20%	45.18%	202756	47.15%
Urban	39.13%	43.80%	54.82%	227245	52.85%
Total	100.00%	100.00%	100.00%	430001	100.00%
Total	9160	63806	357035	430001	
Overall %	2.13%	14.84%	83.03%	100.00%	

The speed limit on the roadway at the time of injury collisions was most often between 31 mph and 55 mph (67%) with little variation across categories of injury severity as can be seen in Table 157. Collisions occurring on roads with speed limits below 30 mph were less common in fatal collisions (11%) compared to serious and other injury collisions (17% and 19% respectively). At speed limits above 55 mph, fatal collisions were more common (20%) compared to serious injury (11%) and other injury collisions (8%).

Table 157: Speed limit by collision severity

Speed limit	Fatal	Serious injury	Other injury	Total	Overall %
<=30	11.48%	16.73%	18.86%	156048	18.42%
31-55	64.93%	67.35%	66.68%	565362	66.74%
56-69	11.28%	6.11%	4.73%	42710	5.04%
70+	8.84%	4.63%	3.03%	28485	3.36%
Don't know	3.47%	5.19%	6.70%	54484	6.43%
Total	100.00%	100.00%	100.00%	847089	100.00%
Total	15438	119030	712621	847089	
Overall %	1.82%	14.05%	84.13%	100.00%	

For the majority of injury collisions the roadway was dry at the time of collision (86%) as shown in Table 158 and this was somewhat more common for fatal collisions (90%) compared to other injury collisions (86%).

Table 158: Road condition by collision severity

Road surface	Fatal	Serious injury	Other injury	Total	Overall %
Blacktop	93.85%	92.41%	91.85%	396416	91.97%
Other	6.15%	7.59%	8.15%	34592	8.03%
Total	100.00%	100.00%	100.00%	431008	100.00%
Total	9215	64047	357746	431008	
Overall %	2.14%	14.86%	83.00%	100.00%	

As shown in Table 159, the majority of (92%) injury collisions occurred on straight roads but this was less common for fatal collisions (83%) compared to serious and other injury collisions (89% and 93% respectively). Conversely, when collisions occurred on a curved road, fatal collisions were more common (17%) compared to serious and other injury collisions (11% and 7% respectively).

Table 159: Road alignment by collision severity

Road alignment	Fatal	Serious injury	Other injury	Total	Overall %
Straight	82.78%	89.39%	93.26%	398506	92.46%
Curved	17.22%	10.61%	6.74%	32503	7.54%
Total	100.00%	100.00%	100.00%	431009	100.00%
Total	9214	64048	357747	431009	
Overall %	2.14%	14.86%	83.00%	100.00%	

Whether the road was level or had a grade at the injury crash location is presented in Table 160. In the majority of all injury collisions, the road was level (90%) and there was little variation across categories of injury severity.

Table 160: Profile of road by collision severity

Profile of road	Fatal	Serious injury	Other injury	Total	Overall %
Level	86.97%	90.02%	90.47%	389322	90.33%
Grade	13.03%	9.98%	9.53%	41687	9.67%
Total	100.00%	100.00%	100.00%	431009	100.00%
Total	9214	64048	357747	431009	
Overall %	2.14%	14.86%	83.00%	100.00%	

The location of the injury collision was an intersection in 45% of all injury collisions and this was less common among fatal collisions (30%) compared to serious and other injury collisions (47% and 42% respectively) (see Table 161). When the collision was not at an intersection, fatal collisions were more common (61%) compared to serious (47%) and other injury collisions (42%).

Table 161: Intersection related by collision severity

Intersection	Fatal	Serious injury	Other injury	Total	Overall %
No	60.89%	46.59%	41.72%	184708	42.85%
Yes	29.91%	41.55%	45.73%	192961	44.77%
Other	9.20%	11.86%	12.55%	53340	12.38%
Total	100.00%	100.00%	100.00%	431009	100.00%
Total	9214	64048	357747	431009	
Overall %	2.14%	14.86%	83.00%	100.00%	

Table 162 shows that the type of vehicle involved in injury collisions was most often a passenger car (63%), but this was less common in fatal collisions (50%) compared to serious injury (57%) and other injury collisions (64%). Collisions involving a motorcycle were somewhat more common among fatal collisions (11%) compared to serious (7%) and other injury collisions (3%).

Table 162: Vehicle type by collision severity

Vehicle type	Fatal	Serious injury	Other injury	Total	Overall %
Car	49.51%	57.43%	64.23%	525677	63.00%
Van	6.25%	7.23%	7.49%	61969	7.43%
Truck	22.36%	20.84%	19.89%	167438	20.07%
Heavy truck/Bus	6.38%	3.17%	2.70%	23662	2.84%
Motorcycle	11.02%	7.22%	2.57%	28218	3.38%
Other	4.48%	4.12%	3.12%	27440	3.29%
Total	100.00%	100.00%	100.00%	834404	100.00%
Total	15240	117883	701281	834404	
Overall %	1.83%	14.13%	84.05%	100.00%	

In terms of the vehicle model year, the majority of all injury collisions involved vehicle models from the year 2000 and up (44%) followed by models from 1997 or earlier (32%). There were no notable differences across categories of injury severity (see Table 163.).

Table 163: Vehicle model year by collision severity

Model year	Fatal	Serious injury	Other injury	Total	Overall %
<=1997	32.43%	32.91%	31.50%	268653	31.71%
1998-2000	18.47%	18.69%	18.90%	159772	18.86%
2001-2003	19.84%	20.83%	21.19%	178887	21.12%
2004+	24.18%	22.70%	22.84%	193499	22.84%
Don't know	5.08%	4.87%	5.57%	46278	5.46%
Total	100.00%	100.00%	100.00%	847089	100.00%
Total	15438	119030	712621	847089	
Overall %	1.82%	14.05%	84.13%	100.00%	

In summary, although the majority of injury collisions occurred on roads with four or more lanes, crashes that occurred on one or two lane roads were somewhat more common among fatal (39%) and serious collisions (36%) compared to other injury collisions (32%). The road on which collisions occurred was divided in 54% of all injury collisions and there was little difference between levels of injury severity for this variable. When the collision occurred on the roadway, it occurred more often in fatal collisions (29%) compared to serious injury (22%) and other injury collisions (16%). When the collisions occurred in a rural area, fatal (61%) and serious injury collisions (56%) were more common compared to other injury collisions (45%). At speeds above 55 mph, fatal collisions were more common (20%) compared to serious

injury (11%) and other injury collisions (8%). Although in the majority of injury collisions the roadway was dry at the time of collision (86%), this was somewhat more common for fatal collisions (90%) compared to other injury collisions (86%). The majority of (92%) of injury collisions occurred on straight roads; however, when the collision occurred on a curved road, fatal collisions were more common (17%) compared to serious (11%) and other injury collisions (7%). In the majority of all injury collisions, the road was level (90%) and there was little variation across categories of injury severity. When the collision was not at an intersection, fatal collisions were more common (61%) compared to serious (47%) and other injury collisions (42%). While the majority of injury collisions involved a passenger car, this was less common in fatal collisions (50%) compared to serious injury (57%) and other injury collisions (64%). Collisions involving a motorcycle were somewhat more common among fatal collisions (11%) compared to serious (7%) and other injury collisions (3%).

Temporal and environmental characteristics. Table 164 shows that injury collisions were fairly evenly distributed across the four quarters of the year and there was little variation as a function of collision severity.

Table 164: Quarter of year by collision severity

Quarter of year	Fatal	Serious injury	Other injury	Total	Overall %
Jan-Mar	26.36%	26.51%	26.19%	113102	26.24%
Apr-Jun	25.31%	25.13%	25.01%	107895	25.03%
Jul-Sep	22.51%	23.87%	24.08%	103514	24.02%
Oct-Dec	25.82%	24.50%	24.72%	106526	24.71%
Total	100.00%	100.00%	100.00%	431037	100.00%
Total	9220	64052	357765	431037	
Overall %	2.14%	14.86%	83.00%	100.00%	

As shown in Table 165, overall injury collisions were somewhat more common on Fridays (11%) and 28% of all collisions occurred on Friday, Saturday or Sunday. Fatal collisions were more common on Saturday and Sunday (24%) compared to serious injury and other injury collisions (19% and 16% respectively).

Table 165: Day of week by collision severity

Day of week	Fatal	Serious injury	Other injury	Total	Overall %
Monday	7.86%	8.67%	9.29%	39511	9.17%
Tuesday	7.39%	8.61%	9.35%	39658	9.20%
Wednesday	8.05%	8.83%	9.49%	40331	9.36%
Thursday	8.16%	9.01%	9.58%	40777	9.46%
Friday	10.17%	10.59%	10.90%	46722	10.84%
Saturday	12.06%	9.96%	8.96%	39556	9.18%
Sunday	11.82%	9.22%	7.37%	33375	7.74%
Don't know	34.49%	35.11%	35.06%	151107	35.06%
Total	100.00%	100.00%	100.00%	431037	100.00%
Total	9220	64052	357765	431037	
Overall %	2.14%	14.86%	83.00%	100.00%	

Table 166 indicates that overall, the most common time of day in which all injury collisions occurred was between 3:00pm and 5:59pm (23%), the evening rush hour. This was less common in fatal collisions (14%) compared to serious injury and other injury collisions (21% and 23% respectively). Collisions occurring between 12:00pm and 2:59pm were also common (18%), but this was less frequently the case for fatal collisions (12%) compared to serious injury and other injury collisions (17% and 18% respectively). In addition, fatal collisions occurred more often at night, between 9:00pm to 5:59am, (39%) than did serious injury (23%) and other injury collisions (18%).

Table 166: Time of day by collision severity

Time	Fatal	Serious injury	Other injury	Total	Overall %
12am-2:59am	14.26%	7.49%	5.52%	25861	6.00%
3am-5:59am	8.56%	4.47%	3.46%	16017	3.72%
6am-8:59am	9.01%	11.40%	12.56%	53081	12.31%
9am-11:59am	9.24%	12.26%	13.25%	56102	13.02%
12pm-2:59pm	11.70%	16.70%	18.18%	76834	17.83%
3pm-5:59pm	13.81%	20.66%	23.34%	98015	22.74%
6pm-8:59pm	17.64%	15.94%	14.96%	65364	15.16%
9pm-11:59pm	15.78%	11.07%	8.73%	39761	9.22%
Total	100.00%	100.00%	100.00%	431035	100.00%
Total	9220	64052	357763	431035	
Overall %	2.14%	14.86%	83.00%	100.00%	

Table 167 shows that the majority of all injury collisions occurred on weekdays (68%) but this was less commonly the case for fatal collisions (55%) compared to serious injury and other injury collisions (64% and 69% respectively). However weekend collisions (Friday 6:00pm to Sunday 5:59am) were more common among fatal collisions (45%) compared to serious injury (36%) and other injury (30%) collisions.

Table 167: Weekday/end by collision severity

Weekday/end	Fatal	Serious injury	Other injury	Total	Overall %
Weekday	55.26%	64.37%	69.54%	191648	68.46%
Weekend	44.74%	35.63%	30.46%	88281	31.54%
Total	100.00%	100.00%	100.00%	279929	100.00%
Total	6040	41564	232325	279929	
Overall %	2.16%	14.85%	82.99%	100.00%	

As revealed in Table 168, the majority of all injury collisions occurred during daylight (68%) and this was least common for fatal collisions (43%) followed by serious injury and other injury collisions (63% and 70% respectively). Fatal collisions were more common when it was dark with some lighting (26%) compared to serious injury (13%) and other injury collisions (7%). When it was dark with no lighting, fatal collisions were also more common (26%) compared to serious (20%) and other injury collisions (19%).

Table 168: Light conditions by collision severity

Light conditions	Fatal	Serious injury	Other injury	Total	Overall %
Daylight	43.46%	62.75%	69.81%	292192	68.20%
Dusk/dawn	4.42%	4.18%	4.09%	17597	4.11%
Dark	25.58%	20.27%	19.23%	83630	19.52%
Dark but lighted	26.53%	12.80%	6.87%	35018	8.17%
Total	100.00%	100.00%	100.00%	428437	100.00%
Total	9154	63727	355556	428437	
Overall %	2.14%	14.87%	82.99%	100.00%	

As shown in see Table 169, in the majority of injury collisions there were no adverse weather conditions at the time of the crash (90%). There was little variation across categories of injury severity in terms of weather conditions.

Table 169: Weather conditions by collision severity

Weather conditions	Fatal	Serious injury	Other injury	Total	Overall %
No adverse weather	91.68%	91.38%	89.75%	388060	90.04%
Rain	6.24%	7.34%	9.02%	37546	8.71%
Other	2.08%	1.29%	1.23%	5404	1.25%
Total	100.00%	100.00%	100.00%	431010	100.00%
Total	9214	64048	357748	431010	
Overall %	2.14%	14.86%	83.00%	100.00%	

In summary, injury collisions were fairly evenly distributed across the four quarters of the year with not much difference as a function of collision severity. Fatal collisions were somewhat more common on Saturday and Sunday (24%) compared to serious injury (19%) and other injury collisions (16%). The most common time of day in which a collision occurred was between 3:00pm and 5:59pm (23%). This was less common in fatal collisions (14%) compared to serious injury (21%) and other injury collisions (23%). In addition, fatal collisions occurred more often at night between 9:00pm to 5:59am (39%) than did serious injury (23%) and other injury collisions (18%). Collisions occurring between 12:00pm and 2:59pm were less frequent for fatal collisions (12%) compared to serious injury and other injury collisions (17% and 18% respectively). While the majority of all injury collisions occur on weekdays (68%), weekend collisions were more common among fatal collisions (45%) compared to serious injury (36%) and other injury (30%) collisions. Although the majority of all injury collisions occurred during the daylight (68%), fatal collisions were more common when it was dark with no lighting (26%) or dark with some lighting (26%) compared to serious injury (13% and 20% respectively) and other injury collisions (7% and 19% respectively). In the majority of injury collisions there were no adverse weather conditions at the time of the crash (90%) and there was little variation across categories of injury severity in terms of weather conditions.

Massachusetts State Crash Results

Table 170 shows that approximately 1% of all injury collisions in Massachusetts for the years 2005, 2006, and 2007 were fatal injury collisions and 99% were non-fatal (see overall row %). There was no information available on serious injury collisions for this state. There was little variation across categories of injury severity in relation to crash year.

Table 170: Year by collision severity

Year	Fatal injury	Non-fatal injury	Total	Overall %
2005	33.96%	35.19%	41702	35.17%
2006	32.82%	33.70%	39939	33.69%
2007	33.22%	31.12%	36917	31.14%
Total	100.00%	100.00%	118558	100.00%
Total	1228	117330	118558	
Overall %	1.04%	98.96%	100.00%	

Type of collision. Table 171 shows that three-quarters of all injury collisions involved multiple vehicles (75%), but this was less common for fatal collisions (39%) compared to non-fatal collisions (75%). Conversely, it was more common for fatal collisions to involve a single vehicle (61%) compared to non-fatal injury collisions (25%).

Table 171: Number of vehicles by severity

No. of vehicles	Fatal injury	Non-fatal injury	Total	Overall %
Single vehicle	61.07%	25.03%	30117	25.40%
Multiple vehicle	38.93%	74.97%	88439	74.60%
Total	100.00%	100.00%	118556	100.00%
Total	1228	117328	118556	
Overall %	1.04%	98.96%	100.00%	

Table 172 shows the most harmful event in the crash according to collision severity. Unfortunately, for the majority of collisions, the most harmful event in the crash was unknown (88%). When the most harmful event was known, it was somewhat less common for fatal collisions to involve a collision with another motor vehicle (6%) than among non-fatal collisions (10%).

Table 172: Harmful event by severity

Harmful event	Fatal injury	Non-fatal injury	Total	Overall %
Collision with motor vehicle	6.15%	9.81%	127383	9.78%
Collision with parked vehicle	0.37%	0.32%	4228	0.32%
Collision with ped/cyclist	0.77%	0.16%	2132	0.16%
Collision with fixed object	3.40%	1.38%	18273	1.40%
Overturn/rollover	0.86%	0.16%	2235	0.17%
Other	0.41%	0.23%	3045	0.23%
Unknown	88.04%	87.93%	1145566	87.93%
Total	100.00%	100.00%	1302862	100.00%
Total	13357	1289505	1302862	
Overall %	1.03%	98.97%	100.00%	

As shown in Table 173, rear-end collisions occurred most frequently (34%) followed by angle collisions (27%) and single vehicle crashes (23%). As expected, rear-end collisions occurred less frequently in fatal collisions (4%) compared to non-fatal collisions (34%). Angle collisions were also less common in fatal (16%) vs. non-fatal collisions (28%). Single vehicle crashes were more common for fatal collisions (58%) than non-fatal collisions (22%), as were head-on collisions (11% vs. 5%).

Table 173: Manner of collision by severity

Manner of collision	Fatal injury	Non-fatal injury	Total	Overall %
Angle	16.45%	27.57%	32552	27.46%
Head-on	11.48%	4.73%	5696	4.80%
Rear-end	4.48%	33.99%	39936	33.68%
Sidswipe	3.91%	5.80%	6848	5.78%
Single vehicle crash	57.74%	22.39%	26982	22.76%
Unknown	5.94%	5.52%	6544	5.52%
Total	100.00%	100.00%	118558	100.00%
Total	1228	117330	118558	
Overall %	1.04%	98.96%	100.00%	

In summary, although the majority of all injury collisions involved multiple vehicles (75%), it was more common for fatal collisions to involve a single vehicle (61%) compared to non-fatal injury collisions (25%). When the most harmful event was known, it was somewhat less common for fatal collisions to involve a collision with another motor vehicle (6%) than among non-fatal collisions (10%). Rear-end collisions occurred less frequently in fatal collisions (4%) compared to non-fatal collisions (34%). Angle collisions were also less common in fatal (16%) vs. non-fatal collisions (28%). Finally, single vehicle crashes were more common among fatal collisions (58%) than non-fatal collisions (22%), as were head-on collisions (11% vs. 5%).

Driver characteristics. Table 174 shows the vehicle manoeuvre performed by the driver prior to the crash. The vehicle manoeuvre for the majority of cases was unfortunately not known (95%). When the vehicle manoeuvre was known, the driver was most often travelling straight at the time of the collision (3%). There was little variation between fatal and non-fatal injury collisions for this variable.

Table 174: Vehicle manoeuvre by collision severity

Vehicle manoeuvre	Fatal injury	Non-fatal injury	Total	Overall %
Travelling straight	2.82%	2.83%	36806	2.83%
Slowing/stopped	0.13%	1.08%	13971	1.07%
Turning	0.19%	0.52%	6737	0.52%
Entering/leaving traffic lane	0.10%	0.18%	2324	0.18%
Other	0.48%	0.31%	4058	0.31%
Don't know	96.27%	95.08%	1238966	95.10%
Total	100.00%	100.00%	1302862	100.00%
Total	13357	1289505	1302862	
Overall %	1.03%	98.97%	100.00%	

In summary, only one variable describing driver characteristics was available for analysis. The vehicle manoeuvre performed by the driver prior to the crash for the majority of cases was unfortunately not known (95%). When the vehicle manoeuvre was known, the driver was most often travelling straight at the time of the collision (3%). Drivers were less commonly slowing or were stopped in fatal collisions compared to non-fatal injury collisions.

Road and vehicle characteristics. As shown in Table 175, the road conditions were dry in the majority of injury collisions (72%). When the roads were covered in snow, slush or ice, fatal collisions (3%) were somewhat less common than non-fatal injury collisions (7%). This may be indicative of increased driver caution when driving in unfavorable weather conditions.

Table 175: Road conditions by collision severity

Road condition	Fatal injury	Non-fatal injury	Total	Overall %
Dry	75.11%	72.42%	83907	72.44%
Wet	20.56%	20.08%	23259	20.08%
Snow/slush/ice	3.00%	6.52%	7515	6.49%
Other	1.32%	0.98%	1144	0.99%
Total	100.00%	100.00%	115825	100.00%
Total	1133	114692	115825	
Overall %	0.98%	99.02%	100.00%	

Table 176 indicates that the type of vehicle involved in injury collisions was not known for the majority of cases (95%). When the type of vehicle was known, the most common vehicle involved in collisions was a passenger car (3%) followed by a van, pickup truck, or SUV (1%). There was little variation across categories of injury severity for this variable.

Table 176: Vehicle type by collision severity

Vehicle type	Fatal injury	Non-fatal injury	Total	Overall %
Car	2.02%	3.10%	40247	3.09%
Van/Pickup/SUV	1.15%	1.17%	15297	1.17%
Motorcycle	0.46%	0.10%	1410	0.11%
Heavy truck/bus	0.21%	0.12%	1637	0.13%
Other	0.05%	0.02%	279	0.02%
Don't know	96.11%	95.48%	1243992	95.48%
Total	100.00%	100.00%	1302862	100.00%
Total	13357	1289505	1302862	
Overall %	1.03%	98.97%	100.00%	

In summary, only two variables pertaining to road and vehicle characteristics were available for analysis. The road conditions were dry in the majority of injury collisions (72%). When the roads were covered in snow, slush or ice, fatal collisions (3%) were somewhat less common than non-fatal injury collisions (7%). When the type of vehicle was known the most common vehicle involved in collisions was a passenger car (3%) followed by a van, pickup truck, or SUV (1%).

Temporal and environmental characteristics. The quarter of the year during which injury collisions occurred was fairly evenly distributed across the year as shown in Table 177. There was little difference between fatal injury collisions and non-fatal injury collisions with regards to the time of the year.

Table 177: Quarter of year by collision severity

Quarter of year	Fatal injury	Non-fatal injury	Total	Overall %
Jan-Mar	21.99%	24.77%	29334	24.74%
Apr-Jun	24.84%	25.07%	29725	25.07%
Jul-Sep	26.87%	25.54%	30294	25.55%
Oct-Dec	26.30%	24.62%	29205	24.63%
Total	100.00%	100.00%	118558	100.00%

Total	1228	117330	118558
Overall %	1.04%	98.96%	100.00%

Table 178 reveals that overall, injury collisions were somewhat more common on Fridays (16%), and 42% of all collisions occurred on Friday, Saturday or Sunday. Collisions occurring on Friday, Saturday or Sunday were more common among fatal injury collisions (51%) compared to non-fatal injury collisions (42%).

Table 178: Day of week by collision severity

Day of week	Fatal injury	Non-fatal injury	Total	Overall %
Sunday	16.37%	11.21%	13351	11.26%
Monday	12.38%	13.80%	16342	13.78%
Tuesday	11.32%	14.61%	17285	14.58%
Wednesday	12.95%	14.49%	17163	14.48%
Thursday	12.62%	15.05%	17808	15.02%
Friday	16.86%	16.64%	19736	16.65%
Saturday	17.51%	14.20%	16873	14.23%
Total	100.00%	100.00%	118558	100.00%

Total	1228	117330	118558
Overall %	1.04%	98.96%	100.00%

The time of the day during which the collision occurred is presented in Table 179. Overall, the most common time of day in which collisions occurred was between 3:00pm and 5:59pm

(21%), the evening rush hour. This was less common in fatal collisions (16%) compared to non-fatal injury collisions (21%). Collisions occurring during the day (6:00am to 2:59pm) were also less common for fatal collisions (31%) compared to non-fatal collisions (47%). In addition, fatal collisions occurred more often at night between 9:00pm and 5:59am (38%) than did non-fatal injury collisions (19%).

Table 179: Time of day by collision severity

Time	Fatal injury	Non-fatal injury	Total	Overall %
12am-2:59am	15.88%	6.95%	8351	7.04%
3am-5:59am	8.22%	5.47%	6516	5.50%
6am-8:59am	8.79%	14.40%	17006	14.34%
9am-11:59am	9.28%	14.71%	17370	14.65%
12pm-2:59pm	12.87%	18.38%	21725	18.32%
3pm-5:59pm	16.29%	21.40%	25304	21.34%
6pm-8:59pm	14.74%	11.64%	13844	11.68%
9pm-11:59pm	13.93%	7.05%	8442	7.12%
Total	100.00%	100.00%	118558	100.00%

Total	1228	117330	118558
Overall %	1.04%	98.96%	100.00%

Table 180 shows that the majority of injury collisions occurred on a weekday (70%) but they were less common among fatal collisions (70%) compared to non-fatal collisions (59%). However, fatal collisions were more common on the weekend (Friday 6:00pm to Sunday 5:59am) (41%) compared to non-fatal injury collisions (30%).

Table 180: Weekday/end by collision severity

Weekday/end	Fatal injury	Non-fatal injury	Total	Overall %
Weekday	58.71%	69.80%	82615	69.68%
Weekend	41.29%	30.20%	35943	30.32%
Total	100.00%	100.00%	118558	100.00%

Total	1228	117330	118558
Overall %	1.04%	98.96%	100.00%

As shown in Table 181, most injury collisions occurred during daylight (69%), but this was less common among fatal injury collisions (47%) compared to non-fatal injury collisions (69%). Fatal collisions were more prevalent when it was dark with no lighting (18%), as well as when it was dark with lighting (28%), compared to non-fatal injury collisions (5% and 20% respectively).

Table 181: Light conditions by collision severity

Light conditions	Fatal injury	Non-fatal injury	Total	Overall %
Daylight	47.29%	69.60%	80997	69.38%
Dark	17.57%	5.14%	6148	5.27%
Dark & lighted	28.15%	19.67%	23058	19.75%
Dawn/dusk	4.98%	4.63%	5409	4.63%
Other	2.01%	0.96%	1133	0.97%
Total	100.00%	100.00%	116745	100.00%
Total	1144	115601	116745	
Overall %	0.98%	99.02%	100.00%	

Table 182 shows that the majority of injury collisions occurred when there were no adverse weather conditions (87%) but this was much more common among fatal injury collisions (89%) compared to non-fatal injury collisions (37%).

Table 182: Weather conditions by collision severity

Weather conditions	Fatal injury	Non-fatal injury	Total	Overall %
No adverse weather	89.51%	86.90%	99427	86.92%
Rain	8.62%	10.18%	11630	10.17%
Sleet/snow	1.24%	2.42%	2760	2.41%
Other	0.62%	0.50%	571	0.50%
Total	100.00%	100.00%	114388	100.00%
Total	1125	113263	114388	
Overall %	0.98%	99.02%	100.00%	

In summary, there was little difference between fatal injury collisions and non-fatal injury collisions with regards to the time of the year. Collisions occurring on Friday, Saturday or Sunday were more common among fatal injury collisions (51%) compared to non-fatal injury collisions (42%). Collisions occurring between 3:00pm and 5:59pm (21%) were less common in fatal collisions (16%) compared to non-fatal injury collisions (21%). Collisions occurring during the day (6:00am to 2:59pm) were also less common for fatal collisions (31%) compared to non-fatal collisions (47%). In addition, fatal collisions occurred more often at night (9:00pm-5:59am) (38%) than did non-fatal injury collisions (19%). While the majority of injury collisions occurred on weekdays (70%), fatal collisions were more common on weekends (41%) compared to non-fatal injury collisions (30%). Although most injury collisions occurred during daylight (69%), this was less common in fatal injury collisions (47%) compared to non-fatal injury collisions (69%). Fatal collisions were also more common when it was dark with no lighting (18%) and when it was dark with lighting (28%) compared to non-fatal injury collisions (5% and 20% respectively). The majority of injury collisions occurred when there were no adverse weather conditions (87%) but this was much more common among fatal injury collisions (89%) compared to non-fatal injury collisions (37%).

APPENDIX C:

PROGRAM INSTRUMENT

Survey of Current Practices
Dealing with Fatal and Injury Collisions

The Traffic Injury Research Foundation (TIRF) has been hired by the I-95 Corridor Coalition to provide an inventory of effective traffic safety measures that can be implemented across the I-95 Coalition member states to reduce the major categories of fatal and serious injury collisions.

As part of the study, TIRF is reviewing current practices for dealing with fatal and serious injury collisions in all member states in the I-95 Corridor Coalition, a selection of other U.S. states, and several other countries. These practices include policy (i.e., laws and their enforcement), programs (e.g., licensing, education, etc.) and road engineering measures. This survey will help to provide a more comprehensive picture of how jurisdictions are currently dealing with these collisions and which measures might be relevant and beneficial to all of the I-95 Corridor Coalition member states.

The survey questionnaire is being sent to those people identified as being involved in legislative, enforcement, licensing, education, and road engineering measures that are related to the improvement of traffic safety. The questionnaire asks questions about seat belt use, impaired driving, speeding, collision avoidance, improperly licensed drivers and road engineering measures.

If you are not the appropriate person to answer some or all of the questions in this survey, please forward it by e-mail to the appropriate person(s) and let me know so I can follow-up with this person(s).

If you would like further information about this survey, please contact Brian Jonah at TIRF either by email (brianj@tirf.ca) or at (877) 238-5235. We would appreciate it if you could complete the questionnaire and send it to Brian Jonah by e-mail before November 16, 2009**.**

Throughout the questionnaire the option "Please specify" is provided for some responses. In the provided space, please provide more detailed information if you aware of any.

SEAT BELT USE

1. Does your jurisdiction have a primary or secondary seat belt use law?
- ☐ Primary law
- ☐ Secondary law
- ☐ No law, **Go to Question 12**

2. What is the maximum fine for a violation of this seat belt law?
$ _____
- ☐ Don't know

3. Are any demerit points associated with violating the seat belt law?
- ☐ Yes _____points
- ☐ No
- ☐ Don't know

4. How often do the state and local police in your jurisdiction conduct seat belt enforcement programs such as *Click It or Ticket*?
- ☐ Never, **Go to Question 12**
- ☐ Rarely
- ☐ Sometimes
- ☐ Often
- ☐ Don't know
- ☐ Please specify _____

5. When are these enforcement programs usually conducted? Check all that apply.
- ☐ Weekdays
- ☐ Week nights
- ☐ Weekend days
- ☐ Weekend nights
- ☐ Holiday weekends
- ☐ Don't know

6. How often are these enforcement programs conducted on two lane rural roads?
- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Often
- ☐ Don't know
- ☐ Please specify _____

7. How often are educational programs conducted in conjunction with these enforcement programs?
- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Often
- ☐ Don't know
- ☐ Please specify _____

8. Are any of these enforcement campaigns targeted at young male drivers (16-24) who are typically less likely to wear seat belts?

- ☐ Yes
- ☐ No
- ☐ Don't know

9. Is there a website where these enforcement or educational campaigns are described?

_____
_____

10. Have there been any innovative measures taken in your jurisdiction to increase seat belt use? Please provide a website or reference if possible.

_____
_____

11. Have any of these seat belt programs been evaluated?

- ☐ Yes, please provide a website or research reference _____
- ☐ No
- ☐ Don't know

IMPAIRED DRIVING

12. How often do the state and local police in your jurisdiction conduct impaired driving enforcement programs such as sobriety checkpoints or saturation patrols?

- ☐ Never, **Go to Question 20**
- ☐ Rarely
- ☐ Sometimes
- ☐ Often
- ☐ Don't know
- ☐ Please specify _____

13. When are these enforcement programs usually conducted? Check all that apply.

- ☐ Weekdays
- ☐ Week nights
- ☐ Weekend days
- ☐ Weekend nights
- ☐ Holiday weekends
- ☐ Don't know

14. Do these programs target areas where there is a higher level of drinking (e.g., areas where there are a lot of bars, sporting events, etc.)?

- ☐ Yes
- ☐ No
- ☐ Don't know

15. How often are these enforcement programs conducted on two lane rural roads?

- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Often
- ☐ Don't know
- ☐ Please specify _____

16. How often are educational programs conducted in conjunction with these enforcement programs?
- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Often
- ☐ Don't know
- ☐ Please specify _____

17. Is there a website where these enforcement or educational campaigns are described?
_____
_____

18. Are there any innovative measures that have been used in your jurisdiction to reduce impaired driving? Please provide a website or reference, if possible.
_____
_____

19. Have there been any evaluations conducted on the effectiveness of these impaired driving enforcement campaigns?
- ☐ Yes, please provide a website or research reference _____
- ☐ No
- ☐ Don't know

SPEEDING

20. Typically, what is the speed limit on two lane rural roads in your jurisdiction?
_____ mph

21. Has your jurisdiction reduced the speed limit on any two lane rural roads in the last 5 years or is it being considered?
- ☐ Yes, it has been reduced
- ☐ No, it has not been reduced and is not being considered
- ☐ No, but it is being considered
- ☐ Don't know

22. How often do the state or local police conduct speed enforcement programs on two lane rural roads in your jurisdiction?
- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Often
- ☐ Don't know
- ☐ Please specify _____

23. Have there been any educational programs conducted in conjunction with these speed enforcement programs?
- ☐ Yes
- ☐ No
- ☐ Don't know

24. Are speed cameras used in your jurisdictions to reduce speeds?
These cameras take a picture of the license plate of a speeding vehicle and the owner of the vehicle is mailed a ticket.

- ☐ Yes
- ☐ No, **Go to Question 27**
- ☐ Don't know**, Go to Question 27**

25. How often are speed cameras used to detect speeders on two lane rural roads?

- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Often
- ☐ Don't know
- ☐ Please specify _____

26. Is there contact information for the speed camera program or a website for further information on who delivers these programs?

_____
_____

27. Is there a website where these speed enforcement or educational campaigns are described?

_____
_____

28. Are there any innovative measures that have been used in your jurisdiction to reduce speeding? Please provide a website or reference, if possible.

_____
_____

29. Have there been any evaluations of speed enforcement programs in your jurisdiction?

- ☐ Yes, please provide a website or research reference _____
- ☐ No
- ☐ Don't know

COLLISION AVOIDANCE

30. How often do driver education courses teach new drivers what to do if they are driving on the highway and the wheels of their vehicle go off the pavement onto the soft shoulder?

- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Often
- ☐ Don't know
- ☐ Please specify _____

31. Does the knowledge test for obtaining a driver's license in your jurisdiction include question(s) about what to do if they are driving on the highway and the wheels of their vehicle go off the pavement onto the soft shoulder?

- ☐ Yes (Please specify)_____
- ☐ No
- ☐ Don't know

32. Does the knowledge test include any other questions related to collision avoidance techniques?
- ☐ Yes Please specify_____
- ☐ No
- ☐ Don't know

IMPROPERLY LICENSED DRIVERS

33. If a driver whose licence is suspended or revoked is caught driving, what are the consequences for that driver? Check all that apply.
- ☐ Fine, please specify amount _____
- ☐ Extension of suspension
- ☐ Vehicle impoundment or forfeiture
- ☐ Other, please specify_____
- ☐ Don't know

34. Does your jurisdiction use technology such as the Automated License Plate Recognition in order to identify drivers whose licenses have been suspended or revoked or who never obtained a license?
This technology reads the license plate number, identifies the vehicle owner and then links to the driver licensing system to determine the owner's license status.
- ☐ Yes
- ☐ No, **Go to Question 37**
- ☐ Don't know, **Go to Question 37**

35. Have there been any evaluations of the Automated License Plate Recognition in your jurisdiction?
- ☐ Yes, please provide a website or research reference _____
- ☐ No
- ☐ Don't know

36. What enforcement activities are targeted toward unlicensed drivers?
_____
_____

37. Are police able to identify unlicensed drivers at the roadside?
- ☐ Yes
- ☐ No
- ☐ Don't know

38. What organization do you work for and in what jurisdiction (i.e. state, province, country)?
Organization_____
Jurisdiction_____

39. If we wanted to follow up for more details about some of these programs, who should we contact?
_____
_____

ROAD ENGINEERING

If possible, in the "Please specify" area please provide what percentage of roads.

How often are rumble strips used on the outer edges of highways to alert drivers that they are leaving the lane?

- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Often
- ☐ Don't know
- ☐ Please specify _____

40. How often are the shoulders of highways paved beyond the traveled part of roadway?

- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Often
- ☐ Don't know
- ☐ Please specify _____

41. How often are guard rails installed on the outer edge of curves on highways to prevent vehicles from going off the roadway into the roadside?

- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Often
- ☐ Don't know
- ☐ Please specify _____

42. How often is the highway pavement on curves treated with a compound which increases the tire friction thereby decreasing loss of control of the vehicle?

- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Often
- ☐ Don't know
- ☐ Please specify _____

43. How often are road safety audits performed on the roads in your jurisdiction to identify high risk locations or black spots (i.e., road segments with higher risk of collisions)?

- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Often
- ☐ Don't know
- ☐ Please specify _____

44. How often are road safety audits conducted on two lane rural roads?

- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Often
- ☐ Don't know
- ☐ Please specify _____

45. How often are rumble strips used on the centre line of two lane rural roads to alert drivers that they are crossing into the oncoming lane?

- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Often
- ☐ Don't know
- ☐ Please specify _____

46. How often are roundabouts used instead of standard intersections on two lane rural roads?

- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Often
- ☐ Don't know
- ☐ Please specify _____

47. How often are roundabouts used instead of standard intersections on roads in urban or suburban areas?

- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Often
- ☐ Don't know
- ☐ Please specify _____

48. Is there a website where the use of these road engineering measures in your jurisdiction is described?

_____
_____

49. Are there other innovative road engineering measures that your jurisdiction is using to reduce the incidence of motor vehicle collisions? Please provide a website or reference, if possible.

_____
_____

50. Have there been any evaluations of road engineering measures used in your jurisdictions to improve road safety?

- ☐ Yes, Please provide website information _____
- ☐ No
- ☐ Don't know

51. What organization do you work for and in what jurisdiction (i.e. state, province, country)? If you answered this question above, thank you have finished the questionnaire.

Organization_____
Jurisdiction_____

52. If we wanted to follow up for more details about some of these programs, who should we contact?

_____
_____

Thank you for completing this questionnaire

APPENDIX D:

PROGRAM RESPONSES

I-95 States	Other US States	Canadian Jurisdictions	International Jurisdictions
Connecticut	**Arizona**	**Alberta**	**Germany**
Delaware	**California**	**British Columbia**	Victoria, Australia
Florida	**Illinois**	**Manitoba**	New South Wales, Australia
Georgia	**Michigan**	**New Brunswick**	South Australia, Australia
Maine	**Minnesota**	**Newfoundland & Labrador**	Netherlands
Maryland	**New Mexico**	**Northwest Territories**	**United Kingdom**
Massachusetts	Ohio	Nova Scotia	Sweden
New Hampshire	Oregon	Ontario	Czech Republic
New Jersey	**Texas**	**Prince Edward Island**	**Hungary**
New York	**District of Columbia**	**Quebec**	Slovenia
North Carolina		**Saskatchewan**	**Greece**
Pennsylvania		**Yukon**	**Portugal**
Rhode Island			Spain
South Carolina			
Vermont			
Virginia			
District of Columbia			
Surveys Sent: 17	Surveys Sent: 10	Surveys Sent: 10	Surveys Sent: 13
Surveys Retuned: 11	Surveys Returned: 8	Surveys Returned: 9	Surveys Returned: 5
Responses Rate: 65.38%	Responses Rate: 80.00%	Responses Rate: 90.00%	Responses Rate: 38.46%
Total Surveys sent: 52			
Total Surveys returned: 35			
Response Rate: 65.38%			
Note: The jurisdictions that are bold represent those that returned the survey.			

APPENDIX E:

PROGRAM INFORMATION

Program Summaries					
	Name of program	**Focus of program**	**Delivery of program**	**Program evaluated**	**Website**
Impaired Driving					
Florida	Sustained DWI enforcement	The goal is to reduce the number of alcohol-related fatalities, injuries, and crashes on Florida's roadways. Conducting high visibility DWI enforcement operations and increasing public awareness.	Piloted in 2003 with 10 counties and in 2009 has grown to 35 counties. Runs throughout the year. Involves several law enforcement agencies, varies by county.	Unable to find an evaluation	http://portal.challengerewards.com/SECinfo/
Maryland	Low manpower sobriety checkpoints	Checkpoints using only a few police officers.	Conducted by State police.	Evaluation conducted- an internal document and not published on the website.	http://www.ncbi.nlm.nih.gov/pubmed/16990234
New York	Special Traffic Options Program for Driving While Intoxicated (STOP-DWI)	Program aimed to reduce alcohol and other drug-related traffic crashes within the context of a comprehensive and financially self-sustaining alcohol and highway safety program.	Delivered by local county government with highly visible law enforcement campaign.	NTSHA review link: http://www.nhtsa.dot.gov/people/injury/alcohol/nystopdwiprogram/pages/TRD.html Last Drink Report- link: http://www.safeny.com/GTSC2008AnnualFULL.pdf	Overview of program: http://www.nysgtsc.state.ny.us/stop-vt.htm Each county has their own website.
Michigan	High Visibility Enforcement (HVE) (pilot program)	A program focusing on alcohol-involved crashes during pre-determined dates and times. Officers conduct late-night traffic patrols on a dedicated corridor, using special awareness tactics to ensure motorists recognize patrols that emphasize drink driving enforcement.	Office of Highway Safety Planning.	n/a	http://www.mcrud.org/IDEAS%20symposium/High%20Visability%20Enforcement.pdf

Program Summaries					
	Name of program	**Focus of program**	**Delivery of program**	**Program evaluated**	**Website**
Minnesota	Operation NightCAP (Nighttime Concentrated Alcohol Patrol)	Year-long sustained high visibility DWI enforcement saturations conducted in the thirteen deadliest alcohol related counties.	Using changeable roadway message signs in conjunction with high visibility saturation patrols.	n/a	http://www.dps.state.mn.us/ots/enforcement_programs/NightCAP/default.asp
New Mexico	Checkpoints, saturation patrols	Coordinated regular impaired driving enforcement efforts.	Involving local, state, and tribal law agencies across several counties.	Conducted by Department of Transportation and University of New Mexico- report not available.	http://www.ghsa.org/html/projects/OTLUA/holiday09.html
Alberta	Alberta Checkstop program	A coordinated province-wide impaired driving checkstop initiative started in 2008.	Joint Forces Operation between police services and Alberta Highway Sherriff Patrol. Municipal police services also conduct impaired driving enforcement programs.	n/a	http://www.saferoads.com/drivers/impaired_checkstop.html
Great Britian	Think! Campaign	To remind all drivers of the personal consequences of drink driving, and that a drink driving conviction can ruin your life.	Department of Transportation.	n/a	http://www.dft.gov.uk/think/
Maine	Impaired driving enforcement campaign	State-wide impaired driving enforcement campaign.	Police departments statewide funded by Bureau of Highway Safety.	NHTSA conducted an evaluation of Maine's impaired driving enforcement program. Report is not available.	n/a
North Carolina	"Booze It & Lose It"	A Sobriety checkpoint program to identifying impaired drivers with innovative and extensive enforcement and education.	Governor's Highway Safety Program.	Conducted by North Carolina's Governor's Highway Safety Program. Report not available.	http://www.ncdot.gov/programs/GHSP/initiatives/default.html

Program Summaries					
	Name of program	**Focus of program**	**Delivery of program**	**Program evaluated**	**Website**
Pennsylvania Delaware, Maryland, Virginia, District of Columbia.	Checkpoint Strikeforce program	Smooth Operator is a model for a coordinated, intra- and interstate program designed to combat the aggressive driving problem and find short- and long-term solutions for it.	Law enforcement agencies, trauma experts, government officials and other professionals working together.	NHTSA evaluated the program Link: http://www.nhtsa.dot.gov/staticfiles/DOT/NHTSA/Communication%20&%20Consumer%20Information/Traffic%20Tech%20Publications/Associated%20Files/tt358.pdf	http://www.checkpointstrikeforce.net/law.html
Speeding					
North Carolina	"No Need 2 Speed" Operation Slowdown	No Need 2 Speed- aims to decrease the frequency and severity of speed related crashes on all roads in NC. Operation Slow down- an Interstate Initiative to ticket speeders on North Carolina's interstates.	Both programs are delivered by Governor's Highway Safety Program with the assistance of NC Highway Patrol.	The No Need 2 Speed has been evaluated link: http://www.ncdot.org/doh/PRECONSTRUCT/traffic/safety/Reports/completed_files/docs/speed2.pdf	http://www.ncdot.gov/programs/GHSP/initiatives/default.html
District of Columbia Maryland, New Jersey, Pennsylvania, Virginia	Smooth Operator Program	A public safety initiative, which aims to provide education, information and solutions for the problem of aggressive driving. The program targets aggressive drivers.		Evaluations conducted yearly, link: http://smoothoperatorprogram.com/materials/2008/SO_08Annual_final.pdf	http://www.smoothoperatorprogram.com/index.asp
New Jersey	Obey Signs or Pay the Fines	The purpose of the campaign is to aggressively enforce speed limits on both highways and residential roads.	The Department of Highway Traffic Safety and law enforcement, during summer months.	New Jersey reported conducting evaluations; report was unavailable	http://www.nj.gov/oag/hts/obey-the-signs.html
Florida	Enhanced speeding zones initiative (pilot program)	Focused enforcement efforts on roads that have a high incidence of speed-related crashes. (Includes increased fines)	The program is delivered by Florida's Department of Transportation and local law enforcement.	Florida reported conducting an evaluation, but was unavailable.	www.flhsmv.gov/html/EPZR.pdf

Program Summaries					
	Name of program	**Focus of program**	**Delivery of program**	**Program evaluated**	**Website**
Delaware	Neighborhood speed campaign.	Focuses on reducing speed-related crashes involving children.	Delaware Department of Transportation.	n/a	http://www.deldot.gov/public.ejs?command=PublicNewsDisplay&id=3072
New York	Neighborhood traffic calming	It involves strategic physical changes to roadways that reduce vehicle speeds.	New York State's Department of Transportation, in collaboration with local communities.	n/a	http://www.nyc.gov/html/dot/html/motorist/dntnbklyntraf.shtml
Illinois	Speed enforcement in work zones	Focused enforcement efforts in work zones. (Includes increased fines)	Department of Transportation and the Illinois State Toll Highway Authority.	n/a	http://www.dot.state.il.us/safetyEng/WZ%20Photo%20Fact%20Sheet.pdf
New Mexico	100 days and nights enforcement program	Increase enforcement from June to September to decrease seasonal roadway trauma and increase public awareness. Targeting all driving behaviors.	New Mexico Department of Transportation and the Department of Public Safety.	n/a	http://www.nmshtd.state.nm.us/stopdwi/100Days.html
Alberta	Enforcement blitz & "No fun being dead" campaign	A province-wide two to three day awareness campaign reminds drivers to slow down and stay alive. No fun being dead campaign- provocative website that uses dark humour to teach young drivers serious traffic safety lessons.	Enforcement blitz by all major enforcement agencies during the month of April.	n/a	http://alberta.ca/home/NewsFrame.cfm?ReleaseID=/acn/200904/256506C799028-D1CE-B7C3-77259400BB589316.html http://www.nofunbeingdead.com/
Saskatchewan	Speed trailers	A portable trailer to report speeds in high-risk zones. Actually speed displayed to driver with speed limit sign also posted.	Saskatchewan Highways and Transportation and law enforcement.	Information will be evaluating, no report available.	http://www.gov.sk.ca/news?newsId=c3689f77-850b-44f8-94e7-709b56a79e2e

Program Summaries					
	Name of program	**Focus of program**	**Delivery of program**	**Program evaluated**	**Website**
Great Britain	Hi-tech 'SPECS' cameras	Calculates a car's average speed over a long distance. Data that is collected by police who determine where enforcement is then needed.	Department for Transport.	Four-year evaluation report on the national safety camera program, Link: http://www.dft.gov.uk/pgr/roadsafety/speedmanagement/nscp/nscp/	http://www.dft.gov.uk/pgr/roadsafety/speedmanagement/nscp/nscp/
Fatigue Driving					
New York	New York State Partnership against drowsy driving (NYPDD)	A joint effort to educate the public and high-risk groups about the dangers of drowsy driving and promotes the adoption of preventive strategies.	New York State Thruway Authority and the New York State Department of Transportation.	n/a	http://www.safeny.com/drow-ndx.htm
Minnesota	Fatigued Driving Evaluation Checklist	Checklist used by state police to recognize fatigue at the roadside.	State police.	n/a	http://www.mntruck.org/pdf/fatigueflier.pdf
Great Britian	Think! campaign	A road safety campaign focusing on the need for drivers and other road users to take responsibility for their own safety as well as for the safety of others on the road. Tiredness and fatigue included.	UK Department of Transport.	n/a	http://www.dft.gov.uk/think/
Seat belt Usage					
Delaware	Nighttime seat belt use enforcement Click It or Ticket campaign	To increase seat belt use at night, with a public awareness component and increased enforcement efforts. High visibility enforcement and public awareness campaign aimed at increasing seat belt.	Delaware Office of Highway Safety.	Delaware conducts an annual statewide observational Seat Belt Use Survey. Link: http://www.google.com/search?hl=en&q=Delaware+conducts+an+annual+statewide+observational+use+survey.	http://ohs.delaware.gov/services/ciot_feb.shtml

Program Summaries					
	Name of program	**Focus of program**	**Delivery of program**	**Program evaluated**	**Website**
Florida	Region IV Safety Belt Demonstration Project Challenge	A NHTSA rural safety belt initiative. The campaign consists of high-visibility enforcement, messages and materials tailored towards rural populations regarding enforcement of seat belt laws.	Florida Public Safety Institute.	Florida's program is ongoing and therefore an evaluation is unavailable.	http://www.region4ruralbeltproject.org/
Maryland	Buckle Up, Tough Guy	Targeting pickup drivers, with a campaign that reaches out to pickup truck drivers with specific messaging and media.	Conducted in partnership with local radio stations and Maryland State Highway Administration.	Maryland reports to have an evaluation, however, the report could not be located.	http://www.choosesafetyforlife.com/buckleup.htm
New Jersey	Seat belts in rear passenger seats	Focuses media efforts, with a media campaign focusing on the importance of all passengers wearing seat belts.	Division of Highway Traffic Safety.	Conducts pre-and post- belt use surveys to assess the impact of increasing belt use. link:http://www.state.nj.us/oag/hts/downloads/ciot-mobilization-rpt-09.pdf	n/a
New York	Battle of the Belts	A fast-paced seatbelt buckling contest is a race against the clock.	Local law enforcement	An annual statewide seat belt observational survey is available: http://www.itsmr.org/pdf/2009%20NY%20OBSERVATIONAL%20SURVEY%20OF%20SEAT%20BELT%20USE.pdf	http://www.fondafultonvilleschools.org/HighSchool/crockwell/hsnews/0809HSNews/BattleofBelts/0809BattleofBelts.htm
North Carolina	RUBuckled	A high school program that ties parking privileges with seat belt use.	North Carolina Department of Transportation Governor's Highway Safety Program.	North Carolina does self evaluations by the schools, which are not publically available.	http://www.ncdot.gov/programs/GHSP/initiatives/default.html http://www.ncdot.gov/programs/GHSP/download/initiatives/RUBUCKLED08.pdf

Program Summaries					
	Name of program	**Focus of program**	**Delivery of program**	**Program evaluated**	**Website**
Alberta	Two to three day province-wide seat belt enforcement blitz	Seat belt enforcement blitz carried out during March, May, and October. Months dedicated to increase seat belt use in annual traffic safety calendar.	Law enforcement agencies.		www.albertaseatbelts.ca
Connecticut	Click it or Ticket	High visibility enforcement and public awareness campaign aimed at increasing seat belt.	Connecticut Department of Transportation.	Evaluation is conducted by the Preusser Research Group (Solomon, 2001).	http://www.ct.gov/dot/cwp/view.asp?a=1388&q=259438
Virginia	Click it or Ticket	High visibility enforcement and public awareness campaign aimed at increasing seat belt.	Virginia Department of Motor Vehicles, Virginia State Police	Virginia requires a statewide seat belt survey; report could not be located	http://www.smartsafeandsober.org/programs/CIOT/
Collision Avoidance					
Arizona	Driver education courses teach Collision Avoidance	Arizona specifically addresses, in driver education courses, over-correction in dry and wet conditions.	Arizona driver education programs approved by MVD.	n/a	n/a
Saskatchewan	Driver education courses teach Collision Avoidance	Driver education courses go detail about what one should do in the event that the wheels go off a sharp edge.	SGI.	n/a	http://www.sasked.gov.sk.ca/docs/drivered/admin/evaluation.html
Alberta	Driver education courses teach Collision Avoidance	Alberta includes information on their Drivers' Handbooks.	Alberta Ministry of Transportation.	n/a	http://www.transportation.alberta.ca/531.htm

Program Summaries					
	Name of program	**Focus of program**	**Delivery of program**	**Program evaluated**	**Website**
Ontario	Driver education courses teach Collision Avoidance	Ontario includes information on their Drivers' Handbooks.	Ontario Ministry of Transportation.	n/a	http://www.mto.gov.on.ca/english/dandv/driver/handbook/section2.0.0.shtml
Road Engineering					
British Columbia	Transverse rumble strips	Grooved or raised corrugations placed on the highway pavement surface to generate audible and vibratory stimuli.	British Columbia Ministry of Transportation.		http://www.th.gov.bc.ca/publications/Circulars/All/T_Circ/2009/t01-09.pdf
	Collision Prediction Models	A regression model that produces an estimate of the collision frequency for a location based on the site-specific characteristics of the location.	British Columbia Ministry of Transportation.	Collision Prediction Models for British Columbia http://www.th.gov.bc.ca/publications/eng_publications/safety/CPMs_for_BC_2008.pdf	http://www.th.gov.bc.ca/publications/Circulars/All/T_Circ/2009/t04-09.pdf
	Collision Modification Factors	A multiplicative factor used to reflect the expected change in safety performance associated with the corresponding change in highway design and/or the traffic control feature.	British Columbia Ministry of Transportation.	Collision Modification Factors for British Columbia http://www.th.gov.bc.ca/publications/eng_publications/safety/CMFs_for_BC_2008.pdf	http://www.th.gov.bc.ca/publications/Circulars/All/T_Circ/2009/t04-09.pdf
	Un-interrupted power supply	To ensure traffic signals are not affected during power outages.	British Columbia Ministry of Transportation.	n/a	http://www.th.gov.bc.ca/publications/Circulars/All/T_Circ/2006/t07-06.pdf
Michigan	Indirect left turns	To increase capacity and reduce delays. Indirect left turns used at intersections where a left turn is not allowed.	Michigan Department of Transportation.	n/a	http://www.michigan.gov/drive/0,1607,7-246-45723-161777--,00.html

Program Summaries					
	Name of program	**Focus of program**	**Delivery of program**	**Program evaluated**	**Website**
Germany	Self explaining roads	Encourages drivers to naturally adopt behavior consistent with design and function of the road. Drivers perceive the type of road and instinctively know how to behave. The environment distinguishes the type of road, requiring less of a need for separate traffic control devices such as additional traffic signs to regulate traffic behavior.			http://74.125.113.132/search?q=cache:Ib-Nb0ItVUQJ:www.erso.eu/knowledge/content/15_road/self_explaining_roads.htm+self+explaining+roads&cd=1&hl=en&ct=clnk

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