Investigation of Fatal Crashes in Florida

Final Report

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The conclusions and opinions expressed in this report are those of the subgrantee, and do not necessarily represent those of the State of Florida, Department of Transportation, State Safety Office, U.S. Department of Transportation, or any other agency of the State or Federal Government.

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STUDY PURPOSE

In 1998, Florida's fatality rate per 100 million vehicle miles traveled was 2.6 compared to the nationwide average of 1.6. Because Florida's fatal crash rates and fatality rates consistently outrank national averages, the Florida Department of Transportation (FDOT) contracted with the Center for Urban Transportation Research (CUTR) at the University of South Florida (USF) to help identify highway safety problem areas that may contribute to less safe travel on Florida roadways. This research was conducted as part of a larger pooled-fund study to determine why fatal crash rates are higher in the Southeastern United States (US) compared to rest of the nation and what could be done to reduce fatal crashes in the region. The research objective was to identify problem areas related to highway safety in which Florida is over-represented relative to other states and the nation as a whole. The research results provide policy makers and highway safety advocates with a better understanding of the factors that may contribute to higher fatality rates in Florida and may be used to help identify specific problem areas where the FDOT can focus safety improvement measures.

RESEARCH APPROACH

CUTR researchers conducted several activities to accomplish the research objective. Data were collected and analyzed through the application of a multiple–step process used to identify highway safety problem areas unique to Florida.

Data Collection. Researchers obtained data on all fatal crashes in the United States that occurred from 1994 to 1998 from the Fatal Analysis Reporting System (FARS) database. The data included motor vehicle traffic crashes from all states during the five-year period resulting in a fatal injury to a vehicle occupant or non-motorist within 30 days of the crash.

Data Analysis. First, states were grouped based on fatality rates to allow comparison of Florida to other states. During the study period, Florida's fatality rate was lower than 11 states but higher than 39 states. States with higher fatality rates were classified as a single group **(Less Safe).** States with lower fatality rates were divided into two groups: states with average fatality rates less than 25 percent lower than Florida's **(Safer)** and states with average fatality rates more than 25 percent lower than Florida's **(Safest).**

The analyses were conducted separately for three person types: drivers, passengers, and non-motorists (pedestrians and bicyclists). These person types were separated due to differences in how exposure is measured and likely contributing factors and because they differ in terms of shares between Florida and the nation as a whole.

The analysis proceeded in three steps. Level-One analysis examined individual variables from the FARS dataset to identify a preliminary list of highway safety problem areas where Florida may be over-represented relative to the other state groups and the nation as a whole. Exposure analysis applied the concept of quasi-induced exposure to the problem areas identified in Step 1 to control for differences in exposure between Florida and each of the state groups and the nation as a whole. The last step, Multi-Factor analysis, introduced additional variables to examine preliminary problem areas to which the quasi-induced exposure approach was not applicable. The statistical program, SPSS, and Microsoft Excel were used to analyze the data based on the degree of over-representation (DOR), data quality, and statistical significance. Researchers synthesized the results and ranked problem areas for further research consideration.

RESEARCH FINDINGS

Level-One Analysis. This analysis measured the degree of over-representation of fatalities in Florida relative to each of the state groups and included several components for each variable. Researchers computed the proportions of fatalities the different values of a given variable represent within Florida and each of the other state groups and tested for statistical significance. Researchers calculated the degree of over-representation for every value of a given variable relative to each of the three state groups.

The Level-One analysis identified a number of highway safety problem areas that are over-represented in Florida relative to the state groups and the nation as a whole. Some of the problem areas are common to **drivers, passengers, and non-motorists**, including roads with 4 lanes, roads with 6 lanes, regulatory signs, and divided roads with no barriers. Some areas are common to **drivers and passengers only**, including shoulders, urban local roads, and vehicles turning left just prior to the crash. Some are common to **passengers and non-motorists only**, including intersections. Some are common to **drivers and non-motorists only**, including urban non-interstate highways. Still others are unique to the individual person types. Unique to **non-motorists** are U.S. highways, roads with 26-45 mph speed limits, drivers with at least one non-speed related moving violation conviction, and having activities in roadway such as walking, riding, standing, etc. Unique to **drivers** are traffic signals and being struck. And unique to **passengers** are municipal roads and drivers 75 years or older. However, these results only illustrate areas that are potential problems because any over-representation may be eliminated once exposure is controlled or other factors are introduced.

Exposure Analysis. This step applied quasi-induced exposure to drivers directly and to passengers and non-motorists indirectly through varying degrees of modification to account for the differences in exposure across the state groups.

The Exposure analysis revealed that the many highway safety areas of concern identified through the Level-One analysis were no longer so or the degree of concern is significantly reduced once exposure is considered. Results are presented using four different scenarios.

Scenario 1: High degrees of over-representation under Level-One analysis with no statistically significant reduction in the degree of over-representation.

This scenario includes highway safety problem areas that were highly over-represented in the Level-One analysis and as a result of the Exposure analysis, show no statistically significant reduction in the degree of over-representation. Most highly over-represented among these are shoulders and vehicles turning left just prior to the crash for both **drivers and passengers** and U.S. highways for **non-motorists**. Among the other potential problem areas, dark but lighted conditions, municipal roads, regulatory signs, and drivers 75 years or older are common to both **drivers and passengers**; motorcycles, 9-clock impact point, being struck are unique to **drivers;** divided roads with no barrier and 3-clock impact are unique to **passengers;** and intersections, state highways, and urban non-interstate highways are unique to **non-motorists**.

Scenario 2: Under-represented in Level-One analysis but over-represented once exposure is controlled.

Potential problem areas identified under this scenario include those that were identified in the Level-One analysis as being under-represented but show significant degrees of over-representation once exposure is controlled. Common to both drivers and passengers are crashes involving one drunk driver, roads on grade, and non-junctions. Unique to drivers is head-on crashes, unique to passengers is the problem of drivers involved in one crash in the 3 years prior to the crash in question.

Scenario 3. High degrees of over-representation under Level-One analysis and higher over-representation after exposure.

Potential problem areas identified with high degrees of over-representation under the Level-One analysis and show even higher degrees of over-representation once exposure is controlled are included in this scenario. These include dark conditions and state highways, both of which are unique to **non-motorists.**

Scenario 4. High degrees of over-representation under Level-One analysis but Exposure analysis is not applicable.

This scenario includes problem areas identified with high degrees of over-representation in the Level-One analysis but to which Exposure analysis is not applicable. These include non-motorists walking, riding, or having other activities in roadway, drivers with at least one suspension or revocation in the 3 years prior to the crash in question, and drivers with at least one non-speed related moving violation conviction in the 3 years prior to the crash in question. All these are unique to **non-motorists**.

Multi-Factor Analysis. The Exposure analysis was not applicable to certain problem areas identified in the Level-One analysis for passengers or non-motorists. For passengers, these include personal characteristics, such as age. For non-motorists, these include characteristics that drivers and non-motorists do not share. The multi-factor analysis attempts to determine under what specific situations problem areas identified in the Level-One analysis are more over-represented than under other situations.

Two issues related to non-motorists were examined through multi-factor analysis. One issue is related to non-motorist fatalities in general. Level-One analysis revealed that non-motorist fatalities as a person type are over-represented in Florida relative to the state groups and the nation as a whole. The question to be answered was "in what areas of concern is the degree of over-representation particularly high?" The multi-factor analysis revealed that **non-motorist** fatalities are over-represented by over 100 percent relative to each of the three state groups under dark conditions, on U.S. highways, and in crashes involving regulatory signs. In addition, this problem is far more over-represented in rural areas than in urban areas, indicating that non-motorist fatalities in Florida may not be the result of lacking pedestrian facilities. Also, the problem is far more over-represented on curved alignment than on straight alignment, on roads with grade than without grade, on U.S. and state highways than on other types of roadway ownership, and among 16-64 years old than the very young or the old.

Multi-factor analysis was also used to examine another issue related to non-motorists in terms of a specific area of concern. Level-One analysis revealed that non-motorists having certain activities in roadway represent the most serious problem to non-motorist fatalities in Florida. The question to be answered was "under what situations is the degree of over-representation of this problem particularly high?" The multi-factor analysis revealed that non-motorists having activities in roadway are over-represented by over 100 percent relative to each of the three state groups under dark but lighted conditions, on 4-lane or 6-lane roads, on urban arterials, in urban areas, on municipal roads, in crashes in which traffic signals are present, and roads that are divided but with no barrier. In addition, the problem is far more over-represented among females than among males and among the young and old than among the other age groups.

Overall. Table E-1 summarizes the top highway safety problem areas based on the degree of over-representation and an index that indicates the potential reduction in the number of fatalities if over-representation were eliminated.

Table E-1 Top Three Highway Safety Problem Areas Based on Degree of Over-Representation and Index Values

Person Type	Criteria	Top Three Problem Areas		
Drivers	DOR	Shoulder	Turning left	One drunk driver
	Index	Non-junction	One drunk driver	Regulatory sign
Passengers	DOR	Shoulder	Turning left	Roads at grade
	Index	Divided with no barrier	Non-junction	Turning left
Non-motorists	DOR	Activities in roadway	State highway	U.S. highway
	Index	Activities in roadway	State highway	U.S. highway
Combined	Total Index	Non-junction	One drunk driver	Regulatory sign

Notes: DOR stands for "Degree of Over Representation." Problem areas based on DOR are derived from Table 6.1, while those based on index values are from Table 6.3.

Based on the ***degree of over-representation,*** the top three problem areas for **drivers** were: shoulders, vehicles turning left just prior to the crash, and crashes with one drunk driver. The top three problem areas for **passengers** were: shoulders, vehicles turning left just prior to the crash, and road segments at grade. The top three problem areas for **non-motorists** were: having activities in roadway, state highways, and U.S. highways.

Based on the ***index***, the top three problem areas for **drivers** were: non-junction crashes, crashes involving one drunk driver, and regulatory signs. The top three problem areas for **passengers** were: roads divided without barrier, non-junctions, and vehicles turning left just prior to the crash. The top three problem areas for **non-motorists** were: having activities in roadway, state highways, and U.S. highways. The top three problem areas for all person types combined were the same as those for drivers when the index is used.

CONCLUSIONS

The research study demonstrated the application of an analytic approach to identify problem areas related to highway safety in which Florida is over-represented relative to other states and the nation as a whole. The aggregate level analyses resulted in the identification of previously unknown areas where Florida has a higher risk of highway travel compared to the rest of the U.S. The results provide policymakers and highway safety advocates with a better understanding of the factors that may contribute to less safe highway travel in Florida. Finally, the research provides a basis for future research to examine whether and how roadway engineering practices and legislative policies related to highway safety problem areas differ from those practices and policies in states with safer highway travel.

Chapter 1
INTRODUCTION

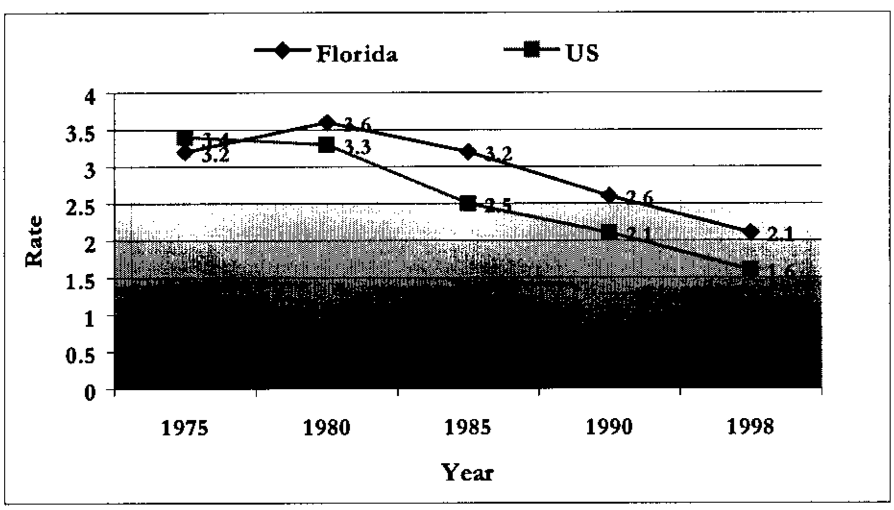
1.1 STUDY PURPOSE

The eight southeastern states comprising the Federal Highway Administration's (FHWA) Atlanta Resource Center (formerly known as Region IV), namely Alabama, Florida, Georgia, Kentucky, Mississippi, North and South Carolina, and Tennessee, consistently outrank other regions with respect to number of fatal crashes and fatal crash rates. Approximately one-forth of the Nation's fatalities occur in the southeastern region where the fatality rate is about 20 percent above the national mean rate.

In 1998, the FHWA Atlanta Resource Center commissioned a study to investigate crash data, determine causative factors, and make recommendations for reducing fatal crashes as part of the agency's 10-year Strategic Plan to reduce fatalities and injuries in the southeastern region by 20 percent. The eight states voluntarily agreed to participate in a regional pooled-fund study coordinated by Georgia Institute of Technology[1].

As Figure 1.1 shows, Florida's fatality rate per 100 million vehicle miles traveled is 2.1 compared to the national rate of 1.6 in 1998. Because Florida's fatal crashes and fatality rates outranks national averages, the Florida Department of Transportation (FDOT) contracted with the Center for Urban Transportation Research (CUTR) at the University of South Florida (USF) to develop a technical scope of work that was consistent with the overall objectives of the pooled-fund study.

Figure 2.1 Fatality Rate per 100 Million Vehicle Miles Traveled: Florida vs. US, 1975-1998



Source: FARS data.

[1] For more information on the pool-funded study and results, contact Simon Washington, Ph.D., School of Civil and Environmental Engineering, Georgia Institute of Technology, Atlanta, Georgia, 30332 at Simon.Washington@ce.gatech.edu, or phone (404) 894-6476.

1.2 RESEARCH OBJECTIVE

The purpose of the research was to identify problem areas related to highway safety in which Florida is over-represented relative to other states and the nation as a whole. The research results provide policy makers and highway safety advocates with a better understanding of the factors that may contribute to less safe highway travel in Florida. The results may be used to help identify specific problem areas where the FDOT can focus safety improvement measures.

1.3 RESEARCH APPROACH

CUTR researchers conducted several activities to accomplish the research objective. Data were collected and analyzed through the application of a multiple-step process used to identify highway safety problem areas unique to Florida.

Data Collection. Researchers obtained data on all fatal crashes in the United States that occurred from 1994 to 1998 from the Fatal Analysis Reporting System (FARS) database. The data included motor vehicle traffic crashes from all states during the five-year period resulting in a fatal injury to a vehicle occupant or non-motorist within 30 days of the crash.

Data Analysis. First, states were grouped based on fatality rates to allow comparison of Florida to other states. During the study period, Florida's fatality rate was lower than 11 states but higher than 39 states[2]. States with higher fatality rates were classified as a single group **(Less Safe).** States with lower fatality rates were divided into two groups: states with average fatality rates less than 25 percent lower than Florida's **(Safer)** and states with average fatality rates more than 25 percent lower than Florida's **(Safest).**

The analyses were conducted based on three person types: drivers, passengers, and non-motorists (pedestrians and bicyclists). These person types were separated due to differences in how exposure is measured and likely contributing factors and because they differ in terms of shares between Florida and the nation as a whole (see Figure 1.2).

The analysis proceeded in three steps. Level-One analysis examined individual variables from the FARS dataset to identify a preliminary list of highway safety problem areas where Florida may be over-represented relative to the other state groups and the nation as a whole. The degree of over-representation (DOR) was calculated as follows:

$$\mathrm{DOR}_{\mathrm{Step\ 1}} = \left(\frac{\text{FL Proportion of Fatalities}}{\text{Comparison Group's Proportion of Fatalities}} - 1 \right) \times 100$$

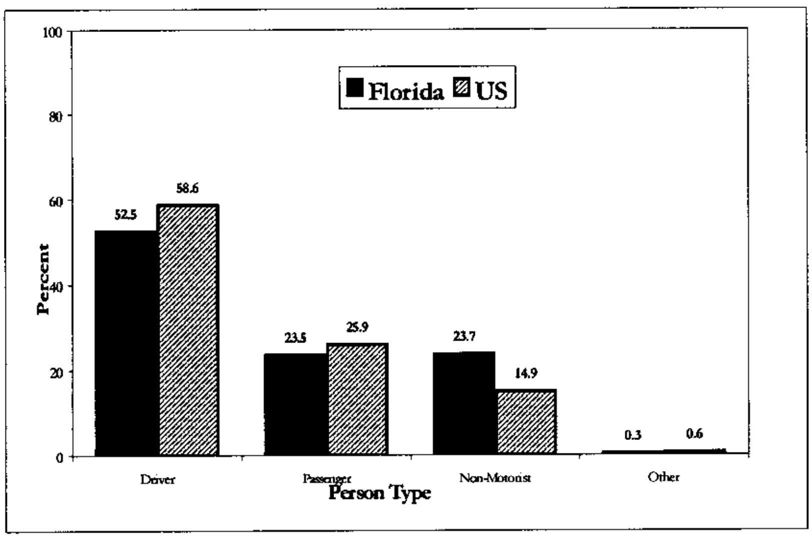
Exposure Analysis applied the concept of quasi-induced exposure to the problem areas identified in Step 1 to control for differences in exposure between Florida and each of the state groups and the nation as a whole. The degree of over-representation was calculated based on the following:

[2]The District of Columbia and the other 49 states were divided into three groups of different levels of highway safety. For convenience, the District of Columbia is referred to as a state.

$$DOR_{Step\ 2} = \left(\frac{\dfrac{\text{FL Proportion of Fatalities}}{\text{FL Proportion of Exposure}}}{\dfrac{\text{Comparison Group's Proportion of Fatalities}}{\text{Comparison Group's Proportion of Exposure}}} - 1 \right) \times 100$$

The last step, Multi-Factor analysis, introduced additional variables to examine preliminary problem areas to which the quasi-induced exposure approach was not applicable. The statistical program, SPSS, and Microsoft Excel were used to analyze the data based on the DOR formulas, data quality, and statistical significance. Researchers synthesized the results and ranked problem areas for further research consideration.

Figure 1.2 Distribution of Fatalities by Person Types in Florida and U.S., 1994-1998



Source: Tabulated from FARS, 1994-1998, www.nhta.dot.gov/people/ncsa/fars.html, NHTSA.

Final Report Preparation. Researchers documented the results of the analyses and presented them both graphically and in writing. This report constitutes the project deliverable.

1.4 Report Organization

The remainder of this report is divided into six chapters. Chapter 2 details the research methodology used to identify problem areas. Chapters 3-5 summarize the results from the three steps of the methodology. Chapter 6 identifies methodological lessons learned from the project, discusses the results, and makes recommendations on further research.

Chapter 2
METHODOLOGY

2.1 INTRODUCTION

Researchers used a multi-step process to help identify problem areas that may contribute to Florida's relatively low level of highway safety. The process began with grouping states according to average fatality rates and proceeded with determining areas where Florida is over-represented relative to other state groups. Over-representation occurs when the number of fatalities in certain situation is disproportionately higher in Florida than in the defined state groups. This process was done in two sequential levels. The first level of analysis, or Level-One analysis, identified potential problem areas without taking into consideration any differences in exposure between Florida and other state groups. The second level of analysis varied, depending on the nature of problem areas identified from Level-One analysis. In most cases, the second level introduced differences in exposure and is referred to as Exposure analysis. In the other few cases for which exposure could not be measured, the second level introduced additional variables to determine under what situations these problem areas are most highly over-represented. This third level of analysis is referred to as Multi-Factor analysis.

The analyses were conducted separately for three person types: drivers, passengers, and non-motorists (pedestrians and bicyclists). These three types of persons were selected due to differences in how exposure is measured and likely contributing factors. In addition, these person types were separated because they differ in terms of shares between Florida and the nation as a whole. For example, Florida had 3,282 non-motorists died from highway crashes during the period from 1994 to 1998, representing 23.7 percent of all highway traffic fatalities in this period. In comparison, the nation as a whole had 14.9 percent of all highway traffic fatalities as non-motorists in the same period.

2.2 STATE GROUPING

The District of Columbia and the other 49 states were divided into three groups of different levels of highway safety (See Table A-1 in Appendix A). Hereafter, the District of Columbia is also referred to as a state for convenience. The rationale was that the comparison of Florida with multiple groups of states with different levels of highway safety would provide more insight into highway safety problem areas where Florida is over-represented.

This grouping is based on fatality rates, i.e., the number of fatalities per 100 million vehicle miles of travel (VMT). These fatality rates were defined as averages over the period 1993-97. Data on the number of fatalities and the amount of vehicle travel by individual states were from the Highway Statistics for the years 1993 through 1997 from the website of FHWA's Office of Highway Information. The period from 1993-1997 was used for grouping rather than from 1994-1998 because Highway Statistics for 1998 was not available when the states were grouped at the beginning of the project. The grouping was little changed when the period from 1994 to 1998 was used.

During the period from 1993 to 1997, Florida's fatality rate was lower than 11 states but higher than 39 states. It was decided to keep the states with higher fatality rates as a single group (Less Safe).

However, it was decided to divide the states with lower fatality rates further into two groups: states with their average fatality rate more than 25 percent lower than Florida's (Safest) and states with their average fatality rate less than 25 percent lower than Florida's (Safer). Note that Florida's rate at 2.14 is about 25 percent higher than the national rate at 1.71.

2.3 Data Sources

FARS data from 1994 to 1998 was the main data source for the analyses. This was supplemented with data on vehicle travel from Highway Statistics produced by the Federal Highway Administration. Data on vehicle travel were used to calculate the average number of fatalities per unit of vehicle travel for individual states. For each database, the following briefly describes: the sources of the data, data items, and potential errors and biases in the data.

2.3.1 Highway Statistics

Data Sources. Data on daily vehicle-miles of travel (DVMT) in Highway Statistics are derived from the Highway Performance Management System (HPMS). In concept, travel is a calculated value that is a product of the annual average daily traffic (AADT) and the centerline length of the section for which the AADT is reported. AADT is required to be reported for each section of Interstate, NHS, and other principal arterial; as a result, travel can be computed for these functional systems on a 100-percent basis. For minor arterial, rural major collector and urban collector systems, travel is calculated from samples using the AADT, centerline length reported for each sample section and the HPMS sample expansion factor for each section. The DVMT will be adjusted for the functional systems where sample data are used if the universe and expanded sample length do not equal. For the most part, states use unknown methods to estimate travel for the rural minor collector and rural/urban local functional systems. For these systems, travel values are developed by the States using their own procedures and are provided in HPMS. Some states use supplemental traffic counts outside of the HPMS procedures; others employ estimating techniques, such as fuel use, to determine travel on these systems.

Errors and Biases. Travel estimates reported via the HPMS should be of reasonable quality particularly for the higher order functional systems. AADT and travel data are edited by the HPMS software for unusual values and for unusual changes to previously reported values. FHWA routinely works with State data providers to modify reported AADT values that do not appear to be reasonable before incorporating them into a final master file. Although AADT is required to be updated annually in the HPMS, counts are required to be updated on a 3-year cycle. For any reporting year, AADT for uncounted sections is to be derived by factoring the latest year's count for those sections. States that follow the HPMS sampling instructions in developing traffic counting programs have adequate counting and classification tools to prepare quality AADT and travel estimates for HPMS. The consistency of the sampling and counting procedures should also provide comparable state-to-state traffic data.

In practice, FHWA is aware that not all states rigorously follow the recommended sampling, counting, and estimating procedures. Reporting of AADT based on actual traffic counts, on all Interstate and principal arterials on a 3-year cycle is a required but not necessarily followed protocol for HPMS reporting. The calculation and application of various adjustment factors to 24- or 48-hour coverage counts to enable them to represent AADT is as much art as science. Classification counts, which are needed to adjust pneumatic tube counts collected for three or more axle vehicles as well as for other HPMS items, are difficult to collect and to apply on a statewide basis. Equipment used to obtain count information is only accurate within certain limits and can suffer from malfunctions and breakdowns, which can affect the reliability of traffic counts.

2.3.2 FARS

Data Sources. The National Highway Traffic Safety Administration (NHTSA) has a cooperative agreement with an agency in each state to provide information on all qualifying fatal crashes in the state. These agreements are managed by Regional Contracting Officer's Technical Representatives located in the 10 NHTSA Regional Offices. State employees, called "FARS analysts," are responsible for gathering, translating, and transmitting their state's data to NHTSA in a standard format. Each FARS analyst attends a formal training program, and also receives on-the-job training. The number of analysts varies by state, depending on the number of fatal crashes and the ease of obtaining data.

FARS data are obtained solely from the state's existing documents, which generally include some or all of the following:

- Police Accident Reports (PARS)
- State vehicle registration files
- State driver licensing files
- State Highway Department data
- Vital Statistics
- Death certificates
- Coroner/Medical examiner reports
- Hospital medical records
- Emergency medical service reports

Analysts use these documents to code FARS data items on three standard FARS forms. The Accident Form asks for information such as the time and location of the crash, the first harmful event, whether the crash was a hit-and-run crash, whether a school bus was involved, and the number of vehicles and people involved. The Vehicle and Driver Forms call for data on each crash-involved vehicle and driver such as vehicle type, initial and principle impact points, most harmful event, and drivers' license status. The Person Form contains data on each person involved in the crash, including age, gender, role in the crash (driver, passenger, non-motorist), injury severity, and restraint use. The data collected within FARS do not include any personal identifying information, such as names, addresses, or social security numbers. Each analyst enters data into a local microcomputer data file, and forwards weekly updates to NHTSA's central computer database. Data are automatically checked when entered for acceptable range values and for consistency, enabling the analyst to make corrections immediately. To be included in FARS, a crash must involve a motor vehicle traveling on a traffic way customarily open to the public, and result in the death of a person (either an occupant of a vehicle or a non-occupant) within 30 days of the crash.

Data Items. The FARS file contains descriptions of each fatal crash reported. Each case has more than 100 coded data elements that characterize the crash, the vehicles, and the people involved. The final data for each year are organized into three files: the Accident File, the Vehicle and Driver File, and the Person File. Table 2.1 shows the size of each file by state grouping. The variables, for the period under study, unique to each of these files are listed separately in Tables A-2 – A-4 in Appendix A.

Table 2.1 Fatal Crashes, Vehicles Involved, and Persons Involved: Florida Compared to Other State Groups, 1994-1998

	Florida	Safest	Safer	Less Safe	All
Accident File					
Number of crashes	12,537	73,909	63,513	35,435	185,394
Vehicle and Driver File					
Number of vehicles	19,832	112,557	97,372	52,946	282,707
Person File					
Died from crash	13,854	82,146	72,063	40,019	208,082
Injured from crash	13,094	75,808	69,090	37,697	195,689
Not Injured	8,779	40,669	32,688	17,845	99,981
Died prior to crash	0	21	12	4	37
Unknown	239	1,511	1,305	725	3,780
Total	35,966	200,155	175,158	96,290	507,569

Source: Adapted from FARS, 1994-1998.

Errors and Biases. Because FARS is a census of all fatal crashes, there are no sampling errors. However, non-sampling errors can still exist. There are mainly three forms of non-sampling errors involving FARS data. The first is non-response error, which results when information was not collected for a certain variable or a particular value within this variable. These were not collected either because they were missing in one of the state data sources, such as Police Accident Reports, or because they are not included in the state sources for data collection. Another form of non-sampling error in FARS is coding error. In this case, correct data were obtained from individual state sources, but errors were made in coding state data into FARS. The third form of non-sampling error is measurement error, which can result, for example, from the investigating office incorrectly estimating the traveling speeds of the vehicles involved in a fatal crash. Some of these errors are not visible in the data files, while others reflect themselves as missing or being coded as unknown. Potentially, these errors could pose a serious problem to analyses conducted in the study if they account for a large share of the crashes within each state group and these shares differ between Florida and other state groups.

2.4 Level-One Analysis

2.4.1 Data Preparation

Data were prepared in several steps. First, the FARS files from each of the five years were appended together into a single file for each file type, resulting in three expanded files: the expanded Accident file, the expanded Vehicle and Driver file, and the expanded Person file.

Second, the variables in each expanded file for further analysis were selected. They include 30 from the Accident File, 46 from the Vehicle and Driver File, and 18 from the Person File. Except those variables for identification, variables in Tables A-2 – A-4 not included for further analysis are shaded.

Third, the remaining variables in the expanded Accident File and the expanded Vehicle and Driver File were merged into the expanded Person File. The merging of the Accident File into the Person File was facilitated through the variable indicating the year in which a crash occurred and the crash identification number within a given year. The merging of the Vehicle and Driver File into the Person File was facilitated through both the year of crash and crash identification number and the vehicle number. The merged Person File contained a total of 94 variables for analysis.

Fourth, each of these variables was examined to determine if any recoding was needed for further analysis. For example, several variables contain values on a continuous scale and were recoded into appropriate discrete ranges. Also, several variables contain a large number of discrete values and were recoded into fewer values. In addition, some variables, such as those indicating the hour and minute of the occurrence of an event, were recoded into a single variable, indicating the time of the event.

Finally, those persons who did not die from the crashes were deleted to focus on fatalities. The final Person file contained a total of 208,082 fatalities and a total of 73 variables.

2.4.2 Analytic Methods

Level-One analysis measured the degree of over-representation of fatalities in Florida relative to each of the state groups and included several components for each variable. One component involved computing the proportions of fatalities the different values of a given variable represent within Florida and each of the other state groups. For instance, let V_{ij} (i = 1,2,…,I; j = FL, Safest, Safer, Less Safe) be the number of fatalities associated with value i in a variable for state group j. Further, let Vj (j = FL, Safest, Safer, and Less Safe) be the total number of fatalities within state group j. Then $P_{ij} = V_{ij}/V_j$ represent the proportion associated with value i of the variable under consideration within state group j.

The second component involved testing whether any difference in the proportions of a particular value within a given variable between Florida and any state group is statistically significant. This is a standard test of equality between two proportions. Suppose one wants to test the statistical significance of difference in the proportions of fatalities in urban areas between FL and Less Safe: P_{FL} and P_{LS}. The difference $P_{FL} - P_{LS}$ approaches the normal form when $V_{FL}P_{FL}$, $V_{HI}P_{LS}$, $V_{FL}Q_{FL}$, and $V_{LS}Q_{LS}$ are all at least 10. The test statistic is then given by:

$$z = \frac{P_{FL} - P_{LS}}{\sqrt{PQ\left(\frac{V_{FL} + V_{LS}}{V_{FL}V_{LS}}\right)}}$$

where $P = (V_{FL}P_{FL} + V_{LS}P_{LS}) / (V_{FL} + V_{LS})$, $Q = 1 - P$, and the first subscript in the symbols indicating a particular value in a variable has been dropped for simplicity. For this study, the testing was done at the 0.05 significance level.

The third component involved calculating the degree of over-representation for every value of a given variable relative to each of the three state groups. The degree of over-representation in Florida relative to state group j in the type of fatalities associated with value i of a variable is given by O_{ij} =

100 [($P_{i,FL}$ / Pij) – 1], j = Safest, Safer, or Less Safe. A positive value of O_{ij} indicates that Florida is over-represented relative to state group j in the type of fatal crashes associated with value i of the variable considered. A negative value of O_{ij}, on the other hand, means that Florida is under-represented.

2.5 EXPOSURE ANALYSIS

Exposure analysis applied quasi-induced exposure to drivers directly and to passengers and non-motorists indirectly through varying degrees of modification. One problem with Level-One analysis is that it does not take into account differences in exposure across the state groups. Suppose Level-One analysis indicated that 54 percent of fatalities in Florida happened in urban areas, compared with 35 percent in the Safer states. This would indicate that Florida is over-represented in urban fatalities relative to the Safer states. The degree of over-representation is 100 * (54 / 35 - 1) = 54.29 percent. However, this measure of over-representation would overestimate the true value if proportionally more travel in Florida is done in urban areas than in the Safer states. Suppose further that 60 percent of travel in Florida is urban and 30 percent in the Safer states. How should one adjust the calculation of the degree of over-representation taking into account the difference in exposure? One could start the adjustment with computing the relative exposure between Florida and the Safer states: 30/60 = 0.5. This relative exposure risk is then used in adjusting the degree of over-representation as follows: 100 * [**0.50** * (54 / 35) - 1]} = -22.86 percent. Florida was actually under-represented in urban fatalities relative to the Safer states once Florida's over-exposure to urban travel is considered.

2.5.1 Exposure Measure

The commonly used measure of vehicle miles of travel is useful when exposure is measured at aggregated levels such as functional classification. Data for vehicle miles of travel, however, are unavailable for disaggregated situations, which most FARS variables describe. An alternative was needed.

This research used the quasi-induced exposure measure. As originally designed, the approach applies to drivers and derives exposure estimates from the distribution of non-responsible drivers in the set of two-vehicle crashes for which fault can be reasonably attributed to one and only one driver. These are often referred to as the "clean" crashes. An underlying assumption of this approach is that not-at-fault drivers constitute a representative random sample of those on the road. This measure has been in the development since 1967. Stamatiadis and Deacon (1997) reassessed the quasi-induced exposure measure in terms of its underlying assumptions and concluded: 1) the quasi-induced measure provides an accurate reflection of exposure to multiple-vehicle crashes; 2) the quasi-induced measure is an acceptable surrogate for vehicle miles of travel when estimates are made for conditions during which the mix of road users is fairly constant; and 3) the quasi-induced measure is powerful tool for measuring relative exposure of drivers when real exposure data are unavailable.

In addition to applying the induced exposure to drivers, researchers modified the procedure to apply to passengers and non-motorists, respectively. The steps in the procedure are discussed separately for each person type.

Drivers. Several steps were involved measuring the quasi-induced exposure for drivers. First, researchers created a file that included drivers involved in two-vehicle crashes. All levels of injury severity were included in the file. As shown in Table 2.2, the file included 9,933 Florida drivers. (Note that the number of drivers can be smaller than the number of vehicles within a given state group because of absence of drivers, for example.)

Researchers then assigned at-fault or not-at-fault to the drivers. A driver was innocent if the investigating officer did not indicate any violation. Table 2.3 shows the number of drivers by fault. Drivers involved two-vehicle crashes in which none of the drivers or both drivers were at fault were deleted from the file. This resulted in 16,935 drivers remaining, as indicated in Table 2.3.

Table 2.2 Drivers by Group and Vehicles Involved

Number of Vehicles	Florida	Safest	Safer	Less Safe	All
One	6,525	41,966	35,011	20,553	104,055
Two	9,933	53,196	48,327	25,072	136,528
Three+	3,284	16,696	13,426	6,956	40,362
Total	19,742	111,858	96,764	52,581	280,945

Source: Adapted from the Person File, FARS, 1994-1998.

Table 2.3 Drivers by Group and Fault in Two-Vehicle Crashes

Fault	Florida	Safest	Safer	Less Safe	All
None at Fault	4,324	22,608	20,703	11,327	58,962
One at Fault	1,058	7,066	6,394	2,417	16,935
Two at Fault	4,032	20,166	19,793	9,953	53,944
Unknown	467	3,051	1,179	1,278	5,975
Total	9,881	52,891	48,069	24,975	135,816

Source: Adapted from the Person File, FARS, 1994-1998. A driver was at fault if the investigating officer charged him a violation.

Next, researchers deleted FARS variables that were not feasible for measuring quasi-induced exposure. Finally, researchers computed exposure for each value of every FARS variable remaining in the file. Specifically, this step determined the total number of not-at-fault drivers in Florida (N_{FL}) in the remaining file and the number of not-at-fault drivers in Florida (A_{FL}) that is associated with a particular value in a variable (e.g., urban). The level of exposure for Florida is measured by $E_{FL} = N_{FL} / A_{FL}$. Similarly the level of exposure for group j is measured by $E_j = N_j / A_j$.

Passengers. The measure of exposure was modified slightly for passengers from that used for drivers. The same set of clean 2-vehicle crashes was used. In the case of drivers, the exposure measure was based on the distribution of not-at-fault drivers in those clean crashes. For passengers, the exposure measure was based on the distribution of the passengers of those not-at-fault drivers.

Non-Motorists. For non-motorists, the measure of exposure was modified from that for drivers more significantly, though the basic concept remained the same. The following steps were used in calculating this exposure measure. The first step created a file of drivers from the vehicle file who were involved in single-vehicle crashes. The second step assigned at-fault or not-at-fault to the driver. A driver was innocent if the investigating officer did charge the driver with any violations. The third step merged this new variable measuring who is at fault into the person file and assigned fault or innocence to the non-motorists. Because there were no variables indicating violation charges on non-motorists, the non-motorists were assumed to be not-at-fault whenever the driver was at fault. The fourth step reduced the person file to include only those drivers and non-motorists involved in single vehicle crashes with at least one non-motorist. The fifth step computed exposure for each value of relevant FARS variables. The computation is similar to the cases for drivers and passengers. However, both not-at-fault drivers and non-motorists were considered in measuring exposure. This is because both the amount of traffic and the number of non-motorists exposed to this traffic are important in determining the exposure for non-motorists.

2.5.2 Analytic Methods

Once exposure was measured for both Florida and another state group, the analysis proceeded with computing the relative exposure $E_{FL,j} = E_{FL} / E_j$. The relative exposure was then used to adjust the degree of over-representation from Level-One analysis: $O_{ij} = 100\,[E_{FL,j}\,(P_{i,FL} / Pij) - 1]$, j = Safest, Safer, or Less Safe. Again, a positive value of O_{ij} indicates that Florida is over-represented relative to state group j in the type of fatal crashes associated with value i of the variable considered. A negative value of O_{ij}, indicates that Florida is under-represented.

Table 2.4 compares relative exposure estimates using vehicle miles of travel and the induced approach with respect to drivers. What is shown in the table is $E_{FL,j}$ (j = Safest, Safer, Less Safe, or All) for urban and rural areas, respectively. The comparison uses land use between urban and rural areas because land use is the only variable in FARS for which relatively reliable statistics are available for both induced exposure and vehicle miles of travel. Using vehicle miles of travel, urban exposure in the Safest states, Safer states, Less Safe states, and the nation as a whole is only 89 percent, 76 percent, 72 percent, and 82 percent of that in Florida, respectively. At the same time, rural exposure in these state groups is 30 percent, 70 percent, 81 percent, and 51 percent more than in Florida, respectively. Under the induced approach, these percentages change to 82, 59, 61, and 71 for urban exposure and 28, 66, 64, and 46 for rural exposure. In addition to evidence from the literature, this further indicates the value of the quasi-induced measure in controlling exposure.

Table 2.4 Comparison of Relative Exposure Between Approaches

Approach	Land Use	Safest	Safer	Less	All
VMT	Urban	0.89	0.76	0.72	0.82
	Rural	1.30	1.70	1.81	1.51
Induced	Urban	0.82	0.59	0.61	0.71
	Rural	1.28	1.66	1.64	1.46

Note: Results on the VMT approach were based on Highway Statistics 1994-1998, while results on the induced approach were based on the methodology stated earlier.

2.6 Multi-Factor Analysis

The Exposure analysis was not applicable to certain problem areas involving passengers and non-motorists identified in the Level-One analysis. For passengers, these include personal characteristics, such as age. For non-motorists, these include characteristics that drivers and non-motorists do not share. The Multi-factor analysis attempts to determine under what more specific situations problem areas identified in the Level-One analysis are more over-represented than under other situations.

2.7 SUMMARY

In sum, a multi-step process was used to identify highway safety problem areas that may contribute to less safe travel on Florida's roadways. For comparative purposes, States were separated into three comparison groups based on fatality rates during the five-year period. Level-One analysis calculated the degree of over-representation by comparing Florida's proportion of fatalities to a comparison group's proportion of fatalities. Problem areas identified in the Level-One analysis were furthered analyzed using Exposure analysis. The concept of quasi-induced exposure was used to account for the differences in exposure between Florida and each of the comparison groups. Finally, Multi-factor analysis was used to determine under what specific situations problem areas identified in the Level-One analysis were more over-represented than other situations.

Chapter 3
LEVEL-ONE ANALYSIS

3.1 INTRODUCTION

This chapter presents the results from the Level-One analysis for each of the three person types: drivers, passengers, and non-motorists. In addition, the chapter presents results on whether or not and by how much traffic fatalities among each of the three person types is over-represented in Florida relative to the other state groups.

While a large number of FARS variables and values within each variable were analyzed, only a limited number were retained for further analysis. The following criteria were used in the screening:

1. The number of traffic fatalities related to unknown values within a FARS variable represent no more than 5 percent of the total in Florida; and the share of these unknown traffic fatalities is no more than 10 percent higher than any of the state groups.
2. The product between the number of traffic fatalities related to any value within a FARS variable and its share among all traffic fatalities is at least 10.
3. The difference in the shares of a particular value within a FARS variable between Florida and a state group is significantly different at the 0.05 level.

Results from the Level-One analysis are further analyzed in Chapter 4 using the Exposure analysis method described in the methodology section. For problem areas to which Exposure analysis was not applicable the results of the Multi-factor analysis method are presented in Chapter 5.

3.2 PERSON TYPE

Table 3.1 shows whether or not and by how much Florida is over-represented in each of the person types relative to each state group. The first two columns list the FARS variable and values within the variable. In this case, the variable indicates person type and the values indicate the particular types of person. The third column lists the number of fatalities among each person type. The fourth column shows the percent distribution of traffic fatalities among the person types. The last four columns show the degree of over-representation between Florida and each of the state groups. A positive number indicates over-representation, while a negative number indicates under-representation. A 100 value of over-representation relative to a comparison group means that Florida's share of non-motorist fatalities is twice as large as in the comparison group. Similarly, a negative 100 value means that Florida's share is half as large.

Table 3.1 Over-Representation of Non-Motorist Fatalities

FARS Variable	FARS Value	Problem Size		State Group			
		Number	Share	Safest	Safer	Less Safe	All
Person Type	Drivers	7,277	52.5%	-8	-13	-13	-10
	Passengers	3,249	23.5%	**-5**	-13	-13	-9
	Non-motorists	3,282	23.7%	37	94	102	59

Source: Computed from FARS, 1994-1998, using the Level-One analysis. Bold indicates that the difference in shares between Florida and the corresponding state group is **not** statistically different at the 0.05 level.

During the period from 1994 to through 1998, a total of 7,277 drivers died from traffic crashes in Florida, representing 52.5 percent of all traffic fatalities in the state (see Table 3.1). During the same period, equal number of passengers and non-motorists died in traffic crashes (3,249 and 3,282, respectively). While both driver and passenger fatalities were under-represented in Florida relative to any of the state groups, non-motorist fatalities are significantly over-represented. In fact, the share of non-motorist fatalities among all traffic fatalities in Florida is 37 percent higher than in the Safest states, 94 percent higher than in the Safer states, and 102 percent higher than in the Less Safe states.

3.3 Driver Analysis

Table 3.2 presents the results of Level-One analysis for drivers. This table and the others presented in the chapter are similar to Table 3.1 in structure with two exceptions. First, there are more than one FARS variables included. As a result, the fourth column shows the distribution of driver fatalities within each FARS variable. Second, the table includes only those areas of concern with a degree of over-representation of at least 25 relative to all states. The following discussion focuses on selected areas of concern organized into two categories: those in which Florida is over-represented by at least 100 percent and a few special areas not included in the first category.

3.3.1 High Over-Representation

As Table 3.2 indicates, the degree of over-representation is at least 100 percent for five areas including: roads with four lanes, roads with six lanes, urban non-interstate freeways, regulatory signs, and vehicles turning left just prior to the crash. The number of driver fatalities related to these areas from 1994 to 1998 is 1,838, 600, 703, 2,339, and 806, respectively. These represent 25.3 percent, 8.2 percent, 9.7 percent, 32.1 percent, and 11.1 percent of all driver fatalities, respectively. The range in the degree of over-representation relative to the state groups is 138.4 percent to 291.3 percent for roads with four lanes, 976.6 percent to 1917.9 percent for roads with six lanes, 122.4 percent to 851.5 percent for urban non-interstate freeways, 198.1 percent to 211.5 percent for regulatory signs, and 119.4 percent to 127.0 percent for vehicles turning left prior to the crash.

3.3.2 Areas of Special Concern

The very old drivers are an area of special concern in Florida. A total of 958 drivers died in traffic-related crashes in Florida from 1994 to 1998 who were 75 years or older at the time of crash. This represents 13.2 percent of all traffic fatalities among all ages of drivers. The degree of over-representation is around 50 percent relative to each of the state groups. Note that driver fatalities among those 65-74 years old are not over-represented in Florida.

Drivers with at least one conviction of non-speed related moving violations also are an area of special concern. A total of 1,783 of these drivers died in traffic crashes in Florida from 1994 to 1998. This is almost a quarter of all driver fatalities in the state. This problem is over-represented in Florida by 27.9 percent relative to the Safest states, by 68.2 percent relative to the Safer states, and 82.3 percent relative to the Less Safe states.

The lack of restraint use among drivers does not seem to be a problem that is over-represented in Florida (data not included in Table 3.2). A total of 4,083 drivers that died in traffic crashes in Florida from 1994 to 1998 were not wearing any restraint at the time of crash. This represents 56.1 percent of all driver fatalities. While it is a significant problem in an absolute sense, it is not a large problem relative to the other state groups. Compared to the Safest states, this problem is over-represented by 7.3 percent in Florida. Compared to the other state groups or the nation as a whole, however, this problem is either not over-represented (relative to the Safer states) or slighted under-represented (relative to the Less Safe states or the nation) in Florida.

Table 3.2 Driver Results from Level-One Analysis

FARS Variable	FARS Values	Problem Size			State Group		
		Number	Share	Safest	Safer	Less Safe	All
Light Condition	Dark but lighted	1,294	17.8%	18.4	78.8	117.8	48.0
Manner of Collision	Angle	2,625	59.8%	30.3	40.3	45.1	33.4
Number of Lanes	4 lanes	1,838	25.3%	138.4	209.2	291.3	158.2
	6 lanes	600	8.2%	976.8	1,738.9	1,917.9	702.2
Profile	Level	6,295	86.5%	21.7	30.4	47.8	27.6
Relation to Junction	Intersection	2,197	30.2%	56.1	70.7	123.8	65.5
Relation to Roadway	Shoulder	875	12.0%	141.7	225.2	295.3	163.9
	Off roadway	1,350	18.6%	65.7	47.4	-18.6	28.6
Functional Classification	Urban other freeway	703	9.7%	122.4	226.4	851.5	175.5
	Urban local	822	11.3%	101.1	64.7	199.8	87.3
Land Use	Urban	3,601	49.5%	15.9	58.6	95.0	39.1
Roadway Ownership	Municipality	1,421	19.5%	29.4	183.7	65.0	65.7
Speed Limit	26-45 mph	3,680	50.6%	50.3	100.2	48.6	59.3
Traffic Control Device	Traffic signal	910	12.5%	81.9	134.1	160.5	100.0
	Regulatory sign	2,339	32.1%	198.1	172.5	211.5	160.8
Traffic-Way Flow	Divided with no barrier	3,362	46.2%	168.4	119.8	98.2	114.8
Vehicle Body Type	Motorcycles	833	11.4%	7.1	61.8	63.2	31.3
Initial Impact Point	9 o'clock point	1,195	17.8%	38.0	29.1	67.1	36.2
Role in Collision	Struck	2,247	30.9%	73.7	67.4	92.6	67.4
Non-Speeding Moving Violations Convictions	At least one in 3 years	1,783	24.5%	27.9	68.2	82.3	46.7
Vehicle Maneuver Prior Crash	Turning left	806	11.1%	119.4	122.1	127.0	106.9
Driver Age	75 years or older	958	13.2%	42.5	52.7	76.4	47.9

Source: Computed from FARS 1994-1998, using the Level-One analysis method.

3.4 Passenger Analysis

Table 3.3 presents the Level-One analysis results for passengers. The following discussion focuses on selected areas of concern organized into two categories: those in which Florida is over-represented by at least 100 percent and a few special areas not included in the first category.

High Over-Representation

As Table 3.3 indicates, the degree of over-representation is at least 100 percent for four areas including: roads with four lanes, roads with six lanes, regulatory signs, and vehicles turning left just prior to the crash. The number of passenger fatalities related to these areas from 1994 to 1998 is 907, 331, 965, and 576, respectively. These represent 27.9 percent, 10.2 percent, 29.7 percent, and 17.7 percent of all passenger fatalities, respectively. The range in the degree of over-representation relative to the state groups is 142.7 percent to 272.3 percent for roads with four lanes, 954.0 percent to 1760.6 percent for roads with six lanes, 135.6 percent to 167.5 percent for regulatory signs, and 132.7 percent to 144.3 percent for vehicles turning left prior to the crash. Compared to drivers, the degree of over-representation among passengers is higher with respect to vehicles turning left but is lower with respect to regulatory signs.

Areas of Special Concern

The very old drivers and passengers are an area of special concern in Florida. A total of 481 passengers died in traffic crashes in Florida from 1994 to 1998 who were 75 years or older at the time of crashes. This represents 14.8 percent of all traffic fatalities among all ages of passengers. The degree of over-representation ranged from 36.1 percent relative to the Safest states to 92.2 percent relative to the Less Safe states. In addition, a total of 363 passengers died in traffic crashes whose drivers were 75 years or older. Older drivers are more highly over-represented in Florida than older passengers.

Again, the lack of restraints use among passengers does not seem to be an area of concern in terms of over-representation. A total of 2,043 passengers died in traffic crashes in Florida from 1994 to 1998 without wearing any restraint. This represents 62.9 percent of all passenger fatalities. While it is a significant problem in an absolute sense, it is not a large problem relative to the other state groups. This problem is over-represented by 14.9 percent relative to the Safest states and by 2.7 percent relative to the Safer states. It is, however, under-represented to the Less Safe states by 5.5 percent. The degree of over-representation is higher among passengers than among drivers.

Table 3.3 Passenger Results from Level-One Analysis

FARS Variable	FARS Values	Problem Size			State Group		
		Number	Share	Safest	Safer	Less Safe	All
Light Condition	Dark but lighted	631	19.4%	13.3	72.7	132.5	45.0
Manner of Collision	Angle	1,415	67.8%	31.1	44.4	44.5	34.9
Lanes	4 lanes	907	27.9%	142.7	217.2	272.3	160.5
	6 lanes	331	10.2%	954.0	1898.0	1760.6	699.3
Profile	Level	2,859	88.0%	24.0	29.5	45.2	27.9
Relation to Junction	Intersection	1,198	36.9%	57.9	74.8	116.8	67.0
Relation to Roadway	Shoulder	283	8.7%	72.2	142.6	172.0	99.0
Functional Classification	Urban local	350	10.8%	83.7	50.6	194.6	74.2
Land Use	Urban	1,616	49.7%	15.9	64.0	100.3	41.5
Roadway Ownership	Municipality	606	18.7%	12.9	161.7	57.6	51.3
Speed Limit	26-45 mph	1,642	50.5%	56.4	106.4	61.9	66.4
Traffic Control Device	Traffic signal	605	18.6%	97.8	161.2	180.2	116.7
	Regulatory sign	965	29.7%	160.5	135.6	167.6	130.6
Traffic-Way Flow	Divided with no barrier	1,630	50.2%	142.4	100.8	72.5	95.2
Initial Impact Point	3 o'clock point	780	26.9%	51.7	48.9	84.6	51.1
Vehicle Age	Two years or newer	690	26.7%	36.8	29.3	20.1	27.8
Vehicle Maneuver Prior Crash	Turning left	576	17.7%	132.7	160.2	144.3	125.4
Driver Age	75 years or older	363	11.3%	57.4	90.0	138.2	74.0
Passenger Age	75 years or older	481	14.8%	36.1	64.3	92.2	51.0

Source: Computed from FARS data 1994-1998, using the Level-One analysis method. Bold indicates that the difference in shares between Florida and the corresponding state group is **not** statistically different at the 0.05 level.

3.5 Non-Motorist Analysis

Table 3.4 presents the results of Level-One analysis for non-motorists. The following discussion focuses on selected areas of concern organized into two categories: those in which Florida is over-represented by at least 100 percent and a few special areas not included in the first category.

3.5.1 High Over-Representation

As shown in Table 3.4, the degree of over-representation is at least 100 percent for three areas including roads with six lanes, urban non-interstate freeways, and regulatory signs. The number of non-motorist fatalities related to these areas from 1994 to 1998 is 413, 518, and 699, respectively.

These represent 12.6 percent, 15.8 percent, and 21.3 percent of all non-motorist fatalities, respectively. The range in the degree of over-representation relative to the state groups is 586.7 percent to 3008.2 percent for roads with six lanes, 235.5 percent to 928.7 percent for urban non-interstate freeways, and 474.4 percent to 533.2 percent for regulatory signs. Compared to both drivers and passengers, the degree of over-representation among non-motorists is higher with respect to regulatory signs.

Table 3.4 Non-Motorists Results from Level-One Analysis

FARS Variable	FARS Values	Problem Size		State Group			
		Number	Share	Safest	Safer	Less Safe	All
Number of Lanes	4 lanes	1,012	30.8%	78.9	82.2	280.8	79.2
	6 lanes	413	12.6%	586.7	696.7	3008.2	369.1
Relation to Junction	Intersection	629	19.2%	21.6	96.3	78.5	40.3
Functional Classification	Urban other freeway	518	15.8%	235.5	260.8	928.7	197.6
Roadway Ownership	U.S. highway	948	28.9%	240.3	80.7	45.6	99.3
	State highway	980	29.9%	26.4	53.3	24.0	28.8
Speed Limit	26-46 mph	2,310	70.4%	27.0	45.1	30.7	28.4
Traffic Control Device	Regulatory sign	699	21.3%	528.0	533.2	474.4	299.9
FARS Variable	**FARS Values**	**Problem Size**			**State Group**		
		Number	**Share**	**Safest**	**Safer**	**Less Safe**	**All**
Traffic-Way Flow	Divided with no barrier	1,602	48.8%	90.6	78.2	40.4	63.0
Other Moving Violations	At least one other moving conviction	751	23.0%	23.7	73.0	81.0	38.0
Suspensions/Revocations	At least one suspension/revocation	452	13.9%	22.2	54.0	53.7	30.8
Person Factor	Walking/riding, etc., in roadway	1,516	46.2%	150.1	78.8	52.3	82.7

Source: Computed from FARS 1994-1998, using the Level-One analysis method. Bold indicates that the difference in shares between Florida and the corresponding state group is **not** statistically different at the 0.05 level.

3.5.2 Areas of Special Concern

Unique to non-motorists is the problem associated with people having activities in roadway. This problem accounted for 1,516 fatalities, representing 46.2 percent of all non-motorist fatalities in Florida from 1994 to 1998. Unlike many of the other areas of concern, the degree of over-representation is highest relative to the safest states (the Safest states with 150.1 percent) and is the lowest relative to the least safe states (the Less Safe states with 52.3 percent).

3.6 SUMMARY

The Level-One analysis identified a number of areas that are over-represented in Florida relative to other state groups. Some of these are common to drivers, passengers, and non-motorists, including roads with 4 lanes, roads with 6 lanes, regulatory signs, and divided roads with no barriers. Some of these are common to drivers and passengers only, including shoulders, urban local roads, and vehicles turning left just prior to the crash. Some are common to passengers and non-motorists only, including intersections. Some are common to drivers and non-motorists only, including urban non-interstate highways. Still others are unique to the individual person types. Unique to non-motorists are U.S. highways, roads with 26-45 mph speed limits, drivers with at least one non-speed related moving violation conviction, and having activities in roadway. Unique to drivers are traffic signals and being struck. And unique to passengers are municipal roads and drivers 75 years or older.

However, these results only show areas that potentially are problems because any over-representation may be eliminated once exposure is controlled or other factors are introduced. Exposure analysis was used to account for differences in exposure between Florida and the comparison states and is described in the next chapter.

Chapter 4
EXPOSURE ANALYSIS

4.1 Introduction

This chapter presents the results from the Exposure analysis for drivers, passengers, and non-motorists. Two sets of areas of concern were considered: those that have been identified through the Level-One analysis and those in which Florida is changed from being under- to over-represented. The focus on the first set is how Exposure analysis changes the direction and degree of over-representation for those areas of concern identified in the Level-One analysis. For the second set, the following criteria were used in the screening:

1. The number of traffic fatalities related to unknown values within a FARS variable represent no more than 5 percent of the total in Florida; and the share of these unknown traffic fatalities is no more than 10 percent higher than any of the state groups.
2. The product between the number of traffic fatalities related to any value within a FARS variable and its share among all traffic fatalities is at least 10.
3. The difference in the shares of a particular value within a FARS variable between Florida and a state group is significantly different at the 0.05 level.

4.2 Driver Analysis

4.2.1 Changes From Level-One Analysis

Table 4.1 shows how Exposure analysis changes the direction and degree of over-representation for those areas of concern identified as over-represented in the Level-One analysis. The first two columns list the FARS variables and values. The next four columns repeat the results from Level-One analysis for ease of comparison. The last four columns show the degree of over-representation as a result of the Exposure analysis. A bold number indicates that the difference between the proportions for the two groups in question is not statistically significant at the 0.05 level. This statistical significance was determined by applying a test for differences in proportions to the clean crashes (process described in Chapter 2).

Changes in the degree of over-representation in Table 4.1 may be discussed in two categories: those with reduced degrees of over-representation and those with more or less the same degree of over-representation.

4.2.2 Reduced Over-Representation

Among those that changed from being over-represented to being under-represented are urban local streets and drivers with at least one convictions of non-speed related moving violations. Among those with reduced degrees of over-representation are angled crashes, roads with 4 or 6 lanes, level roads, intersections, urban non-interstate freeways, urban areas, roads with speed limits between 26 mph and 45 mph, traffic signals, regulatory signs, and roads divided but without barriers. In either case, these results support the notion that drivers in Florida were over-represented relative to the state groups in these conditions because they had larger exposure. Once over exposure is taken into account, Florida drivers are actually under-represented, only slightly over-represented, or over-represented with a much lower degree in these conditions. Those with an adjusted degree of over-representation of over 25 are still potential problems, including traffic signals and regulatory signs.

Table 4.1 Changes from Exposure Analysis in Level-One Analysis Results for Drivers

FARS Variable	FARS Value	Level-One Analysis				Exposure Analysis			
		M25	L25	HI	All	M25	L25	HI	All
Light Condition	Dark but lighted	18	79	118	48	**34**	**29**	**72**	**35**
Manner of Collision	Angle	30	40	45	33	-2	-3	4	-1
Number of Lanes	4 lanes	138	209	291	158	-7	15	-7	3
	6 lanes	977	1,739	1,918	702	-13	13	**129**	9
Profile	Level	22	30	48	28	3	2	11	4
Relation to Junction	Intersection	56	71	124	66	15	14	50	19
Relation to Roadway	Shoulder	142	225	295	164	**298**	**451**	**594**	**333**
	Off roadway	66	47	-19	29	4	**-21**	**-83**	**-29**
Functional Classification	Urban other freeway	122	226	851	176	-46	-15	2	-24
	Urban local	101	65	200	87	-14	-3	-13	-5
Land Use	Urban	16	59	95	39	-5	-6	19	-1
Roadway Ownership	Municipality	29	184	65	66	**22**	**19**	**61**	**24**
Speed Limit	26-45 mph	50	100	49	59	0	1	6	1
Traffic Control Device	Traffic signal	82	134	161	100	24	24	83	29
	Regulatory sign	198	173	212	161	74	75	73	64
Traffic-Way Flow	Divided with no barrier	168	120	98	115	1	-4	16	1
Vehicle Body Type	Motorcycles	7	62	63	31	**-20**	**-9**	**20**	**-9**
Initial Impact Point	9 o'clock point	38	29	67	36	**62**	**32**	**53**	**45**
Role in Collision	Struck	74	67	93	67	**58**	**39**	**67**	**47**
Non-Speeding Moving Violations Convictions in 3 Years	At least one in 3 years	28	68	82	47	-14	-19	-27	-15
Vehicle Maneuver Prior Crash	Turning left	119	122	127	107	**136**	**114**	**197**	**120**
Driver Age	75 years or older	43	53	76	48	**11**	**2**	**11**	**8**

Source: Computed from FARS 1994-1998, using the Exposure analysis method. Bold indicates that the relative exposure between Florida and the corresponding state group is not statistically different at the 0.05 level.

4.2.3 No Change in Over-Representation

Several areas of concern show no measurable changes in the degree of over-representation after controlling exposure, due to no statistically different exposure between Florida and the state groups. These include dark but lighted conditions, shoulders, off roadway with unknown location, roads under municipal ownership, motorcycles, vehicles turning left prior to the crash, and drivers 75 years or older.

4.2.4 Changes from Under- to Over-Representation

In addition to those areas from Level-One analysis that show no reduction in the degree of over-representation from exposure control or large degrees of over-representation, the areas in Table 4.2 are also potentially serious concerns. In each of these areas, Florida appears to be under-represented, highly so in most of these cases, under Level-One analysis. However, such under-representation appears to be the result of under-exposure by drivers in Florida to conditions represented by these areas of concern. Once exposure is controlled, Florida becomes over-represented relative to the state groups. Some of these areas of concern that are highly over-represented (25 or higher), include crashes involving one drunk driver, head-on collisions, roads with grades, and non-junctions. Note that many of these areas of concern are likely to be related. For example, roads with 2 lanes, non junction, no traffic control device, roads not divided, and head-on collisions may more likely be present or occur in rural areas.

Table 4.2 Changes from Under- to Over-Representation for Drivers

FARS Variable	FARS Value	Problem Size		Level-One Analysis				Exposure Analysis			
		Number	Share	M25	L25	HI	All	M25	L25	HI	All
Number Drunk Drivers	One	2,406	33.1%	-9.3	-6.4	-7.6	-7.4	81.5	72.5	74.0	72.2
Manner of Collision	Head-on	980	22.3%	-42.2	-49.1	-49.2	-44.6	48.3	47.0	35.2	44.1
Number of Lanes	2 lanes	4,171	57.3%	-26.6	-31.6	-34.6	-29.0	21.2	15.3	15.2	16.3
Profile	Grade	810	11.1%	-55.9	-57.9	-68.0	-58.4	30.2	43.4	29.0	31.8
Relation to Junction	Non junction	4,456	61.2%	-14.2	-16.6	-21.0	-15.8	39.5	43.6	34.9	37.7
Land Use	Rural	3,676	50.5%	-10.9	-26.3	-32.2	-21.2	14.3	22.0	11.1	15.2
Speed Limit	46+ mph	3,346	46.0%	-22.4	-35.3	-23.8	-26.9	13.8	19.1	8.4	15.1
Traffic Control Device	No control device	3,935	54.1%	-30.6	-31.3	-33.1	-30.1	9.9	12.5	7.5	9.8
Traffic-Way Flow	Not divided	3,828	52.6%	-23.5	-28.4	-28.4	-25.3	6.8	3.5	-4.3	3.2

Source: Computed from FARS 1994-1998, using the Exposure analysis method. Bold indicates that the relative exposure between Florida and the corresponding state group is **not** statistically different at the 0.05 level.

4.3 PASSENGER ANALYSIS

4.3.1 Changes from Level-One Analysis

Table 4.3 shows the changes in direction and degree of over-representation for those areas of concern related to passengers identified in Level-One analysis after exposure is controlled. The first two columns again list the FARS variables and values. Note that no results from Exposure analysis are available for angled crashes because no passengers died in angled crashes in the clean crashes. As before, these changes in the degree of over-representation in Table 4.3 may be discussed in two categories: those with reduced degrees of over-representation and those with more or less the same degree of over-representation. Note that personal characteristics in Table 4.3 cannot be and were not evaluated using Exposure analysis.

Table 4.3 Changes from Exposure Analysis in Level-One Analysis Results for Passengers

FARS Variable	FARS Value	Level-One Analysis				Exposure Analysis			
		M25	L25	HI	All	M25	L25	HI	All
Light Condition	Dark but lighted	13.3	72.7	132.5	45.0	**37.8**	**22.3**	**62.3**	**32.5**
Manner of Collision	Angle	31.1	44.4	44.5	34.9				
Number of Lanes	4 lanes	142.7	217.2	272.3	160.5	-6.5	10.4	-16.2	-2.5
Number of Lanes	6 lanes	954.0	1,898.0	1,760.6	699.3	21.9	**-3.0**	**-25.2**	-4.1
Profile	Level	24.0	29.5	45.2	27.9	2.3	2.0	4.1	2.4
Relation to Junction	Intersection	57.9	74.8	116.8	67.0	22.5	16.6	38.9	20.3
Relation to Roadway	Shoulder	72.2	142.6	172.0	99.0	**294.8**	**448.8**	**498.8**	**337.9**
Functional Classification	Urban other freeway	148.2	309.7	1,296.0	217.1	-35.0	-6.1	**-15.2**	-20.0
Functional Classification	Urban local	83.7	50.6	194.6	74.2	-10.7	**-4.1**	-26.2	-6.9
Land Use	Urban	15.9	64.0	100.3	41.5	0.3	-4.2	5.5	-0.7
Roadway Ownership	Municipality	12.9	161.7	57.6	51.3	**18.2**	-4.6	**15.3**	**8.3**
Speed Limit	26-45 mph	56.4	106.4	61.9	66.4	2.5	5.4	13.3	3.3
Traffic Control Device	Traffic signal	97.8	161.2	180.2	116.7	20.1	2.4	6.2	10.0
Traffic Control Device	Regulatory sign	160.5	135.6	167.6	130.6	**61.5**	43.1	47.0	44.9
Traffic-Way Flow	Divided with no barrier	142.4	100.8	72.5	95.2	94.0	84.5	51.8	71.5
Initial Impact Point	3 o'clock point	51.7	48.9	84.6	51.1	**62.8**	**20.4**	**52.7**	**39.3**
Vehicle Age	Under 3 years old	36.8	29.3	20.1	27.8	-6.9	**-6.4**	-23.1	**-9.6**
Vehicle Maneuver Prior Crash	Turning left	132.7	160.2	144.3	125.4	**160.2**	**184.0**	**217.9**	**155.0**
Driver Age	75 years or older	57.4	90.0	138.2	74.0	**-17.1**	**-16.5**	**-6.1**	**-14.2**

Source: Computed from FARS 1994-1998, using the Exposure analysis method. Bold indicates that the relative exposure between Florida and the corresponding state group is **not** statistically different at the 0.05 level.

Among those variables with reduced degrees of over-representation are: roads with 4 or 6 lanes, level roads, intersections, urban non-interstate freeways, urban local streets, urban areas, roads with speed limits between 26 mph and 45 mph, traffic signals, regulatory signs, roads divided but without barriers, and vehicles under 3 years old. However, regulatory signs and roads divided without barriers are still potential problems because of their high degree of over-representation even with exposure control.

Those with the same degree of over-representation show no statistically different exposure between Florida and the state groups. These include: dark but lighted conditions, shoulders, municipal roads, initial impact being the 3-clock point, vehicles turning left prior to the crash, and drivers 75 years or older.

4.3.2 Changes from Under- to Over-Representation

In addition to those areas from Level-One analysis that show no reduction in the degree of over-representation from exposure control or relatively high degrees of over-representation even with exposure control in Table 4.3, the areas in Table 4.4 are also potentially serious concerns. In each of these areas, Florida appears to be under-represented, highly so in most of these cases, under Level-One analysis. However, such under-representation appears to be the result of under-exposure by passengers in Florida to conditions represented by these areas of concern. Once exposure is controlled, Florida becomes over-represented relative to the state groups. Some of these areas of concern are highly over-represented (with a degree of over-representation 25 or higher), including: crashes involving one drunk driver, roads with grades, non-junctions, and drivers with at least one crash in 3 years prior to the current one. Note that many of these areas of concern are likely to be related. For example, roads with 2 lanes, non-junction, and head-on collisions may be more likely to be seen or occur in rural areas.

Table 4.4 Changes from Under- to Over-Representation for Passengers

FARS Variable	FARS Value	Problem Size		Level-One Analysis				Exposure Analysis			
		Number	Share	M25	L25	HI	All	M25	L25	HI	All
Number Drunk Drivers	One	859	26.4%	-13.7	-14.9	-14.5	-13.6	71.6	50.7	24.6	52.4
Manner of Collision	Head-on	340	16.3%	-49.0	-57.8	-56.5	-52.4	19.7	22.6	24.6	23.3
Number of Lanes	2 lanes	1,696	52.2%	-31.3	-36.7	-38.8	-33.7	5.1	1.6	5.3	3.7
Profile	Grade	332	10.2%	-59.8	-60.0	-69.4	-60.9	74.4	88.1	95.4	82.0
Relation to Junction	Non junction	1,819	56.0%	-17.6	-20.9	-24.0	-19.3	25.3	32.9	31.2	28.6
Land Use	Rural	1,633	50.3%	-11.2	-27.6	-33.1	-22.1	4.9	13.2	10.7	9.4
Number of Crashes	One crash in 3 years	271	8.3%	-39.6	-48.8	-39.2	-41.9	63.2	54.1	60.5	58.8

Source: Computed from FARS 1994-1998, using the Exposure analysis method. Bold indicates that the relative exposure between Florida and the corresponding state group is **not** statistically different at the 0.05 level.

4.4 Non-Motorist Analysis

4.4.1 Changes from Level-One Analysis

Table 4.5 shows how Exposure analysis changes the direction and degree of over-representation for those areas of concern identified as over-represented in Level-One analysis. The first two columns again list the FARS variables and values. Note that no results from Exposure analysis are available for variables describing either driver characteristics or non-motorist characteristics because the method of measuring exposure uses variables applicable to both drivers and non-motorists. The former includes driver convictions of moving violations and license suspension or revocations. The latter includes non-motorists having activities in roadway.

As before, these changes in the degree of over-representation in Table 4.5 may be discussed in three categories: those with reduced degrees of over-representation, those with more or less the same degree of over-representation, and those with increased degrees of over-representation.

Table 4.5 Changes from Exposure Analysis in Level-One Analysis for Non-motorists

FARS Variable	FARS Value	Level-One Analysis				Exposure Analysis			
		M25	L25	HI	All	M25	L25	HI	All
Light Condition	Dark	61.5	-2.5	-9.6	17.9	**57.9**	12.1	8.7	28.0
Number of Lanes	4 lanes	78.9	82.2	280.8	79.2	-18.9	-46.1	-3.7	-31.5
	Six lanes	586.7	696.7	3008.2	369.1	-27.4	**-64.6**	**1.4**	-47.6
Relation to Junction	Intersection	21.6	96.3	78.5	40.3	**-19.2**	**-29.2**	**-25.4**	**-26.7**
Functional Classification	Urban other freeway	235.5	260.8	928.7	197.6	**105.4**	27.2	14.7	29.5
Roadway Ownership	U.S. highway	240.3	80.7	45.6	99.3	103.2	**76.5**	**56.3**	**69.3**
	State highway	26.4	53.3	24.0	28.8	78.2	**80.7**	86.0	71.1
Speed Limit	26-46 mph	27.0	45.1	30.7	28.4	-8.8	-23.3	-8.4	-15.0
Traffic Control Device	Regulatory sign	528.0	533.2	474.4	299.9	-32.3	-37.5	-24.7	-39.2
Traffic-Way Flow	Divided with no barrier	90.6	78.2	40.4	63.0	-24.5	-17.5	-30.0	-23.4

Source: Computed from FARS 1994-1998, using the Exposure analysis method. Bold indicates that the relative exposure between Florida and the corresponding state group is **not** statistically different at the 0.05 level.

Among those with reduced degrees of over-representation are: roads with 4 or 6 lanes, urban non-interstate freeways, roads with speed limit between 26 mph and 45 mph, regulatory signs, and roads divided without barriers. These results support the notion that non-motorists in Florida were over-represented relative to the state groups in these conditions because they had greater exposure. Those with the same degree of over-representation show no statistically different exposure between Florida and the state groups. These include: intersections, U.S. highways, and state highways. These areas are potential problems, especially those with high degrees of over-representation in Level-One analysis, such as U.S highways. State highways and dark conditions seem to show increased degrees of over-representation from exposure control.

4.4.2 Changes from Under- to Over-Representation

Non-divided roads appear to be under-represented in Florida under Level-One analysis. However, such under-representation appears to be the result of under-exposure by non-motorists in Florida to non-divided roads. Once exposure is controlled, non-divided roads become over-represented relative to the state groups, though the degree of over-representation is relatively small.

4.5 SUMMARY

Exposure analysis reveals that the many areas of concern identified through the Level-One analysis are no longer so or the degree of concern is significantly reduced once exposure is considered. However, a number of areas stand out to be potential problems. There are four types of these. One type includes those that were identified with high degrees of over-representation under Level-One analysis and show no statistically significant reduction in the degree of over-representation. Most highly over-represented among these are: shoulders and vehicles turning left just prior to the crash for both drivers and passengers and U.S. highways for non-motorists. Among the other potential problem areas, dark but lighted conditions, municipal roads, regulatory signs, and drivers 75 years or older, are common to both drivers and passengers; motorcycles, 9-clock impact point, being struck are unique to drivers; divided roads with no barrier and 3-clock impact are unique to passengers; and intersections, state highways, and urban non-interstate highways are unique to non-motorists.

The other type of potential problem areas include those that were identified under Level-One analysis as being under-represented but show significant degrees of over-representation once exposure is controlled. Common to both drivers and passengers are crashes involving one drunk driver, roads on grade, and non-junctions. Unique to drivers is head-one crashes, unique to passengers is the problem of drivers involved in one crash in the 3 years prior to the crash in question.

The third type of potential problem areas includes those that were identified with high degrees of over-representation under Level-One analysis and show even higher degrees of over-representation once exposure is controlled. These include dark conditions and state highways, both of which are unique to non-motorists.

The final type of potential problem areas includes those identified with high degrees of over-representation under Level-One analysis but to which Exposure analysis is not applicable. These include non-motorists walking, riding, or having other activities in roadway, drivers with at least one suspension or revocation in the 3 years prior to the crash in question, and drivers with at least on non-speed related moving violation conviction in the 3 years prior to the crash in question. All these are unique to non-motorists.

Chapter 5
MULTI-FACTOR ANALYSIS

5.1 INTRODUCTION

The objective of the Multi-factor analysis is two fold. One is to examine the over-representation of non-motorist fatalities among all person types relative to the state groups. Second is to further consider those problem areas from the Level-One analysis for passengers or non-motorists that could not be evaluated through Exposure analysis. These include driver convictions of moving violations and license suspension or revocations and non-motorists having activities in roadway for non-motorists. To illustrate the concept, only the results for non-motorists having activities in roadway are shown. In both cases, the purpose is to determine under what specific situations these problem areas are most over-represented.

5.2 OVER-REPRESENTATION OF NON-MOTORISTS

Table 5.1 shows how the degree of over-representation of non-motorists in Florida varies across different FARS values of a given FARS variable. The first column of the table lists FARS variables. The FARS variables included are those that describe FARS crashes and persons involved and are relatively reliably measured. In addition, only those variables that show a high variation in degrees of over-representation across its values are included. A total of 10 variables are included. The first row under the headings gives the overall problem of non-motorists from Level-One analysis. This is included here for ease of comparison. The second column lists the included FARS values within each FARS variable. For a given FARS variable, only those values with reasonably large frequency are included. The third column gives the number of non-motorist fatalities in Florida related to the particular value of a given FARS variable. The fourth column gives the share of these non-motorist fatalities among all highway traffic fatalities in Florida related to the particular value of a given FARS variable. For example, there were 183 non-motorist deaths on curved segments of roadway in Florida during 1994-1998, representing 8.6 percent of all traffic fatalities on curved segments during the same period.

The next four columns present the degree of over-representation with respect of the number of non-motorist fatalities between Florida and Safest states, the Safer states, and Less Safe states, and all states in the nation. For example, the share of non-motorist fatalities on curved roads is about 80 percent higher in Florida than the Safest states, 151 percent higher than the Safer states, 170 percent higher than the Less Safe states, and 109 percent higher than all states combined. Several areas of concern stand out from this analysis. Each is discussed in some detail below.

Table 5.1 Over-Representation of Non-Motorist Fatalities in General

FARS Variable	FARS Value	Problem Size		State Group			
		Number	Share	Safest	Safer	Less Safe	All
Person Type	Non-Motorists	3,282	23.7%	37	94	102	59
Alignment	Straight	3,094	26.4%	23	75	79	44
	Curved	183	8.6%	80	151	170	109
Light Condition	Day Light	986	15.7%	**13**	91	117	46
	Dark	1,141	28.5%	103	112	121	97
	Dark but Lighted	1,014	34.3%	**10**	32	18	15
Profile	Level	2,982	24.5%	24	80	77	43
	Grade	250	17.9%	70	118	115	91
Relation to Junction	Non-Junction	2,337	27.0%	61	108	127	80
	Intersection	629	15.6%	**12**	130	74	42
	Intersection Related	200	32.3%	-33	**16**	**-6**	**-17**
Land Use	Urban	2,303	30.5%	10	38	44	20
	Rural	979	15.5%	116	126	95	102
Roadway Ownership	Interstate	167	11.5%	**2**	**1**	**30**	**6**
	U.S. Highway	948	30.1%	142	211	187	143
	State Highway	980	25.7%	93	169	169	111
	County Road	188	14.1%	**27**	61	75	45
	Municipality	725	26.3%	-27	**0**	**5**	**-16**
Traffic Control Device	None	2,190	28.1%	56	105	120	76
	Traffic signal	362	19.2%	-31	48	58	-7
	Regulatory sign	699	17.4%	185	364	288	150
Traffic-Way Flow	Not Divided	1,627	23.0%	56	115	138	82
	Divided with no barrier	1,602	24.2%	**7**	66	56	30
Person Age	1-5 Years Old	81	37.9%	-3	33	58	19
	6-15 Years Old	290	42.2%	10	54	63	31
	16-24 Years Old	329	12.2%	64	100	126	79
	25-64 Years Old	1,879	26.5%	57	108	112	74
	65-74 Years Old	289	22.9%	**5**	96	104	37
	75 Years or Older	413	22.2%	-7	72	69	19

Source: Computed by the research team from FARS, 1994-1998, using the method described in Chapter 2. A number in bold indicates that the difference in shares between Florida and the corresponding state group is not statistically different at the 0.05 level.

Alignment. Non-motorist fatalities account for 26.4 percent of all fatalities on straight alignment, compared to 8.6 percent on curved alignment. Non-motorist fatalities are highly over-represented relative to other state groups on both straight and curved alignment. However, non-motorist fatalities on curved alignment are much highly over-represented relative to other state groups than on straight alignment. In fact, the degree of over-representation is more than twice as high on curved alignment than on straight alignment relative to each of the state groups. Relative to all states, for example, the degree of over-representation is 44 on straight alignment versus 109 on curved alignment.

Light Condition. Florida's over-representation with respect to non-motorist fatalities is present under each of the major light conditions: daylight, dark, and dark but lighted. The most serious problem appears to be related to dark conditions. First, a total of 1,141 non-motorists died from 1994 through 1998 in crashes occurring under dark conditions, which is more than any other light condition. Second, non-motorist fatalities under dark conditions represent a much larger problem than fatalities that occur under day light conditions. The share of non-motorist fatalities out of all traffic fatalities under day light conditions is 15.7 percent, compared to 28.5 percent under dark conditions. Third, the degree of over-representation is more than 100 percent relative to each of the three state groups, indicating that the share of non-motorist fatalities under dark conditions in each of these state groups is less than half of what is observed in Florida.

Road Profile. Non-motorist fatalities account for 24.5 percent of all fatalities on roads without grade, compared to 17.9 percent on roads with grade. Non-motorist fatalities are highly over-represented relative to other state groups on roads either with or without grade. However, non-motorist fatalities on roads with grade are much highly over-represented relative to other state groups than on roads without grade. In fact, the degree of over-representation is more than twice as high on roads with grade than on roads without grade relative to most of the state groups. Relative to all states, for example, the degree of over-representation is 43 on roads without grade versus 91 on roads with grade.

Land Use. The problem of non-motorist fatalities, as expected, is larger in urban areas than in rural areas. In fact, the number of non-motorist fatalities accounts for 30.5 percent of all highway fatalities in urban areas, compared with 15.5 percent in rural areas. Also, a total of 979 non-motorists died in rural areas during the study period, compared to a total of 2,303 in urban areas.

However, the degree of over-representation in non-motorist fatalities is much higher in rural areas than in urban areas. In fact, over-representation is more than 11 times higher in rural areas relative to the Safest states, 3 times relative to the Safer states, and 2 times relative to the Less Safe states. In addition, the degree of over-representation of non-motorist fatalities in rural areas is more than 100 percent relative to the Safest and Safer states and close to 100 percent relative to the Less Safe states.

These results on the discrepancy of over-representation between urban and rural areas have important implications related to potential reasons for Florida's over-representation in non-motorist fatalities. The fact that non-motorist fatalities are more over-represented in rural than in urban areas provides evidence that Florida's over-representation in non-motorist fatalities may not result from a lack of sidewalks or being more urban than other states.

Roadway Ownership. The problem of non-motorist fatalities appears to be the most serious on both U.S. highways and state highways, compared to all types of roadway ownership. A large number of non-motorists died on these highways, with 948 and 980 on U.S. and state highways, respectively. Non-motorist fatalities also represent higher shares of all traffic fatalities on these highways than in general, with 30.1 percent and 25.7 percent on U.S. and state highways, respectively. Finally, non-motorist fatalities on these two types of roadway ownership are very highly over-represented relative to the other state groups. In contrast, non-motorist fatalities on interstates and municipal roads are not over-represented in Florida, while they are relatively modestly over-represented on county roads.

Traffic Control Device. The problem of non-motorist fatalities related to regulatory signs is relatively small, compared to no control device or other control devices. This is true in terms of either the number of fatalities or the share out of all traffic fatalities related to a particular type of control device. However, over-representation is dramatically higher under regulatory signs than other no device or other devices. Relative to all states, for example, non-motorist fatalities are over-represented in Florida by 150 percent with regulatory signs, compared to 38 percent without any control devices and 0 with traffic signals.

Traffic Way Flow. About 1,600 non-motorists died on non-divided roads and divided roads without barriers, representing 23.0 percent and 24.2 percent of all fatalities on these two road types, respectively. The degree of over-representation on divided roads without barriers is much higher than on non-divided roads. Relative to all states, for example, the degree of over-representation is 82 on divided roads without barriers, compared to 30 on non-divided roads.

Person Age. Non-motorist fatalities are over-represented in Florida across all age groups. However, they are most over-represented among those 16-64 years old.

5.3 NON-MOTORIST ACTIVITIES IN ROADWAY

As indicated in the Level-One analysis, having activities in the roadway is related to a significant portion of the problem of non-motorist fatalities in Florida. In fact, a total of 1,516 non-motorists died in Florida from 1994 to 1998. This represents 46.4 percent of all non-motorist fatalities in Florida during the study period. This share is 131 percent higher than that in the Safest states, 65 percent higher than in the Safer states, and 24 percent higher than in the Less Safe states. This section reports on a Multi-factor analysis of this problem by introducing additional FARS variables. The purpose is to identify under what conditions this problem is more serious than other conditions.

Table 5.2 shows the results of the Multi-factor analysis. The following discusses several conditions related to the problem of non-motorist fatalities having activities in the roadway in Florida.

Before the individual areas are discussed, it is interesting to point out a pattern related to the results on this problem. In dividing the other states into the three groups of state with different levels of highway traffic safety, it was hoped that the degree of over-representation for a particular problem would be higher relative to the most safe states than relative to the less safe states. In most of the analyses carried out in this problem, this hoped pattern does not appear, except this case. For most of the FARS variables and values included here, this pattern does seem to hold.

Table 5.2 Over-Representation of Non-Motorist Fatalities Related to Having Activities in Roadway

FARS Variable	FARS Value	Problem Size		State Group			
		Number	Share	Safest	Safer	Less Safe	All
Person Factor	Non-motorist activities in roadway	1,516	46.2%	150	79	52	83
Light Condition	Day Light	357	36.2%	171	130	66	112
	Dark	637	55.8%	85	42	30	43
	Dark but Lighted	477	47.0%	167	122	108	111
Number of Lanes	2 lanes	596	42.0%	110	49	22	58
	4 lanes	529	52.3%	222	141	128	108
	6 lanes	238	57.6%	242	150	**447**	52
Functional Classification	Urban Interstate	56	51.9%	89	70	93	72
	Urban Other Freeway	234	45.2%	110	76	**81**	50
	Urban Principal Arterial	320	44.8%	233	162	125	150
	UrbanMinor Arterial	166	41.6%	190	106	110	124
	Urban Local	214	44.2%	151	104	47	90
Land Use	Urban	1,015	44.1%	173	103	100	107
	Rural	501	51.2%	87	54	31	48
Roadway Ownership	Interstate	89	53.3%	93	77	75	74
	U.S. Highway	447	47.2%	127	83	34	53
	State Highway	428	43.7%	141	60	19	64
	County Road	84	44.7%	101	46	**14**	54
	Municipality	328	45.2%	204	113	141	141
Traffic Control Device	No Device	1043	47.6%	127	73	49	76
	Highway traffic signal	135	37.3%	550	405	204	268
	Regulatory sign	327	46.8%	343	264	70	67
Traffic-Way Flow	Not divided	755	46.4%	131	65	24	68
	Divided with no barrier	737	46.0%	199	124	108	98
Gender	Male	1,102	45.8%	129	69	49	72
	Female	414	47.2%	209	109	62	113
Person Age	Under 6 Years Old	41	50.6%	263	186	110	166
	6-15 Years Old	127	43.8%	196	211	77	139
	16-24 Years Old	158	48.0%	93	38	35	50
	25-64 Years Old	879	46.8%	114	60	45	64
	65-74 Years Old	120	41.5%	213	86	61	109
	75 Years or Older	191	46.2%	333	156	76	158

Source: Computed from FARS, 1994-1998, using the Multi-factor analysis method. Bold indicates that the difference in shares between Florida and the corresponding state group is not statistically different at the 0.05 level.

Light Conditions. Within Florida, the darker the condition is, the more dangerous for non-motorists having activities in roadway. From 1994 to 1998, a total of 637, 477, and 357 non-motorists died while they were having certain activities in roadway under dark, dark but lighted, and day light conditions, respectively. They represent 55.8 percent, 47.0 percent, and 36.2 percent of all non-motorist fatalities under these conditions, respectively. Relative to the state groups, non-motorist fatalities having activities in roadway are over-represented under each of the light conditions. However, the degree of over-representation appears to be highest with dark but lighted conditions and lowest with day light conditions.

Functional Classification. In urban areas, the problem of non-motorists having activities in roadway is most serious on arterials, especially principal arterials. While it is over-represented in Florida relative to the state groups across all types of classification, the degree of over-representation is far higher on arterials than on other types of roadway classifications. Relative to all states, for example, the degree of over-representation is 150 for principal arterials and 124 for minor arterials, compared to 72 for interstates, 50 for non-interstate freeways, and 90 for local roads. Note that the problem was not considered for rural areas by functional classification because of missing data.

Land Use. The problem related to non-motorists having activities in the roadway is far more serious in urban areas than in rural areas. In fact, the degree of over-representation of the problem in urban areas more than doubles that in rural areas with twice as many non-motorist fatalities in occurring in urban areas than in rural areas (1,015 in urban versus 501 in rural).

Roadway Ownership. The problem of non-motorists having activities in the roadway is most serious on municipal roads in terms of over-representation. While it is over-represented in Florida relative to the state groups across all types of ownership, the degree of over-representation is far higher on municipal roads than other types of ownership. Relative to all states, for example, the degree of over-representation is 141 for municipal roads, compared to 74 for interstates, 53 for U.S. highways, 64 for state highways, and 54 for county roads.

Traffic-Way Flow. The problem of non-motorists having activities in the roadway is similar between non-divided roads and divided roads without barriers in terms of either magnitude (755 versus 737) or as a percent of all non-motorist fatalities (46.4 percent versus 46.0 percent). The problem is highly over-represented on both types of road. However, this problem is far more over-represented on divided roads without barriers and on non-divided roads.

Gender. The problem of non-motorists having activities in the roadway is a much larger problem in magnitude among males than among females (1,202 versus 414 deaths). It represents a similar problem between the genders in terms of the percent of all non-motorist fatalities due to them having activities in the roadway (45.8 percent for males and 47.2 percent for females). However, the problem of non-motorists having activities in the roadway is much serious among females in terms of over-representation. Relative to all states, for example, the degree of over-representation is 72 among males versus 113 among females.

Person Age. The share of non-motorist fatalities related to this problem does not seem to vary with person age in any systematic way. It is lowest at 41.5 percent among those 65 to 74 years old and highest at 50.6 percent among those under 6 years old. However, the problem does appear to be more over-represented among the very old and the very young segments of the population. Relative to the most safe states (Safest), for example, the degree of over-representation is 263 percent for those under 6 years old, 196 percent for those 6 to 15 years old, 213 percent for 65 to 74 years old, and 333 percent for those 75 years or older.

5.4 Summary

This chapter examined two issues related to non-motorists through a Multi-factor analysis. One issue is related to non-motorist fatalities in general. Level-One analysis revealed that non-motorist fatalities as a person type are over-represented in Florida relative to the three state groups. The question to be answered was: "In what areas of concern is the degree of over-representation particularly high?" The Multi-factor analysis revealed that non-motorist fatalities are over-represented by over 100 percent relative to each of the three state groups under dark conditions, on U.S. highways, and under regulatory signs. In addition, this problem is far more over-represented in rural areas than in urban areas, indicating that non-motorist fatalities in Florida may not be the result of lacking pedestrian facilities. Also, the problem is far more over-represented on curved alignment than on straight alignment, on roads with grade than without grade, on U.S. and state highways than on other types of roadway ownership, and among 16-64 years old than the very young or the old.

The other issue is related to non-motorists in terms of a specific area of concern. Level-One analysis revealed that non-motorists having certain activities in roadway represent the most serious problem to non-motorists in Florida. The question to be answered was: "Under what situations is the degree of over-representation of the problem particularly high?" The Multi-factor analysis revealed that non-motorists having activities in roadway are over-represented by over 100 percent relative to each of the three state groups under dark but lighted conditions, on 4-lane or 6-lane roads, on urban arterials, in urban areas, on municipal roads, under traffic signals, and roads that are divided but with no barrier. In addition, the problem is far more over-represented among females than among males and among the young and old than among the other age groups.

Chapter 6
RESULTS

6.1 Introduction

This chapter summarizes the results from the multi-step analysis and focuses on highway safety problem areas that are over-represented in Florida relative to other state groups. Some possible reasons for why Florida is over-represented in a particular area are also discussed. The chapter concludes with suggestions for future research to examine if differences in legislative policies and engineering practices contribute to over-representation of these problem areas in Florida.

6.2 Results Summary

Table 6.1 summarizes problem areas found to be over-represented in Florida by person type. The key criterion for including a problem area in Florida was that the degree of over-representation relative to all states was at least 25 percent. Problem areas were assigned into four categories: behavior, environment, vehicle, and engineering. Those included in the behavior category relate to the persons involved, including age, gender, history of crashes and traffic convictions, etc. Those in the environment category relate to the driving environment, including weather, time of day, etc. The vehicle category relates to vehicle characteristics, including age, movements just prior to the crash, and the nature of the crash, etc. The engineering category relates to roadway types, locations on roadway, traffic control device, etc.

The first column lists the problem areas within each category that appeared to be over-represented in Florida. The next three groups of columns summarize the results for drivers, passengers, and non-motorists, respectively. Three pieces of information are shown for a given person type. Two define the size of the problem area: the number of deaths related to the problem area and the percent share of these deaths out of the total number of traffic deaths for the given person type and factor. For example, when junction factor is considered, the number of drivers killed in crashes occurring at non-junctions from 1994 to 1998 in Florida is 4,456. The share of fatalities at non-junction locations is 61 percent. The third piece of information is the degree of over-representation of this problem area. The degree of over-representation shown is relative to the nation as a whole and measures by how much Florida's share of fatalities at non-junctions is higher than the national share. For example, the problem area of driver fatalities on non-junctions as a share of all traffic fatalities in Florida is 38 percent higher than driver fatalities on non-junctions as a share of all traffic fatalities in the nation.

Problem areas are defined and an interpretation of the Exposure analysis is furnished in the next section.

Table 6.1 Summary of Overall Study Results

Category	Problem Areas	Drivers			Passengers			Non-motorists		
		Deaths	Share	DOR[1]	Deaths	Share	DOR	Deaths	Share	DOR
Behavior	Crashes - 1 drunk driver	2,406	33%	72%	859	26%	52%			
	Drivers -1crash in 3 years				271	8%	59%			
	Non-motorists having activities in roadway [2]							1,516	46%	83%
	Drivers with at least one non-speed moving violation in 3 years [2]							743	23%	38%
	Persons - 75 or older [2]				481	15%	51%			
	Drivers with at least one suspension or revocation in 3 years [2]							452	14%	31%
Environ-ment	Light Condition-Dark but lighted	1,294	18%	35%	631	19%	33%			
	Light Condition-Dark							1,141	35%	28%
Vehicle	Maneuver -Turning left	806	11%	120%	576	12%	155%			
	Collision - Head on	980	13%	44%						
	Initial Impact Point-9 o'clock point	1,195	18%	45%						
	Initial Impact Point-3 o'clock point				780	24%	39%			
Engineering	Relation to Junction-Non junction	4,456	61%	38%	1,819	56%	29%			
	Traffic Control Device-Regulatory Signs	2,339	32%	64%	965	30%	45%			
	Traffic Control Device-Traffic Signals	910	13%	29%						
	Relation to Roadway-Shoulder	875	12%	333%	283	9%	338%			
	Traffic-Way Flow-Divided with no barrier				1,630	50%	72%			
	Roadway Ownership-State highways							980	30%	71%
	Roadway Ownership-U.S. highways							948	29%	69%
	Roadway Profile-Roads at grade	810	11%	32%	332	10%	82%			
	Functional Classification-Urban non-interstate freeway							518	16%	30%

Source: Compiled from results in Chapters 3-5. **Notes:** 1. DOR stands for "Degree of Over-Representation." 2. These problem areas were not evaluated under the Exposure analysis because quasi-induced exposure cannot be measured.

6.3 Over-Represented Problem Areas

The 21 problem areas highlighted in Table 6.1 are discussed in the following sections that describe major features of behavior, environmental, vehicle and engineering aspects of fatal crashes found to be over-represented in Florida when compared to other states. A definition of the problem areas is offered along with an interpretation of the analysis.

6.3.1 Behavioral Aspects

Florida is over-represented in six areas that can be categorized as behavioral. Common to drivers and passengers are fatal crashes involving one drunk driver. Two problems areas unique to passengers are: persons 75 years or older and drivers with one prior crash in last three years. The remaining three problem areas are common to non-motorists. These include: non-motorists having activities in roadway, drivers with at least one non-speed related violation conviction in three years, and drivers with at least one suspension or revocation in three years. Some discussion is offered for each of the six problem areas.

Crashes with one drunk driver. The number of drunk drivers in a fatal crash was a variable derived by NHTSA. Data from the vehicle file are analyzed and if there is sufficient information to conclude that a driver was drunk, i.e., if the BAC is positive, or if the police reported alcohol involvement, then the driver is counted as a drunk driver. A driver being charged with an alcohol violation alone does not result in the driver being counted as a drunk driver.

From 1994 to 1998 in Florida, 2,406 drivers and 859 passengers died from traffic crashes involving one drunk driver. This represents 33 percent of all driver fatalities and 26 percent of all passenger fatalities during the period. These shares are slightly lower than those for the nation as a whole. This under-representation, however, appears to be the result of Florida's under-exposure to traveling by drunk drivers. After exposure is controlled, driver and passenger fatalities from crashes with one drunk driver become highly over-represented. In fact, the degree of over-representation is 72 percent with respect to drivers and 52 percent with respect to passengers.

Florida law[3] states that it is illegal to operate a motor vehicle if blood alcohol concentration (BAC) exceeds 0.08 g/dl. Florida observes a " per se" law[4]: BAC at or above 0.08 g/dl is per se illegal. Florida drivers can restore driving privileges during the 6-month of Administrative License Suspension only if special hardship is demonstrated. Unlike some states, Florida lacks legislation that imposes mandatory jail time or community services for first offenses.

Differences in legislative laws and enforcement practices between Florida and other states may contribute to the over-representation. Thus, it may be worthwhile to document the differences and to gain awareness of countermeasures that the safer and safest states have implemented that have directly reduced crashes involving one drunk driver. Further, it may prove meaningful to review studies that have documented crash reduction rates in states where BAC level was reduced from 0.10

[3] Florida statutes chapter 316 section 193.

[4] States, which enforce a "per se" DUI law, maintain that is illegal to operate a vehicle if the requisite BAC legal limit is exceeded. Evidence of a person's BAC at or above the prescribed limit is illegal. In other words, there need be no finding of impairment. < http://www.lastcall.org/topics/perse.htm>

to 0.08 gm/dl in addition to before and after studies that document changes in crash rates with implementing administrative license revocation laws.

Passengers age 75 years or older. A total of 481 passengers age 75 or older died in traffic crashes in Florida from 1994 to 1998 representing 15 percent of all passenger fatalities. The share of passenger fatalities among persons 75 years or older is more than 50 percent higher than the nation's share. Because the quasi-induced Exposure analysis is not applicable to problem areas characterized purely by passenger characteristics, no measure of over-representation is available. As a result, any over-representation is likely to disappear once exposure is taken into account.

Even though this particular problem area may not be over-represented in Florida, steps should be taken to understand different characteristics of these crashes and attempts should be made to reduce the crash rate involving passengers over 75 years old. For example, patterns may be found where drivers in these crashes are within a specific age group and/or higher instances of night driving in these crashes. In a recent report (Dissanayake and Lu, 2000), several critical issues/concerns of older drivers nationwide were ranked in order of most critical and they are: location and size of traffic signs and lettering, nighttime visibility, perception-reaction time, gap acceptance, deficiencies in driving knowledge, narrow lanes, driving in congestion, maneuvering curves, and freeway driving.

Several factors such as driver demographics and history, types of roads, time of crashes, first harmful events, safety equipment use, etc., could be investigated further so that countermeasures directly targeting the problem can be identified.

Drivers with at least one prior crash in three years. From 1994 to 1998 in Florida, a total of 271 passengers died in traffic crashes whose drivers had been involved in at least one crash in the previous three years. These fatalities represent 8 percent of all passenger deaths from traffic crashes. This share is significantly lower than the national share. This under-representation, however, appears to be the result of Florida's under-exposure to the problem. Once exposure is controlled, the problem area becomes over-represented with a DOR of 59 percent.

Further investigation of the problem area may be beneficial to better understand driver characteristics related to prior driving convictions such as age, gender, crash history, and crash characteristics such as speed levels and lighting conditions.

Non-motorists having activities in roadway. The problem related to non-motorists having activities in the roadway appears to be significant in Florida. This refers to non-motorists walking, riding with or against traffic, playing, working, sitting, lying, standing, etc. in the roadway. From 1994 to 1998, a total of 1,516 non-motorists were struck by a motor vehicle while having activities in the roadway, representing 46 percent of all non-motorist fatalities in Florida. The share of non-motorists killed while having these activities in roadway is 83 percent higher in Florida than the national share.

While the quasi-induced exposure approach does not apply to this problem, the Multi-factor analysis suggests a number of situations where this problem is highly over-represented. These include dark but lighted conditions, 4-lane roads, urban arterials, urban areas, municipal roads, female, and among the very young and old. For each situation, the degree of over-representation relative to the nation is over 100 percent. In other words, Florida's share of fatalities involving non-motorists having activities in roadway is more than two times the national share in each of these situations.

Several roadway design and traffic operations features improve or impact non-motorists safety including: signs and markings, signalization sidewalks and paths, refuge islands, capacity, pedestrian level of service and lighting. Florida may want to review some of the "best practices" from other states relating to roadway design and traffic operations and improving non-motorists safety.

Drivers with prior convictions. Drivers with at least one suspension[5]/revocation[6] or one non-speed moving violation conviction in three years prior to the crash in question appear to be highly involved in non-motorist fatalities in Florida. A total of 751 non-motorists died in traffic crashes in which the driver had at least one non-speed moving violation conviction in the previous 3 years, compared with 452 fatalities with respect to suspension or revocation (these represent 23 percent and 14 percent of all non-motorist fatalities, respectively). Both these shares are over-represented in Florida being 38 percent and 31 percent higher than the national share, respectively. Although the quasi-induced exposure approach is not applicable in this situation, every different aspect of the problem should be considered and potential solutions should be sought out.

In case of drivers with prior conviction, it may be beneficial to understand legislative differences between Florida and other states, particularly California, identified from the analysis as one of the safest in this area. For instance, the point system differs significantly between the states. In California, license suspension occurs after 4 points in 12 months (suspension for 60 days), whereas in Florida it is 12 points in 12 months (suspension for 30 days).

6.3.2 Environmental Aspects

Two problem areas in this category are related to lighting conditions at the time of the crash. Crashes occurring under dark but lighted conditions are a problem area for motor-vehicle occupants, while crashes occurring under dark condition are a problem area for non-motorists. The literature suggests some possible factors contributing to high crash occurrences at night.

- Glare from a variety of sources such as headlights, street lights, and building lights.
- Dirty windshields presents problems in terms of both visual discomfort and reduced visual efficiency.
- Fatigue and lack of alertness could also be considered factors affecting the driver
- Lack of congestion may encourage speeding
- Low visibility of warning signs and pedestrians
- Headlights cannot follow curves, dips, hills in the road
- Alcohol is more prevalent at nighttime

Dark but lighted condition. From 1994 to 1998, a total of 1,294 drivers and 631 passengers died in Florida in crashes occurring under dark but lighted conditions, representing 18 percent of all driver fatalities and 19 percent of all passenger fatalities, respectively. Fatalities among vehicle occupants under these conditions are over-represented in Florida relative to the nation as a whole. The share of driver and passenger fatalities in crashes occurring under dark but lighted condition is 48 percent and 45 percent higher in Florida than in the nation, respectively.

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[5] Suspension means temporary withdrawal of a licensee's privilege to drive a motor vehicle.

[6] Revocation means that a licensee's privilege to drive a motor vehicle is terminated. A new license may be obtained only as permitted by law.

Over-representation of crashes occurring under dark but lighted condition among drivers and passengers in Florida does not appear to be the result of over-exposure. Without exposure control, one would expect over-representation of such conditions in Florida because Florida has better weather conditions and appears to be more urbanized than the nation as a whole. More travel is likely to be done at night when the weather is good. In addition, more travel at night is likely to be completed under lighted conditions in urban areas than in rural areas. Once exposure is controlled, one would expect such over-representation to disappear. However, the over-representation of dark but lighted conditions for drivers and passengers does not disappear when exposure is controlled.

Warrants for roadway lighting and standards of illumination can be compared between different state groups so that safety improvements leading to the reduction of nighttime could be achieved.

Dark condition. From 1994 to 1998, 1,141 non-motorists died in crashes occurring under dark conditions in Florida, representing 35 percent of all non-motorist fatalities during this period. Relative to the nation as a whole, fatalities among non-motorists in crashes occurring under dark conditions are over-represented by approximately 25 percent.

Over-representation of crashes occurring under dark conditions among non-motorist fatalities in Florida does not appear to be the result of over-exposure. When exposure is not controlled as in the Level-One analysis, the share of non-motorist fatalities occurring under dark conditions among all non-motorist fatalities is 18 percent higher in Florida than in the nation. When exposure control is introduced, the degree of over-representation increases to about 28 percent.

Possible factors contributing to this over-representation is the prevalence of alcohol use for both pedestrians and drivers involved. Low visibility of pedestrians by motorists may be another factor. Recommended safe walking tips include: wearing reflective clothing, crossing at intersection or pedestrian walkway, walking on sidewalks if available, and walking against traffic flow if no sidewalk is available unless the road is curved, in which case a pedestrian has to walk with traffic flow. In addition to design issues that may not favor pedestrians, education of both driver and pedestrian to share the road has to come to focus nationwide and in Florida particularly.

6.3.3 Vehicle Aspects

Four problem areas identified are related to vehicles. Vehicles turning left just prior to the crash appear to be a problem to both drivers and passengers. In addition, an initial impact at the 9-clock point and head-on collisions were identified as problem areas for drivers, while an initial impact at the 3-clock point appears to be a problem for passengers.

Maneuver—turning left. This variable is defined as the maneuver that the driver executes just prior to entering a crash situation. According to the *Traffic Safety Toolbox* (ITE, 1999), some of the issues associated with left-turn movements may be summarized as follows:

- Left-turn phasing may be a problem if design does not consider driver or pedestrian conflicts, especially if there is a wide median to cross.
- Left-turn arrows installed if 3 to 5 left-turn crashes per year or 10-14 conflicts.
- Rear-end collisions and other types of crashes associated with overly aggressive driving behavior may occur under congested conditions (peak periods) at left-turns (suggested countermeasure: reversible lanes)

- Exclusive left-turn lanes at signalized intersections: the highest crash rates occur in permissive-only left-turn approaches, followed by protected/permissive.

Level-One analysis with respect to the vehicle maneuver prior to the crash indicated that turning left was a problem area with a total of 806 driver fatalities and 576 passenger fatalities (11 and 12 percent, respectively). Comparing with the other states, a significant over-representation of 107 percent and 125 percent was noted. Exposure analysis increases over-representation to 120 percent and 155 percent, respectively.

Warrants for installing left-turning lanes and design standards can be compared between Florida and other state groups that are safer in this particular area. If a correlation between the differences in warrants and standards and over-representation of crashes while vehicle is turning left in Florida is found, then appropriate countermeasures could be identified and implemented.

Head-on collisions. From 1994 to 1998 in Florida, a total of 980 drivers died in head-on traffic crashes, representing 22 percent of all driver deaths involving collisions with another motor vehicle in transport. This share is significantly lower than the national share (45 percent). The under-representation, however, appears to be the result of Florida's under-exposure to this problem. Once exposure is controlled, the problem area becomes over-represented with a degree of over-representation of 44 percent.

Several factors may contribute to head-on collisions[7] including excessive speed, lighting problems, absence of medians and slippery surfaces. Warrants for median installation and design standards, speed limits, and lighting warrants and standards can be compared between Florida and other state groups.

Initial impact: 9-clock point. From 1994 to 1998 in Florida, 1,195 drivers died in traffic crashes after their vehicle was struck directly on the driver side, representing 18 percent of all driver fatalities involving collisions with another motor vehicle in transport. This share of driver fatalities is 36 percent higher than the national share. When exposure is controlled, the degree of over-representation increases to 45 percent, though the difference between these two measures of over-representation is not significant at the 0.05 level.

Initial impact: 3-clock point. From 1994 to 1998 in Florida, 780 passenger fatalities occurred after the vehicle was struck directly on the passenger side, representing 27 percent of all passenger deaths involving collisions with another motor vehicle in transport. This share of passenger fatalities is more than 51 percent higher than the national share. When exposure is taken into account, the degree of over-representation decreases to 39 percent, though the difference is not significant at the 0.05 level.

6.3.4 Engineering Aspects

Nine of the problem areas where Florida is over-represented are included in the engineering category. Four of these areas are common to drivers and passengers: non-junction, regulatory signs, shoulders and roads at grade. Crashes on U.S. roadways and state highways are common to non-

[7] Traffic Engineering Handbook ITE, 1999, Table 7-14, page 206.

motorists as well as roadways classified as urban non-interstate freeways. Traffic signals are unique to drivers while divided highways with no barriers are unique to passengers.

Relation to junction—non-junction. A non-junction crash is defined as a non-intersection, non-intersection related or driveway access crash. From 1994 to 1998 in Florida, 4,456 drivers and 1,819 passengers died in crashes at non-junctions, representing 61 percent of drivers and 56 percent of passengers of all fatalities when the junction factor is considered. These shares are significantly lower than the national shares. However, when exposure is controlled, over-representation by 38 percent and 29 percent is noted for drivers and passengers, respectively.

Traffic control devices—regulatory signs. Regulatory signs, a type of traffic control device, contribute to safety by conveying essential control information to drivers, such as the legal requirements to stop, yield to the right of way to another road user, travel in the correct direction, etc. From 1994 to 1998 in Florida, 2,339 drivers and 965 passengers were killed in crashes that took place where regulatory signs are used. These numbers represent 32 percent and 30 percent of driver and passenger fatalities, respectively. After controlling exposure, there is the significant over representations of 64 percent and 45 percent respectively compared to the nation as a whole.

Traffic control device—traffic signals. The term traffic signal applies to the control of traffic at at-grade street locations, ramp metering, lane-use control, flashing beacons, rail-road highway grade crossings, and moveable bridges. The FARS code "traffic signals" includes:

- Traffic control signal (on colors) without pedestrian signal
- Traffic control signal (on colors) with pedestrian signal
- Traffic control signal (on colors) not known if pedestrian signal
- Flashing traffic control signal
- Flashing beacon
- Flashing highway traffic signal, type unknown, or other
- Lane use control signal
- Other highway traffic signal
- Unknown highway traffic signals

From 1994 to 1998 in Florida, 910 drivers died in traffic crashes that occurred at locations with traffic signals, representing 13 percent of all driver fatalities. After exposure is controlled, the problem area is over-represented by 29 percent.

Relation to roadways—shoulders. This variable represents the number of crashes that occurred on the shoulders of the roadway, which is that portion of the roadway contiguous with the traveled way for accommodation of vehicles stopped for emergencies, and for lateral support of base and surface courses. From 1994 to 1998 in Florida, a total of 875 drivers and 283 passengers were killed in crashes occurring on the shoulder, representing 12 percent and 9 percent of all driver and passenger fatalities, respectively. The share of fatalities related to this problem area is higher than the national share. After exposure is controlled, the problem area becomes over-represented with a DOR of 333 and 338, respectively.

Traffic way flow—divided with no barriers. In general, highways can be divided into two or more roadways by leaving an intervening space or by a physical barrier or clearly indicated dividing section so constructed as to impede vehicular traffic. From 1994 to 1998 in Florida, a total of 1,630 passengers died on divided roadways with no barriers, representing one-half of all passenger fatalities during this period. Exposure analysis lowers the over-representation, but still it is 71.5 percent.

Roadway ownership—state highways. A total of 980 non-motorists died in Florida between 1994 and 1998, represent a 30 percent share, which is significantly higher than the national average. The results from the Exposure analysis show the degree of over-representation of 71 percent.

Roadway ownership—U.S. highways. A total of 948 non-motorists fatalities in Florida between 1994 and 1998, represent a 29 percent share, which is significantly higher than the national average. The results from the Exposure analysis show the degree of over-representation of 69 percent.

Roadway profile—roads at grade. The number of fatalities in crashes that occurred on roads at grade is 810 drivers and 332 passengers, representing 11 percent and 10 percent of all driver and passenger fatalities, respectively. These percentages are not over-represented with respect to other states as the Level-One analysis reveals. Once exposure is controlled, the problem area becomes over-represented with a DOR of 32 and 82 for drivers and passengers, respectively.

Functional Classification—urban non-interstate freeway. With 518 non-motorist fatalities and 16 percent share this category is highly over-represented according to the Level-One analysis. Once exposure is controlled, the problem of urban non-interstate freeways related to fatal crashes is still over-represented with a degree of over-representation of 30 percent.

Chapter 7
FUTURE RESEARCH DIRECTION

7.1 INTRODUCTION

Possible future studies should focus on those problem areas summarized in Table 7.1 in which Florida is highly over-represented relative to other states after differences in exposure are appropriately controlled. The top three problem areas with the highest degrees of over-representation for **drivers** were: shoulders, vehicles turning left just prior to the crash, and crashes with one drunk driver. The top three problem areas for **passengers** were: shoulders, vehicles turning left just prior to the crash, and road segments at grade. The top three problem areas for **non-motorists** were: having activities in the roadway, state highways, and U.S. highways.

Alternatively, the choice of such studies should take into account not only the degree of over-representation but also the size of the problem. The index for each person type and the total index in Table 7.2 are created just for this alternative approach to selecting future studies. Specifically, the index for a given person type indicates the potential reduction in the number of fatalities related to a certain area of concern for that person type if the over-representation in this area of concern were eliminated. For a specific state group j, the index is calculated as $R_j = V [Q_j / (100 + Q_j)]$, where V is the number of fatalities related to a given problem area and Q_j is the degree of over-representation of this problem area in Florida relative to state group j. The total index sums those for the individual person types for a given problem area. The problem areas in Table 7.2 have been ranked in a descending order with respect to this total index.

The top three problem areas with the highest index values for **drivers** were: non-junction crashes, crashes involving one drunk driver, and regulatory signs. The top three problem areas for **passengers** were: roads divided without barrier, non-junctions, and vehicles turning left just prior to the crash. The top three problem areas for **non-motorists** were: having activities in roadway, state highways, and U.S. highways. The top three problem areas for **all person types** combined were the same as those for drivers when the index is used.

Table 7.1 Top Three Problem Areas Based on Degree of Over-representation and Index Values

Person Type	Criteria	Top Three Problem Areas		
Drivers	DOR	Shoulder	Turning left	One drunk driver
	Index	Non-junction	One drunk driver	Regulatory sign
Passengers	DOR	Shoulder	Turning left	Roads at grade
	Index	Divided with no barrier	Non-junction	Turning left
Non-motorists	DOR	Activities in roadway	State highway	U.S. highway
	Index	Activities in roadway	State highway	U.S. highway
Combined	Total Index	Non-junction	One drunk driver	Regulatory sign

Table 7.2 Indexing Problem Areas

Problem Areas	Drivers		Passengers		Non-Motorists		Total Index[3]
	DOR[1]	Index[2]	DOR[1]	Index[2]	DOR[1]	Index[2]	
Non- Junctions	38	1,227	29	409			1,636
One Drunk Driver	72	1,007	52	294			1,301
Regulatory Sign	64	913	45	299			1,212
Shoulder	333	673	338	218			891
Turning Left	120	440	155	350			790
Having Activities in Roadway [4]					83	688	688
Divided with no Barrier			72	682			682
Dark but Lighted	35	335	33	157			492
State Highway					71	407	407
U.S. Highway					69	387	387
Initial Impact Point – 9 o'clock point	45	371					371
Roads on Grade	32	196	82	150			346
Head-on Collision	44	299					299
Dark Condition					28	250	250
3 clock Point Impact			39	219			219
Driver with at least one non-speeding conviction in 3 years [4]					38	205	205
Traffic Signal	29	205					205
Persons 75 years or older [4]			51	162			162
Urban Non-Interstate Freeway					30	120	120
Drivers with at least one suspension or revocation in 3 years [4]					31	107	107
Drivers with one prior crash in 3 years			59	101			101

Source: Compiled from results in Chapters 3-5. **Notes:** 1. DOR stands for "Degree of Over-Representation." The measure from the Exposure analysis was used if the relative exposure between Florida and the nation as a whole is statistically different. Otherwise, the measure from the Level-One analysis was used.
2. The index indicates the potential reduction in the number of fatalities related to a certain area of concern if the over-representation in this area of concern were eliminated. The index is calculated as $R_j = V\,[Q_j / (100 + Q_j)]$ for state group j, where V is the number of fatalities related to a given problem area and Q_j is the degree of over-representation of this problem area in Florida relative to state group j. 3. The total index sums those for individual person types for a given problem area. 4. These problem areas were not evaluated under the Exposure analysis because quasi-induced exposure cannot be measured for them.

The remainder of the section defines a strategy for future research to explore why and how the problem areas identified in this research are over-represented in Florida compared to other states.

7.2 Future Research Objective

Chapter 6 summarized specific problem areas within the behavior, environmental, vehicle and engineering categories identified by the analysis as over-represented in Florida when compared to other "safer" states. Future research should be directed to understand why Florida is over-represented in these problem areas. The basis for the research is to determine if certain roadway engineering practices and legislative policies contribute to Florida's over-representation in these problem areas when compared to other state groups. In other words, the proposed research will answer the question; "do differences in engineering practices and legislative policies directly correlate to the over-representation?" The research findings can be instrumental in pinpointing specific areas where the State can adopt safety improvement measures that are successfully practiced in other state groups identified as "safer" or "safest".

7.3 Suggested Research Approach

The top three problem areas with the highest degrees of over-representation for drivers were: shoulders, vehicles turning left just prior to the crash, and crashes with one drunk driver. The top three problem areas for passengers were: shoulders, vehicles turning left just prior to the crash, and road segments at grade. The top three problem areas for non-motorists were: having activities in roadway, state highways, and U.S. highways. Taking a closer look into these problem areas, Florida's design standards and legislative policies will be compared to those of other state groups. From this comparison, comprehensive reasons why these problem areas are over-represented in Florida will be better understood. Also, the role these differences play in overall highway safety in Florida will be defined. Consequently, safety professionals in Florida can make informed decisions on different approaches to adopt traffic safety countermeasures to address these problem areas.

7.4 Proposed Research Methodology

Prior to identifying differences in these practices and policies, the problem areas highlighted in Table 6.1 will be explained in sufficient detail. A total of five tasks are proposed in this research plan. The first task is necessary to provide a more comprehensive understanding of safety issues associated with each problem area. Noteworthy here is that problem areas (or variables) fall into two main types: human and structural. Legislative policy differences will be used to research human or behavioral aspects of over-represented factors while design standards and implementation practices will be used to compare structural differences. The second task compiles legislative differences of traffic laws between Florida and other state groups and documents how other states accomplished crash reduction rates through legislation policies, enforcement practices, coordinated safety programs, community efforts, etc. The third task compiles design practices associated with vehicle, engineering and environmental problem areas that are over-represented in Florida. The data collection instrument used for this task will be a survey administered to state agencies. The fourth task will analyze and examine the various data collected and the final task will present the findings of the analysis and conclusions drawn from the research. The following sections detail the proposed tasks.

Task 1: Problem Areas Investigated
For evaluative purposes, problem areas are grouped into four major categories. Definitions from FARS and from national and state manuals will be provided for each problem area. The following problem areas will be investigated:

- Behavior category
  - Crashes with one drunk driver
  - Non-motorists having activities in the road
  - Drivers with at least one non-speeding moving violation in 3 years
  - Drivers with at least one suspension or revocation in 3 years
- Environment category
  - Dark but lighted condition
  - Dark condition
- Vehicle category
  - Turning left
  - Head-on Collision
- Engineering category
  - Traffic way flow—divided with no barriers
  - Traffic control device—traffic signals
  - Relation to roadway--shoulders

Task 2: Policy and Programs
Differences in legislative laws and enforcement practices between Florida and other states may contribute to the over-representation. Legislative policies that regulate drinking and driving penalties in Florida and other states will be compared as well as definitions of different traffic violations that relate to over-represented variables that describe drivers' behavior and history. Internet and other resources will be used to compare state statutes pertaining to drunk driving, convictions, suspensions and revocations. A detailed literature search will be conducted using databases such as TRIS, WORLDCAT, ECO, DOTBOT and other resources to identify studies that document the relationship between crash rates and driver traffic violation history, the effects of selective legislative policies on the reduction of traffic crashes, law enforcement practices that help reduce crash rates, and successful interagency coordinated safety programs.

Task 3: Design Standards and Practices
Design standards and implementation practices identified in Task 1 will be used in this task as elements to be compared between Florida and other safer and safest state groups. Several comprehensive subtasks will be accomplished so that meaningful comparisons can be presented. As previously mentioned, a survey will be administrated to other state groups to compile information on their design standards and practices. Survey preparation tasks include: identifying key persons within agencies to survey, designing the survey may require solicitation of input from traffic safety engineers and consulting national and state manuals, pre-testing of survey instrument, revising survey based on pretest results, administering the survey, sending reminders and conducting follow-ups through mail-outs, faxes and emails.

Task 4: Data Analysis

Florida's design standards and legislative laws will be compared with states within each of the three state groups: less safe states, safer states, and safest states. The purpose of the latter comparison is to examine if differences in standards and law between Florida and other states show any correlation with overall highway safety. Furthermore, if data permitting, multivariate analysis may be carried out to examine the role of differences in these standards and law in overall highway safety while holding other characteristics constant.

There are two basic approaches to analyze the survey results. One approach involves simple comparisons of those standards and law between Florida and other states in areas that are determined to be over-represented in Florida. The focus would be on whether those standards and law in Florida are lower or less restrictive than those in other states. If they are, some conclusions may be drawn about the role of these lower standards or less restrictive law in the areas of over-representation in Florida.

The alternative approach involves multivariate regression analysis of overall highway safety at the state level by including not only differences in those standards and law but also differences in other factors across states. This approach is commonly used in the economics literature, examining the effects of policies related to seat belt law, alcohol law, annual vehicle inspection law, driver licensing law, etc.

The first approach is simple to understand. It directly deals with the areas of over-representation in Florida. However, any conclusions from this approach are not conclusive simply because it ignores many other factors that may have also played a large role in the over-representation of these areas in Florida. The second approach, on the other hand, is more technical. It deals with overall highway safety, such as fatality rates per unit of travel. Its advantage is that conclusions from this approach are likely to be more conclusive simply because it accounts for other factors that can be measured. The applicability of this second approach depends on the data collected from the survey, including the number of responses and the complexity of standards and law.

Task 5: Findings and Conclusions

The final task will discuss the findings and implications of this research. The report will also include practical conclusions assessing the extent to which differences in legislative policies and engineering practices between Florida and other states influence highway safety and suggest possible changes existing practices and legislative policies.

SUMMARY

This chapter presented the top three problem areas for each person type based on degrees of over-representation and the size of the problem (index). These results provide direction for potential research studies that should include these and other problem areas discussed in Chapter 6. The chapter also defines a strategy for directing future research to explore why and how problem areas are over-represented in Florida compared to other states. The research methodology includes five proposed tasks and mainly focuses on examining the differences in engineering practices and legislative policies between Florida and the other state groups.

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Appendix A: State Groupings and FARS Variables

Table A-1. State Groupings for the Period 1993-1997

Groups	States	VMT (millions)	Fatalities	Rate
M25: States whose death rates are at least 25 percent lower than Florida (18 states)	Rhode Island	35,409	350	0.99
	Massachusetts	242,151	2,465	1.02
	Connecticut	138,889	1,617	1.16
	New Jersey	306,846	3,910	1.27
	Minnesota	223,150	2,955	1.32
	Virginia	344,463	4,570	1.33
	North Dakota	32,905	448	1.36
	Washington	243,262	3,340	1.37
	New Hampshire	53,669	741	1.38
	Ohio	501,920	7,047	1.40
	Wisconsin	258,022	3,657	1.42
	Maryland	225,203	3,204	1.42
	New York	579,721	8,360	1.44
	Maine	63,304	921	1.45
	California	1,378,377	20,259	1.47
	Indiana	321,003	4,754	1.48
	Illinois	471,902	7,404	1.57
	Pennsylvania	472,234	7,476	1.58
L25: States whose death rates are less than 25 percent lower than Florida (21 states)	Delaware	37,108	602	1.62
	Vermont	31,177	508	1.63
	Michigan	438,542	7,305	1.67
	Hawaii	39,677	665	1.68
	Georgia	429,604	7,344	1.71
	Colorado	175,368	3,019	1.72
	Nebraska	79,365	1,374	1.73
	Oregon	151,731	2,634	1.74
	Dist. of Columbia	17,486	306	1.75
	Missouri	295,598	5,202	1.76
	Utah	93,898	1,658	1.77
	Kansas	126,412	2,283	1.81
	Iowa	131,726	2,397	1.82
	Texas	912,909	16,662	1.83
	Oklahoma	190,412	3,637	1.91
	North Carolina	378,313	7,245	1.92
	South Dakota	38,468	775	2.01
	Wyoming	35,439	714	2.01
	Kentucky	207,863	4,197	2.02
	Idaho	61,082	1,242	2.03
	Alaska	20,692	427	2.06
FLORIDA	Florida	634,276	13,601	2.14
HI: States whose death rates are higher than Florida (11 states)	West Virginia	87,328	1,888	2.16
	Tennessee	281,811	6,105	2.17
	Alabama	251,678	5,575	2.22
	New Mexico	104,019	2,332	2.24
	South Carolina	193,183	4,407	2.28
	Arizona	201,694	4,680	2.32
	Louisiana	189,363	4,421	2.33
	Montana	46,101	1,077	2.34
	Arkansas	131,481	3,099	2.36
	Nevada	70,919	1,747	2.46
	Mississippi	147,052	4,116	2.80
U.S. TOTAL		**12,124,205**	**206,722**	**1.71**

The tables A2-A4 list the FARS variables unique to the Accident, Vehicle and Driver, and Person files, respectively. The shaded variables are not included in our analysis. Among these variables are four identification numbers that allow one to link these files: ST_CASE, VEH_NO, PER_NO, and N_MOT_NO. ST_CASE appears in all three files. It is a unique identifier for every crash within a given year. It is used as the key, when any two of these files, from the same year, are merged. VEH_NO is in each Vehicle and Person record. VEH_NO and ST_CASE are often used together as a key, when the Vehicle file and the Person file are merged for the same year. This is done to insure that the correct occupants are placed in the proper vehicle. PER_NO identifies each person involved in a crash. N_MOT_NO appears in the Person file and applies only to non-motorists and reflects the vehicle that made contact with the non-occupant being coded. The number must match the vehicle number of the striking vehicle.

Table A-2. Variables in Accident File for the Period 1994-1998

Count	Name	Explanation
1	ALIGNMNT	Roadway alignment
[redacted]	[redacted]	[redacted]
4	CF1, CF2, and CF3	Related factors-accident level
[redacted]	[redacted]	[redacted]
7	C_M_ZONE	Construction and/or maintenance zone
[redacted]	[redacted]	[redacted]
9	DAY_WEEK	Day of week
10	DRUNK_DR	Number of drunk drivers involved in the crash
11	FATALS	Number of fatalities in the crash
12	HARM_EV	First harmful event to the crash
13	HIT_RUN	Hit-and-run
[redacted]	[redacted]	[redacted]
17	LGT_COND	Light condition
18	MAN_COLL	Manner of collision
[redacted]	[redacted]	[redacted]
21	MONTH	Month of the crash
[redacted]	[redacted]	[redacted]
25	NO_LANES	Number of lanes
26	PAVE_TYP	Roadway surface type
27	PEDS	Number of non-motorist forms submitted
28	PERSONS	Number of person forms submitted
29	PROFILE	Roadway grade
[redacted]	[redacted]	[redacted]
31	REL_JUNC	Relation to junction
32	REL_ROAD	Relation to roadway
33	ROAD_FNC	Roadway function class
34	ROUTE	Roadway ownership
35	SCH_BUS	School bus related
36	SP_JUR	Special jurisdiction
37	SP_LIMIT	Speed limit
38	STATE	State of the crash
39	ST_CASE	Crash identification number
40	SUR_COND	Roadway surface condition
41	TRA_CONT	Type of traffic control devices
42	TRAF_FLO	Traffic way flow

Table A-2. Variables in Accident File for the Period 1994-1998 (Cont'd)

Count	Name	Explanation
[redacted]	[redacted]	[redacted]
44	T_CONT_F	Traffic control device functioning
45	VE_FORMS	Number of vehicles involved in the crash
45	WEATHER	Atmospheric conditions
46	YEAR	Year of the crash

Table A-3. Variables in Vehicle and Driver File for the Period 1994-1998

Count	Name	Explanation
1	AVOID	Driver maneuver to attempt to avoid the crash
[redacted]		
3	BODY_TYP	Vehicle body type
4	CARGO_BT	Cargo body type
5	CDL_STAT	Driver license status
6	DEATHS	Number of fatalities in the vehicle
7	DEFORMED	Extent of vehicle deformation
8	DR_CF1 DR_CF2 DR_CF3	Related factors - driver level
9	DR_DRINK	Driver drinking, derived by FARS
[redacted]		
12	EMER_USE	Emergency use
13	FIRE_EXP	Fire occurrence
14	FIRST_MO	Month of 1st accident, suspension, conviction in last 3years
15	FIRST_YR	Year of 1st accident, suspension, conviction in last 3 years
[redacted]		
17	HAZ_CARG	Hazardous cargo
18	IMPACT1	Initial impact point
19	IMPACT2	Principal impact point
20	IMPACTS	Vehicle role
21	J_KNIFE	Jackknife
22	LAST_YR	Month of last accident, suspension, convn in last 3 years
23	LAST_MO	Year of last accident, suspension, conviction in last 3 years
24	L_COMPL	Driver license type compliance
25	L_ENDORS	Compliance with license endorsements
26	L_RESTRI	Compliance with license restrictions
[redacted]		
28	L_STATUS	Driver license status
[redacted]		
32	MOD_YEAR	Model year
33	M_HARM	Most harmful event
34	OCUPANTS	Number of occupants in the vehicle
35	OWNER	Registered vehicle owner type
36	PREV_ACC	# previously recorded accidents in last 3 years
37	PREV_DWI	# previously recorded DWI convictions in last 3 years
38	PREV_OTH	# previously recorded other moving violations in 3 years
39	PREV_SPD	# previously recorded speeding convictions in 3 years
40	PREV_SUS	# previously recorded suspensions in 3 years

Table A-3. Variables in Vehicle and Driver File for the Period 1994-1998 (Cont'd)

Count	Name	Explanation
41	REG_STAT	State of vehicle registration
42	ROLLOVER	Rollover
[redacted]		
44	SPEC_USE	Special use
45	ST_CASE	FARS crash identification number
46	TOWAWAY	Vehicle manner of leaving scene
47	TOW_VEH	Towed trailing unit
48	TRAV_SP	Travel speed reported by the investigating officer
49	UNDERRIDE	Over- or under-ride by striking vehicle
50	VEH_CF1 VEH_CF2	Related factors - vehicle level
51	VEH_MAN	Driver maneuver just prior to entering a crash situation
52	VEH_NO	FARS vehicle identification number
[redacted]		
57	VIN_WGT	Weight of automobiles
[redacted]		
59	VIOLATE1, 2, 3	Violations charged (1997 and 1998)
60	VIOL_CHG	Violations charged (1994-1996)
61	V_CONFIG	Vehicle configuration for medium or heavy truck or bus
62	WGTCD_TR	Weight code for trucks
[redacted]		

Table A-4. Variables in Person File for the Period 1994 -1998

Count	Name	Explanation
1	AGE	Age
2	AIR BAG	Deployment of airbag for occupants
[redacted]	[redacted]	[redacted]
4	ALC RES	Result of alcohol test
[redacted]	[redacted]	[redacted]
13	DRINKING	Police reported alcohol involvement
14	DRUGRES1,2,3	Result of drug test
15	DRUGS	Police reported drug involvement
[redacted]	[redacted]	[redacted]
18	EJECTION	Whether ejected
19	EJ PATH	Ejection path
20	EXTRICAT	Ejection extrication
21	HOSPITAL	Whether taken to hospital
22	INJ SEV	Injury severity
[redacted]	[redacted]	[redacted]
25	LOCATION	Location of non-motorist on roadway
26	N MOT NO	FARS non-motorist striking vehicle number
27	PER NO	Person number
28	PER TYP	Person type
29	P CF1 or P CF2 or P CF3	Related factors - person level
30	REST USE	Restraint usage
31	SEAT POS	Seating position
32	SEX	Sex
33	ST CASE	FARS crash identification number
34	VEH NO	FARS vehicle number
35	WORK INJ	Fatal injury at work

Appendix B: Results from Level-One Analysis

Table B-1. Results for Drivers from Level-One Analysis

FARS Variable	FARS Values	Problem Size			State Group		
		Number	Share	Safest	Safer	Less Safe	All
Light Condition	Dark but lighted	1,294	17.8%	18.4	78.8	117.8	48.0
Manner of Collision	Angle	2,625	59.8%	30.3	40.3	45.1	33.4
Number of Lanes	4 lanes	1,838	25.3%	138.4	209.2	291.3	158.2
	6 lanes	600	8.2%	976.8	1,738.9	1,917.9	702.2
Profile	Level	6,295	86.5%	21.7	30.4	47.8	27.6
Relation to Junction	Intersection	2,197	30.2%	56.1	70.7	123.8	65.5
Relation to Roadway	Shoulder	875	12.0%	141.7	225.2	295.3	163.9
	Off roadway	1,350	18.6%	65.7	47.4	-18.6	28.6
Functional Classification	Urban other freeway	703	9.7%	122.4	226.4	851.5	175.5
	Urban local	822	11.3%	101.1	64.7	199.8	87.3
Land Use	Urban	3,601	49.5%	15.9	58.6	95.0	39.1
Roadway Ownership	Municipality	1,421	19.5%	29.4	183.7	65.0	65.7
Speed Limit	26-45 mph	3,680	50.6%	50.3	100.2	48.6	59.3
Traffic Control Device	Traffic signal	910	12.5%	81.9	134.1	160.5	100.0
	Regulatory sign	2,339	32.1%	198.1	172.5	211.5	160.8
Traffic-Way Flow	Divided with no barrier	3,362	46.2%	168.4	119.8	98.2	114.8
Vehicle Body Type	Motorcycles	833	11.4%	7.1	61.8	63.2	31.3
Initial Impact Point	9 o'clock point	1,195	17.8%	38.0	29.1	67.1	36.2
Role in Collision	Struck	2,247	30.9%	73.7	67.4	92.6	67.4
Non-Speeding Moving Violations Convictions	At least one in 3 years	1,783	24.5%	27.9	68.2	82.3	46.7
Vehicle Maneuver Prior Crash	Turning left	806	11.1%	119.4	122.1	127.0	106.9
Driver Age	75 years or older	958	13.2%	42.5	52.7	76.4	47.9

Source: Computed by CUTR from FARS 1994-1998. A number in bold indicates that the difference in shares between Florida and the corresponding state group is not statistically different at the 0.05 level.

Table B-2. Results for Passengers from Level-One Analysis

FARS Variable	FARS Values	Problem Size		State Group			
		Number	Share	Safest	Safer	Less Safe	All
Light Condition	Dark but lighted	631	19.4%	13.3	72.7	132.5	45.0
Manner of Collision	Angle	1,415	67.8%	31.1	44.4	44.5	34.9
Lanes	4 lanes	907	27.9%	142.7	217.2	272.3	160.5
	6 lanes	331	10.2%	954.0	1898.0	1760.6	699.3
Profile	Level	2,859	88.0%	24.0	29.5	45.2	27.9
Relation to Junction	Intersection	1,198	36.9%	57.9	74.8	116.8	67.0
Relation to Roadway	Shoulder	283	8.7%	72.2	142.6	172.0	99.0
Functional Classification	Urban local	350	10.8%	83.7	50.6	194.6	74.2
Land Use	Urban	1,616	49.7%	15.9	64.0	100.3	41.5
Roadway Ownership	Municipality	606	18.7%	12.9	161.7	57.6	51.3
Speed Limit	26-45 mph	1,642	50.5%	56.4	106.4	61.9	66.4
Traffic Control Device	Traffic signal	605	18.6%	97.8	161.2	180.2	116.7
	Regulatory sign	965	29.7%	160.5	135.6	167.6	130.6
Traffic-Way Flow	Divided with no barrier	1,630	50.2%	142.4	100.8	72.5	95.2
Initial Impact Point	3 o'clock point	780	26.9%	51.7	48.9	84.6	51.1
Vehicle Age	Two years or newer	690	26.7%	36.8	29.3	20.1	27.8
Vehicle Maneuver Prior Crash	Turning left	576	17.7%	132.7	160.2	144.3	125.4
Driver Age	75 years or older	363	11.3%	57.4	90.0	138.2	74.0
Passenger Age	75 years or older	481	14.8%	36.1	64.3	92.2	51.0

Source: Computed by CUTR FARS 1994-1998. A number in bold indicates that the difference in shares between Florida and the corresponding state group is not statistically different at the 0.05 level.

Table B-3. Results for Non-Motorists from Level-One Analysis

FARS Variable	FARS Values	Problem Size		State Group			
		Number	Share	Safest	Safer	Less Safe	All
Number of Lanes	4 lanes	1,012	30.8%	78.9	82.2	280.8	79.2
	6 lanes	413	12.6%	586.7	696.7	3008.2	369.1
Relation to Junction	Intersection	629	19.2%	21.6	96.3	78.5	40.3
Functional Classification	Urban other freeway	518	15.8%	235.5	260.8	928.7	197.6
Roadway Ownership	U.S. highway	948	28.9%	240.3	80.7	45.6	99.3
	State highway	980	29.9%	26.4	53.3	24.0	28.8
Speed Limit	26-46 mph	2,310	70.4%	27.0	45.1	30.7	28.4
Traffic Control Device	Regulatory sign	699	21.3%	528.0	533.2	474.4	299.9

FARS Variable	FARS Values	Problem Size			State Group		
		Number	Share	Safest	Safer	Less Safe	All
Traffic-Way Flow	Divided with no barrier	1,602	48.8%	90.6	78.2	40.4	63.0
Other Moving Violations	At least one other moving conviction	751	23.0%	23.7	73.0	81.0	38.0
Suspensions/Revocations	At least one suspension/revocation	452	13.9%	22.2	54.0	53.7	30.8
Person Factor	Walking/riding, etc., in roadway	1,516	46.2%	150.1	78.8	52.3	82.7

Source: Computed by CUTR from FARS 1994-1998. A number in bold indicates that the difference in shares between Florida and the corresponding state group is not statistically different at the 0.05 level.

Appendix C: Results from Exposure Analysis

Table C-1. Changes from Exposure Analysis in Level-One Analysis Results for Drivers

FARS Variable	FARS Value	Level-One Analysis				Exposure Analysis			
		M25	L25	HI	All	M25	L25	HI	All
Light Condition	Dark but lighted	18	79	118	48	**34**	**29**	**72**	**35**
Manner of Collision	Angle	30	40	45	33	-2	-3	4	-1
Number of Lanes	4 lanes	138	209	291	158	-7	15	-7	3
	6 lanes	977	1,739	1,918	702	-13	13	**129**	9
Profile	Level	22	30	48	28	3	2	11	4
Relation to Junction	Intersection	56	71	124	66	15	14	50	19
Relation to Roadway	Shoulder	142	225	295	164	**298**	**451**	**594**	**333**
	Off roadway	66	47	-19	29	**4**	**-21**	**-83**	**-29**
Functional Classification	Urban other freeway	122	226	851	176	-46	-15	2	-24
	Urban local	101	65	200	87	-14	-3	-13	-5
Land Use	Urban	16	59	95	39	-5	-6	19	-1
Roadway Ownership	Municipality	29	184	65	66	**22**	**19**	**61**	**24**
Speed Limit	26-45 mph	50	100	49	59	0	1	6	1
Traffic Control Device	Traffic signal	82	134	161	100	24	24	83	29
	Regulatory sign	198	173	212	161	74	75	73	64
Traffic-Way Flow	Divided with no barrier	168	120	98	115	1	-4	16	1
Vehicle Body Type	Motorcycles	7	62	63	31	**-20**	**-9**	**20**	**-9**
Initial Impact Point	9 o'clock point	38	29	67	36	**62**	**32**	**53**	**45**
Role in Collision	Struck	74	67	93	67	**58**	**39**	**67**	**47**
Non-Speeding Moving Violations Convictions in 3 Years	At least on e in 3 years	28	68	82	47	-14	-19	-27	-15
Vehicle Maneuver Prior Crash	Turning left	119	122	127	107	**136**	**114**	**197**	**120**
Driver Age	75 years or older	43	53	76	48	**11**	**2**	**11**	**8**

Source: Computed by CUTR from FARS 1994-1998. A bold number indicates that relative exposure between the two groups in question is statistically not different from one at the 0.05 level.

Table C-2. Changes from Under- to Over-Representation for Drivers

FARS Variable	FARS Value	Problem Size		Level-One Analysis				Exposure Analysis			
		Number	Share	M25	L25	HI	All	M25	L25	HI	All
Number Drunk Drivers	One	2,406	33.1%	-9.3	-6.4	-7.6	-7.4	81.5	72.5	74.0	72.2
Manner of Collision	Head-on	980	22.3%	-42.2	-49.1	-49.2	-44.6	48.3	47.0	35.2	44.1
Number of Lanes	2 lanes	4,171	57.3%	-26.6	-31.6	-34.6	-29.0	21.2	15.3	15.2	16.3
Profile	Grade	810	11.1%	-55.9	-57.9	-68.0	-58.4	30.2	43.4	29.0	31.8
Relation to Junction	Non junction	4,456	61.2%	-14.2	-16.6	-21.0	-15.8	39.5	43.6	34.9	37.7
Land Use	Rural	3,676	50.5%	-10.9	-26.3	-32.2	-21.2	14.3	22.0	11.1	15.2
Speed Limit	46+ mph	3,346	46.0%	-22.4	-35.3	-23.8	-26.9	13.8	19.1	8.4	15.1
Traffic Control Device	No control device	3,935	54.1%	-30.6	-31.3	-33.1	-30.1	9.9	12.5	7.5	9.8
Traffic-Way Flow	Not divided	3,828	52.6%	-23.5	-28.4	-28.4	-25.3	6.8	3.5	-4.3	3.2

Source: Computed by CUTR from FARS 1994-1998. A bold number indicates that relative exposure between the two groups in question is statistically not different from one at the 0.05 level.

Table C-3. Changes from Exposure Analysis in Level-One Analysis Results for Passengers

FARS Variable	FARS Value	Level-One Analysis				Exposure Analysis			
		M25	L25	HI	All	M25	L25	HI	All
Light Condition	Dark but lighted	13.3	72.7	132.5	45.0	**37.8**	**22.3**	**62.3**	**32.5**
Manner of Collision	Angle	31.1	44.4	44.5	34.9				
Number of Lanes	4 lanes	142.7	217.2	272.3	160.5	-6.5	10.4	-16.2	-2.5
Number of Lanes	6 lanes	954.0	1,898.0	1,760.6	699.3	21.9	**-3.0**	**-25.2**	-4.1
Profile	Level	24.0	29.5	45.2	27.9	2.3	2.0	4.1	2.4
Relation to Junction	Intersection	57.9	74.8	116.8	67.0	22.5	16.6	38.9	20.3
Relation to Roadway	Shoulder	72.2	142.6	172.0	99.0	**294.8**	**448.8**	**498.8**	**337.9**
Functional Classification	Urban other freeway	148.2	309.7	1,296.0	217.1	-35.0	-6.1	**-15.2**	-20.0
Functional Classification	Urban local	83.7	50.6	194.6	74.2	-10.7	**-4.1**	-26.2	-6.9
Land Use	Urban	15.9	64.0	100.3	41.5	0.3	-4.2	5.5	-0.7
Roadway Ownership	Municipality	12.9	161.7	57.6	51.3	**18.2**	-4.6	**15.3**	**8.3**
Speed Limit	26-45 mph	56.4	106.4	61.9	66.4	2.5	5.4	13.3	3.3
Traffic Control Device	Traffic signal	97.8	161.2	180.2	116.7	20.1	2.4	6.2	10.0
Traffic Control Device	Regulatory sign	160.5	135.6	167.6	130.6	**61.5**	43.1	47.0	44.9
Traffic-Way Flow	Divided with no barrier	142.4	100.8	72.5	95.2	94.0	84.5	51.8	71.5
Initial Impact Point	3 o'clock point	51.7	48.9	84.6	51.1	**62.8**	**20.4**	**52.7**	**39.3**
Vehicle Age	Under 3 years old	36.8	29.3	20.1	27.8	-6.9	**-6.4**	-23.1	**-9.6**
Vehicle Maneuver Prior Crash	Turning left	132.7	160.2	144.3	125.4	**160.2**	**184.0**	**217.9**	**155.0**
Driver Age	75 years or older	57.4	90.0	138.2	74.0	**-17.1**	**-16.5**	**-6.1**	**-14.2**

Source: Computed by CUTR from FARS 1994-1998. A bold number indicates that relative exposure between the two groups in question is statistically not different from one at the 0.05 level.

Table C-4. Changes from Under- to Over-Representation for Passengers

FARS Variable	FARS Value	Problem Size		Level-One Analysis				Exposure Analysis			
		Number	Share	M25	L25	HI	All	M25	L25	HI	All
Number Drunk Drivers	One	859	26.4%	-13.7	-14.9	-14.5	-13.6	71.6	50.7	24.6	52.4
Manner of Collision	Head-on	340	16.3%	-49.0	-57.8	-56.5	-52.4	19.7	22.6	24.6	23.3
Number of Lanes	2 lanes	1,696	52.2%	-31.3	-36.7	-38.8	-33.7	5.1	1.6	5.3	3.7
Profile	Grade	332	10.2%	-59.8	-60.0	-69.4	-60.9	74.4	88.1	95.4	82.0
Relation to Junction	Non junction	1,819	56.0%	-17.6	-20.9	-24.0	-19.3	25.3	32.9	31.2	28.6
Land Use	Rural	1,633	50.3%	-11.2	-27.6	-33.1	-22.1	4.9	13.2	10.7	9.4
Number of Crashes	One crash in 3 years	271	8.3%	-39.6	-48.8	-39.2	-41.9	63.2	54.1	60.5	58.8

Source: Computed by CUTR from FARS 1994-1998. A bold number indicates that relative exposure between the two groups in question is statistically not different from one at the 0.05 level.

Table C-5. Changes from Exposure Analysis in Level-One Analysis for Non-motorists

FARS Variable	FARS Value	Level-One Analysis				Exposure Analysis			
		M25	L25	HI	All	M25	L25	HI	All
Light Condition	Dark	61.5	-2.5	-9.6	17.9	**57.9**	12.1	8.7	28.0
Number of Lanes	4 lanes	78.9	82.2	280.8	79.2	-18.9	-46.1	-3.7	-31.5
	Six lanes	586.7	696.7	3008.2	369.1	-27.4	**-64.6**	**1.4**	-47.6
Relation to Junction	Intersection	21.6	96.3	78.5	40.3	**-19.2**	**-29.2**	**-25.4**	**-26.7**
Functional Classification	Urban other freeway	235.5	260.8	928.7	197.6	**105.4**	27.2	14.7	29.5
Roadway Ownership	U.S. highway	240.3	80.7	45.6	99.3	103.2	**76.5**	**56.3**	**69.3**
	State highway	26.4	53.3	24.0	28.8	78.2	**80.7**	86.0	71.1
Speed Limit	26-46 mph	27.0	45.1	30.7	28.4	-8.8	-23.3	-8.4	-15.0
Traffic Control Device	Regulatory sign	528.0	533.2	474.4	299.9	-32.3	-37.5	-24.7	-39.2
Traffic-Way Flow	Divided with no barrier	90.6	78.2	40.4	63.0	-24.5	-17.5	-30.0	-23.4

Source: Computed by CUTR from FARS 1994-1998. A bold number indicates that relative exposure between the two groups in question is statistically not different from one at the 0.05 level.

Appendix D: Results from Multi-Factor Analysis

Table D-1. Over-Representation of Non-Motorist Fatalities in General

FARS Variable	FARS Value	Problem Size		State Group			
		Number	Share	Safest	Safer	Less Safe	All
Person Type	Non-Motorists	3,282	23.7%	37	94	102	59
Alignment	Straight	3,094	26.4%	23	75	79	44
	Curved	183	8.6%	80	151	170	109
Light Condition	Day Light	986	15.7%	**13**	91	117	46
	Dark	1,141	28.5%	103	112	121	97
	Dark but Lighted	1,014	34.3%	**10**	32	18	15
Profile	Level	2,982	24.5%	24	80	77	43
	Grade	250	17.9%	70	118	115	91
Relation to Junction	Non-Junction	2,337	27.0%	61	108	127	80
	Intersection	629	15.6%	**12**	130	74	42
	Intersection Related	200	32.3%	-33	**16**	**-6**	**-17**
Land Use	Urban	2,303	30.5%	10	38	44	20
	Rural	979	15.5%	116	126	95	102
Roadway Ownership	Interstate	167	11.5%	**2**	**1**	**30**	**6**
	U.S. Highway	948	30.1%	142	211	187	143
	State Highway	980	25.7%	93	169	169	111
	County Road	188	14.1%	**27**	61	75	45
	Municipality	725	26.3%	-27	**0**	**5**	**-16**
Traffic Control Device	None	2,190	28.1%	56	105	120	76
	Traffic signal	362	19.2%	-31	48	58	-7
	Regulatory sign	699	17.4%	185	364	288	150
Traffic-Way Flow	Not Divided	1,627	23.0%	56	115	138	82
	Divided with no barrier	1,602	24.2%	**7**	66	56	30
Person Age	1-5 Years Old	81	37.9%	-3	33	58	19
	6-15 Years Old	290	42.2%	10	54	63	31
	16-24 Years Old	329	12.2%	64	100	126	79
	25-64 Years Old	1,879	26.5%	57	108	112	74
	65-74 Years Old	289	22.9%	5	96	104	37
	75 Years or Older	413	22.2%	-7	72	69	19

Source: Computed by CUTR from FARS, 1994-1998. A number in bold indicates that the difference in shares between Florida and the corresponding state group is not statistically different at the 0.05 level.

Table D-2. Over-Representation of Non-Motorist Fatalities Related to Activities in Roadway

FARS Variable	FARS Value	Problem Size		State Group			
		Number	Share	Safest	Safer	Less Safe	All
Person Factor	Non-motorist activities in roadway	1,516	46.2%	150	79	52	83
Light Condition	Day Light	357	36.2%	171	130	66	112
	Dark	637	55.8%	85	42	30	43
	Dark but Lighted	477	47.0%	167	122	108	111
Number of Lanes	2 lanes	596	42.0%	110	49	22	58
	4 lanes	529	52.3%	222	141	128	108
	6 lanes	238	57.6%	242	150	**447**	52
Functional Classification	Urban Interstate	56	51.9%	89	70	93	72
	Urban Other Freeway	234	45.2%	110	76	**81**	50
	Urban Principal Arterial	320	44.8%	233	162	125	150
	Urban Minor Arterial	166	41.6%	190	106	110	124
	Urban Local	214	44.2%	151	104	47	90
Land Use	Urban	1,015	44.1%	173	103	100	107
	Rural	501	51.2%	87	54	31	48
Roadway Ownership	Interstate	89	53.3%	93	77	75	74
	U.S. Highway	447	47.2%	127	83	34	53
	State Highway	428	43.7%	141	60	19	64
	County Road	84	44.7%	101	46	**14**	54
	Municipality	328	45.2%	204	113	141	141
Traffic Control Device	No Device	1043	47.6%	127	73	49	76
	Highway traffic signal	135	37.3%	550	405	204	268
	Regulatory sign	327	46.8%	343	264	70	67
Traffic-Way Flow	Not divided	755	46.4%	131	65	24	68
	Divided with no barrier	737	46.0%	199	124	108	98
Gender	Male	1,102	45.8%	129	69	49	72
	Female	414	47.2%	209	109	62	113

Table D-2. Over-Representation of Non-Motorist Fatalities Related to Activities in Roadway

FARS Variable	FARS Value	Problem Size		State Group			
		Number	Share	Safest	Safer	Less Safe	All
Person Age	Under 6 Years Old	41	50.6%	263	186	110	166
	6-15 Years Old	127	43.8%	196	211	77	139
	16-24 Years Old	158	48.0%	93	38	35	50
	25-64 Years Old	879	46.8%	114	60	45	64
	65-74 Years Old	120	41.5%	213	86	61	109
	75 Years or Older	191	46.2%	333	156	76	158

Source: Computed by CUTR from FARS, 1994-1998. A number in bold indicates that the difference in shares between Florida and the corresponding state group is not statistically different at the 0.05 level.

Appendix E: Summary of Results

Table E-1. Summary of Overall Results

Category	Problem Areas	Drivers			Passengers			Non-motorists		
		Deaths	**Share**	**DOR[1]**	**Deaths**	**Share**	**DOR**	**Deaths**	**Share**	**DOR**
Behavior	Crashes - 1 drunk driver	2,406	33%	72	859	26%	52			
	Drivers -1crash in 3 years				271	8%	59			
	Non-motorists having activities in roadway [2]							1,516	46%	83
	Drivers with at least one non-speed moving violation in 3 years [2]							743	23%	38
	Persons - 75 or older [2]				481	15%	51			
	Drivers with at least one suspension or revocation in 3 years [2]							452	14%	31
Environ -ment	Light Condition- Dark but lighted	1,294	18%	35	631	19%	33			
	Light Condition- Dark							1,141	35%	28
Vehicle	Maneuver -Turning left	806	11%	120	576	12%	155			
	Collision – Head on	980	13%	44						
	Initial Impact Point- 9 o'clock point	1,195	18%	45						
	Initial Impact Point- 3 o'clock point				780	24%	39			
Engineering	Relation to Junction- Non junction	4,456	61%	38	1,819	56%	29			
	Traffic Control Device- Regulatory Signs	2,339	32%	64	965	30%	45			
	Traffic Control Device- Traffic Signals	910	13%	29						
	Relation to Roadway- Shoulder	875	12%	333	283	9%	338			
	Traffic-Way Flow- Divided with no barrier				1,630	50%	72			
	Roadway Ownership- State highways							980	30%	71
	Roadway Ownership- U.S. highways							948	29%	69
	Roadway Profile- Roads at grade	810	11%	32	332	10%	82			
	Functional Classification- Urban non-interstate freeway							518	16%	30

Source: Compiled by CUTR.
Notes: 1. DOR stands for "Degree of Over-Representation." 2. These problem areas were not evaluated under the Exposure analysis because quasi-induced exposure cannot be measured for them.

Table E-2. Indexing Problem Areas

Problem Areas	**Drivers**		**Passengers**		**Non-Motorists**		**Total Index[3]**
	DOR[1]	**Index[2]**	**DOR[1]**	**Index[2]**	**DOR[1]**	**Index[2]**	
Non- Junctions	38	1,227	29	409			1,636
One Drunk Driver	72	1,007	52	294			1,301
Regulatory Sign	64	913	45	299			1,212
Shoulder	333	673	338	218			891
Turning Left	120	440	155	350			790
Having Activities in Roadway [4]					83	688	688
Divided with no Barrier			72	682			682
Dark but Lighted	35	335	33	157			492
State Highway					71	407	407
U.S. Highway					69	387	387
Initial Impact Point – 9 o'clock point	45	371					371
Roads on Grade	32	196	82	150			346
Head-on Collision	44	299					299
Dark Condition					28	250	250
3 clock Point Impact			39	219			2193
Driver with at least one non-speeding conviction in 3 years [4]					38	205	205
Traffic Signal	29	205					205
Persons 75 years or older [4]			51	162			162
Urban Non-Interstate Freeway					30	120	120
Drivers with at least one suspension or revocation in 3 years [4]					31	107	107
Drivers with one prior crash in 3 years			59	101			101

Source: Compiled by CUTR.
Notes: 1. DOR stands for "Degree of Over-Representation." The measure from the Exposure analysis was used if the relative exposure between Florida and the nation as a whole is statistically different. Otherwise, the measure from the Level-One Analysis was used.
2. The index indicates the potential reduction in the number of fatalities related to a certain area of concern if the over-representation in this area of concern were eliminated. The index is calculated as $R_j = V\,[Q_j / (100 + Q_j)]$ for state group j, where V is the number of fatalities related to a given problem area and Q_j is the degree of over-representation of this problem area in Florida relative to state group j. 3. The total index sums those for individual person types for a given problem area. 4. These problem areas were not evaluated under the Exposure analysis because quasi-induced exposure cannot be measured for them.